8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

DIRECT TESTIMONY OF MITCHELL MILLER

ON BEHALF OF

PITTSBURGH UNITED

April 5, 2019

Revised May 6, 2019

Topics Addressed:

Termination Procedures

The Discontinuance of Service to Leased Premises Act (DSLPA)

Collections

Low Income Programs

Community Environmental Project (CEP)

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

VERIFICATION

I, Mitchell Miller, hereby state that the facts set forth by me in the foregoing documents:

- Pittsburgh UNITED Statement C-1, the Direct Testimony of Mitchell Miller on Behalf of Pittsburgh UNITED
- Pittsburgh UNITED Statement C-1SR, the Surrebuttal Testimony of Mitchell Miller on Behalf of Pittsburgh UNITED
- Pittsburgh UNITED Statement C-1-SUPP-R, the Supplemental Rebuttal Testimony of Mitchell Miller on Behalf of Pittsburgh UNITED

are true and correct to the best of my knowledge, information, and belief, and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements made herein are subject to the penalties of 18 Pa. C.S. § 4904 (relating to unsworn falsifications to authorities).

Mitchell Miller
Witness on behalf of Pittsburgh UNITED

August 20, 2019

PREPARED DIRECT TESTIMONY OF MITCHELL MILLER

I. BACKGROUND AND QUALIFICATIONS

Q: Please state your name, occupation, and business address.

A: Mitchell Miller. I currently provide consulting services regarding utility programs that promote the public interest, with a focus on programs which assist low income households to afford and maintain utility services. My address is 60 Geisel Road, Harrisburg, PA, 17112.

Q: Briefly outline your education and professional background.

A: As my attached resume shows, I received a B.S. in Community Development from Pennsylvania State University, where I graduated *cum laude* in 1974, and an M.A. in Public Administration from Shippensburg University in 1984. I have over 35 years of experience in the development, implementation, and evaluation of program design for residential utility consumers. The focus of my work has concerned education, energy efficiency, credit and collections, and customer assistance programs.

After serving as a research analyst at both the Pennsylvania Governors Action Center and the Pennsylvania Public Utility Commission ("Commission"), I was appointed Chief of the Commission's Division of Research and Planning in 1978 and, in 1992, I was designated as the Director of the Bureau of Consumer Services, where I served until my retirement from the Commission in 2009.

Following my retirement from the Commission in 2009, I served for over three years as a consultant to the Pennsylvania Department of Community and Economic Development ("DCED") on weatherization and energy efficiency for the Pennsylvania Weatherization Assistance Program (WAP). My resume is attached as Appendix A.

Q: Please describe the focus of your work over the past thirty-five years.

A: During my tenure at the Commission, I was primarily engaged in activities relating to regulatory policy involving residential customer service, complaint handling, credit and collections, and universal service, including customer assistance programs and low income energy efficiency and conservation. The Bureau of Consumer Services has regulatory authority and responsibility for policy development for all areas of consumer services including resolving consumer complaints and problems, enforcing consumer regulations, developing, implementing and evaluating programs involving complaint handling, complaint analysis, collections, enforcement of consumer regulations, utility customer assistance programs and low income conservation. My focus at DCED was the creation of a performance-based Weatherization Assistance Program system, dedicated to a high standard of quality, compliance, and production.

Q: Do you have any relevant experience in applying the Commission's rules and regulation to newly regulated municipal utilities placed under the Commission's jurisdiction by legislation?

A: Yes. In 2000, as the then-Director of the Commission's Bureau of Consumer Services, I oversaw the transition of the Philadelphia Gas Works (PGW) to Commission oversight and control. In this role, I was responsible for ensuring that PGW's policies and practices fully adhered to all applicable laws, regulations, and policies for residential billing, collections, and terminations. The circumstances of PGW at the time were substantially similar to those currently faced by the Pittsburgh Water and Sewer Authority (PWSA). Specifically, both entities were facing aging infrastructure, a poor management history, inadequate capital and revenue structure, lax compliance of their own internal rules and regulations, and the need to raise rates while seeking to

ensure affordability of service for those least able to afford service. Furthermore, both entities were required by legislative action to adhere to PUC rules and regulations on a short time frame.

Q: Do you have experience in addressing issues of due process and affordability for municipal water utilities?

A: Yes. From 2013 to 2016, I served as a policy consultant to the Philadelphia Water Department (PWD). In this role, I provided consulting services to PWD that resulted in improving the informal dispute and hearing process. Specifically, I identified and resolved disagreements between advocates and PWD regarding which company actions are subject to consumer appeals; how consumers are notified of appeal rights; and how stays on enforcement should be implemented pending consumer appeals. I also worked with PWD to structure and implement a water assistance program and deferred payment agreements.

Q: Please discuss your experience on issues of low income utility affordability.

A: During my tenure, the Commission emerged as a national leader in research, development, and oversight of programs addressing credit and collection issues affecting low income utility consumers. I was responsible for evaluating utility and Commission customer service programs, identifying problems and making recommendations for change. These activities led to the recognition of the need for the development of integrated programs for low income consumers. As director of BCS, I was responsible for the development, oversight, and monitoring of the initial pilot and then the statutorily required low income Universal Service Programs. Each of these programs is structured to provide a different form of assistance to low income customers to enable those customers to afford and maintain basic service. For example, the Customer Assistance Program (CAP) provides alternatives to traditional collection methods for low income, payment troubled utility customers, and the Low Income Usage Reduction Program (LIURP) is a targeted

weatherization program designed to assist low income households with the highest energy consumption, payment problems, and arrearages. These programs work in tandem and are designed to assist low income households to have affordable utility services and safe living environments while reducing utility collection and therefore benefitting other ratepayers.

I supervised the review and determination of thousands of low income consumer complaints and inquiries as well as the reviews of utility performance at handling these customer complaints and payment arrangement requests.

I directed the creation, development, and evaluation of the effectiveness and the expansion of the Universal Service Programs in Pennsylvania that are targeted toward low income households. These programs included CAP and LIURP, as well as the Customer Assistance Referral Evaluation program (CARES) and utility-funded hardship funds. Since the programs' inception, followed by the passage of the Electricity Generation and the Electric Customer Choice and Competition Acts, which required that the Commission ensure that universal service and energy conservation services are appropriately funded and available in each utility distribution territory, until about the time of my retirement in 2009, the Bureau of Consumer Services was responsible for Commission oversight of these programs.

Further, upon my retirement from the Commission, I served as a consultant to the Department of Community and Economic Development (DCED) on weatherization and energy efficiency, in particular the administration of the Weatherization Assistance Program (WAP) during the height of its funding after the American Recovery and Reinvestment Act (ARRA). I was instrumental in transforming the WAP program by creating a performance-based system, dedicated to a high standard of quality, compliance, and production. Innovations included introducing performance standards for production, quality and compliance and independent state

certification and training for all state WAP workers. I was also responsible for coordinating DCED's WAP program with the Commission's LIURP and Act 129 low income programs.

I have participated at the National Association of Regulatory Utility Commissioners ("NARUC"), the National Low Income Energy Consortium and the National Energy Utility Affordability Conference meetings, and have presented numerous sessions related to low income utility affordability. Most recently, I served on the board of directors of the Keystone Energy Efficiency Alliance ("KEEA") and as co-chair of the KEEA annual conferences, and I am a current member of the WAP Policy Advisory Council.

Q: Have you testified in any proceeding before the Pennsylvania PUC?

A: Yes. I have presented testimony in many proceedings before the PUC. A complete list is attached as the last page of my resume at Appendix A.

Q: Have you provided litigation support for the Commission?

A: Although I did not testify in any proceeding during my tenure at the Commission, I directed the Bureau's activities in policy development, as well as enforcement litigation to ensure compliance with customer service regulations and statutes.

Q: For whom are you testifying in this proceeding?

A: I am testifying on behalf of Pittsburgh UNITED.

II. SCOPE OF TESTIMONY / ISSUES ADDRESSED

Q: What is the purpose of your testimony?

A: The purpose of my testimony is to assess PWSA's policies, practices, and procedures to ensure that PWSA is in compliance, or has a reasonable plan to reach compliance, with all applicable statutes, regulations, and Commission policy. I will identify areas of deficiency in PWSA's current and planned practices, and recommend improvements to PWSA's implementation of Commission standards.

In assessing PWSA's compliance with applicable laws and regulations, I note that there are a number of complex legal questions at issue in this proceeding. I am not an attorney. While I attempt to note throughout my testimony where additional legal issues may be addressed in briefing, I am advised by counsel for Pittsburgh UNITED that I am not under any obligation to do so in order to preserve those issue(s) for further litigation. Specifically, Pittsburgh UNITED reserves the right to address any legal issues which are at issue in this case through briefing – regardless of whether I have specifically identified the issue in testimony.

Q: What issues do you plan to address in your testimony?

A: I will address the following issues, in this order:

- Termination of Service
- Discontinuance of Service to Leased Premises Act
- Collections
- Low Income Assistance Programs
- Community Environmental Project (CEP)

I note that while PWSA considers the Community Environmental Program (CEP) part of its low income assistance programs, I will address this program separately below. The CEP is a

unique project, which provides assistance to low income households to replace lead service lines. The considerations in assessing this project – which is proposed to be very limited in scope and duration – are very different from the considerations in assessing PWSA's plans for its other low income assistance programs – which provide direct bill payment assistance and/or protection from termination and do not have a proposed end date.

With regard to termination of service and collections issues, I note that my testimony will be limited in scope, and will respond only to the specific issues raised by PWSA witness Julie Quigley in Direct Testimony. (See PWSA St. C-4 at 7, 11-16 (discussing termination issues), and 17-20 (discussing collections issues)). Service termination and collections issues are directly related to PWSA's compliance with Chapter 14 of the Public Utility Code and Chapter 56 of the Commission's regulations. These issues were expressly reserved by the Commission for consideration in Stage 2 of this proceeding - which will commence in late 2019, after the conclusion of this proceeding.[1] Indeed, BCS was ordered to conduct a series of workshops to address Chapter 14 and 56 issues informally, with the goal of achieving consensus on various compliance issues and/or identifying outstanding issues with Chapters 14 and 56 to be further explored through litigation in Stage 2.[2]

Nevertheless, PWSA addressed certain issues that touch on Chapter 14/Chapter 56 compliance in their direct testimony. (PWSA St. C-4 at 7, 17-20). Thus, I will respond to PWSA's testimony on these limited issues and offer appropriate recommendations. However, I am advised by counsel that Pittsburgh UNITED nevertheless reserves the right to raise any and all issues

[1] Nov. 28, 2018 Secretarial Letter at 3.
[2] Nov. 28, 2018 Secretarial Letter at 4; March 22, 2019 Secretarial Letter; Reconsideration Order at 2.

associated with compliance with Chapter 14/Chapter 56 concerning termination of service and collections in the Stage 2 proceeding.

Q: Did you previously testify on behalf of Pittsburgh UNITED regarding PWSA's compliance with applicable statutes, regulation, and Commission policy?

A: Yes. I provided extensive direct, rebuttal, and surrebuttal testimony in the context of PWSA's recent water and wastewater rate proceedings, at docket numbers R-2018-3002645 (water) and R-2018-3002647 (wastewater). In relevant part, my testimony addressed PWSA's low income assistance programs and customer service policies and practices – much of which was deferred for resolution as part of this Compliance Plan proceeding.

Q: Have PWSA's policies and practices changed as a result of the Joint Settlement in the rate case?

A: While some of PWSA's policies and practices have since changed as a result of the recently approved Joint Settlement in that proceeding, most of PWSA's policies and practices remain as they were as of April 1, 2018 when PWSA came under the jurisdiction of the Commission. My testimony in that proceeding was entered into the record on November 14, 2018, by Administrative Law Judges Mark A. Hoyer and Conrad A. Johnson, and was filed with Secretary's Bureau on the same day.[3] PWSA agreed in the Joint Settlement that it would not object to the admission of "any testimony, documents, or answers to interrogatories exchanged throughout the course of [the rate proceeding]."[4]

---

[3] See Pa. PUC v. PWSA, Docket Nos. R-2018-3002645, -3002647, Letter Filing Preserved Testimony of Pittsburgh UNITED (filed Nov. 14, 2018).

[4] See Pa. PUC v. PWSA, Docket Nos. R-2018-3002645, -3002647, Recommended Decision, at 31, para. H.3 (order entered Jan. 17, 2019) (hereinafter RD).

Q: Are you seeking to incorporate by reference your testimony, and the testimony of other Pittsburgh UNITED witnesses from the rate case in this proceeding?

A: Yes. To avoid excessive duplication of the information I provided in PWSA's rate proceeding, I am incorporating my testimony by reference herein so that it can be considered in the context of this proceeding.[5] For that same reason, I will also reference relevant sections of testimony submitted in by Mr. Daniel Vitek, witness for Pittsburgh UNITED in PWSA's rate case proceeding.[6] Throughout my testimony, I will specifically reference relevant sections of this prior testimony with particularity to provide additional information, data, or context to my direct testimony in this proceeding. To the extent PWSA has made any changes to its policies, I will explain those changes and identify whether they have altered my assessment or recommendations.

III. TERMINATION OF SERVICE

Q: Please summarize the scope of your testimony regarding PWSA's termination of service processes and procedures.

A: As I mentioned above, the Commission expressly preserved issues related to Chapters 14 and 56 – which applies to residential customer billing, collections, and termination procedures – for litigation in Stage 2 of this proceeding. Nevertheless, the Stage 1 Staff Report posed several directed questions related to PWSA's process for service discontinuation, suspension, and

---

[5] 52 Pa. Code § 1.33 (Incorporation by reference); 52 Pa. Code § 5.407.
I am advised by counsel that, pursuant to section 5.407(a), Pittsburgh UNITED agrees to supply copies of this testimony if so required by the ALJs or the Commission. Furthermore, to the extent that I refer to specific portions of my previously submitted testimony or the testimony of Mr. Vitek, I will directly cite to those specific sections.

The testimony from PWSA's rate proceeding that I will incorporate herein by reference, includes:
Pittsburgh UNITED St. 2 (Miller Direct)
Pittsburgh UNITED St. 2-R (Miller Rebuttal)
Pittsburgh UNITED St. 2-SR (Miller Surrebuttal)
Pittsburgh UNITED St. 3 (Vitek Direct)
Pittsburgh UNITED 3-SR (Vitek Surrebuttal)

[6] Id.

termination.[7] PWSA witness Julie Quigley responded to these directed questions, offering limited testimony responding to: "(1) the advance notice time period within which customers must notify PWSA of a voluntarily [sic] request to discontinue service; and, (2) the language, format and method of providing suspension and termination notices to customers." (PWSA St. C-4 at 7:13-20). My testimony responds only to these issues raised by Ms. Quigley and the policies and practices she identified therein.

In response to Ms. Quigley's testimony, I identified three primary compliance issues. First, PWSA's notification procedures immediately prior to termination are inconsistent with Chapters 14 and 56, which require a utility employee to make personal contact with a responsible adult at the property immediately before terminating service to the residence. Second, PWSA's written notices of termination have a number of technical deficiencies and lack clarity; they should be revised to more appropriately advise consumers of their rights and obligations. Third, PWSA's proposed process for termination of service to a shared service line serving multiple premises is not consistent with the Commission's regulations, as it provides notice of termination when, in fact, PWSA has no intention of terminating those accounts for non-payment. I will address each issue in turn.

[7] See Stage 1 Staff Report at 8 (citing 52 Pa. Code § 65.12).

a. Procedures Immediately Prior to Termination

Q: Please explain PWSA's process for providing personal notice immediately prior to termination.

A: In answering that question, it is important to first explain that public utilities are required to notify customers of a pending termination at several crucial points and by specified means and methods prior to terminating service: [8]

(1) **10 Days Prior to Termination:** Section 56.91 requires public utilities to send a written notice of termination, the contents of which are carefully prescribed in the regulation.[9]

(2) **3 Days Prior to Termination:** Section 56.93 requires public utilities to attempt to make personal contact with the customer or a responsible adult occupant three days prior to termination of service, and is explicit in the manner and method for which this "3-day personal contact notice" must be provided.[10]

(3) **48 Hours Prior to Termination:** Section 56.95 requires public utilities to post notice at the service location 48 hours prior to termination during the winter months (December through March).[11]

(4) **Immediately Prior to Termination:** Section 56.94 requires public utilities "to attempt to make personal contact with a responsible adult at the residence of the customer" at the time service is terminated.[12]

---

[8] There are different termination rules for victims of domestic violence with a Protection from Abuse Order (PFA) or other court order with evidence of domestic violence. See 66 Pa. C.S. § 1417; 52 Pa. Code §§ 56.321 – 56.361. I understand from counsel that Pittsburgh UNITED intends to more closely assess PWSA's policies and practices relating to victims of domestic violence – including PWSA's process for terminating victims of domestic violence – in the context of the Stage 2 proceeding.

[9] 52 Pa. Code § 56.91; 66 Pa. C.S. § 1406(b)(1)(i).

[10] 52 Pa. Code § 56.93; 66 Pa. C.S. § 1406(b)(1)(ii).

[11] 52 Pa. Code § 56.95; 66 Pa. C.S. § 1406(b)(1)(iii). Victims of domestic violence with a PFA or other court order which contains evidence of domestic violence are to be provided with this additional 48-hour posted notice of termination year-round. 52 Pa. Code §§ 56.335.

[12] 52 Pa. Code § 56.94; 66 Pa. C.S. § 1406(b)(1)(iv) ("After complying with paragraphs (ii) and (iii), the public utility shall attempt to make personal contact with the customer or responsible adult *at the time service is terminated.*" (emphasis added)).

It is this last section, section 56.94 - *Procedures immediately prior to termination* - that is at issue.[13] The Commission's regulation provides that the utility may not complete the termination "[i]f evidence is presented which indicates that payment has been made, a serious illness or medical condition exists, or a dispute or complaint is properly pending or if the employee is authorized to receive payment and payment."[14]

Ms. Quigley explained in direct testimony that PWSA attempts to contact residential customers by phone three days prior to termination of service. (PWSA St. C-4 at 13:12-18). If unable to reach the customer, "PWSA field personnel go to the residence to post the written notice of termination." (PWSA St. C-4 at 13:12-18). PWSA's field personnel "will provide the PWSA Customer Service contact telephone number when they encounter customers during this process;" but they do not make any affirmative attempt to actually speak with a member of the household – either at the time the three-day notice is posted *or at the time service is actually terminated.* (PWSA St. C-4 at 13:12-18)[15]. Ms. Quigley argues that this policy is justifiable for two reasons: (1) PWSA's field personnel cannot accept payment in the field; and (2) PWSA asserts that attempting to affirmatively contact a customer about an imminent termination could place a technician at risk of physical harm. (PWSA St. C-4 at 13-14). Ms. Quigley cited "numerous occasions" where field personnel contacted the police for protection. (PWSA St. C-4 at 14:5-8). However, in response to discovery, she was able to provide documentation of only 17 instances over a period of more than three years (June 2015 through October 2018) where an account was "flagged for a police escort"

---

[13] Note that public utilities are also required to provide written notice immediately *after* service is terminated – either by "conspicuously" posting to the property or delivering notice "to a responsible adult person or occupant at the residence." 52 Pa. Code § 56.96; 66 Pa. C.S. § 1406(b)(1)(v).

[14] 52 Pa. Code § 56.94(1).

[15] Appendix B, UNITED III-1, III-2, III-2 Attach A.

as a result of "hostile interactions with customers."[16] Ms. Quigley did not further define or explain how PWSA classifies an interaction as "hostile" or the circumstances that result in a request for a police escort.

In short, I do not believe that PWSA's procedures immediately prior to termination are compliant with Commission regulation or applicable statutes. I am advised by counsel that many of the issues discussed by Ms. Quigley require legal analysis, and will be thoroughly addressed in briefing. Nevertheless, Ms. Quigley raised a number of policy reasons in support of PWSA's policies, which I will address.

Section 56.94 explicitly prohibits a utility employee from completing a termination if the employee is presented with evidence that the occupant is seriously ill or has satisfied the payment requirement.[17] In other words, it requires the employee to assess whether there are extenuating circumstances that would stop a termination *before* the termination proceeds – thereby avoiding possible severe consequences which may result. If a utility employee proceeds with a termination without ever attempting to make actual contact with an adult at the residence, there is no opportunity for the household to present the employee with evidence that could avoid an improper termination. For example, another provision of the regulations allow a household member to notify a utility employee that they are seeking a medical certificate which then requires the utility to stay termination for at least 3 days.[18] In the absence of attempted personal contact at the residence immediately prior to termination, this provision could not be fully effectuated. Additionally, receipt of payment – perhaps made hours or even minutes before the employee

[16] Appendix B, UNITED V-11, Supplemental Response.
[17] 52 Pa. Code § 56.94.
[18] 52 Pa. Code § 56.112.

arrives to terminate service – may also stop the termination, as would presenting proof that the household filed an informal complaint with the Commission consistent with 52 Pa. Code § 56.141. But pursuant to PWSA's current practice, residential customers are not afforded with a reasonable opportunity to present such evidence immediately prior to their termination – causing the customer to incur additional fees for reconnection, and potentially causing harmful consequences to the health and safety of household members and/or damage to the property due to the loss of water. If PWSA's employees were to simply knock on the door and attempt personal contact, customers would have the opportunity to avoid all of these negative consequences.

I note that I am not suggesting that PWSA's field employees must accept payment in the field or negotiate a payment arrangement. This is permitted, but is not a requirement in the regulations. That said, if a customer calls in to PWSA's call center and makes a payment or negotiates a payment arrangement over the phone prior to the field employee terminating service – even if it is while the field employee is at the residence to terminate service – this action should stop a termination. The point is, the customer or adult occupant must be given the opportunity – immediately prior to termination – to present the field employee with evidence or take immediate action that would stop the termination from occurring and prevent the resultant harm and additional costs that will otherwise attach.

While I am sensitive to the safety concerns Ms. Quigley notes, I do not believe that it outweighs the strong policy considerations that I described above. To be sure, the requirement of the regulations apply to *all* public utilities and, during my time at the Commission, I do not recall utilities raising public safety concerns in fulfilling the requirement to attempt personal contact at the time of termination. Indeed, Chapter 56 has gone through a number of proceedings over the years, resulting in numerous revisions to the termination process and procedure, but I do not recall

objections by utilities to the personal contact requirement in section 56.94 – which was in place as a regulatory requirement even before the General Assembly included the process in Chapter 14.[19] I believe it is a better practice to alert someone in the household that there is a utility employee on the property to avoid being mistaken for a trespasser. Indeed, a utility employee could place themselves at risk if they enter a property *without* attempting to notify the customer of their presence on the property. In fact, Ms. Quigley's anecdotal account of prior threats and assaults by the occupant ostensibly occurred under PWSA's current policy of terminating service *without* attempting actual personal contact with an adult at the residence to advise the occupant that they are on the premise – and to provide them with an opportunity to present evidence that could stop the termination from taking place.[20] Ultimately, I believe the Commission's regulations require an attempted personal contact with an adult occupant at the residence at the time of termination. This important step in the termination process protects both the health and safety of the residential customer and the utility employee. To the extent there is ever a security threat to utility employees while performing a termination, PWSA could continue its current practice of contacting local law enforcement for an escort rather than terminate service without identifying one's self as a utility worker.

---

[19] See 52 Pa. Code §§ 56.94, 56.334; see also Rulemaking to Amend the Provisions of 52 Pa. Code, Chapter 56 to Comply with the Provisions of 66 Pa. C.S., Chapter 14, Docket No. L-00060182, Final Rulemaking Order (order entered Feb. 24, 2011); Rulemaking to Amend the Provisions of 52 Pa. Code, Chapter 56 to Comply with the Amended Provisions of 66 Pa. C.S. Chapter 14, Docket No. L-2015-2508421, Final Rulemaking Order, (order entered Feb. 28, 2019).

[20] Appendix B, UNITED III-1, III-3.

Q: Are you aware of any other public utilities that do not attempt to make personal contact with a responsible adult immediately prior to termination?

A: No, I am not aware of nor do I recall there being any public utilities, regulated by the Commission, that do not attempt to make personal contact at the residence immediately prior to termination.

I reviewed the facts contained in the formal complaint decisions cited by Ms. Quigley in her direct testimony as evidence of other utility policies, but each decision appeared to address only the provision of the 3-day notice (52 Pa. Code § 56.93) – not the utilities' procedures *immediately prior to termination* (52 Pa. Code § 56.94). In fact, in two of the three cases referenced by Ms. Quigley, the facts clearly indicate that the utility employees *affirmatively knocked on the door* immediately before terminating service to the residence.[21] I am advised by counsel that the legal aspects of these decisions, as related to this issue, will be further addressed in briefing.

Q: What is your recommendation regarding PWSA's practices immediately prior to termination of service?

A: PWSA should revise its practices. Specifically, its field employees should knock on the door of the residence immediately prior to termination of service and attempt to make personal contact before terminating water service at the curb stop. In turn, field employees should receive periodic training on medical, domestic violence, and landlord/tenant protections, and other circumstances that they may encounter which would cause them to not proceed with a termination

[21] Spotti v. Equitable Gas Co., LLC, Docket No. C-2012-2305688, Initial Decision at 5, para. 19 (ID entered May 24, 2013; Final Order entered July 19, 2013); Juffe v. Metropolitan Edison Co., Docket No. F-2010-2192131, Initial Decision at 4, para. 13 (ID entered Mar. 16, 2012; Final Order entered May 4, 2012).

of service. This training should be developed in consultation with the Bureau of Consumer Services and interested stakeholders to ensure that PWSA's field employees are appropriately trained. In terms of timing, I believe all new employees should receive the training prior to performing any terminations, and all current employees should be trained as soon as practicable – and then at least annually prior to the conclusion of the winter moratorium.

b. Notice of Termination[22]

Q: Do PWSA's written notices conform to the Commission's regulations?

A: No, not entirely. With regard to PWSA's 10-day notices, I identified the following deficiencies (PWSA St. C-4, Exhibit JAQ/C-2):

- PWSA's notice does not clearly advise customers of the full range of options to avoid termination of service, as required in section 56.91(b)(4).
- Information about universal service programming which may prevent termination is confusing, and fails to note that grant assistance may be available to prevent termination of service, consistent with 56.91(b)(9). Notice of PWSA's Bill Discount Program is included on the notice of termination, but advises that "[e]nrollment in the bill discount program will not stop the shut off of service." Enrollment in PWSA's Hardship Fund provides grant assistance to those facing an imminent termination, and may stop a service termination, but there is no mention of the availability of this program on the notice of termination.
- There is no information in Spanish – or any other language – on PWSA's notices directing Spanish-speaking (or limited English) customers to numbers to call for information or translation assistance, consistent with section 56.91(b)(17).

With regard to PWSA's 3-day written termination notice, I identified the following deficiencies (PWSA St. C-4, Exhibit JAQ/C-3):

- PWSA's 3-day written notice indicates that it is valid for up to 60 days. This is incorrect. While a 10-day notice of termination is valid for up to 60 days, the 3-day notice of termination is only valid for up to 3 days prior to the termination.

[22] Note that I will address PWSA's 30-day notice of termination to tenants below, when I discuss PWSA's compliance with the Discontinuance of Service to Leased Premises Act (DSLPA).

PWSA should revise its termination notices accordingly to eliminate these technical issues to ensure that its notices are fully compliant with Commission regulation. The revised notices should be subsequently shared with the Bureau of Consumer Services and PWSA's Low Income Assistance Advisory Committee, and should be submitted as an Exhibit as part of the Stage 2 proceeding, which will look holistically at PWSA's compliance with Chapter 56. I note that Ms. Quigley explained in direct testimony that PWSA recently contracted with a language translation and interpretation provider, which I was pleased to see; however, it remains unclear when PWSA's notices will be revised to include information in Spanish or other languages.[23]

Q: Do you have any other observations about PWSA's notice of termination?

A: Yes. In addition to the above technical issues, I also believe PWSA should revise its 10-day and 3-day written termination notices to more clearly and conspicuously disclose the required information. As is, the notices are not sufficiently clear and conspicuous to properly advise consumers of various protections, how to file a complaint with the Commission, information about adult occupancy liability, or PWSA's reconnection fees.

As drafted, PWSA's notices provide all the vast majority of information about these various consumer protections under the bold and capitalized heading: MEDICAL EMERGENCY NOTICE. (PWSA Exhibit JAQ/C-2). The notices do not contain any subsequent heading, despite the fact that critical information unrelated to medical protections follows. (Id.) And, unrelated protections are often jumbled in the same paragraph, rather than appearing in separate and distinct sections in order to be easily identified. For example, notice to tenants is also buried in the same paragraph which notifies consumers about the availability of protections for victims of domestic

[23] See Appendix B, UNITED III-4.

violence. This information should have separate headings, or at least appear in separate paragraphs throughout the notice. (Id.)

Q: Do you have any specific recommendations for revisions to PWSA's written notices?

A: Yes. I believe PWSA should further revise its written termination notices consistent with my recommendations above, and submit the revised notices for review in Stage 2 to allow for a holistic review of PWSA's Chapter 56 termination policies.

c. Termination of Service to Multiple Premises

Q: Was PWSA's process for terminating service to multiple premises with a shared water service line previously identified as a compliance issue in PWSA's rate proceeding?

A: Yes. While it was not specifically raised in the proceeding by any of the parties, the Administrative Law Judges identified in their Recommended Decision that PWSA's tariff "[a]llows termination of service to multiple premises on shared main connection if one customer becomes delinquent."[24] The ALJs noted "PWSA must address and comply with 66 Pa. C.S. § 1406."[25] While the Commission ultimately approved the tariffs without requiring PWSA to make this recommended change, it deferred resolution of the ALJ's recommendation for determination as part of PWSA's Compliance Plan proceeding.[26]

Q: What is PWSA's current process for termination of service to multiple premises which have a shared water service line?

A: In direct testimony, Ms. Quigley explained that "while PWSA's current practice is to post notice of the non-payment of party line accounts, PWSA does not terminate service based on one

---

[24] RD at 138.
[25] Id.
[26] Pa. PUC v. PWSA, Docket Nos. R-2018-3002645, -3002647, Final Order at 11 (order entered Feb. 27, 2019) (hereinafter Final Order).

person on the party line not paying for service." (PWSA St. C-4 at 39). In response to interrogatories, Ms. Quigley clarified that notice of non-payment "is posted only for the customer with the delinquency" – and that a "notice of non-payment" may be any of the termination notices provided in PWSA Exhibits JAQ/C-2 through C-7.[27] It is unclear how often this situation arises for residential party lines. PWSA has 484 flat water accounts, "of which an unknown number are party service lines."[28] Unfortunately, PWSA does not know how often a residential party line is terminated in a given year[29]; however, I believe that number is likely small relative to PWSA's total number of residential customer accounts.

Q: Do you have any concerns about this process?

A: Yes. Chapter 56 expressly prohibits public utilities from threatening termination "when it has no present intent to terminate service *or* when actual termination is prohibited."[30] As explained above, PWSA admittedly has no present intent to terminate service *and* actual termination is prohibited given termination to one premises on a shared service line would terminate service to other residential properties.[31] Thus, PWSA's current process is not compliant with Chapter 56.

Q: Do you have any recommendations for how PWSA could collect from delinquent accounts served by a party line?

A: Yes. PWSA should create a separate notice of nonpayment, which contain much of the same information that is contained on the termination notice, but without the threat of termination.

---

[27] Appendix B, UNITED V-8.
[28] Appendix B, UNITED V-9.
[29] Appendix B, UNITED V-10.
[30] 52 Pa. Code § 56.99 (Use of termination notice solely as a collection device prohibited) (emphasis added).
[31] See 52 Pa. Code § 56.83.

PWSA should also update its tariff to clarify that it does not terminate service to residential customers on a shared service line.

IV. DISCONTINUANCE OF SERVICE TO LEASED PREMISES ACT (DSLPA)[32]

Q: Please briefly describe the tenant protections available through DSLPA.

A: DSLPA, which is found in Chapter 15, subchapter B of the Public Utility Code, protects tenants from the loss of service to their leased premises – either because the landlord stops paying for the service or voluntarily requests that service to the leased premises be discontinued. Daniel Vitek, witness for Pittsburgh UNITED in the recent rate case, summarized the protections available to tenants, and the corresponding duties and liabilities of a public utility and landlord, which I am incorporating by reference herein.[33] In short, DSLPA "protects tenants from the loss of landlord-paid utility service."[34] In other words, it provides tenants with the right to continued utility service if their landlord fails to pay or requests that the utility discontinue service to the residence.[35] A tenant may exercise this right by either (1) paying for the last 30 days of service[36] or (2) subscribing to future service in their name.[37] The tenant may choose whichever option they prefer, without assuming liability for the landlord's prior debts.[38] DSLPA further allows a tenant to deduct payments made to the utility from their rent, and protects a tenant from retaliation by the landlord for exercising their rights under the Act.[39]

---

[32] Ms. Quigley asserts in testimony, on advice of counsel, that PWSA is subject only to the requirements of DSLPA, and not the requirements of the Utility Service Tenants' Rights Act (USTRA). See 68 P.S. §§ 399.1 *et seq.* I am advised by counsel that the continued applicability of USTRA to PWSA – in light of PWSA's transition to Commission oversight – is an outstanding legal issue. I will not address it here.
[33] Pittsburgh UNITED St. 3 at 4-8.
[34] Pittsburgh UNITED St. 3 at 5.
[35] 66 Pa. C.S. § 1527 (a)-(b), (d).
[36] 66 Pa. C.S. § 1527(b).
[37] 66 Pa. C.S. § 1527(d).
[38] 66 Pa. C.S. § 1527.
[39] 66 Pa. C.S. §§ 1529, 1531.

The consequences of the loss of water and wastewater service to a residential property are severe, and can result in children being removed from their home, families being forced into homelessness, and properties being condemned due to the loss of water service to the property.[40] When a landlord is responsible for providing utility service, and stops paying the bill or requests that service to the residence be discontinued, the consequences can be even more severe, as the tenant has no control over the bill[41] – nor do they have control over the landlord's accrual of debts. As Mr. Vitek explained in direct testimony, landlords often try to circumvent the eviction process by moving to unlawfully terminate utility service to the residence – forcing families to relocate without warning, incurring additional expenses, and causing added harm.[42]

Below, I will address three primary issues associated with PWSA's adherence with the requirements of DSLPA, and its policies and practices for implementing the protections. First, I will discuss the process and procedure that PWSA requires tenants to follow in order to exercise their right to continued service under DSLPA, which I believe is unduly burdensome and exposes tenants to liability for their landlord's debts. Second, I will address PWSA's termination notices for landlords and tenants, which contain a number of deficiencies that must be addressed. Finally, I will discuss PWSA's current process of identifying residential accounts, and will recommend additional processes to ensure that all tenant-occupied accounts are protected from termination.

---

[40] Pittsburgh UNITED St. 2 at 16-18.

[41] As I will discuss below, the only way for a tenant to receive a copy of the bill is to be added to the account – with landlord approval. The tenant then receives a copy of the bill, but is also treated as the customer, and is held liable for debts accrued at the property.

[42] Pittsburgh UNITED St. 3 at 5-6 (noting that "self-help eviction is illegal in Pennsylvania, but is nevertheless a common practice of landlord[s], particularly in low-income communities where tenants often lack knowledge of the law and/or the resources to defend themselves.").

Q: How many accounts are potentially subject to DSLPA?

A: As of March 26, 2019, there were approximately 32,514 accounts coded as a landlord/tenant account – 814 of which were eligible for termination based on the landlord's non-payment[43], and an additional 3,545 of which were in arrears.[44]

a. Process and Procedure for Exercising Rights Under DSLPA

Q: What options does PWSA provide for tenants attempting to exercise their right to continued service under DSLPA?

A: PWSA allows a tenant to either (1) pay for the last month of service and each successive month of service thereafter to prevent service from being terminated, or (2) be listed on the account (either as a responsible tenant or a customer). To varying degrees, PWSA requires tenants seeking to be listed on the account to accept liability for past, current, and/or future debts accrued at the property.

If a tenant pursues the first option, they must make an in-person payment for the prior months' service by check or credit card at PWSA's downtown office. (PWSA St. C-4, Exhibit JAQ/C-8 at slide 9). Cash is not accepted. The tenant must provide "reasonable identification" – including a driver's license, photo identification, or documentation "issued by a public agency which contains the name and address of the tenant." (Id.)[45] Every 30 days from the date of the initial notice of termination, the tenant will receive a subsequent 30-day notice of termination, and

---

[43] PWSA does not terminate accounts protected under DSLPA in the wintertime, so delinquent accounts became eligible for termination as of April 1.

[44] Appendix B, UNITED VI-1, VI-2, VI-3.

[45] PWSA's identification requirements for DSLPA were amended in the Joint Settlement in PWSA's recent rate case proceeding, and are consistent with the provisions of DSLPA. See RD at 19, para. D.9; see also 66 Pa. C.S. § 1526(a)(5) ("Reasonable identification shall include, but not be limited to, a driver's license, photo identification, medical assistance or food stamp identification or any similar document issued by any public agency which contains the name and address of the tenant.").

must continue to make the required in-person payments downtown, by check or credit card, to prevent termination. (PWSA St. C-4, Exhibits JAQ/C-6 and C-8 at slide 10).

A tenant may also be listed on the account by completing an "Owner/Tenant Addition Form" or an "Assumption Affidavit". If the tenant completes an "Owner/Tenant Addition Form", they must first obtain the landlord's approval and signature.[46] Once an Owner/Tenant Addition Form is completed, PWSA will treat the tenant as a customer and will impose liability on the tenant for any prior or subsequent bills accrued while the tenant resided at that property.[47] If the tenant completes an "Assumption Affidavit," they must assume full liability for all debts at the property – including debts incurred by the landlord or previous tenants before they moved in.[48]

Q: With regard to the first option you described, which allows tenants to continue service by making ongoing in-person payments every 30 days, do you have any concerns about PWSA's current process and procedure for exercising this right?

A: Yes. I believe PWSA's in-person payment requirements are unduly burdensome for tenants, and may be particularly onerous for low income and other vulnerable renters. Traveling downtown to make a payment in person, on a weekday, between the hours of 8:00 am and 6:00 pm, is impractical, and may be impossible, for working households, families with children, seniors, disabled individuals, and other vulnerable households. These populations often have difficulty with mobility, lack access affordable to stable transportation, work multiple or inflexible jobs, or lack adequate childcare. Under PWSA's current policy, tenants exercising their right to

[46] Appendix B, UNITED III-22 Attach. A.
[47] Appendix B, UNITED VI-9.
[48] Appendix B, UNITED III-21, III-22 Attach. B.

continued service as a result of their landlord's failure to pay must make this trip *every 30 days*. This is more than a trivial inconvenience – it is a serious imposition.

Moreover, many low income households are unbanked or underbanked, and do not have access to a checking account or credit card with which to make the required payment.[49] This is perhaps why the statute makes it clear that tenants must be allowed to make a cash payment to prevent termination.[50]

Ms. Quigley asserts that the in-person payment requirement is necessary "to discourage landlords or third parties from paying only the current charges to stop a collections action."[51] But this rationale rings hollow, given tenants must provide identification to PWSA showing that they reside at the property. This eliminates the possibility that a landlord or a third party could try to pose as a tenant to make the payment on behalf of the landlord. Furthermore, the landlord in any such surreptitious arrangement would continue to owe the underlying debt, and would be subject to PWSA's lien authority – regardless of whether the tenant continues to receive service. In my years of service at the Commission, I do not recall any utilities asserting that a tenant was colluding with their landlord to continue service based on the current charges.

I do not believe it is reasonable for PWSA to impose difficult and burdensome processes on the off chance that a landlord could collude with their tenant to avoid payment of past debt. Far

---

[49] See Board of Governors of the Federal Reserve System, Report on the Economic Well-Being of US Households (2015), https://www.federalreserve.gov/econresdata/2016-economic-well-being-of-us-households-in-2015-banking-credit-access-credit-usage.htm ("The likelihood of being unbanked or underbanked varies substantially by income, with lower-income adults being much less likely to have a traditional banking relationship. Among individuals with incomes under $40,000 per year, just over half (56 percent) are fully banked. This compares to 88 percent of those in the highest income group who are fully banked.").

[50] 66 Pa. C.S. § 1527(b) ("The tenant or tenants shall make payment to the utility on account of nonpayment of charges by the landlord ratepayer by check or money order drawn by the tenant to the order of the utility or by cash." (emphasis added)).

[51] Appendix B, UNITED III-20.

more often, these burdensome requirements work to prevent tenants from exercising their right to continued service in a reasonable manner. When a landlord stops paying for utilities, they may also have stopped caring for the property more generally – putting the tenant in an already untenable position.

Q: Do you have any recommendations to improve PWSA's process and procedure for a tenant to make ongoing payments to prevent termination of the landlord's account?

A: Yes. PWSA should develop a process to allow tenants to make ongoing payments on the account through the mail or in person at PWSA's other payment locations (7-11 and Dollar General), where the tenant could make a cash payment if they so choose. Practically, I believe this could be accomplished by including a payment slip on the tenant notice which could be used to appropriately apply payments on the account, without requiring the tenant to become a customer.[52] Allowing tenants access to these additional payment options would provide a far more reasonable process for tenants, who are already aggrieved by the actions of the landlord, to access the relief to which they are entitled.

Q: Above, you explained that a tenant may also choose to be listed on the account by completing an "Owner/Tenant Addition Form" or an "Assumption Affidavit". Do you have any concerns about this process?

A: Yes. As I explained above, in order for the tenant to be listed on the account, PWSA requires the tenant to accept liability for all or part of the landlord's debt,[53] which I do not believe is consistent with DSLPA.

---

[52] See 66 Pa. C.S. § 1526

[53] Appendix B, UNITED III-5, III-13, III-22 Attach. A & B, VI-8, VI-9.

As I noted above, DSLPA provides tenants with the option of subscribing to future service as an individual customer.[54] More specifically, DSLPA states:

> "Any tenant of a residential building or mobile home park who has been notified of a proposed discontinuance of utility service pursuant to section 1523 (relating to notices before service to landlord discontinued) *shall have the right to agree to subscribe for future service individually* if this can be accomplished without a major revision of distribution facilities or additional right-of-way acquisitions."

To subscribe to *future* service as a customer of the public utility – PWSA's current policy does not allow a tenant to do so without accepting liability for some or all of the landlord's past debt.

Under either option – the "Owner/Tenant Addition Form" or the "Assumption Affidavit" – tenants must accept liability for all or part of the landlord's debt in order to be listed on the account and receive a bill. If a tenant completes the Owner/Tenant Addition Form, they assume liability for debts accrued while they resided at the property. However, this is precisely the type of debt transfer that DSLPA was intended to prevent. DSLPA is intended to shield tenants from the loss of critical utility services when a landlord stops paying or otherwise improperly seeks to discontinue service to the property. But PWSA's policy leaves the tenant on the hook for debt accrued by the landlord, which is contrary to the provision of the DSLPA that allows tenants the option to obtain service in their name on a *forward going basis* to prevent the loss of service. Moreover, completion of the Owner/Tenant Addition Form requires landlord approval and signature – but tenants seeking to exercise their right to continued service due to the landlord's nonpayment are likely doing so because their relationship with the landlord has broken down, or because the landlord has left town or is otherwise unable to be reached, making it impractical to expect a tenant to obtain the landlord's signature to be added to the bill. The alternative option –

[54] 66 Pa. C.S. § 1527(d).

completing an Assumption Affidavit – is even worse, as it requires the tenant to assume full liability for the landlord's debts, including any debts accrued *before* the tenant moved in to the residence. Under either "option", PWSA is inappropriately requiring tenants to take responsibility for debts accrued by the landlord. Again, I do not believe this is consistent with DSLPA, which was designed to shield tenants from the loss of service based on the landlord's debts.

I do not believe that tenants exercising their right to continued service under DSLPA should, under any circumstances, be asked or required to assume liability for the debts of their landlord – or other prior occupants – in order to become a customer on a forward going basis.

Q: Do you have any recommendations to improve PWSA's process and procedure for a tenant to subscribe to future service, pursuant to DSLPA?

A: PWSA should be required to allow tenants who are exercising their right to continued service under DSLPA to become a customer without accepting liability for the landlord's debt or requiring a landlord's signature.

b. Notice of Termination to Landlords and Tenants

Q: Please describe PWSA's current process for delivering notice of termination to affected tenants.

A: PWSA provides a written 30-day notice of termination to affected properties or, if known, directly to affected tenants. This is the only termination notice that a tenant who is not listed on the account receives. (PWSA St. C-4, Exhibit JAQ/C-8 at slides 7-8).[55] While PWSA's training documents indicated that PWSA only makes *one* attempt to provide this notice – by posting *or* by

[55] See also Appendix B, UNITED III-13. If a tenant is listed on the account by submitting an Owner/Tenant Addition Form, PWSA treats that tenant as a customer, and will provide tenants with a 10-day notice of termination *instead of* the 30-day notice of termination. See Appendix B, UNITED III-13 & VI-9.

mail – PWSA indicated that it is in the process of changing this process to make two attempts to provide the 30-day notice – both by posting at the property *and* by mail to the service address – in compliance with DSLPA.[56] As an initial matter, PWSA should be required to update its training materials to property reflect its policy.

Q: Is there a required form for this 30-day notice of termination?

A: Yes. Section 1526 sets forth the exact language, font size and style, and capitalization which must be included in the notice to tenants:

> All notices shall contain the following information: … (4) The following statement of the tenant's rights, the words and phrases of which appear all in capital letters to be printed in 12-point bold-faced type with the first letter printed in upper case and the letters that follow in lower case and the words and phrases which do not appear all in capital letters to be printed in ten-point type, with any letter in upper case to remain so and the rest in lower case.[57]

Q: Is PWSA's 30-day notice compliant with this requirement?

A: No. With the exception of the headings, all of the text in PWSA's 30-day notice is in 10 point font, and nearly all of the text appears in bold, rather than the key language singled out by the statute. (PWSA St. C-4, Exhibit JAQ C-6). This minimizes the tenant's ability to identify the most critical information contained throughout the notice and is not consistent with the statute.

Likewise, the statute provides that language in ALL CAPITAL LETTERS in the statute should appear in the notice in bold, 12 point font, and with only the first letter capitalized. Instead, PWSA's notice provides this text in all capital letters, all of which – apart from the headings – is in 10 point font. (PWSA St. C-4, Exhibit JAQ C-6).

---

[56] Appendix B, UNITED III-24; see also 66 Pa. C.S. § 1526 (requiring public utilities to provide tenant notice by posting *and* by mail to the affected address (even if the utility does not know the name of the occupant at the time the notice is mailed).

[57] 66 Pa. C.S. § 1526(a)(4).

PWSA's 30-day notice also fails to advise tenants that their landlord cannot evict them for exercising their rights under the statute. In relevant part, the statute requires the following language (emphasis added): "Your landlord cannot raise your rent, *cannot evict you* and cannot take action against you in any other way for paying the utility bill and deducting it from rent."[58] But PWSA's notice is missing the phrase "cannot evict you." (PWSA St. C-4, Exhibit JAQ C-6). This is a critical omission.

PWSA's 30-day notice also provides incomplete information regarding the tenant's right to recover damages from the landlord. The statute requires the following statement (emphasis added): "You have a right to recover money damages from the landlord for *any damages or* injury he causes you for exercising your rights as a result of this notice."[59] PWSA's 30-day notice provides: "You have a right to recover money damages for injury he/she causes you for exercising your rights as a result of this notice." (PWSA St. C-4, Exhibit JAQ C-6).

Also, the notice is missing a critical clause advising tenants that filing a complaint with the PUC could prevent the termination. The statute requires the following: "YOU SHOULD CALL OR WRITE BEFORE THE SHUTOFF. TO AVOID SHUTOFF, YOUR LETTER MUST BE RECEIVED BEFORE THE SHUTOFF DATE."[60] But PWSA's notice provides: "You should call or write before the shut off. Your letter must be received before the shut off date." (PWSA St. C-4, Exhibit JAQ C-6). The critical missing piece in PWSA's notice is the absence of the phrase "TO AVOID SHUTOFF." Likewise, the text is in the same font and size as other information in that paragraph. This is, on its face, inconsistent with the statutory requirements.

---

[58] 66 Pa. C.S. § 1526(a)(4)(emphasis added).
[59] 66 Pa. C.S. § 1526(a)(4)(emphasis in original).
[60] 66 Pa. C.S. § 1526.

Q: Do you have recommendations for how PWSA could bring its notice into compliance?

A: Yes. I believe PWSA should further revise its 30-day written termination notice to tenants consistent with my recommendations above, and submit the revised notice for review in Stage 2 to allow for a holistic review of PWSA's Chapter 56 termination policies.

V. COLLECTIONS

Q: Did you provide testimony in the context of PWSA's recent rate case regarding PWSA's collections practices?

A: Yes. In PWSA's rate case, I provided extensive testimony which outlined the excessive collections fee structure and other consumer issues associated with PWSA's collections agency, Jordan Tax Service (JTS).[61] Pittsburgh UNITED witness Daniel Vitek also provided testimony regarding PWSA's collections practices.[62] As I explained at the outset of my testimony, rather than reiterate the lengthy analysis and conclusions in the relevant rate case testimony, I have incorporated it by reference herein. In short, my analysis of PWSA's collections policies in the rate proceeding centered on three conclusions:

> PWSA's collections process and associated fees (1) contradict the laws, regulations, and policies implemented and enforced by the Commission regarding residential collections and associated fees; (2) are regressive and unduly punitive, particularly for low income consumers; and (3) unreasonably exacerbate uncollectible expenses.[63]

My ultimate recommendation in the rate case was for the Commission to disallow all collections-related fees included in PWSA's proposed tariffs, and for PWSA to not condition service on payment of debts referred to collections to JTS.[64]

---

[61] Pittsburgh UNITED St. 2 at 33-38.
[62] Pittsburgh UNITED St. 3 at 29-37.
[63] Pittsburgh UNITED St. 2 at 34.
[64] Pittsburgh UNITED St. 2 at 37.

Q: Did PWSA make changes to its collections policy after the conclusion of the rate case?

A: Yes. PWSA suspended its use of JTS pursuant to the terms of the rate case Settlement (PWSA St. C-4 at 20)[65]; however, it is now in the process of developing a new plan for debt collection, which may include reinstituting its relationship with JTS – or contracting with a new collections agency.[66] PWSA also removed the associated collections fees from its tariffs; however, it retained all of those provisions in a document titled "Supplemental Service Conditions."[67]

Q: Has PWSA set forth any specific plans for its future collections policies and practices?

A: No. Ms. Quigley explained in direct testimony that PWSA believes the Commission intended for collections issues to be included in Stage 2 of this proceeding. (PWSA St. C-4 at 18-19). Thus, while she noted generally that PWSA "is in the process of evaluating its collections process as a result of [its JTS] suspension to include a cost effective manner of collecting overdue payments", she did not provide any further specifics about PWSA's plans. (PWSA St. C-4 at 20:12-14). In response to interrogatories, Ms. Quigley explained that, in the interim, "PWSA will continue with its internal, regulated Collections process and will lien debt that remains uncollectible following a termination of service."[68]

In response to interrogatories, Ms. Quigley noted that PWSA is "evaluating whether and how the previously transferred debts [that were referred to JTS for collections] may be introduced onto a residential customer's bill, and whether/how the debt which was previously referred for

[65] Appendix B, UNITED V-2, Attach. A.
[66] See Appendix B, UNITED V-5.
[67] See RD at 21, Section III.E.4.
[68] Appendix B, UNITED V-3.

collections could trigger the termination process."[69] However, she provided no further information about the status of PWSA's negotiations with JTS or other debt collection agencies.

Q: Do you agree with PWSA that collections issues should be addressed in Stage 2?

A: *Yes and no. First, I agree that it is prudent to preserve the issue for litigation in* Stage 2. Preserving collections issues for Stage 2 is consistent with the Commission's directives to address Chapter 56 issues as part of Stage 2, and allows an appropriate time-frame for PWSA to further develop a comprehensive plan for collections. It also allows time for PWSA to consult with other parties and the Commission in developing that plan. Stage 2 litigation is slated to begin in late 2019, which will give PWSA approximately eight months from the date of this testimony to develop a new process and procedure for collections. I believe this is a reasonable timeframe to provide PWSA to develop a new plan for collections. In the interim, consumers will continue to be protected from exorbitant fees and costs which attach when debts are referred to JTS for collections. Likewise, PWSA will continue to collect on debts through its "internal, regulated Collection process" and through utilization of its lien process,[70] which will control the growth of PWSA's uncollectible expenses while a new collections plan is developed.

That said, I am concerned that PWSA may plan to enter a new contract for debt collection services before the Stage 2 proceeding is complete and PWSA has a clearer understanding of all of its obligations under Chapter 14/56. Furthermore, leading up to Stage 2, the Commission's directives were clear that PWSA should be working to actively resolve collections issues in consultation and coordination with the Bureau of Consumer Services and interested parties through Commission-ordered workshops.

---

[69] Appendix B, UNITED V-4.
[70] Appendix B, UNITED V-3.

There are a number of contentious Chapter 56 compliance issues that are intimately related to and intertwined with the method and manner of PWSA's future collections process.[71] For example, whether PWSA is able to continue its current practice of allowing debt to run with the property – rather than the person – is a serious issue which continues to be explored through the ongoing Commission-ordered Chapter 56 workshop led by BCS. If, as part of Stage 2, PWSA is required to assign debts to the consumer rather than the property, this would necessarily – and quite substantially – impact the method and manner in which PWSA conducts its collections. Likewise, as mentioned above, PWSA is still assessing whether and how it could reintroduce debts onto a customer's bill that were previously referred to JTS for collections – and whether those debts could form the basis of a termination. PWSA's plan for collection of unpaid debts previously referred to JTS could impact PWSA's compliance with the Commission's standards for termination pursuant to Chapter 56 – which is, again, a topic that is currently subject to the ongoing Chapter 56 workshop.

Ultimately, while I agree that the issue should be deferred for litigation in Stage 2, I nevertheless have concerns that PWSA's plan for collections will continue to lack necessary detail with which to fully assess the plan in Stage 2 – or that PWSA will be prematurely locked into contract terms for collections services which were not developed with full consideration of the interdependent provisions of Chapters 14 and 56.

[71] Appendix B, UNITED V-3 & V-4.

Q: Do you have any recommendations for how PWSA should develop its collections plan for evaluation in Stage 2?

A: Yes. I recommend that the Commission require PWSA to submit a further revised Compliance Plan prior to the litigation of Stage 2, identifying its plans for collections and how those plans will fully comply with Chapter 56. I further recommend that the Commission prohibit PWSA from contracting for collections services until Stage 2 is complete.

VI. LOW INCOME ASSISTANCE PROGRAMS

Q: Did you previously testify about the need for low income assistance programming across PWSA's service territory?

A: Yes. In PWSA's recent rate case, I provided testimony about the poverty rates of PWSA's residential customers, and the affordability – or, rather, unaffordability – of water and wastewater service for low income households.[72] I also explained the risks of water and wastewater unaffordability – both to individuals and the broader community.[73]

Q: The rate increase which was approved in PWSA's rate proceeding was less than the proposed increase. Does this change your analysis of unaffordability in the rate proceeding?

A: While the numbers are slightly better, the outcome is still the same for low income families. As I showed in that proceeding, water and wastewater service was unaffordable for low income households at the prior rates – far exceeding accepted affordability standards.[74] The increase approved by the Commission increased the level of unaffordability for low income households.

---

[72] Pittsburgh UNITED St. 2 at 11-12; 16-23.
[73] Pittsburgh UNITED St. 2 at 16-18; see also Pittsburgh UNITED St. 2-R at 2-7.
[74] Pittsburgh UNITED St. 2 at 21-23.

Q: Please summarize Ms. Quigley's testimony regarding PWSA's low income programs.

A: Ms. Quigley explains the genesis of PWSA's low income assistance programs, noting that the programs were established in late 2017 to both provide assistance to low income customers, and to "decrease the pressure of uncollectible expense that PWSA will be required to recover from other customers." (PWSA St. C-4 at 23-24). PWSA's current programs include a Bill Discount Program, a Hardship Grant Cash Assistance Program, a Winter Moratorium, and a Private Lead Line Replacement Community Environmental Project.[75]

Without providing data or analysis of its current programming offerings, Ms. Quigley concludes that PWSA's assistance programs "offer a reasonable amount of financial assistance to low-income customers to improve their ability to pay more of their bill than they otherwise not be able to pay resulting in a positive overall impact on the amount of revenue PWSA is able to receive from its customers." (PWSA St. C-4 at 24).

Ms. Quigley went on to assert that PWSA is not statutorily required to offer universal service and energy conservation programming and is not subject to the provisions contained in the Commission's Customer Assistance Program (CAP) Policy Statement. (PWSA St. C-4 at 24-26). She also concludes, in response to the Commission's directed questions, that its programs do not constitute rate discrimination, as defined in section 1304 of the Public Utility Code. (PWSA St. C-4 at 25-26).

---

[75] As I explained at the outset of my testimony, while PWSA includes its Community Environmental Project (CEP) as part of its low income assistance programming, I will address this program separately below in section VII. The CEP is unique, as the program benefits, terms, and conditions are intertwined with PWSA's larger plan for replacing lead service lines throughout its service territory. And, unlike PWSA's other three low income assistance programs, the CEP does not provide financial bill payment assistance and/or relief from termination for nonpayment.

Finally, Ms. Quigley explains that PWSA is not proposing any changes to its customer assistance programs, which she notes were recently approved by the Commission as part of the base rate proceeding. The approved Settlement in that proceeding requires PWSA to develop a comprehensive Plan detailing the eligibility criteria, benefits, and conditions of participation in each program, which necessarily includes PWSA's processes for enrollment and/or reenrollment.[76] To assist with developing that Plan, PWSA committed to forming a Low Income Assistance Advisory Committee – which Ms. Quigley testified "will provide invaluable information about how to enhance and improve these programs." (PWSA St. C-4 at 28)[77]. This Plan is required to be submitted as part of PWSA's next base rate proceeding.[78] In response to interrogatories, Ms. Quigley further explained that "input will be solicited at planned LIAAC [Low Income Assistance Advisory Committee] meetings, and a plan will be drafted and circulated among committee members for review and comment."[79] As for a timeframe, Ms. Quigley explained that the "timeline will be driven by the LIAAC, whose initial meeting was held March 4, 2019."[80]

Shortly before the submission of this testimony, PWSA indicated through discovery that it had "engaged a consultant to conduct a low income assistance program needs assessment" to be conducted in 2019, and that "progress and preliminary findings will be shared with the [LIAAC] at periodic meetings."[81] PWSA indicated that the study "will be completed prior to the next base rate filing so that any recommended changes to PWSA's current CAP, hardship, or other assistance

[76] RD at 24, para. F.4.
[77] RD at 23, para. F.3.
[78] RD at 24, para. F.4.
[79] Appendix B, UNITED III-27.
[80] Appendix B, UNITED III-27.
[81] Appendix B, UNITED VI-12.

programs can be incorporated into the filing and implemented upon approval."[82] However, additional details about the scope of the needs assessment remain unclear. Given the late date at which this additional information about PWSA's low income assistance program plans were disclosed, I reserve the right to further comment as necessary in my rebuttal testimony, after additional discovery is conducted.

Q: Do you agree with Ms. Quigley's first conclusion that PWSA's low income programming currently "offer a reasonable amount of financial assistance to low-income customers to improve their ability to pay more of their bill ... resulting in a positive overall impact on the amount of revenue PWSA is able to receive from its customers."?

A: No, I do not believe that the available information and data about PWSA's low income assistance programming supports such a conclusion. There has been no formal analysis of PWSA's assistance programs, the relative need, and the impact it has had on payment patterns or bill affordability.[83] And the data and information which is available tends to show that PWSA's current customer assistance programs are not providing an adequate, equitable, and accessible level of assistance to meet the needs of its low income customers.

First, the data provided to date tends to show that PWSA's programs are not currently reaching the eligible population, and fall woefully short of meeting the likely needs of the community PWSA serves.[84] I discussed PWSA's enrollment and outreach issues in my direct testimony in the recent rate proceeding.[85] PWSA's enrollment trends have not significantly

---

[82] Appendix B, UNITED VI-12.
[83] Appendix B, UNITED II-1(d)-(e), II-9, II-10.
[84] Pittsburgh UNITED St. 2 at 77-78, 81-82; see also Appendix B, UNITED II-5, II-7, II-8.
[85] Pittsburgh UNITED St. 2 at 67-70, 77-78, 81-82.

improved since the rate proceeding.[86] Table 1, below, shows the monthly BDP and Hardship Fund enrollment numbers. Throughout the next year, I believe PWSA's BDP enrollment levels may further decline, given PWSA's current reenrollment process – which provides a single written notice to customers 30 days prior to their reenrollment.[87] If a participant does not reenroll before the end of the month, they are removed from the program and will again receive full rate bills.[88] By PWSA's own estimates, there are *approximately 19,193 eligible households* within its service territory – which means that only a very small fraction of potentially eligible households have successfully accessed assistance through PWSA's BDP or Hardship Fund programs.[89]

TABLE 1, BDP and Hardship Fund Enrollment[90]

		Bill Discount Program	Hardship Program[91]
2018	January	87	-
	February	1118	-
	March	1758	-
	April	1882	10
	May	1968	20
	June	2022	28
	July	2068	13
	August	2124	42
	September	2174	2
	October	2240	18
	November	2222	17
	December	2360	7
2019	January	2504	11
	February	2677	7

[86] Through discovery, I learned that the BDP enrollment figures I relied on in the rate case were over-reported, and included both those enrolled in the BDP and in PWSA's winter moratorium. Appendix B, UNITED II-5 Supplemental Response; Pittsburgh UNITED St. 2 at 77-78. PWSA's BDP has a lower income threshold (150% FPL) than PWSA's winter moratorium (250% FPL), so inclusion of enrollment for both programs over-represented.
[87] Appendix B, UNITED II-11 Attach. A, UNITED II-14.
[88] See Appendix B, UNITED II-11, II-14.
[89] Pittsburgh UNITED St. 2 at 67-68, 77, 81.
[90] Appendix B, UNITED II-5, II-6, II-7.
[91] The Hardship Fund program began operating in April 2018.

In addition to low enrollment, PWSA's programs are not currently providing equitable assistance capable of producing consistently affordable bills for program participants. I discussed this at length in my direct testimony in PWSA's recent rate proceeding, which I am incorporating by reference herein.[92] In short, PWSA's current Bill Discount Program provides an inflexible, flat discount which is not scaled to the customer's household income.[93] Thus, those enrolled in the program do not receive consistently affordable bills – participants with income between 100-150% of the federal poverty level (FPL) pay significantly more of their total household income on water and wastewater services.[94]

Q: Do you agree with Ms. Quigley's conclusion that PWSA is not legally required to operate a low income assistance program or to comply with the Commission's CAP Policy Statement?

A: While there is no statute that says that water utilities, like PWSA, must provide low income assistance programs, I believe PWSA is wrong to conclude that it has no obligation to provide assistance to those who cannot afford to pay for water or wastewater service. The Commission's oversight authority to provide universal service programming is not limited to a single policy statement. Indeed, the Commission has an overarching duty and obligation to ensure that utilities – and any associated programming – is reasonable and cost-effective.

Natural gas and electric Customer Assistance Programs (CAPs) date back to 1990, during my tenure at the Bureau of Consumer Services, when the Commission ordered the first mandatory customer assistance program in the state:

---

[92] Pittsburgh UNITED St. 2 at 22-23, T4 & T5, 73-76.
[93] Pittsburgh UNITED St. 2 at 22-23, T4 & T5, 73-76.
[94] Id.

> [F]or the poorest households with income considerably below the poverty line, existing initiatives do not enable these customers to pay their bills in fill and to keep their service ... Consequently, to address realistically these customers' problems and to stop a wasteful cycle of consecutive, unrealistic payment agreements that cannot be kept, despite the best of intentions, followed by service termination, then restoration, and then more unrealistic agreements, we believe that new approaches like PECO's CAP program and the OCA's proposed EAP program should be tried.[95]

These programs were not only "tried", they were successful at achieving the Commission's stated goals and ultimately led the Commission to adopt its CAP Policy Statement in 1992 to establish consistent policies, best practices, and appropriate cost-control measures for universal service programming – which at the time was limited to natural gas and electric utilities.[96]

Until recently, water and wastewater services did not face the same chronic unaffordability challenges that led the Commission to require the creation of comprehensive universal service programming for electric and natural gas companies in the 1990s. But today, we face incredible water and wastewater infrastructure investment challenges across the state and the nation, which are causing water rates to skyrocket.[97] In short, low income households cannot afford to pay the rapidly increasing cost of water and wastewater service, creating an affordability crisis for those without the financial means to shoulder exponentially increased costs.[98] As I detailed through testimony in PWSA's base rate proceeding, this problem is particularly pronounced in Pittsburgh,

---

[95] Pa. PUC v. Columbia Gas of Pa., Docket No. R-891468, Columbia Gas EAP Order, at 159 (Sept. 19, 1990); see also Pa. PUC v. Equitable Gas Co., Docket No. R-901595, Final Order, at 63-74 (Nov. 21, 1990).
[96] 52 Pa. Code §§ 69.261-.267. The CAP Policy Statement was adopted in 1992, and revised in 1999.
[97] See, e.g., Joseph Kane, The Brookings Inst., Water Affordability Is Not Just a Local Challenge, But a Federal One Too (Jan. 25, 2018), https://www.brookings.edu/blog/the-avenue/2018/01/25/water-affordability-is-not-just-a-local-challenge-but-a-federal-one-too/; Elizabeth A. Mack, A Burgeoning Crisis? A Nationwide Assessment of the Geography of Water Affordability in the United States, PLOS (Jan. 11, 2017), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0169488; Food and Water Watch, America's Secret Water Crisis: National Shutoff Survey Reveals Water Affordability Affecting Millions (Oct. 22, 2018), https://www.foodandwaterwatch.org/insight/americas-secret-water-crisis.
[98] See id.

where PWSA faces substantial infrastructure challenges and correspondingly substantial rate increases.[99] PWSA's residential service rates have climbed precipitously since 2016 – most recently pursuant to the Commission's approval of the Joint Settlement in PWSA's rate proceeding – and are expected to continue to climb substantially over the next several years as PWSA plans to invest hundreds of millions of dollars into critical infrastructure repairs and upgrades.[100]

In my view, in assessing PWSA's low income programming, it would be prudent to look at the elements contained in the CAP Policy Statement ensure that CAPs are appropriately designed to meet the goals and objectives of low income assistance programming. That is, to (1) provide low income customers with access to affordable service, and (2) minimize uncollectible expenses which will be recovered from other customers as a result of unaffordable bills. The fact that PWSA may not be explicitly subject to the Commission's policy statement regarding Customer Assistance Programs for electric and natural gas distribution companies should not alleviate PWSA of its duty to show that its programs are cost effective, prudently designed, and adequately available to serve the needs of the community PWSA serves.

Q: Above, you explained that PWSA did not propose any changes to its low income assistance programs in light of its obligation to file a comprehensive Plan as part of its next base rate proceeding. Do you agree with this approach?

A: For the most part, yes; however, there is work to be done in the meantime to ensure that PWSA has the information needed to make the appropriate adjustments at that time. Notwithstanding my conclusion above that PWSA's low income assistance programs require

---

[99] See Pittsburgh UNITED St. 2 at 11-24.

[100] See id.; RD at 8; Final Order at 10-11 (approving a $21 million dollar increase in rates); PWSA, Notice of Rate Change, http://apps.pittsburghpa.gov/pwsa/Rate_Brochure-2016.pdf.

revision to target affordability, both in their design and reach, I nevertheless agree with Ms. Quigley that further changes to the program should be addressed in the context of PWSA's next base rate proceeding. (PWSA St. C-4 at 28:3-4). As Ms. Quigley notes, PWSA is required to file a detailed plan outlining the terms and conditions of its programming as part of its next base rate proceeding. In the interim, and in anticipation of creating that Plan, the Settlement requires PWSA to work with stakeholders through its LIAAC to improve PWSA's current programs and assess the feasibility of transition to a percentage of income program.[101] (PWSA St. C-4 at 28). PWSA is also required to collect and share a number of critical data points which will allow for a more detailed assessment of PWSA's programming.[102] And, as I noted above, PWSA recently disclosed that it has contracted with a third party to conduct a needs assessment, the results of which will be shared with members of the LIAAC to better inform PWSA's ultimate Plan.[103] In balance, I believe that this is a reasonable plan, and will provide PWSA with an appropriate amount of time to work with stakeholders through the LIAAC to modify its programming, assess the feasibility of a program design overhaul, and adopt reasonable, data-driven program reforms to improve the overall reach and effectiveness of PWSA's low income assistance programming.

Q: Do you nevertheless have any recommendations for PWSA with regard to its low income assistance programming?

A: Yes. While I agree that PWSA's program design issues should be tackled as part of its next base rate filing, I am concerned that PWSA does not have the appropriate tools in place to develop such a plan. For example, PWSA's has no current or future plans to conduct a third party

[101] RD at 23, para. F.3.
[102] RD at 22-23, paras. F.1 & F.3
[103] Appendix B, UNITED VI-12.

evaluation of its programming, nor does it have any intent to do so.[104] And, while it is a positive development that PWSA has taken steps to conduct a formalized needs assessment, the details of that assessment – including the scope, the metrics to be evaluated, the expertise of the evaluator, and the terms of the contract for services – remain unclear.[105] As I noted above, I reserve the right to further comment on the sufficiency of PWSA's third party needs assessment through rebuttal testimony, once further details are known. Moreover, throughout this proceeding, PWSA has had difficulty tracking and reporting on basic program metrics, such as enrollment and reenrollment rates and income level of program participants.[106] Thus, I am concerned that PWSA lacks current infrastructure and expertise to collect critical data points which are necessary to appropriately assess and analyze its programs. And, while I agree with Ms. Quigley that PWSA's newly formed LIAAC will provide invaluable insight and recommendations, and strongly support PWSA's plan to engage closely with members of the LIAAC to develop its plan, I am concerned that the group does not meet with sufficient frequency to appropriately inform the development of PWSA's Plan within an appropriate timeframe.

To assist PWSA in developing its Plan, and gathering and assessing relevant data, I recommend that PWSA establish a sub-committee within the LIAAC, which meets more frequently than the quarterly LIAAC meetings (I suggest that this subcommittee meet in person or by conference call at least once a month) until the Plan is complete, to look more closely at the relevant data and third party needs assessment and to make recommendations to the full LIAAC and, ultimately, to PWSA for inclusion in its Plan. I further recommend that PWSA commit to

---

[104] Appendix B, UNITED II-1(d)-(e), II-9, II-10.
[105] Appendix B, UNITED VI-12.
[106] See, e.g., Appendix B, UNITED II-5, II-12, II-13

conducting a periodic third-party evaluation of its programs. Finally, I reserve the right to provide further recommendations about the scope of PWSA's needs assessment through rebuttal testimony, once further details about this assessment are shared.

VII. COMMUNITY ENVIRONMENTAL PROJECT

Q: Did you previously provide testimony in support of support the Community Environmental Project?

A: Yes. The Community Environmental Project (CEP) is an important project, and serves as a critical piece to ensuring that low income households have access to safe drinking water. As I explained in direct testimony in PWSA's recent rate proceeding, which I am incorporating by reference herein: [107]

> Providing lead service line replacements in low income communities is particularly important, as these households simply do not have the resources necessary to remediate lead issues on their own. It is critical that the assistance remain available for tenants, even if the owner of the property is not themselves low income. Many landlords of low income / affordable rental properties do not make investments into the properties of this magnitude. And, if they do make a substantial investment, the landlord most often will raise rent in order to recover the cost of their investment – which would price many low income families out of their homes. Either way, low income families lose.[108]

However, just as I noted in PWSA's rate proceeding, the CEP should in no way absolve PWSA from offering additional protections for low income households – particularly those with pregnant women and young children – in its broader lead remediation efforts, including prioritizing low income households for lead service line replacements through its other programs and providing filters free of charge to low income households with lead or suspected lead lines prior to replacement. This is particularly true because any CEP funds that are unused by November 2020

---

[107] Pittsburgh UNITED St. 2 at 83-88.
[108] Id.

must be paid to DEP as a civil penalty.[109] Even if these funds are fully utilized, PWSA expects to perform only 200 replacements through the CEP,[110] though there are likely many more low income customers receiving water through lead service lines.

Q: Do you have any concerns about the CEP?

A: Yes. My main concern is that PWSA's outreach efforts in connection with the CEP are inadequate. To date, only 18 replacements have been conducted under the CEP—even though PWSA expects it can replace 200 lead service lines through the program.[111] PWSA must take more proactive steps to enroll eligible customers in the CEP to ensure that the full $1.8 million is spent on lead service line replacements before the program expires in November 2020. Specifically, I support Pittsburgh UNITED witness Bruce Lanphear's recommendation that PWSA canvass low income neighborhoods where lead service lines have been identified to talk to residents about the program.[112]

I also recommend that PWSA discuss and develop new outreach efforts in coordination with both of its newly established committees – the LIAAC and the Community Lead Response Advisory Committee (CLRAC). Currently, I understand that CEP is discussed with the CLRAC, but LIAAC members likely have additional expertise in effective community engagement and outreach – particularly in underserved, low income communities. PWSA could benefit from exploring CEP issues with both groups, preferably in a joint meeting where members of the CLRAC and LIAAC can share ideas across fields.

---

[109] See PWSA St. 1, at 55-56.
[110] Press Release, PWSA, Nearly $2 Million Remains Available for Free On-Demand Lead Line Replacements (Mar. 14, 2019), http://pgh2o.com/release?id=7807.
[111] Appendix B, UNITED IV-6.
[112] Pittsburgh UNITED St. C-3 at 40.

Q: Do you have any other concerns about PWSA's lead service line replacement program?

A: Yes, I have three concerns that relate to the ability of low and moderate income customers to participate in and benefit from PWSA's lead reduction and remediation programs.

First, PWSA has not committed to providing free private-side lead service line replacements beyond 2020. It is vital that PWSA include private-side lead service lines in its future replacement programs because customers—especially low and moderate income customers—do not have the resources to conduct replacements themselves. PWSA's recent estimates put the cost of a private-side lead service line replacement at $7,500, *excluding the costs of restoring interior and exterior property that may be damaged during the replacement.*[113] As I previously described at length in PWSA's recent rate proceeding, low and moderate income customers most often struggle to pay their monthly water and wastewater bills.[114] These households simply lack the capacity to pay an expense of this magnitude – regardless of the financing that might be available.[115] Low income renters are particularly vulnerable, as landlords of low income / affordable rental properties are either unwilling to make the steep investment or will pass the cost to tenants through increased rents, which low income tenants cannot afford.[116] If PWSA does not provide free private-side service line replacements to customers beyond 2020, low income and

[113] See Appendix B, UNITED I-14.
[114] Pittsburgh UNITED St. 2 at 11-12, 16-23.
[115] Pittsburgh UNITED St. 2 at 83-87.
[116] Id.

moderate income residents who cannot afford to replace the lines on their own will bear a disproportionate risk that lead from their service lines will negatively impact their health and safety.[117] This is especially true because the CEP will only serve up to 200 customers, and is set to expire in November 2020.

Second, I am concerned that PWSA has not committed to continuing its low income filter distribution program after December 31, 2019. (PWSA St. C-1 at 63-63). Currently, PWSA provides an NSF-certified filter and replacement cartridges, free of charge and prior to a lead service line replacement, to households that qualify for an existing low income assistance program where the household's public- and/or private-side service line is made of lead or an unknown material.[118] Pittsburgh UNITED's health expert, Dr. Bruce Lanphear, states that all customers with lead or unknown service lines have an elevated risk of exposure to lead and should be protected from that risk—particularly because it could be years until the lead service line is replaced, if at all.[119] PWSA's recommended water pitcher filter costs $33, and replacement filter cartridges cost at least $9 each.[120] PWSA has coupons available on its website for $10 off the pitcher, $2.50 off a 2-pack of cartridges, $7.50 off a 4-pack of cartridges, and $15 off an 8-pack of cartridges.[121] But even with this discount, the cost of filters is significant for low income households which lack discretionary or expendable income.[122] As I have described, thousands of

---

[117] Pittsburgh UNITED St. C-3 at 6-9.
[118] RD at 13-14, paras. C.1.iv.
[119] See Pittsburgh UNITED St. C-3 at 30.
[120] See https://ww.zerowater.com/products-10-Cup-Ready-Pour-Round; https://ww.zerowater.com/replacement-filters.
[121] See https://www.zerowater.com/resources/ZW-180821-01_coupon-sheet_eng_print.pdf.
[122] For example, as of September 19, 2018, Walmart's retail prices were $28.09 for PWSA's recommended ZeroWater ZP-010 filter pitcher and $49.99 for a four-pack of replacement filters. PWSA's coupons are for $10 off a filter pitcher, for $2.50 off a two-pack of replacement filters, and for $5.00 off a four-pack of replacement filters. See http://pittsburghpa.gov/safepgh2o/ZeroWater_Coupons.pdf.

PWSA's customers already struggle to pay their monthly water and wastewater bills, and cannot afford yet another expense in order to drink safe water.[123] It is not reasonable, just, or realistic to expect low and moderate income customers to pay for their own water filters to keep their water safe while they await a lead service line replacement.

The fact that PWSA currently provides free pre-replacement filters to households with water sample results above 15 parts per billion does not address my concern.[124] To obtain a filter under this program, a customer must request a tap water sample kit, understand and follow the instructions, collect and return the sample, and then, if their sample shows water lead levels above 15 parts per billion, go online and input a voucher code.[125] To continue receiving replacement cartridges, the customer must collect and submit a water sample every six months.[126] Many low income customers simply lack the time and resources to complete all of these steps and so will not benefit from this program. In any event, Dr. Lanphear testifies that the program is not sufficiently health protective because 15 parts per billion is not a health-based standard.[127] PWSA should therefore continue to provide free pre-replacement filters to low income households after 2020, until lead levels are consistently low.[128] Consistent with my recommendations above, I believe PWSA should seek input from its LIAAC and CLRAC to improve the reach of this program.

Third, I am concerned about who will bear the costs of property restoration if PWSA includes private-side lead service line replacements in its programs beyond 2020. Although PWSA states that most of its private-side replacements are performed via a trenchless method, causing

---

[123] Pittsburgh UNITED St. 2 at 11-12, which discusses the struggle that low income households face attempting to afford the most basic needs – not including extra expenses such as water filters.
[124] RD at 13-14, paras. C.1.iv.
[125] See Appendix B, UNITED XI-10 (Rate Case).
[126] RD at 13-14, paras. C.1.iv.
[127] Pittsburgh UNITED St. C-3 at 32-33.
[128] Id. at 34.

less disruption to private property, the construction work to access and replace a service line may still cause damage walkways, driveways, landscaping, hardscaping, and interior finishes. I explained how these costs impact low income customers in PWSA's rate proceeding:

> The costs to restore this damage are variable, expensive, and hard for customers to predict. For low and moderate income customers, this could places the prospect of replacement out of reach. To avoid being forced to shoulder these restoration costs …, landlords and low and moderate income homeowners may decline to have their private-side lead service line replaced at all, even if PWSA will replace the service line at no cost. The burden of restoration costs thus increases the likelihood that low income customers, both renters and homeowners, will be subjected to increased risks of lead exposure from continued use of their lead service lines.[129]

Underscoring this point is the fact that, under PWSA's 2019 replacement program, approximately 10% of customers who declined PWSA's offer for a free private-side lead service line replacement cited property damage and the high costs of repairs as the reason for their refusal.[130]

PWSA should develop and fund a program to restore or pay for property damage caused by lead service line replacements for low and moderate income customers, the terms of which should be developed and presented in PWSA's next base rate filing. Assisting with property restoration is particularly important for low and moderate income customers whose households include individuals who are elderly or disabled, or young children, and whose mobility may be affected by damage to a paved walkway, driveway, stairs, or ramp. In addition, prior to a lead service line replacement, PWSA should continue to consult with residents and make sure that it is providing customers with customized information about what property damage will occur, how much of the restoration work PWSA will pay for or perform, and how much PWSA estimates it will cost the customer to restore any remaining damage.

---

[129] Pittsburgh UNITED St. 2 at 86-87.
[130] Appendix B, UNITED VII-2, Attach. A.

Q: Please summarize your recommendations for PWSA's lead remediation program.

A: Yes. As I explained above, PWSA should (1) take more proactive steps to enroll eligible customers in the CEP to ensure that the full $1.8 million is spent on lead service line replacements before the program expires in November 2020; (2) replace private-side lead service lines at no direct cost to customers as part of its lead service line replacement programs beyond 2020; (3) continue to provide free water filters and replacement cartridges to low income customers with lead or unknown service lines beyond 2020 and until water lead levels reach consistently low levels; and (4) develop a program, to be presented in PWSA's next base rate proceeding, to restore or pay for property damage caused by lead service line replacements for low and moderate income customers, particularly property damage that interferes with customers' mobility or other basic needs. These four measures are necessary and prudent to ensure that economically vulnerable households are able to benefit fully from PWSA's lead service line replacement program and lead remediation program more broadly, and are provided with reasonably-priced access to safe water.

Q: Does this conclude your Direct Testimony?

A: Yes.

APPENDIX A: Resume of Mitchell Miller

MITCHELL MILLER
60 GEISEL Road
Harrisburg, PA 17112
Home: (717) 599-5510 Mobile: (717) 903-2196
Mitchmiller77@hotmail.com

EMPLOYMENT

2009-Present **Mitch Miller Consulting, LLC**

Practice provides consulting services that promote the public interest with a focus on low income households. Specifically over 35 years of expertise is applied to the evaluation of regulatory policy involving customer service, complaint handling, credit and collections and universal service. Objective is to promote public policy development, program design, and implementation of programs for consumer education, energy efficiency, credit and collections, and customer assistance.

2009-2012 **Pennsylvania Department of Community and Economic Development**
Consultant

Served as a Consultant on weatherization and energy efficiency for the Pennsylvania Weatherization Assistance Program (WAP) at PA DCED. Was instrumental in transforming the WAP program by creating a performance-based system, dedicated to a high standard of quality, compliance and production. Innovations include introducing performance standards for production, quality and compliance and independent certification and training for all state WAP workers. Also responsible for coordinating the states WAP program with the PUC, utilities and other efficiency programs.

1992-2009 **Pennsylvania Public Utility Commission**

Director, Bureau of Consumer Services

Until his retirement from state service Mr. Miller was director of Consumer Services and PA PUC. His bureau has regulatory authority and responsibility for policy development for all areas of consumer services including resolving consumer complaints and problems, enforcing consumer regulations, developing, implementing and evaluating programs involving complaint handling, complaint analysis collections, enforcement of consumer regulations, utility customer assistance programs and low income conservation. He also directed BCS responsibilities for implementing the Pennsylvania Electric, Gas and Telephone Customer Choice Programs. Specific areas under his Direction include:

Program Evaluation and Regulation

- Monitoring and evaluating the customer service practices and programs of utilities
- Promulgating regulations, implementing procedures to meet regulatory requirement and taking enforcement action to assure compliance
- Field reviews and audits of utilities' operations and advice the Commission regarding issues of interest and concern of utility consumers
- Compliance enforcement including informal investigations and prosecution of formal cases

- Track trends in the number and type of consumer complaints and inquiries, utility performance at handling customer complaints and payment arrangement requests. Other databases utilized to track utility termination activity, collection of delinquent accounts, compliance with customer service regulations and other areas critical to evaluating utility customer service performance.
- Produce utility performance and evaluative reports for the PUC, utilities and the public

Universal Service Programs

- The LIURP is targeted toward low-income households with the highest energy consumption, payment problems, and high arrearages. Since the program's inception to 2009, the major electric and gas companies required to participate in LIURP have spent over $530 million to provide weatherization treatments to more than 350,000 low-income households in Pennsylvania. The budgets for 2008 were 22.million for electric utilities and 9 million for gas utilities
- Customer Assistance Programs (CAPs) provide an alternative to traditional collection methods for low income, payment troubled utility customers. Customers make regular monthly payments, which may be for an amount that is less than the current bill for utility service. Budgets for CAP programs in 2008 were 189 million for electric companies and 174 million for gas companies. Utility companies have spent over 2 billion dollars for CAP through 1998.

Utility Complaint Handling and Regulation

- Responsible for establishing procedures and directing 90 staff in investigating annually over 100,000 informal consumer complaints for regulated fixed utilities, payment arrangement requests and responding to over 70,000 inquiries.
- Arbitrate billing, credit and other informal complaints and issue binding decisions to resolve informal disputes expeditiously. Investigators also issue decisions regarding the amortization of overdue electric, gas, steam heat, water, wastewater and basic telephone bills.

1978-1992 Pennsylvania Public Utility Commission

PA Chief, Division of Research and Planning

Reported to Director of Bureau of Consumer Services with direct responsibility for the direction, supervision and planning of a Division of 15 professionals who are delegated program responsibilities for regulation enforcement, utility program evaluation, customer assistance programs and consumer education. As the first Division Chief he was instrumental in creating these activities

- Bureau's compliance program in enforcing customer service regulations and statues through regulator interpretations, citations and litigation; including preparing with legal staff formal records, briefs, motions, interrogatories, reviewing utility responses and negotiating equitable settlements.

- Development and implementation of computer information evaluation systems for evaluation of utility customer service programs; systematic performance problems are identified through statistical analysis and observation and correction actions recommended via public reports, formal rate cases and consumer services audit programs.
- Managed the development of Commission's first consumer education program including proposing annual plans, statewide networking, supervising staff in conducting of workshops and conferences, and preparation of consumer education materials.

- Supervised the development of an integrated program for low income consumers; through program evaluation, leading to testimony, preparation of policy recommendations, interdepartmental coordination, regulation promulgation and establishing evaluation criteria

1977-1978 Pennsylvania Public Utility Commission Harrisburg, PA Research Analyst

Responsible for evaluating existing utility and Commission customer service programs and identifying problems and recommendations for change, which led to Division's current programs.

1974-1977 Governor's Action Center Harrisburg, PA
Research Supervisor

Office supervisor for a research and information unit. Duties included the modification and maintenance of an information and evaluation system, writing technical and topical reports, quality control review and staff training. Responsible for the supervision of five case evaluator and student interns.

EDUCATION

M.S., Shippensburg University, 1984
Major: Public Administration
G.P.A. 3.9/4.0

B.S., Pennsylvania State University, 1974
Major: Community Development
Cum Laude

ADDITIONAL AFFILIATIONS

Member, Pennsylvania WAP Policy Advisory Council

Member, Keystone Energy Efficiency Alliance

Past Co-Chair Keystone Energy Efficiency Alliance Conference

Past Co-Chair National Energy and Utility Affordability Conference

EXPERT TESTIMONY

- Pa. PUC v. Pittsburgh Water and Sewer Authority, Docket No. R-2018-3002645; R-2018-3002647
- Pa. PUC v. PECO Energy Co., Docket No. R-2018-30000164
- Pa. PUC v. Columbia Gas of Pennsylvania, Inc., Docket No. R-2018-2647577
- PECO Energy Company's Pilot Plan for an Advance Payments Program and Temporary Waiver of Portions of the Commissions Regulations, Docket No. P-2016-2573023
- Pa. PUC v. UGI Penn Electric, Inc., Docket R- 2016-2580030
- Pa. PUC v. Metropolitan Edison Company, Docket No. R-2016-2537349
- Pa. PUC v. Pennsylvania Electric Co., Docket No. R-2016-2537352
- Pa. PUC v. Pennsylvania Power Co., Docket No. R-2016-2537355
- Pa. PUC v. West Penn Power, Docket No. R-2016-2537953
- Pa. PUC v. UGI Utilities, Inc. – Gas Division, Docket No. R-2015-2518438
- Petition of Duquesne Light for Approval its Act 129 Phase III Energy Efficiency and Conservation Plan, Docket No. M-2015-2515375
- Petition of PECO Energy Co. for Approval its Act 129 Phase III Energy Efficiency and Conservation Plan, Docket No. M-2015-2515619
- Consolidated Petition of First Energy Companies for Approval its Act 129 Phase III Energy Efficiency and Conservation Plan, Docket Nos. M-2015-2514767, -2514768, -2514769, 2514772
- Petition of Philadelphia Gas Works for Approval of its Phase II Demand Side Management Plan, Docket No. P-2014-2459362
- Pa. PUC v. PECO Gas of Pa., Inc., Docket No. R-2015-2468056
- Pa. PUC v. PPL Electric Utilities Corporation, Docket No. R-2015-2469275
- Pa. PUC v. PECO Gas of Pa., Inc., Docket No. R-2014-2406274
- Verizon Pa., LLC, and Verizon North, LLC, Petition for Competitive Classification, Docket Nos. P-2014-2446303, P-2014-2446304
- Petition of PECO Energy Co. for Approval its Act 129 Phase II Energy Efficiency and Conservation Plan, Docket No. M-2012-2333992
- Petition of PECO Energy Co. for Approval of its Default Service Program II, Docket No. P-2012-2283641
- Petition of PECO Energy Co. for Approval of its Universal Service and Energy Conservation Plan, Docket No. M-2012-2290911.

APPENDIX B: Interrogatory Responses

Interrogatories of Pittsburgh UNITED to PWSA

UNITED I-14

UNITED II-1

UNITED II-5, Supplemental Response

UNITED II-6

UNITED II-7

UNITED II-8

UNITED II-9

UNITED II-10

UNITED II-11, Attachment A*

**Note: The sample letter contained in Attachment A to UNITED II-11 contains a "Confidential" water mark. PWSA has confirmed that this document is not considered confidential for the purposes of this proceeding.*

UNITED II-12

UNITED II-13

UNITED II-14, Revised Response

UNITED III-1

UNITED III-2, Attachment A

UNITED III-3

UNITED III-4

UNITED III-5

UNITED III-13

UNITED III-20

UNITED III-21

UNITED III-22, Attachments A & B

UNITED III-24

UNITED III-27

UNITED IV-6

UNITED V-2, Attachment A

UNITED V-3

UNITED V-4

UNITED V-5

UNITED V-8

UNITED V-9

UNITED V-10

UNITED V-11, Supplemental Response

UNITED VI-1

UNITED VI-2

UNITED VI-3

UNITED VI-8

UNITED VI-9

UNITED VI-12

UNITED VII-2, Attachment A

UNITED XI-10, Rate Case

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-14	What does PWSA expect the average cost of a public-side lead service line replacement to be under the small diameter water main program? What does PWSA expect the average cost of a private-side lead service line replacement to be if PWSA were to include those service lines in its small diameter water main program?
Response:	The cost of the public service line replacement is covered under the per foot cost for water main replacement for planning level estimates. PWSA assumed $7500/private side replacement for planning level estimates.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-1 Have the answers and documents provided in response to the following interrogatories exchanged in PWSA's 2018 Base Rate Proceeding (PUC docket numbers R-2018-3002645 and -3002647) been changed, modified, or updated? If so, please provide updated answers and/or documents in response thereto.

a. UNITED I-1: What are the policies and procedures for eligibility and enrollment in PWSA's Bill Discount Program? Please provide a copy of PWSA's written policies, training materials, and other written documents which describe the policies and procedures for PWSA's Bill Discount Program.

b. UNITED I-2: What are the policies and procedures for eligibility and enrollment in PWSA's Hardship Program? Please provide a copy of PWSA's written policies, training materials, and other written documents which describe the policies and procedures for PWSA's Hardship Program.

c. UNITED I-3: What are the policies and procedures for eligibility and enrollment in PWSA's Private Lead Line Replacement Community Environmental Project? Please provide a copy of PWSA's written policies, training materials, and other written documents which describe the policies and procedures for PWSA's Private Lead Line Replacement Community Environmental Project.

d. UNITED I-11: Has PWSA, or a third party on behalf of PWSA, conducted any formal or informal needs assessment for low income assistance programming within PWSA's service territory? Please provide a copy of any such needs assessments.

e. UNITED I-12: Has PWSA, or a third party on behalf of PWSA, conducted an assessment of the effectiveness of PWSA's Customer Assistance Programs? Please provide a copy of any such assessments.

f. UNITED I-13: Please provide a copy of any contract, memoranda of understanding, or other arrangement between PWSA and the Dollar Energy Fund or other third party for administration of PWSA's Customer Assistance Programs.

g. UNITED I-15: Please identify the date, agenda, and attendees for each meeting conducted between PWSA staff, board, or management with staff at the Pennsylvania Public Utility Commission since December 21, 2017, and provide a copy of the minutes from those meetings.

h. UNITED I-18: Please describe how a customer is designated as a "confirmed low income" customer, the proof (if any) required for a customer to be designated as confirmed low

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

income, and how long that designation is applied before new proof is required.

i. UNITED III-15: Please provide a copy of PWSA's contract(s), memoranda of understanding, or other agreements with Jordan Tax Service, Inc.

j. UNITED III-27: See UNITED I-11, Attachment A, paragraph 3. What proof of income is accepted for enrollment in each of PWSA's Customer Assistance Programs? Please provide all written policies, procedures, or memoranda explaining the Customer Assistance Program income verification process and/or specifying the acceptable proof of income.

k. UNITED III-33: What steps does PWSA take to determine whether a dwelling unit is tenant occupied prior to terminating service?

l. UNITED V-1: When a customer applies for service at a residence, does PWSA ask the applicant to identify if the service address will be exclusively occupied by the applicant or whether it may become occupied by tenants? Please provide a copy of any written documents, forms, or call scripts where this information is required or requested.

m. UNITED V-2: When a customer contacts PWSA requesting a voluntary relinquishment of service to a residential property, does PWSA inquire if the service address is occupied exclusively by the owner/ratepayer or by tenants? Please provide a copy of any written documents, letters, forms, or call scripts where this information is required or requested.

n. UNITED V-3: Does PWSA required or provide an affidavit for use by a landlord ratepayer requesting voluntary relinquishment of service to a residential property certifying that no tenants occupy the property? Provide a copy of any affidavits or other written documents, letters, or forms used, currently in use and/or developed for possible use by PWSA.

o. UNITED V-5: Within the past five (5) years, how many requests for the names and addresses of tenants occupying a residential property have been made by PWSA?
a. What is the procedure for requesting that information?
b. Provide copies of any letters and forms used to obtain this information.

Response:

a. While there have been no changes to the policies and procedures for enrollment in PWSA's Bill Discount Program (BDP), the eligibility rules have changed due to the rate case settlement. The reduction in fixed base charges in the BDP

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

has increased from 50% to 75%. See UNITED-II-1 Attach A for the updated 2019 customer flyer.

b. There have been no changes, modifications, or updates regarding PWSA's Hardship Cash Assistance Program.

c. There have been no changes, modifications, or updates regarding PWSA's policies and procedures for eligibility and enrollment in the Private Lead Line Replacement Community Environmental Project.

d. There have been no changes, modifications, or updates regarding PWSA conducting any formal or informal needs assessment for low income assistance programming. PWSA intends to include this topic on the agenda for discussion at its initial Low Income Assistance Advisory Committee (LIAAC) meeting on March 4, 2019.

e. There have been no changes, modifications, or updates regarding PWSA conducting an assessment of the effectiveness of PWSA's Customer Assistance Programs. PWSA intends to include this topic on the agenda for discussion at its initial Low Income Assistance Advisory Committee (LIAAC) meeting on March 4, 2019.

f. There have been no changes, modifications, or updates regarding PWSA's contract with Dollar Energy Fund.

g. A meeting was held between PWSA Customer Service personnel and the Bureau of Consumer Services on November 5, 2018. Please see UNITED-II-1 Attach B for the agenda of that meeting. The following were PWSA's lessons learned from the meeting:

1,PWSA can issue both Friendly Reminders and 10-Day Shut Off Notices for non-payment prior to the end of the Winter Moratorium, as long as no terminations take place before April 1st.
2.When replacing a meter with an MXU with another water meter with an MXU, the meter must be tested.
3.Utility Reports rarely include the date that the customer established the account, the meter serial number, meter readings (actual vs. estimated), and the length of estimation.
4.Utility Reports and Informal Responses too often (28 cases identified) list the CSR as having spoken with an "unnamed" caller.

Another on-site meeting was held on February 27, 2019. A copy of the agenda for that meeting is attached as UNITED-II-1 Attach C. In addition to the items listed on the agenda,

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

BCS representatives were given an introduction of the IT staff and a tour of the server room.

h. There have been no changes, modifications, or updates regarding the methods that Dollar Energy Fund employs to confirm that a PWSA customer is designated as low income.

i. As part of the rate case settlement, PWSA provided verbal notice to Jordan Tax Service, Inc. (JTS) that, effective February 7, 2019, unpaid water and wastewater charges billed by PWSA would no longer be placed with JTS for collection.

j. There have been no changes, modifications, or updates regarding the methods that Dollar Energy Fund employs to verify the income of a PWSA customer.

k. There have been no changes, modifications, or updates regarding the steps that PWSA takes to identify tenant-occupied property.

l. There have been no changes, modifications, or updates regarding PWSA's Application for Final Bill.

m. See PWSA St. No. C-4 and Exhibit JAQ/C-1 for recently revised Residential Rental Property Water Service Discontinuance Request Form that is completed when a landlord requests that service be terminated to a property occupied by tenants.

n. See Response to UNITED II-1.m.

o. See Exhibit JAQ/C-5. The 37-day shut off notice is the only form of communication that PWSA uses to solicit tenant names and addresses from landlords. In the past five years, PWSA has issued 6,728 37-day notices.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

Response of Pittsburgh Water and Sewer Authority ("PWSA") to the Interrogatories of the Pittsburgh United, Set II in Docket No. M-2018-2640802 and Docket No. M-2018-2640803

Supplemental Response

Request: UNITED II-5 How many customers enrolled in PWSA's Bill Discount Program (BDP) since the program's inception, disaggregated by month and income tier? This is a continuing request. Please provide updated information at the conclusion of each month. If possible, please provide the data in response to this question in a form which is the same or substantially similar to the following table:

2018	0-50% FPL	51-100% FPL	101-150% FPL
January			
…			
2019			
January			
…			

Response:

2018	
January	87
February	1,118
March	1,758
April	1,882
May	1,968
June	2,022
July	2,068
August	2,124
September	2,174
October	2,240
November	2,222
December	2,360
2019	
January	2,504
February	2,677

PWSA has an online dashboard to the data that the Dollar Energy Fund (DEF) collects from its customers. This dashboard does not contain a report on customer poverty levels under the Bill Discount Program.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

{L0804590.1}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Supplemental Response:	The enrollment numers provided in this response exclude customers who were only eligible for the Winter Moratorium. The enrollment numbers provided in PWSA's Response to UNITED I-8 in the Rate Case were inclusive of customers who qualified for both the Winter Moratorium and the Bill Discount Program (BDP).
Supplemental Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

{L0804590.1}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-6 How many customers have participated in PWSA's Hardship Program, disaggregated by month and income tier? This is a continuing request. Please provide updated information at the conclusion of each month. If possible, please provide the data in response to this question in a form which is the same or substantially similar to the table provided in UNITED II-5.

Response:

2018	
April	10
May	20
June	28
July	13
August	42
September	2
October	18
November	17
December	7
2019	
January	11
February	7

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-7 How many customers have participated in PWSA's winter moratorium, disaggregated by month and income tier? This is a continuing request. Please provide updated information at the conclusion of each month. If possible, please provide the data in response to this question in a form which is the same or substantially similar to the table provided in UNITED II-5.

Response:

2018	
December	323
2019	
January	493
February	213
March	13

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-8 How many customers have enrolled in PWSA's Private Lead Line Replacement Community Environmental Project since the program's inception, disaggregated by month and income level? This is a continuing request. Please provide updated information at the conclusion of each month. If possible, please provide the data in response to this question in a form which is the same or substantially similar to the table provided in UNITED II-5.

Response: A total of 58 customers have been enrolled in the CEP since its inception. PWSA does not collect data disaggregated by month and income level.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-9	Does PWSA have any current plans or future intentions to perform a formal needs assessment for low income assistance programming within its service territory? If yes, please identify PWSA's timeline for performing a formal needs assessment and provide a copy of any and all documents, contracts, and/or workpapers that set forth a plan and/or establish a methodology to perform the future assessment. If no, please explain why PWSA does not plan to perform formal needs assessment and whether PWSA believes a formal needs assessment necessary.
Response:	See UNITED-II-1.d.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-10 Does PWSA have any current plans or future intentions to perform a formal assessment of the effectiveness of PWSA's Customer Assistance Programs at serving the affordability needs of low income customers?

If yes, please identify PWSA's timeline for performing a formal program assessment and provide a copy of any and all documents, contracts, and/or workpapers that set forth a plan or establish a methodology to perform the future assessment.

If no, please explain why PWSA does not plan to perform a formal program assessment and whether PWSA believes a formal program assessment necessary.

Response: See UNITED-II-1.e.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-11	What is the process and procedure for re-enrollment and/or re-certification in PWSA's Bill Discount Program? Please include a copy of all customer notifications or communications which inform or remind customers of the requirement to reenroll or recertify to remain in the program.
Response:	See UNITED-II-11 Attach A for a sample letter that is mailed to all enrolled customers prior to the end of a program year.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

DOLLAR ENERGY FUND

PGH2O

Dollar Energy Fund
P.O. Box 42329
Pittsburgh, PA 15203-0329
www.dollarenergy.org

Monday, November 12, 2018

[redacted]

Subject: Time to Update Your Pittsburgh Water and Sewer Authority Application

It is now time to renew your application for the Pittsburgh Water and Sewer Authority program. Please contact Dollar Energy Fund at 866-762-2348 and speak with one of our representatives to update your information.

Please do not delay. If your application is not updated, you will no longer receive the 50% reduction of fixed, or minimum, monthly water and/or wastewater conveyance charges in 2019.

Sincerely,

Dollar Energy Fund

Confidential

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-12	How many Bill Discount Program participants completed the process for re-enrollment and/or re-certification described in response to UNITED II-11 at the end of their 12-month enrollment period? Please disaggregate by month. This is a continuing request. Please provide updated information at the conclusion of each month.
Response:	Neither PWSA nor Dollar Energy Fund (DEF) currently track this data.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-13	How many Bill Discount Program participants failed to complete the process for re-enrollment and/or re-certification described in response to UNITED II-11 at the end of their 12-month enrollment period? Please disaggregate by month. This is a continuing request. Please provide updated information at the conclusion of each month.
Response:	Neither PWSA nor Dollar Energy Fund (DEF) currently track this data.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Revised Response

Request: UNITED II-14	Are Bill Discount Program (BDP) participants who fail to complete the process for re-enrollment and/or re-certification automatically removed from BDP? If not, how long can the participant remain enrolled in BDP before being removed from the program?
Response:	PWSA customers who are approved to participate in the BDP are enrolled on a rolling twelve month basis based on their date of enrollment.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

{L0804590.1}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-1	See PWSA St. C-4 at 11-16. At the time of an actual termination, does PWSA personnel make any attempt to speak with a responsible adult resident at the property before proceeding with the termination? If so, please describe how this attempt is accomplished and provide a copy of PWSA's employee handbook, manuals, or related training documents which detail this policy.
Response:	At the time of an actual termination and posting of the shut off notice, PWSA field personnel will advise any customers they encounter to contact Customer Service at 412-255-2423 for assistance. PWSA Technicians are not authorized to accept payment to stop a termination of service due to non-payment, nor do they have the skills or training necessary to change a water meter to stop a termination of service due to non-access.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 11, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-2 See PWSA St. C-4 at 13-14. Has it ever been PWSA's policy for PWSA field personnel to knock on the door or otherwise attempt to speak with a responsible adult at the property at the time a notice of termination is posted? If so, please indicate when PWSA changed or modified its policy, and describe its prior policy regarding personal contact at the time notice of termination is posted.

Response: Prior to coming under Commission regulation on April 1, 2018, PWSA field personnel were not instructed to knock on the door or otherwise attempt to speak with a responsible adult at the property at the time a notice of termination is posted. Currently, PWSA contracts its termination posting services to Cosmos Technologies, Inc. As an agent of PWSA, Cosmos personnel have been trained to attempt personal contact. See the following instruction on slide 7 of the presentation titled, "PWSA PA PUC Posting Training for Cosmos" provided in UNITED-III-2 Attach A:

"Posting on the property: Conspicuously post a written notice at the residence, if PWSA is unsuccessful in attempting to personally contact a responsible adult occupant during the visit."

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

Pittsburgh
Water & Sewer
Authority

PA PUC Posting Training
for
Cosmos Technologies, Inc.

February 11, 2019

Posting Notices Under PA PUC Regulation

- Overview/Training Objectives
- Pennsylvania Public Utility Commission (PA PUC)
- PA PUC Bureau of Consumer Services (BCS)
- Field Related Regulations
- Postings Notices
- Reposting Procedures

PA Public Utility Commission

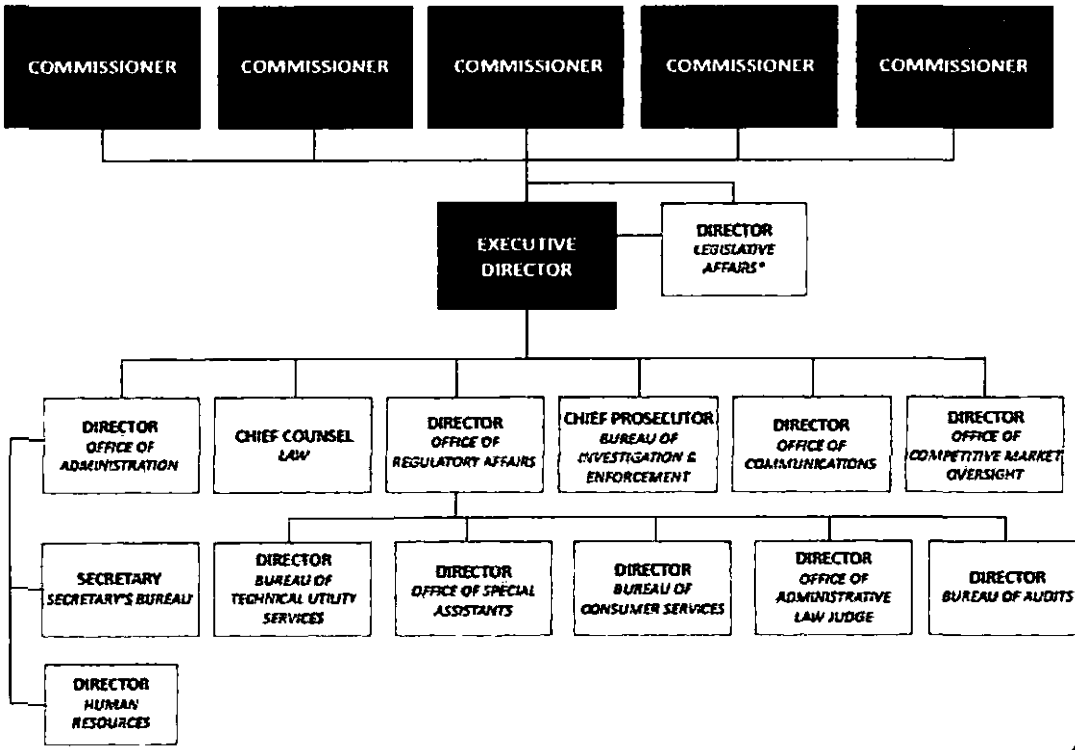
- Established by Legislature
- Five Commissioners
  - Appointed for staggered five year terms
  - Subject to approval by Legislature
- Balance needs of both utilities and ratepayers
- Administration of the Commission
- Twelve bureaus with more than 500 employees
  - Bureaus act in an advisory capacity or serve in a prosecutorial role
  - Informal and Formal Proceedings

PENNSYLVANIA PUC PUBLIC UTILITY COMMISSION

PENNSYLVANIA
PUBLIC UTILITY COMMISSION

PGH2O

PUC Organizational Chart



*Dual reporting relationship to Commissioners and Executive Director

PGH2O

PWSA and PUC Oversight

- **December 21, 2017**
  - Governor Wolf signed Act 65 of 2017 into law
  - PUC now has jurisdiction over quality, reliability and adequacy of service
- **January 18, 2018**
  - Tentative Implementation Order issued
  - PUC conducted "listening sessions" and accepted public comment
- **March 15, 2018**
  - Final Implementation Order issued effective April 1, 2018

PWSA and PUC Oversight cont.

· By nature of the contract with PWSA, Cosmos Technologies, Inc. is required to adhere to regulations enforced by the PA PUC relating to termination and collection activities in general.

· Noncompliance with these regulations can result in civil penalties to PWSA, administered by an Administrative Law Judge with the PA PUC.

66 Pa. C.S.A. § 501(c) Compliance. -- Every public utility, its officers, agents, and employees, and every other person or corporation subject to the provisions of this part, affected by or subject to any regulations or orders of the commission or of any court, made, issued, or entered under the provisions of this part, shall observe, obey, and comply with such regulations or orders, and the terms and conditions thereof.

Termination Notice Procedures

- Service can be terminated if the customer did not 1) pay his/her bills, 2) keep a payment agreement, 3) allow PWSA access to its meter or other equipment, 4) repair a Waste of Water situation.
- 10 Day Notice, active for up to 60 days
- 3 Day Notice, attempts personal contact; can be completed via automated, outbound call or posting on the property
    - Automated, outbound call: PWSA must make two attempts on two separate days. One call must be attempted before 5 PM, and one call must be attempted after 5 PM.
    - Posting on the property: Conspicuously post a written notice at the residence, if PWSA is unsuccessful in attempting to personally contact a responsible adult occupant during the visit.
- 48 Hour Notice, only issued December through March or year-round for customers who have submitted proof of a Protection from Abuse Order

Posting Notices

- Confirm that the correct property address is being posted. If you are unsure of the address, please do not post the property. Consult with PWSA before reposting.

- Do not take pictures of the posting notice if any people are going to be captured in the image.

- If you make contact with a customer regarding their termination, please advise them to call PWSA Customer Service at 412-255-2423 for assistance.

- If you feel threatened by a customer, please report the encounter, including the property address, to PWSA staff.

Reposting Procedures

- If you are unable to post a property on the date as listed on the notice, please add the address to a list of properties to be provided to PWSA *prior to* reposting.

- All potential repostings must be manually reviewed by PWSA to ensure that the customer did not make a payment to cancel the termination.

- Once the manual review is complete, PWSA will send a list to Cosmos of properties that are approved for reposting.

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-3	See PWSA St. C-4 at 13-14. Has it ever been PWSA's policy for PWSA field personnel to knock on the door or otherwise attempt to speak with a responsible adult at the property at the time service is actually terminated? If so, please indicate when PWSA changed or modified its policy, and describe its prior policy regarding personal contact immediately prior to a termination.
Response:	Prior to coming under Commission regulation on April 1, 2018, PWSA field personnel were not instructed to knock on the door or otherwise attempt to speak with a responsible adult at the property at the time service is actually terminated. See UNITED-III-1 regarding current practice.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 11, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-4	See PWSA St. C-4, Exhibits JAQ/C-2 to C-6. Does PWSA plan to further amend these notices to provide information in Spanish or other foreign languages? If yes, please explain and provide a timeline for the planned amendments. If not, please explain why not.
Response:	PWSA provided an executed agreement to United Language Group, LLC (ULG) on March 6, 2019. ULG advised that telephone and written translation services would be available to PWSA within a week.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 11, 2019

{L0793192}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-5 See See PWSA Compliance Plan Supplement at Appendix SB (Termination of Service by Location Class). With regard to PWSA's termination procedure for "Owner Occupied-Tenant Responsible" accounts, please respond to the following:

A. Define the term "owner occupied-tenant responsible" accounts.
B. How does PWSA identify an account as "tenant responsible"?
C. How does PWSA identify an account as "owner occupied"?
D. Docs PWSA perform the "alternative and additional procedures" year-round for victims of domestic violence with a Protection From Abuse Order or other court order containing evidence of domestic violence? (See PWSA Compliance Plan Supplement at Appendix SC at 6).

Response:

A. An "owner occupied-tenant responsible account" is an account where either the owner is in residence or a tenant has completed an assumption affidavit with PWSA and is the sole responsible billing party.
B. PWSA must receive a signed and notarized assumption affidavit to code an account as tenant responsible.
C. The owner of record per the County of Allegheny real estate web site has not supplied PWSA with an alternate billing address.
D. Yes.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-13 See PWSA St. 4-C at 12:5-12. Does PWSA also provide a 10-day written notice of termination to tenants? If not, please explain and provide the basis for this policy.

Response: Yes; if a tenant is listed on the account and receives a copy of the monthly bills, they will also receive a copy of the 10-day notice of termination.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

(L0793192)

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-20 See PWSA St. 4-C, Exhibit JAQ/C-8 at slide 9. Why are tenants required to make "tenant payments" in person, at PWSA's 1200 Penn avenue office location? Please explain, and identify the reasons PWSA does not also accept payments over the phone or by mail.

Response: Tenant paymcnts are required to be made in person to PWSA personnel to discourage landlords or third parties from paying only the current charges to stop a collections action.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-21	See PWSA St. 4-C, Exhibit JAQ/C-8 at slide 12. Does PWSA ever affirmatively ask, request, or direct that a tenant exercising their rights under DSLPA/USTRA establish service in their name?
Response:	If a tenant requests that an account is placed in their name, CSR's will explain the process to submit an Owner-Tenant Addition Form or a notarized Assumption Affidavit. PWSA may offer this process; however, CSR's are trained to provide a tenant with all of the rights available to them under DSLPA. PWSA would not require or direct a tenant exercising their rights under DSLPA to establish service in their name.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 11, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-22 See PWSA St. 4-C, Exhibit JAQ/C-8 at slide 13. Please provide a copy of the "Owner/Tenant Addition form" and the "Assumption Affidavit" that is currently in use by PWSA.

Response: See the "Owner/Tenant Addition form" in UNITED-III-22 Attach A and the "Assumption Form" in UNITED-III-22 Attach B.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

PGH2O Pittsburgh Water & Sewer Authority

Customer Account No:

Re:

CHANGE OF ADDRESS - OWNER/TENANT

Dear :

Below are instructions for the Name/Address change you would like to make:

1. Owner responsible for the bill - change billing address
If you are the owner of the property and wish to change only the address that the bill is sent to, please complete the attached form as follows:

Complete the new billing address section and sign the form in the Owner's signature blank. The completed form should then be returned to The Pittsburgh Water and Sewer Authority.

2. Owner responsible for the bill - change responsibility to tenant
If you are the owner of the property and wish to change responsibility of the water bills to the tenant, please complete the attached form as follows:

A) It is the policy of the Authority that the owner of the property pay any outstanding charges prior to submission of the bills to the tenant. Following receipt of your payment, the billing change you requested will be made. The outstanding balance is $.

B) Complete the new Billing Name and Address section. Both the owner and the tenant must sign the form in the appropriate places. The form should then be returned to The Pittsburgh Water and Sewer Authority.

Sincerely,

Customer Service

Penn Liberty Plaza I
1200 Penn Avenue
Pittsburgh PA 15222

info@pgh2o.com
T 412.255.2423
F 412.255.2475

www.pgh2o.com
@pgh2o

Customer Service /
Emergencies:
412.255.2423

PGH2O Pittsburgh Water & Sewer Authority

CHANGE OF ADDRESS – OWNER/TENANT

To change the billing address for a Pittsburgh Water and Sewer Authority (PWSA) bill, please complete the sections of this form that apply. If a tenant is being added or changed, both the owner and tenant must sign the form in the appropriate places. A monthly invoice will be sent to the tenant and a copy will be sent to the owner. The completed form must then be returned to PWSA. Please allow 7-10 business days for processing.

Service Address: _____ Account No: _____

Owner's Name: _____ Tenant's Name: _____

Tenant Move-in Date: _____

Owner's Current Address:

_____

_____

Phone: _____

Tenant Billing Address:

_____

_____

Phone: _____

Reason For Change: ☐Change of owner's address ☐Change for new tenant ☐Add existing tenant to billing

Owners and Property Managers: as the master account holder, please insure the balance is paid in full before the new tenant assumes responsibility for the billing. Any unpaid balance prior to the new tenant's move in date listed above could postpone processing and/or cause removal of the new tenant's information from the account.

Owner's signature: _____ Date: _____

Tenant's signature: _____ Date: _____

Sincerely,

Customer Service

Penn Liberty Plaza I
1200 Penn Avenue
Pittsburgh PA 15222

info@pgh2o.com
T 412.255.2423
F 412.255.2475

www.pgh2o.com
@pgh2o

Customer Service / Emergencies:
412.255.2423

PGH2O Pittsburgh Water & Sewer Authority

UNITED-III-22 Attach B

Customer Account Number:
Service Address:

Old Billing Name and Address:

_____

_____

_____

New Billing Name and Address:

_____

_____

_____

Phone Number: _____

Reason for Change: _____

_____

_____

Signature: _____ Date: ____/_____/_____

I (We) _____ hereby agree to assume responsibility for the amounts due to The Pittsburgh Water and Sewer Authority and/or Jordan Tax Service, Inc. as of ____/_____/_____.

Sworn to and subscribed before me this _____ day of _____, _____.

_____
Notary Public

My Commission Expires: ____/_____/_____

Penn Liberty Plaza I
1200 Penn Avenue
Pittsburgh PA 15222

info@pgh2o.com
T 412.255.2423
F 412.255.2475

www.pgh2o.com
@pgh2o

Customer Service / Emergencies:
412.255.2423

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-24 See PWSA Compliance Plan Supplement at Appendix SB (Termination of Service by Location Class, Landlord accounts). Please respond to the following:

A. Is the 30-day notice identified here different from the 30 Day Shut Off Notice to tenants described in PWSA St. C-4 at 12:7-9?
B. Is the 30-day notice identified here sent to tenants, landlords, or both?
C. Please describe how PWSA makes "two attempts" to provide 30-day notice of termination.
D. Please explain why Ms. Quigley's testimony and PWSA's updated training materials regarding compliance with DSLPA do not also indicate that "two attempts must be made" to provide 30-day notice of termination.

Response:

A. No.
B. The 30-day notice is sent to tenants, and the 37-day notice is sent to landlords.
C. PWSA both mails the 30-day notice and posts a copy to the property.
D. An investigator with the Bureau of Consumer Services recently advised PWSA of their lack of two attempts to notify tenants of an impending termination. Due to the Winter Moratorium protections, PWSA is not currently issuing terminations to tenant-occupied properties. PWSA is still devising a cost effective plan to add the additional posting notice that will go into effect by April 1, 2019, including updating associated training materials.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

{L0793192}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set III in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-III-27 See PWSA Compliance Plan at 25, para. 3.a. "PWSA will begin to draft a detailed low income assistance program plan through the creation of a Low Income Assistance Advisory Committee." Please respond to the following:

A. Identify PWSA's timeline for developing this plan.
B. Explain how PWSA plans to utilize the LIAAC to develop its Plan.
C. Does PWSA intend to share a draft Plan with the LIAAC and/or solicit feedback and comments from the LIAAC prior to filing? If yes, please describe how that input will be solicited and ultimately incorporated into the Plan.
D. Indicate whether PWSA intends to draft the Plan internally or with the assistance of a consultant or contractor. If applicable, please provide a copy of any contractual agreement between PWSA and a consultant or contractor to develop its Low Income Assistance Program Plan.

Response:

A. A timeline will be driven by the LIAAC, whose initial meeting was held March 4, 2019.
B. PWSA provided a short presentation on its existing Customer Assistance Program (CAP) at the initial LIAAC meeting. PWSA will discuss the following topics with the LIAAC: a formal needs assessment, a formal assessment of the effectiveness of the existing CAP, and the development of a detailed low income assistance program plan.
C. Yes; input will be solicited at planned LIAAC meetings, and a plan will be drafted and circulated among committee members for review and comment.
D. PWSA plans to draft this document internally.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 11, 2019

{L0793192}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-6	How many lead service line replacements has PWSA completed under the Community Environmental Project? (See PWSA St. 1, at 55.)
Response:	As of March 6, 2019, a total of 20 public side and 18 private side lead service lines have been replaced as part of the CEP.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Supplemental Response

Request: UNITED-V-2	Please provide a copy of all correspondence, communications, memoranda, workpapers, documents, or contractual agreements since October 2018 between PWSA and representatives at Jordan Tax Service regarding its contractual relationship for lien and/or collections services.
Response:	There are no responsive documents.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019
Supplemental Response:	See UNITED-V-2 Attach A
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

{L0803960.1}

PGH2O Pittsburgh Water & Sewer Authority

March 22, 2019

Attn.: William R. Linnert, Jr., President
Jordan Tax Service, Inc.
102 Rahway Road
McMurray, PA 15317

Michael McCabe, Esquire
Goehring, Rutter & Boehm, P.C.
437 Grant Street, 14th Floor
Pittsburgh, PA 15219

Re: Termination of Agreement dated September 12, 2008 by and between the Pittsburgh Water and Sewer Authority, Jordan Tax Service, Inc. and Goehring, Rutter & Boehm, P.C.

Dear Mr. Linnert and Mr. McCabe:

Please accept this letter as notice to terminate the Agreement by and between the Pittsburgh Water and Sewer Authority "PWSA," Jordan Tax Service, Inc. "JTS" and Goehring, Rutter & Boehm, P.C., dated September 12, 2008. The PWSA agreed to suspend the use of JTS as part of entering into a settlement agreement with the Pennsylvania Public Utility Commission "PUC." The PWSA made this agreement with the PUC due to JTS' servicing expense of 15%, together with PWSA's interest of 10%, exceeding the allowable late payment charge amount, as regulated under 52 Pa. Code § 56.22:

> **56.22. Accrual of late payment charges.**
> (a) Every public utility subject to this chapter is prohibited from levying or assessing a late charge or penalty on any overdue public utility bill, as defined in § 56.21 (relating to payment), in an amount which exceeds 1.5% interest per month on the overdue balance of the bill. These charges are to be calculated on the overdue portions of the bill only. The interest rate, when annualized, may not exceed 18% simple interest per annum.

If you have any questions in this matter, please contact me at 412-255-8800 ext. 8972.

Very truly yours,

Debbie Lestitian, CPA, Esquire
Chief Corporate Counsel and
Chief of Administration

CC: Julie Quigley, Director of Administration, PWSA
Shannon Barkley, Corporate Counsel, PWSA

Penn Liberty Plaza I
1200 Penn Avenue
Pittsburgh PA 15222

info@pgh2o.com
T 412.255.2423
F 412.255.2475

www.pgh2o.com
@pgh2o

Customer Service /
Emergencies:
412.255.2423

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-V-3	See PWSA Compliance Plan Supplement at 25, para. 2; and PWSA St. C-4 at 20:10-14. How does PWSA plan to perform collections activities on overdue accounts after it suspends use of Jordan Tax Service pursuant to the recently approved Joint Settlement Agreement in PWSA's 2018 base rate proceeding, docket nos. R-2018-3002645, -3002647? If PWSA is still determining this process, please explain the steps PWSA intends to take to evaluate its options, its anticipated timeframe for decision-making, and whether any decisions have been made to date.
Response:	PWSA will continue with its internal, regulated Collections process and will lien debt that remains uncollectible following a termination of service.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-V-4

Once PWSA suspends its use of JTS pursuant to the recently approved Joint Settlement Agreement in PWSA's 2018 base rate proceeding, docket nos. R-2018-3002645, -3002647, what will happen to the debts which were previously referred to JTS for collections?

Please specifically explain whether and how these debts may be reintroduced onto a residential customer's bill, and whether/how debt which was previously referred for collections could trigger the termination process.

Response:

PWSA intends to utilize its internal, regulated Collections process to collect debts aged less than four years. Now that PWSA has suspended use of JTS pursuant to the recently approved Joint Settlement, PWSA is evaluating whether and how the previously transferred debts may be introduced onto a residential customer's bill, and whether/how the debt which was previously referred for collections could trigger the termination process.

Response Provided by:

Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated:

March 14, 2019

{L0800625}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-V-5	Does PWSA have plans or otherwise intend to renegotiate or reestablish its contractual relationship with Jordan Tax Service, now or in the future?
Response:	See UNITED-V-2.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

(L0800625)

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-V-8	See PWSA St. C-4 at 39:20-22. Is the notice of non-payment posted for all customers which share the party line, or only the customer with the delinquency? Please provide a copy of the "notice of the non-payment" that is posted.
Response:	A notice of non-payment is posted only for the customer with the delinquency. The notice of non-payment can be any one of Exhibits JAQ/C-2 through C-7.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-V-9	See PWSA St. C-4 at 39:20-22. How many party line accounts does PWSA currently have on its system?
Response:	While an exact count is unknown, PWSA currently has 484 flat water accounts of which an unknown number are party service lines.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-V-10	See PWSA St. C-4 at 39:20-22. How many party line accounts were terminated for non-payment from 2014-2018 and to date in 2019, disaggregated by year?
Response:	PWSA does not currently track the requested data.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

{L0800625}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set V in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Supplemental Response

Request: UNITED-V-11	See PWSA St. C-4 at 14:5-10. Please provide the date and a copy of any police report(s) for the incidents described by Ms. Quigley in the last 5 years. If any of the incidents resulted in subsequent prosecution, please list the docket number(s) for each proceeding.
Response:	PWSA is not in possession of police reports for the referenced incidents. PWSA will query its Computerized Maintenance Management System for service orders with comments regarding field personnel's request for police assistance.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019
Supplemental Response:	Although it is not PWSA policy to obtain police reports when field personnel request police assistance, there were 17 accounts flagged for a police escort from June 2015 through October 2018 due to hostile interactions with customers.
Supplemental Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Supplemental Response Dated:	March 22, 2019

{L0803960.1}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VI in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VI-1	See UNITED III-18. How many residential customer accounts are currently identified as "tenant occupied"?
Response:	Currently, PWSA has 32,514 accounts identified as tenant occupied in the billing system.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VI in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VI-2	See UNITED III-18. How many residential customer accounts are currently identified as "reoccurring tenant"?
Response:	Currently, PWSA has 127 accounts identified as reoccurring tenant occupied in the billing system.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VI in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VI-3 See UNITED III-16. Of the 32,058 accounts in PWSA's billing system that are classified as a landlord/tenant account, please identify the following:

A. The number of accounts which are currently in arrears.
B. The number of accounts that are currently eligible for termination for nonpayment (notwithstanding any applicable winter-related protection).
C. The number of accounts that are currently protected from termination pursuant to a winter-related protection.
D. The number of accounts that received a 37-day notice of termination in 2017, 2018, and to date in 2019, disaggregated by year.
E. The number of accounts that were terminated for nonpayment in 2017, 2018, and to date in 2019, disaggregated by year.

Response:

A. Of the updated amount listed in UNITED VI-1, 3,545 of those accounts are currently in arrears.
B. Of the updated amount listed in UNITED VI-1, 814 of those accounts are currently eligible for termination for non-payment.
C. Of the updated amount listed in UNITED VI-1, all of those accounts are protected from termination pursuant to 52 Pa. Code § 56.100 (hh).
D. 37-day notices were not tracked by PWSA in 2017. PWSA issued 5,852 37-day notices in 2018 and 1,073 37-day notices since March 1, 2019.
E. Terminations of tenant occupied properties were not separately tracked in 2017. PWSA terminated 1,041 tenant occupied properties for non-payment in 2018 and zero thus far in 2019.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

{L0802565}

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VI in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VI-8	See UNITED III-13. Does a landlord need to provide consent for a tenant to be listed on the account to receive a copy of the bill and any termination notices?
Response:	No; a tenant may independently file a notarized Assumption Affidavit to assume the existing debt for PWSA services at a property and to receive a copy of the bill as well as all of the other required customer protections set forth in Chapter 56.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VI in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VI-9	See UNITED III-13. If a tenant completes an Owner-Tenant Addition Form, is the tenant accepting liability for debt that accrues on the account?
Response:	Yes, but only for the debt that is incurred while the tenant occupies the property. Ultimately, the debt of the property remains with the property and is the responsibility of the property owner because, left unpaid, it can result in a lien.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VI in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VI-12	See UNITED II-9 and II-10. Apart from discussing the issue with the Low Income Assistance Advisory Committee, does PWSA have any specific plans to conduct a low income assistance program needs assessment and/or a timeframe for completion of a needs assessment? Please describe any such plans in detail, and include any documents created by PWSA or its consultants in furtherance of such plans.
Response:	PWSA has engaged a consultant to conduct a low income assistance program needs assessment. The consultant, at the direction of PWSA, will conduct this assessment in 2019, and progress and preliminary findings will be shared with the Low Income Assistance Advisory Committee (LIAAC) at periodic meetings. The study will be completed prior to the next base rate filing so that any recommended changes to PWSA's current CAP, hardship, or other assistance programs can be incorporated into the filing and implemented upon approval by the PUC.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VII in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VII-2 Please provide an up-to-date Excel spreadsheet of PWSA's database tracking customers' reasons for rejecting private-side lead service line replacements. (See Rate Case Joint Petition for Settlement, at 10.)

Response: See UNITED-VII-2 Attach A.

Response Provided by: Robert A. Weimar, Executive Director, The Pittsburgh Water and Sewer Authority
Daniel T. Duffy, P.E.*, PMP, Lead Service Line Replacement Project Manager
Consultant (East Woods Associates, LLC) for
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

{L0803301}

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
1812	Verify	Declined	Private Side Non-Lead	Opt Out via email 1/10/19. Private Side Replaced per owner		Nothing in Cogsdale to show replaced on public	
1938	Verify	Declined	Blank		Yes	Owner said she didnt understand and had questions. Said her neighbor told her she made a mistake. Explained process and would like to opt in. advised will send a new agreement 12/27	Received Accepted Agreement
1956	Verify	Declined	Private Side Non-Lead	Replaced 2017			
6907	Verify	Declined	Can't Afford	Can't afford at this time.	Yes	Spoke to owner on 3/8/19 explained program and benefits. Wants to opt in. asked to email agreement and addendum	Nothing in Cogsdale to show replaced on public
6911	Verify	Declined	Other	1. Lack of trust of PWSA per multiple historical issues and dealings 2. Peperwork only provides responsibilty 30 days past replacement does not mention if contractor is insured/bonded (husband attorney read)			
6933	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
6938	Verify	Declined	Private Side Non-Lead	The service line was replaced in 2018		PWSA SIDE IS LEAD LEAK IS ON WIPE JOINT FLIPPED TO BRILLIANT ON TEMP FROM 6940 NEW 3/4" COPPER LINE FROM METER TO CS IS INSTALLED 10-19-18 MCDONAGH	
6939	Verify	Declined	Private Side Non-Lead	Line from street to my house were changed in 1977	No		Received Accepted Agreement While checking Cogsdale for this property shows that 6938 Bishop replaced on Public 10/18/18
1145	Verify	Declined	Private Side Non-Lead	See attached letter and documentation. In Feb 2011 a leak was detected on my water line. i had insurance through PWSA Vortex Plumbing was the PWSA conractor who replaced my water line	No		Nothing in Cogsdale to show replaced on public
1417	Verify	Declined	Blank		Yes	Owner under the impression there would be cost to her. Explained how the program works and if she is not happy with how they will do replacement at coordination she can still opt out. Will opt in. will send agreement 12/27	Nothing in Cogsdale to show replaced on public
1419	Verify	Declined	Private Side Non-Lead	My service line to home is copper			Nothing in Cogsdale to show replaced on public
1619	Verify	Declined	Private Side Non-Lead	I spent 15k to replace my private line 10 years ago.			
1816	Verify	Declined	Private Side Non-Lead	PWSA replaced the line from main to curb/my husband replaced the line from the curb to the house with copper.			Nothing in Cogsdale to show replaced on public
1931	Verify	Declined	Private Side Non-Lead	By my great grandfather Salvatore C a 1929 inspection done Nov 16th 1929 confirmed copper lineWe do not have lead lines. Inconvienent NOT NEEDED.	Yes	Customer called in for a 3rd time to lead help desk about not wanting us to do a replacement on her property.	Nothing in Cogsdale to show replaced on public
1802-08	Verify	Declined	Private Side Non-Lead	Property was redeveloped in 2018. All water lines were replaced.	No		Nothing in Cogsdale to show replaced on public
1016	Verify	Declined	Private Side Non-Lead	Verbal Opt Out - Lines have been replaced		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
1019	Verify	Declined	Can't Afford	We can not afford to pay any damage to property,walls, lawn or replace lawn if necessary			Nothing in Cogsdale to show replaced on public
1173	Verify	Declined	Private Side Non-Lead	Private line was replaced 2015. But please contact if any issues are unresolved.	No		Nothing in Cogsdale to show replaced on public
1208	Verify	Declined	Private Side Non-Lead	My section of the line was replaced with plastic in 2012.	No		Nothing in Cogsdale to show replaced on public
1217	Verify	Declined	Private Side Non-Lead	Already replaced along with sewer line.	No		Nothing in Cogsdale to show replaced on public
1418	Verify	Declined	Private Side Non-Lead	We replaced the line last September 2018 because line was leaking	No		Aug 2018 water was shut off for waste of water. Nothing in cogsdae to show we replaced the public
1441		Declined	Private Side Non-Lead	I replaced my line with a copper line years ago.	No		Nothing in Cogsdale to show replaced on public
1620	Verify	Declined	Can't Afford	Cannot afford to take time off to let people into the house & have two dogs. Do not want disruption			Nothing in Cogsdale to show replaced on public
1625	Verify	Declined	Private Side Non-Lead	The water line from curb box to my house was replaced in 2013 along with a newmeter, shut off valve & backflow tank. (Additional info in GIS)	No	Per Cogsdale 12/2013 Private side had a leak. Nothing in Cogsdale to show replaced on public. Called in to LHD 3/14 and said is going to opt back in	Nothing in Cogsdale to show replaced on public
1670	Verify	Declined	Private Side Non-Lead	My water line was replaced years ago when I lived here	No		Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
1719	Verify	Declined	Can't Afford	I am a senior on low income would not be able to make any possible repairs or pay any possible repairs			
1720	Verify	Declined	Private Side Non-Lead	I had my private water line replaced in 2017	No	March 2017 homeowner had a leak on their side according to Cogsdale.	
6905	Verify	Declined	Concerned about Impacts	That there may be damage to my property	Yes	Left Mssg concerning decline LSLR 12/31/18	
6916	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
1623	Verify	Declined	Private Side Non-Lead	We replaced the private side line to the house 25 years ago with flexible copper pipe!!! I also have used the lead test kit this summer. We have a undetectable amount according to the test results.	No		Nothing in Cogsdale to show replaced on public
3709	Verify	Declined	Private Side Non-Lead	I have a copper water line coming into my house			Nothing in Cogsdale to show replaced on public
3822	Verify	Declined	Other	Does not want line replaced. Refused to sign agreement.		Msgg left to return agreement 2/13. Verbal Opt out taken by Lead Help Desk 2/18/19	Nothing in Cogsdale to show replaced on public
3830	Verify	Declined	Can't Afford	Afraid of possible financial responsibilities		2nd door hanger 2/18. Verbal opt out taken by LHD. Declined CEP & URA info	Nothing in Cogsdale to show replaced on public
105	Verify	Declined	Private Side Non-Lead	Stated Private line replaced	No	Per Cogsdale: Leak marked over 6" main. Leak repaired, new service curb to main (Mason, Evans, Leckie 05/27/14)-	
40	Verify	Declined	Other	My private water line is not lead, its galvonized iron.	Yes	No answer. No answer Machine 12/21. On 1/7/19 customer called in and spoke to Lead Help Desk and tried to convince him into opting in and he still declined.	Nothing in Cogsdale to show replaced on public
3444	Verify	Declined	Private Side Non-Lead	Privately owned portion of service line has already been replaced (appox 2004) (existing valve & PWSA service line is lead)	No		Nothing in Cogsdale to show replaced on public
2714	Verify	Declined	Private Side Non-Lead	Copper on private side		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
100	Verify	Declined	Concerned about Impacts	Just replaced steps and walls with landscaping for a total of $20,000-water filter is cheap to replace and repair			
300	Verify	Declined	Private Side Non-Lead	Replaced private side 2 years ago	No	Verbal Opt out taken by Lead Help Desk	on Customer side 2014 but nothing showing public repl
304	Verify	Declined	Private Side Non-Lead	We have had the lead supply line from the curb box to our meter replaced	No		Nothing in Cogsdale to show replaced on public
123	Verify	Declined	Other	Property Vacant and should be condemned. Lots of damage.		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
3720	Verify	Declined	Other	Personal reasons		Collected agreement in the field. Wife unable to sign husband signed while she was sitting there.	Nothing in Cogsdale to show replaced on public
3732	Verify	Declined	Can't Afford	Am not financially able to pay additional cost	Yes	Called and spoke to owner explained LSLR program. Decided will opt in. Sent another agreement 1/28/19	Nothing in Cogsdale to show replaced on public
3736	Verify	Declined	Private Side Non-Lead	We have copper pipes in house	No		Nothing in Cogsdale to show replaced on public
3818	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist. 12/20/18. Owner returned call said she declined because she doesn't want anyone in her home. She said she had someone work in her basement before and she had to sue them. she doesn't want to go thru it again. Advised of coordination and how they can explain what all would or could be impacted she said once again she doesnt want us in her home 1/3/19	Nothing in Cogsdale to show replaced on public
2637	Verify	Declined	Private Side Non-Lead	Replaced private side of service line		Offered to collect agreement while canvassing by LHD. Declined. Gave Verbal Opt out to LHD	PWSA made repair to small leak on public 10/201. Customer replaced there lead line
3825	Verify	Declined	Other	Liaison canvassed/Received verbal opt out refused to sign.		Noted to account by Lead Help Desk	Nothing in Cogsdale to show replaced on public
3845	Verify	Declined	Other	I Drink Bottled Water			Nothing in Cogsdale to show replaced on public
416	Verify	Declined	Private Side Non-Lead	In the early 80's I had my lead line replaced with copper from the curb box to the meter			Nothing in Cogsdale to show replaced on public
417	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist. 12/20/18	Nothing in Cogsdale to show replaced on public
419	Verify	Declined	Private Side Non-Lead	Has copper		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
135	Verify	Declined	Can't Afford	I have a retaining wall. I don't want to replace it because it would cost to much to replaces. I don't want my property damage. It might cost too much to repair	Yes	Called owner explained to have coordination first and Let contractor explain how they would do replacement and of not satisfied can decline at coordination customer happy with this option will opt in sent new agreement. 12/27	Received Accepted Agreement
425	Verify	Declined	Can't Afford	Too old. On social security. Can't afford incidentials like landscaping etc.	Yes	Explained process and how he can still opt out after coordination if not happy with info given. He has a wall concerned about and Said he is 78 and received CBI letter that he is non-lead so he really doesn't want it now 12/20/18	Nothing in Cogsdale to show replaced on public
2629	Verify	Declined	Other	Because I can. No further comments			Nothing in Cogsdale to show replaced on public
362	Verify	Declined	Other	Customer's note stated:"Private lead line replacement would involve some work inside my house. The homeowner would be somewhat responsible for making certain areas accessible. I live alone and am 92 years old and not able to get around as before and wou d not be much help. I have lived here since 1985 and drink alot of water (not bottled) tap water"			Nothing in Cogsdale to show replaced on public
2810	Verify	Declined	Other	Lack of Confidence in PWSA			Nothing in Cogsdale to show replaced on public
2837	Verify	Declined	Private Side Non-Lead	A New 3/4" service line was installed at this property		Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
3036	Verify	Declined	Other	Personal			Nothing in Cogsdale to show replaced on public
3232	Verify	Declined	Concerned about Impacts	Just re-landscaped my yard			Nothing in Cogsdale to show replaced on public
3330	Verify	Declined	Private Side Non-Lead	Replaced w/ copper 2008			Nothing in Cogsdale to show replaced on public
3606	Verify	Declined	Concerned about Impacts	Do not want to tear up property. We are too old to start project.	No	Historical records show Copper since 1959 on private side.	Nothing in Cogsdale to show replaced on public
3624	Verify	Declined	Private Side Non-Lead	This house water line was already replaced by owner few years ago.			Nothing in Cogsdale to show replaced on public
3830	Verify	Declined	Other	Lack of Confidence in PWSA			Nothing in Cogsdale to show replaced on public
3955	Verify	Declined	Can't Afford	I live on an fixed income & may not have funds to finish work of concrete sidewalks and steps etc.	Yes	Left detailed VM 12/20/18	Received Accepted Agreement
3959	Verify	Declined	Private Side Non-Lead	Water line replaced 3 yrs ago from curb box to home	No		Nothing in Cogsdale to show replaced on public
321	Verify	Declined	Private Side Non-Lead	Had lines replaced about 20 years ago with copper	No		Nothing in Cogsdale to show replaced on public
11	Verify	Declined	Private Side Non-Lead	I replaced my water line a few years ago	No	In Cogsdale 10/2016 verified leak on private side. Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
2703	Verify	Declined	Other	Moving			Nothing in Cogsdale to show replaced on public
2800	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
127	Verify	Declined	Private Side Non-Lead	I already have copper lines			Nothing in Cogsdale to show replaced on public
430	Verify	Declined	Private Side Non-Lead	The private service line at 430 Venture has already been replaced (also gas line are new)	No		Nothing in Cogsdale to show replaced on public
2815	Verify	Declined	Other	Said wants to opt out while canvassing. Refused to sign		Canvassed 2/25. Verbal Opt out canvassing	Nothing in Cogsdale to show replaced on public
6723	Verify	Declined	Private Side Non-Lead	Was already replaced	No		Nothing in Cogsdale to show replaced on public
6819	Verify	Declined	Other	Water Shut Off Rehab Property	Yes	Called after receiving decline agreement. Wanted to explain the LSLR program. said he just lost his baby sister and it is too much for him to think about. he will call back if he decides to do it . 1/28/19	Nothing in Cogsdale to show replaced on public
7010	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
7111	Verify	Declined	Other	Admin Opt Out 1/10/19. Owner Deceased no POA on File.	Yes	Called Dorothy opted in but she is not the owner. Owner is deceased. She said she is common law wife. Not executor of estate. No paperwork. Her status was changed By Lead Help desk to Opt out	9/22/2016 Contractor hit unmarked service line.
7210	Verify	Declined	Private Side Non-Lead	Line Already Replace			Nothing in Cogsdale to show replaced on public
7038	Verify	Declined	Private Side Non-Lead	My Private line has been replaced with copper pipes	No		Nothing in Cogsdale to show replaced on public
6834	Verify	Declined	Other	Canvassed area. Verbal Opt out Refused to sign		Canvassed 1/22. Verbal Opt out canvassing	Nothing in Cogsdale to show replaced on public
7125	Verify	Declined	Private Side Non-Lead	My Private & PWSA Service lines are copper	No	Per Cogsdale 12/2013 Private side had a leak. Nothing in Cogsdale to show replaced on public.	Nothing in Cogsdale to show replaced on public
7154	Verify	Declined	Private Side Non-Lead	Private side may have been replaced			Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
705	Verify	Declined	Blank		No	Per notes in Cogsdale Owner had a leak on private side. Roto Rooter called Lead Help Desk 12/17 and information was sent to Ops for replacement on public side.	
539	Verify	Declined	Private Side Non-Lead	Canvassed area private side copper		Area canvassed owner gave verbal opt out	Nothing in Cogsdale to show replaced on public
1461	Verify	Declined	Other	Property Vacant water Turned off	No	Vacant	Nothing in Cogsdale to show replaced on public
7208	Verify	Declined	Private Side Non-Lead	Said doesn't have lead lines		LHD called and owner gave a verbal opt out	Nothing in Cogsdale to show replaced on public
6641	Verify	Declined	Private Side Non-Lead	Line replaced already 7-8 years ago		LHD called and owner gave a verbal opt out	Nothing in Cogsdale to show replaced on public
7029	Verify	Declined	Other	Verbally opted out said city is supposed to tear down.		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
7319	Verify	Declined	Private Side Non-Lead	I decline; we do not have lead in our house	No		Nothing in Cogsdale to show replaced on public
275	Verify	Declined	Private Side Non-Lead	I have a 3/4" copper line from curb box to house.	No		Nothing in Cogsdale to show replaced on public
349	Verify	Declined	Other	N/A			Nothing in Cogsdale to show replaced on public
426	Verify	Declined	Private Side Non-Lead	I have copper lines coming into my house			Nothing in Cogsdale to show replaced on public
473	Verify	Declined	Private Side Non-Lead	Copper line Verbal opt out		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
502	Verify	Declined	Private Side Non-Lead	I have copper lines coming into my house			Nothing in Cogsdale to show replaced on public
516	Verify	Declined	Private Side Non-Lead	When my husband was alive he had all the pipes underground replaced-the city replaced a pipe at that time in the front street	No		Nothing in Cogsdale to show replaced on public
230	Verify	Declined	Private Side Non-Lead	New Line Installed November 2003 Please See Attached Drawing	No		Nothing in Cogsdale to show replaced on public
212	Verify	Declined	Private Side Non-Lead	Replaced my portion of service line in Oct/ 2015	No		Nothing in Cogsdale to show replaced on public
330	Verify	Declined	Other	I received a notice from you saying an inspection of my line shows no lead pipes	Yes	Called phone on account. The number was for the old owner. Advised me as a courtesy, if he can find new owner info he will shoot him an email. To contact us 1/7	Nothing in Cogsdale to show replaced on public
354	Verify	Declined	Private Side Non-Lead	The house was just built and therefor there is no lead piping.	No	According to Allegheny County Real Estate Built 2015 (this may be new development)	
438	Verify	Declined	Private Side Non-Lead	house new construction. No lead piping	No	According to Allegheny County Real Estate Built 2016 (this may be new development)	
476	Verify	Declined	Private Side Non-Lead	My home was built in 2017. Water Lines are built to modern standards - no lead pipes.	No	According to Allegheny County Real Estate Built 2017 (this may be new development)	
123	Verify	Declined	Private Side Non-Lead	Replaced my side with copper 2 years ago.			In Cogsdale shows customer had a service leak on their side nothing showing public replaced
215	Verify	Declined	Private Side Non-Lead	Lead Line was replaces with 3/4 copper line from curbstop to meter about 27 years ago			Nothing in Cogsdale to show replaced on public
255	Verify	Declined	Sample Results	Testing shows no lead level in water at home	Yes	Spoke to Owner advised her that shows lead on private and asked if she recently changed line. Said no. Explained the process & coordination She said she is convinced and will opt in. Sent out new agreement 12/27	Received Accepted Agreement
357	Verify	Declined	Private Side Non-Lead	Customer has copper service line			Nothing in Cogsdale to show replaced on public
358	Verify	Declined	Private Side Non-Lead	Had my water line replaced in 77-79, with Copper. Box to main to house.	No		Nothing in Cogsdale to show replaced on public
389	Verify	Declined	Can't Afford	House very old , built in1890 , on fixed income and money is very tight.	Yes	Left Mssg concerning decline LSLR 12/20/18	Nothing in Cogsdale to show replaced on public
313	Verify	Declined	Can't Afford	Cannot incur any additional costs	Yes	Left detailed VM about opting in 12/20/18	Nothing in Cogsdale to show replaced on public
1731	Verify	Declined	Private Side Non-Lead	I replaced a copper line in 2015/2016 PWSA should reimburse.			Nothing in Cogsdale to show replaced on public
18	Verify	Declined	Private Side Non-Lead	New Construction. New Water service to be installed later	No	This was vacant land/new construction	Nothing in Cogsdale to show replaced on public
43	Verify	Declined	Private Side Non-Lead	My side already replaced			Nothing in Cogsdale to show replaced on public
51	Verify	Declined	Private Side Non-Lead	We replaced our house and water line in 1991			Nothing in Cogsdale to show replaced on public
243	Verify	Declined	Other	LHD called owner gave verbal opt out did not want to hear about program when they tried to explain		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
247	Verify	Declined	Other	1. It is unnecessary. I am70 years old and do not have lead poisoning, nor do I know anyone living in the city who does. 2. I dont want to pay to do the repairs that will result from the replacement.	No	Historical records show Copper since 1952 on private side.	Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
253	Verify	Declined	Can't Afford	First of all I am on a fixed income our home is on the high side of our St. We have a 20 foot city block wall Utilities go underneath that wall. It would cause us a fortune The gas,sewer line and water line are extremely close to each other	No		Nothing in Cogsdale to show replaced on public
280	Verify	Declined	Private Side Non-Lead	Private portion of line leading to house is copper	No		Nothing in Cogsdale to show replaced on public
283	Verify	Declined	Can't Afford	Too Costly	Yes	Explained process and how she can still opt out after coordination. Customer said great, will opt-in will send another agreement 12/20/18	Nothing in Cogsdale to show replaced on public
335	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist.12/20/18	Nothing in Cogsdale to show replaced on public
429	Verify	Declined	Private Side Non-Lead	Attached Letter explaining Private and Public side replaced 8-10years ago	no		Nothing in Cogsdale to show replaced on public
122	Verify	Declined	Can't Afford	Live on fixed income - if damages occur I can't afford the expense	Yes	Left detailed Mssg about opting in 12/20/18	Nothing in Cogsdale to show replaced on public
202	No Action	Declined	Private Side Non-Lead	Have copper lines inside house	No	The site action for this property is No Action. Changed to Not Required	Not Required
305	Verify	Declined	Private Side Non-Lead	My Line is Copper			Nothing in Cogsdale to show replaced on public
436	Verify	Declined	Private Side Non-Lead	Private side done 10yrs ago		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
464	Verify	Declined	Can't Afford	cost to repair wall makes this prohibitive	Yes	Explained process and how he can still opt out after coordination. Customer would like to opt-in will send another agreement 12/20/18	Nothing in Cogsdale to show replaced on public
246	Verify	Declined	Private Side Non-Lead	Private side was already replaced			Nothing in Cogsdale to show replaced on public
234	Verify	Declined	Private Side Non-Lead	Service line replaced in 2002		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
315	Verify	Declined	Other	LHD called Customer not interested in replacement		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
267	Verify	Declined	Private Side Non-Lead	Line replaced in 2015 new from street into building	No	In cogsdale 265 Republic "15" main collapsed Need to replace +/- 10' main".Nothing to refer service lince for 267 was replaced from main to curb box.	Nothing in Cogsdale to show replaced on public
200	Verify	Declined	Private Side Non-Lead	Replaced lead with copper from curb box to house.	No		Nothing in Cogsdale to show replaced on public
230	Verify	Declined	Other	LHD called customer not happy, opted out of program		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
250	Verify	Declined	Private Side Non-Lead	The customer side has been replaced		Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
258	Verify	Declined	Private Side Non-Lead	copper from street into house	No	Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
312	Verify	Declined	Private Side Non-Lead	It has been determined our line is copper.			Nothing in Cogsdale to show replaced on public
23	Verify	Declined	Other	Damage that I'll have to repair. Don't believe line to meter is lead due to age of building	Yes	Owner he was worried about having to go thru his steps and them being torn down explained coordination and possible trench-less method. Advise to have coordination and see how the replacement would take place if does not agree with how they would replace can opt out. He will resign agreement 12/27	Received Accepted Agreement
52	Verify	Declined	Private Side Non-Lead	Has been changed with sidewalk (copper).	No		Nothing in Cogsdale to show replaced on public
95	Verify	Declined	Private Side Non-Lead	Had pipes in yard replaced about 7 years ago we have no lead in our water. Terry's Plumbing	No		Nothing in Cogsdale to show replaced on public
519	Verify	Declined	Private Side Non-Lead	Line Replaced with 25 yrs ago	No		Nothing in Cogsdale to show replaced on public
203	Verify	Declined	Private Side Non-Lead	It has already been replaced.	No		Nothing in Cogsdale to show replaced on public
256	Verify	Declined	Private Side Non-Lead	New coper lines installed			Nothing in Cogsdale to show replaced on public
305	Verify	Declined	Blank				
316	Verify	Declined	Can't Afford	I have lived here for 45 yrs, my kids are all grown, It would be too expensive.	Yes	Left Mssg concerning decline LSLR 12/20/18	Nothing in Cogsdale to show replaced on public
329	Verify	Declined	Private Side Non-Lead	Several Years ago I replaced water lined from street meter to my house.			Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
338	Verify	Declined	Concerned about Impacts	My cost to replace my sidewalk and driveway $11,000. I recently had my sidewalk & and driveway replaced with mesh to enhance the strength of the driveway. There is no way that your replacement would be comparable. Also my family lived at this address for 62 years and my mother drank the water for 62 yrs and died at 95. That doesnt sound like she ingested a lot lead	No	Historical records show Copper since 1956 on private side.	Nothing in Cogsdale to show replaced on public
353	Verify	Declined	Private Side Non-Lead	Home Built in 2016 without a lead private water line.			Nothing in Cogsdale to show replaced on public
443	Verify	Declined	Private Side Non-Lead	New property/construction	No	According to Allegheny County Real Estate Built 2013 (this may be new development) In Cogsdale 443, 445 and 447 a order was put in to drill 1in ferrule for each address 11/2012)	
2	Verify	Declined	Private Side Non-Lead	The line was replaced with copper 15 years ago. From meter to curb.			Nothing in Cogsdale to show replaced on public
303	Verify	Declined	Can't Afford	Don't have funds for damages or repairs	Yes	Left VM to find out why declined and how we could assist.12/31/18. Spoke to owner explained how LSLR work and coordination appt. She said she would like to opt in. aware of she is not in agreement at the coordination she can still opt out 1/2/19	Received Accepted Agreement
403	Verify	Declined	Other	2/4/19 Canvassed area with Bill L. Collected agreement. Signed initials. Said he doesnt want anything else to do with it and told me to fill out the rest. And slam the door.			Nothing in Cogsdale to show replaced on public
61	Verify	Declined	Private Side Non-Lead	Copper pipes already			Nothing in Cogsdale to show replaced on public
1227	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
1845	Verify	Declined	Private Side Non-Lead	Water Line replaced in Oct 2015 See attached sheet	No	In Cogsdale does show repairs on private side. Nothing saying replacement on public.	Nothing in Cogsdale to show replaced on public
1904	Verify	Declined	Private Side Non-Lead	I have a copper line!			Nothing in Cogsdale to show replaced on public
919	Verify	Declined	Private Side Non-Lead	We had new water lines put in a few years back	No		Nothing in Cogsdale to show replaced on public
1600	Verify	Declined	Private Side Non-Lead	New 3/4" copper line installed years ago			Nothing in Cogsdale to show replaced on public
964	Verify	Declined	Private Side Non-Lead	Private Side Copper			Nothing in Cogsdale to show replaced on public
972	Verify	Declined	Private Side Non-Lead	Already replaced			Nothing in Cogsdale to show replaced on public
1110	Verify	Declined	Concerned about Impacts	Don't Want Property Messed Up.			Nothing in Cogsdale to show replaced on public
615	Verify	Declined	Other	any damage done to my property PGH2o will be held responsible	Yes	Called because received agreement to decline. Wanted to explained LSLR more Line was busy called twice. 1/24/19	Nothing in Cogsdale to show replaced on public
816	Verify	Declined	Private Side Non-Lead	Already Replaced. Replaced	No		Nothing in Cogsdale to show replaced on public
708	Verify	Declined	Private Side Non-Lead	Private Lead line replacement was completed when home was purchased			Nothing in Cogsdale to show replaced on public
724	Verify	Declined	Blank		Yes	Owner said its cost too much and he has a tenant, told tenant to use water filter. Explained program said to resend agreement by email 12/20.	Received Accepted Agreement
904	Verify	Declined	Private Side Non-Lead	Already Replaced line.	Yes	Collected Agreement in the field. Owner said he replaced it. Said the sewer line collapsed has both replaced	Nothing in Cogsdale to show replaced on public
949	Verify	Declined	Private Side Non-Lead	My private water line is copper pipes.	No		Nothing in Cogsdale to show replaced on public
30	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist.12/21/18	Nothing in Cogsdale to show replaced on public
23	Verify	Declined	Concerned about Impacts	I don't want my yard nd house torn up. I cant afford any unforseen problems. I'll stay as I am. Thank you			
1929	Verify	Declined	Other	Customer called in irrate 3x 's saying he doesn't want to be bothered or nothing from PWSA. Stop calling.		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
850	Verify	Declined	Private Side Non-Lead	Opt-out via email Private Side Replaced	No		Nothing in Cogsdale to show replaced on public
729	Verify	Declined	Private Side Non-Lead	Copper put into whole house 10 years ago. Latest test shows no lead	No		Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow-up	Comments	Additional Notes
836	Verify	Declined	Blank		Yes	Called and asked reason of decline said 82yrs old and there is nothing wrong with his water. The lady from Michigan cost the city a lot of money and if we come to he his house he is going to tell us to get out of here 12/21	Nothing in Cogsdale to show replaced on public
921	Verify	Declined	Private Side Non-Lead	I found out that the line on the house side on in is not lead it was changed a while ago			Nothing in Cogsdale to show replaced on public
20	Verify	Declined	Private Side Non-Lead	My line has been replaced w/ copper			Nothing in Cogsdale to show replaced on public
826	Verify	Declined	Private Side Non-Lead	After a fire in 1995 my house was completely rebuilt. My privately *owned service line is not lead. I have copper pipes from the curb.*	No		Nothing in Cogsdale to show replaced on public
1022	Verify	Declined	Private Side Non-Lead	I have a copper line!			Nothing in Cogsdale to show replaced on public
980	Verify	Declined	Private Side Non-Lead	I have copper to my house			Nothing in Cogsdale to show replaced on public
55	Verify	Declined	Other	I would rather have my water line tied to Roscoe Steet instead of Baldauf Street	Yes	Tried to explained how the LSLR works when she said she cannot afford it. Not sure she is really understanding. She said she uses water filter and said thanks for understanding, she had more focus of where the water line is coming in at . ON GIS looks like she is tied in to Roscoe 1/3/19	Received Accepted Agreement
2359	Verify	Declined	Private Side Non-Lead	Service line already replaced	No		Nothing in Cogsdale to show replaced on public
2361	Verify	Declined	Private Side Non-Lead	Already replace service line			Nothing in Cogsdale to show replaced on public
2603	Verify	Declined	Blank		Yes	Said there property is old. Said they already get water in basement and cannot take on the cost if has problems in the future. Said they tested no detect and use water pictures. Also commented on neighbor they take care of at 2605 12/21	Nothing in Cogsdale to show replaced on public
2605	Verify	Declined	Concerned about Impacts	Can't handle clean-up foundation not good.	No	Neighbor at 2603 said they take of Mrs Kowalewski and she is 85 yrs old. Said her front yard is sinking in and the contractor said it would 40,000 to fix. Said she doesn't have much longer. 12/21	Nothing in Cogsdale to show replaced on public
2666	Verify	Declined	Can't Afford	Can not afford to fix damages that you may cause on my property			Nothing in Cogsdale to show replaced on public
1917	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist.12/21/18	Nothing in Cogsdale to show replaced on public
34	Verify	Declined	Private Side Non-Lead	Water Line was replaced 5 years ago	No		Nothing in Cogsdale to show replaced on public
939	Verify	Declined	Concerned about Impacts	Liaison canvassed area owner refused to sign agreement. Verbal Opt-Out. Said PWSA main broke ~10 years ago and flooded Basement. Said PWSA repaired main but public/private service materials unknown		Area canvassed owner gave verbal opt out	Nothing in Cogsdale to show replaced on public
1123	Verify	Declined	Other	Homeowner calledstated that his grandfather purchased the house in 1898 and he has been living in it for 83 years		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
209	Verify	Declined	Private Side Non-Lead	Its been replaced	No	In Cogsdale 1 11/2018 shows 6" CRACK. (On Main)INSTALLED A SIX INCH STAINLESS. But nothing to show line replacement	Nothing in Cogsdale to show replaced on public
126	Verify	Declined	Private Side Non-Lead	We have replaced private line with copper			
111	Verify	Declined	Private Side Non-Lead	Since 1980 everything has been replaced	No	Historical show private is Copper. Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
618	Verify	Declined	Private Side Non-Lead	We had our water lines replaced a few years ago due to a leak			Nothing in cogsdale to show replaced on public
840	Verify	Declined	Private Side Non-Lead	Lead Line Replaced With Brass Over 10 Yrs Ago			Nothing in cogsdale to show replaced on public
903	Verify	Declined	Private Side Non-Lead	We had the line replaced in January 2017(see attached invoice) We would like to be reimbursed for the cost of replacement.	No	Leak on Homeowners sied was reported 1/2017 in Cogsdale but nothing to show public side was replaced	Nothing in cogsdale to show replaced on public
2701	Verify	Declined	Can't Afford	My wife & I's age and potential cost.			Nothing in Cogsdale to show replaced on public
2725	Verify	Declined	Private Side Non-Lead	Our side of the line was replaced by copper pipe in 1998	No		Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
2786	Verify	Declined	Private Side Non-Lead	OPT-OUT city side copper due to leak 3/20/17 owner did private side later in year	No	Per John Mcarthy: DUG CURB, COPPER ON CITY SIDE. LEAD ON HOMEOWNERS SIDE 244- FORESTER - HUBER 3/17/17	Unsure is this was verbal or by email
2838	Verify	Declined	Other	There is no lead in the house			Nothing in Cogsdale to show replaced on public
2877	Verify	Declined	Sample Results	1. Water tested below risk recently 2. No help from PWSA restoring any mess caused by contractors	Yes	Left Mssg concerning decline LSLR 12/27/18	Nothing in Cogsdale to show replaced on public
2965	Verify	Declined	Private Side Non-Lead	unnecessary (new construction)	No		Nothing in Cogsdale to show replaced on public
3061	Verify	Declined	Blank		Yes	Unable to leave message 12/21	
6373	Verify	Declined	Private Side Non-Lead	use my own contractor	No		Nothing in Cogsdale to show replaced on public
6307	Verify	Declined	Other	How will you do this when it is on my private property. PWSA does nothave consent to replace any lines on my property (addition statement on agreement)			Nothing in Cogsdale to show replaced on public
6361	Verify	Declined	Private Side Non-Lead	We own a new house build in 2004. The Builder said we have copper line and we don't have any lead lines. Please call me with any questions	No	According to Allegheny County Real Estate house built in 2005. Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
6334	Verify	Declined	Other	I agree only to meet with PWSA to hear what the plan is & to learn why lead levels can increase!	Yes	LVM to explained we need an accepted agreement to coordinate 12/27. Owner called into LHD advised of agreement accptance. Sent agreement to customer	Received Accepted Agreement
847	Verify	Declined	Private Side Non-Lead	Private Portion of line replaced with Copper			Nothing in Cogsdale to show replaced on public
909	Verify	Declined	Other	We're old (83 & 71) and house not marketable. We drink bottled water too. Also Representative (cousin) Linda Berry			Nothing in Cogsdale to show replaced on public
10	Verify	Declined	Private Side Non-Lead	Already replaced w/ copper. Happy to have you guys inspect!	No		Nothing in Cogsdale to show replaced on public
809	Verify	Declined	Private Side Non-Lead	My line from inside the house to the middle of the street was replaced Spring of 2008			Nothing in Cogsdale to show replaced on public
839	Verify	Declined	Private Side Non-Lead	had pipes replaced with copper a few years ago.			Nothing in Cogsdale to show replaced on public
6441	Verify	Declined	Private Side Non-Lead	After a sewer backup several yrs ago. We had our lead water lines replaced between the street and the house	No		Nothing in Cogsdale to show replaced on public
725	Verify	Declined	Other	Could only sign agreement after inspection and clear work plan specified	Yes	Explained process and how he can still opt out after coordination if not happy with info given. asked if can put the in the email of opt out option. Said will redo and opt in 12/20/18	Received Accepted Agreement
6510	Verify	Declined	Other	Declined via email owner not satisfied with terms of agreement.		Opt out taken Via email by Lead Help Desk	DUG AND RESE BOX KEY FINE. COPPER BOTH SIDES 242- FORESTER-COLAPITRO 3/8/17
838	Verify	Declined	Concerned about Impacts		Yes	Left vm to see why declined. 12/27. Owner called in spoke to someone at LHD and advised she read fine print and doesn't want to have to pay for wall or any damages after we leave that may incur still declining 12/27	Nothing in Cogsdale to show replaced on public
923	Verify	Declined	Private Side Non-Lead	I do not have lead lines. The system part is not lead either.	No		Nothing in Cogsdale to show replaced on public
984	Verify	Declined	Blank		Yes	Called Spoke to owner thought there was a cost for replacement but said the cost wasnt listed on agreement and didn't want to have to unhook the washer and dryer. Will opt in sent another agreement 12/21	Nothing in Cogsdale to show replaced on public
4344	Verify	Declined	Other	I planned on using a water filter for drinking water.			Nothing in Cogsdale to show replaced on public
4326	Verify	Declined	Concerned about Impacts	Homeowner is declining because of the potential damage to the property. Coordinator will call the homeowner to explain the trenchless options..	Yes	Left Mssg concerning decline sending a new agreement to opt in so can have coordination LSLR 12/20/18. Called back would like to opt in sent agreement by email 12/20/18	Nothing in Cogsdale to show replaced on public
728	Verify	Declined	Other	Not Sure			Nothing in Cogsdale to show replaced on public
6486	Verify	Declined	Blank		Yes	Left mssg to find out why declined and how we could assist.12/21/18	Nothing in Cogsdale to show replaced on public
610	Verify	Declined	Private Side Non-Lead	5/8 Copper Already			Nothing in Cogsdale to show replaced on public
640	Verify	Declined	Other	Verbal Opt out		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
648	Verify	Declined	Private Side Non-Lead	I am declining replacement of the private portion of my water line as it was previous replaced by Matt Mertz Plumbing in July 2018 (please see attached statement)	No		Nothing in Cogsdale to show replaced on public
773	Verify	Declined	Private Side Non-Lead	Water Line into House is Copper	No		Nothing in Cogsdale to show replaced on public
6413	Verify	Declined	Can't Afford	1. House is on Terrace and it would be a major disruption and expense to replaceand restore property. Limited income 2. Im not going to be living here too much longer. (Full explaination in GIS)	No		Also Historical records show copper. Nothing in Cogsdale to show replaced on public
6417	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
924	Verify	Declined	Other	Taking care of husband he's been sick.			Nothing in Cogsdale to show replaced on public
6501	Verify	Declined	Other	I never find lead(pb) problem(above 15ppb) in my house water. As a matter of fact even if my private line is made by pb, it should be covered by thick deposit after so many years. I worked at PWSA as a chemist (more attached in GIS)			Nothing in Cogsdale to show replaced on public
6545	Verify	Declined	Other	Liability			Nothing in Cogsdale to show replaced on public
6589	Verify	Declined	Other	Reversed osmosis system. two letters from lab "non found"	No	Came into front counter. Said he doesn't trust the city. Ever since he had a tree put in by the city and said it was messed up. Doesn't trust anything the city has to do with.	Nothing in Cogsdale to show replaced on public
6611	Verify	Declined	Other	Have water filtering system installed for the entire house			Nothing in Cogsdale to show replaced on public
4261	Verify	Declined	Private Side Non-Lead	I replaced line from curb stop to water meter with copper pipe in 2017			Nothing in Cogsdale to show replaced on public
4349	Verify	Declined	Sample Results	We tested lead level and it was below 15. (It was 5)	Yes	Left Mssg concerning decline LSLR 12/27/18	Nothing in Cogsdale to show replaced on public
3157	Verify	Declined	Other	Not Necessary			Nothing in Cogsdale to show replaced on public
3163	Verify	Declined	Blank		Yes	Said she just doesnt want to. Cannot cover cost. she said the agreement says they are responsible for private. And that we have to come into her house explained we are paying for replacement,restoring sidewalk and back filling yard. said maybe at a later date explained we will no return at a later date said then she still doesn't want to. 12/21	Nothing in Cogsdale to show replaced on public
4303	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
2702	Verify	Declined	Private Side Non-Lead	We are opting out because we just had the privately owned service line replaced(with copper) at the end of October 2018	No		Nothing in Cogsdale to show replaced on public
6347	Verify	Declined	Other	Not Necessary			
6357	Verify	Declined	Private Side Non-Lead	Was replaced line several years ago with copper pipe	No	Nothing in Cogsdale to show replaced on public	Received Accepted Agreement
2035	Verify	Declined	Private Side Non-Lead	We have copper lines	No		Nothing in Cogsdale to show replaced on public
1927	Verify	Declined	Can't Afford	I do not have the means to move washer, dryer or any obsticles in the way			Nothing in Cogsdale to show replaced on public
755	Verify	Declined	Other	Do I house I Public Part (Waste of Money)			Nothing in Cogsdale to show replaced on public
500	Verify	Declined	Other	Verbal Opt Out /Declined to Sign. This is 2nd time in field.			Nothing in Cogsdale to show replaced on public
226	Verify	Declined	Private Side Non-Lead	In 2017 PWSA replaced LWSL. In 2018 I replaced LWSL from my property juncture to PWSA. Replacement of all lines completed	No	Per John Koller 9/2017 DUG AND RESET OX, STOP GOOD, COPPER ON BOTH SIDES. 9/7/17 wd 11 costa	
627	Verify	Declined	Private Side Non-Lead	Declined Via email. Private side replaced w/ copper		Opt out taken Via email by Lead Help Desk	Nothing in Cogsdale to show replaced on public
651	Verify	Declined	Other	Canvassed area. owner Verbally Declined. He refused to sign. He said he willnot sign anything that has to do with the city. Bill asked several times he said No 3 times.	No	Canvassed area. owner Verbally Declined. He refused to sign. He said he willnot sign anything that has to do with the city. Bill asked several times he said No 3 times.	Nothing in Cogsdale to show replaced on public
1221	Verify	Declined	Can't Afford	Can't afford at this time.	Yes	Said had it replaced in 80's to copper. Reason for decline originally was can't afford. He doesn't care if we replace ours but there side is good 12/20/18	Nothing in Cogsdale to show replaced on public
413	Verify	Declined	Other	Personal reasons			Nothing in Cogsdale to show replaced public
429	Verify	Declined	Private Side Non-Lead	They dug up there side already and have copper.		Collected agreement in the field.	Nothing in Cogsdale to show replaced public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
1900	Verify	Declined	Blank		Yes	Unable to leave message. This is a store front unsure of how many units 12/21	Nothing in Cogsdale to show replaced public
1425	Verify	Declined	Private Side Non-Lead	New housing copper pipes at the time of construction	No	According to Allegheny County Real Estate house built in 2010.	Nothing in Cogsdale to show replaced public
1515	Verify	Declined	Private Side Non-Lead	Verbal Opt out Owner Reports property is New and CBI results stated non-lead. Request to be removed from Robo Call list		This verbal out was made via Lead Help Desk. When Canvassed aread was a brand new side walk where curb box was	Nothing in Cogsdale to show replaced on public
2225	Verify	Declined	Concerned about Impacts	We do not want our garden disturbed or the foundaton of our 200 year old home.			Nothing in Cogsdale to show replaced on public
12	Verify	Declined	Private Side Non-Lead	Lines are new to curb box from home - lead line to street replaced by water company			Nothing in Cogsdale to show replaced on public
2136	Verify	Declined	Other	After the criminal plumbing bill I refuse to grant access to my house to the health dept - EVER!	Yes	Left Mssg concerning decline for LSLR and to find out did he replace private because of Health dept inspecting work. 1/4/19	Nothing in Cogsdale to show replaced public
28	Verify	Declined	Other	Daughter states Mother died in August believes the home is going into forclosure and the daughter does not have anything to do with the property	No	Assuming this was a verbal opt out. Unsure of date	Nothing in Cogsdale to show replaced on public
334	Verify	Declined	Private Side Non-Lead	In 1991 the lead service line @ this residence was removed and replaced with a non-lead line	No		Nothing in Cogsdale to show replaced on public
1430	Verify	Declined	Other	We don't know the whole cost of the replacement of the line. We have a concrete porch in its way"	Yes	Spoke to owner after receiving declined agreement. Explained LSLR Program, advised if doesn't agree after coordination can still opt out. said didnt understand and would like to opt in. Sent in agreement. 1/28/19	Nothing in Cogsdale to show replaced public
745	Verify	Declined	Private Side Non-Lead	I have copper line	No	Collected agreement in the field. Owner said he replaced it he doesn't need us doing his line.he replaced in 2000. Cant we see that it has been done already when he remodeled?	Nothing in Cogsdale to show replaced public
20	Verify	Declined	Can't Afford	This is a old house and I can't afford to replace anything that goes wrong on my part. Won't be living here to many more years anyway will buy water for drinking and get filter.	Yes	Explained LSLR program and to have coordination first and let contractor explain how they would do replacement and of not satisfied can decline at coordination. Will opt in sent agreement 1/4/19	Nothing in Cogsdale to show replaced public
2536	Verify	Declined	Concerned about Impacts	Worried about Damage done to landscape	Yes	Left Mssg concerning decline LSLR 1/4/19	Nothing in Cogsdale to show replaced public
625	Verify	Declined	Other	Cavnvassed area. Wife said she was not signing and they don't want anything done. husband was present as well.		Area canvassed owner gave verbal opt out	Nothing in Cogsdale to show replaced public
1118	Verify	Declined	Private Side Non-Lead	Mr. Timothy called in and advised that he sent in his agreement to opt out and he stated this was sent in twice. He stated that if we do not stop calling him, he will file harassment by communications charges against us. I will put decline as a verbal opt out. He stated his lines were replaced on the public side in 1970 with copper.	No	Called into Lead Help desk with Verbal Opt out	Nothing in Cogsdale to show replaced public
508	Verify	Declined	Private Side Non-Lead	My lines are copper own home since 1972 & they have been copper since	No	Historical Records show private is copper since 1949. No records for public	Nothing in Cogsdale to show replaced public
1918	Verify	Declined	Private Side Non-Lead	Opted out w/ LHD over phone said he does not have lead	No	When canvassing in Jan & Feb noticed this is a new contruction property.	Nothing in Cogsdale to show replaced public
1921	Verify	Declined	Private Side Non-Lead	Had the water line replaced 5 or 6 years ago.	No		Nothing in Cogsdale to show replaced public
6	Verify	Declined	Blank		Yes	Unable to leave message 12/21	Nothing in Cogsdale to show replaced
2328	Verify	Declined	Private Side Non-Lead	Have copper pipes	No		Nothing in Cogsdale to show replaced on public
2014	Verify	Declined	Sample Results	We have had out water tested it showed no lead. We do not want to be responsible for the large retaining wall in front of our home. This wall belongs to the city not us			Nothing in Cogsdale to show replaced on public
2025	Verify	Declined	Private Side Non-Lead	Replaced previously	Yes	Collected out in Field. Said both public and private are non-lead. We explained LSLR program. Sad we dont need to do his side we can do whatever we need to on public.	Nothing in Cogsdale to show replaced
1958	Verify	Declined	Private Side Non-Lead	I installed a new 3/4" service line at this property			Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow-up	Comments	Additional Notes
1960	Verify	Declined	Private Side Non-Lead	1' installed a new 3/4" or 1" service line at this property			Nothing in Cogsdale to show replaced on public
1961	Verify	Declined	Private Side Non-Lead	Property has copper water line.	No		Nothing in Cogsdale to show replaced on public
1962	Verify	Declined	Private Side Non-Lead	A new service line was installed			Nothing in Cogsdale to show replaced on public
1964	Verify	Declined	Private Side Non-Lead	1' installed a new 3/4" or 1" service line at this property			Nothing in Cogsdale to show replaced on public
1966	Verify	Declined	Private Side Non-Lead	A new 3/4 inch service line was installed			Nothing in Cogsdale to show replaced on public
2032	Verify	Declined	Private Side Non-Lead	A new 3/4 inch service line was installed			Nothing in Cogsdale to show replaced on public
522	Verify	Declined	Private Side Non-Lead	Line is copper			Nothing in Cogsdale to show replaced on public
111	Verify	Declined	Private Side Non-Lead	My line from curb to property was replaced in 2015	No	Per John Mcarthy in Cogsdale"NEW PLASTIC CURB TO MAIN 240- KIRK-FORESTER 10/5/15"	
2232	Verify	Declined	Private Side Non-Lead	The line was replaced in 2018			Nothing in Cogsdale to show replaced on public
6115	Verify	Declined	Private Side Non-Lead	lead lines were replaced a few years ago when dug up to fix a leak on property.			

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set XI in
Docket No. R-2018-3002645 and Docket No. R-2018-3002647**

Request UNITED-XI-10 With respect to the water filters PWSA provides to customers with lead levels that exceed 15 parts per billion who have not had their service lines replaced, (PWSA St. 1-R, at 24), please identify:

a. When PWSA began providing filters to these customers;

b. How PWSA sends alerts to eligible customers;

c. Who the filter vendor is;

d. What type of filter and replacement cartridges are provided, including product name and model number;

e. How much each filter and replacement cartridge costs;

f. How many replacement cartridges are provided to each customer; and

g. How many filters PWSA has distributed to date.

Response:

a. Around February of 2018

b. PWSA calls the customer and hand delivers a pitcher and filter cartridges. We are transitioning to a program where a voucher will be included in the results letter allowing the customer to get a pitcher and filter cartridges delivered directly through our filter vendor.

c. The current filter vendor is 120 Water Audit.

d. PWSA provides a ZeroWater 10-cup NSF-53 certified water pitcher, model number ZP-010 and ZeroWater 5-stage filter cartridges model number ZR-001.

e. Each water pitcher costs $18.38 and each filter costs $7.70. The pitchers and filters mailed to customers whose test results show an exceedance of 15 ppb lead cost $53.60 including a pitcher, four filters (including the one supplied with the pitcher) and shipping.

f. Four filters are provided including the one supplied with the pitcher.

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set XI in
Docket No. R-2018-3002645 and Docket No. R-2018-3002647**

g. A total of 77 customer requested sample results have exceeded 15 parts per billion. Of those customers, 15 requested a filter. Other customers have reported that they have already received one from PWSA or that they have purchased their own.

Response Provided by: Robert A. Weimar, Executive Director
Barry King, P.E., Interim Director of Engineering and Construction
The Pittsburgh Water & Sewer Authority

Dated: November 5, 2018

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

SURREBUTTAL TESTIMONY OF MITCHELL MILLER

ON BEHALF OF

PITTSBURGH UNITED

May 17, 2019

Topics Addressed:

Termination Procedures

The Discontinuance of Service to Leased Premises Act (DSLPA)

Collections

Low Income Programs

Lead Remediation Program

PREPARED SURREBUTTAL TESTIMONY OF MITCHELL MILLER

Q: Please state your name, occupation and business address.

A: Mitchell Miller. I currently provide consulting services regarding utility programs that promote the public interest, with a focus on low income households. My address is 60 Geisel Road, Harrisburg, PA 17112.

Q: Did you previously submit testimony in this proceeding?

A: Yes. I submitted direct testimony, pre-marked as Pittsburgh UNITED Statement C-1.

Q: What is the purpose of your surrebuttal testimony?

A: The purpose of my surrebuttal testimony is to respond to a number of issues raised by Ms. Julie Quigley, witness for the Pittsburgh Water and Sewer Authority (PWSA), and to further clarify several aspects of my direct testimony that appear to have been misunderstood. I will also briefly respond to a narrow issues raised by PWSA witness Mr. Robert Weimar.

I note that my surrebuttal testimony is not intended to address every issue raised or otherwise discussed by Ms. Quigley, Mr. Weimar, or other witnesses in this proceeding. My lack of response to any specific recommendation or position of any witness does not necessarily indicate that I am in agreement with their testimony. Also note that, unless required for context in providing a further response to rebuttal testimony, I will not reiterate the extensive arguments and evidence I provided in direct testimony. To the extent an argument raised by any party in rebuttal was already sufficiently addressed in direct, I do not intend to specifically respond, and instead stand firmly on the evaluation, analysis, and recommendations contained in my direct.

Q: How is your surrebuttal testimony organized?

A: My surrebuttal testimony is centered on five primary issues: (1) PWSA's inadequate procedure for providing personal contact at a residential property immediately prior to termination;

(2) PWSA's demonstrated failure to implement appropriate procedures to allow tenants to exercise the rights contained in the Discontinuance of Service to Leased Premises Act; (3) PWSA's insistence that it may enter a new collections contract before critical areas of disagreement about the regulatory parameters for collections are addressed; (4) PWSA's failure to propose an adequate process for developing a timely and comprehensive low income assistance plan; and (5) PWSA's resistance to developing a plan to remediate critical property damage for low and moderate income homeowners which may occur during the replacement of a lead service line.

Personal Contact Immediately Prior to Termination

Q: Please summarize Ms. Quigley's rebuttal testimony regarding PWSA's policies for personal contact immediately prior to termination.

A: Ms. Quigley explains that PWSA is "firmly of the view" that section 56.94 of the Commission's regulations do not require a PWSA employee to attempt to make personal contact with an adult resident at the home immediately prior to terminating service at the residence.[1] She then argues that PWSA should not be required to comply with this personal contact requirement because of a "recent uptick in violence (to include here in Pittsburgh) along with the constitutional second amendment right to bear arms."[2] She asserts that PWSA should not be required to simply "'get in line'" behind the other utilities, and argues that PWSA's safety concerns are "unique" and justify PWSA's noncompliance.[3] According to Ms. Quigley, PWSA's concerns are unique for two reasons: (1) "because they are based on PWSA's experiences and are informed by [her] own

[1] PWSA St. C-4R at 6:24-25.
[2] PWSA St. C-4R at 7:1-3.
[3] PWSA St. C-4R at 7:10-13. Note that in her rebuttal testimony, Ms. Quigley uses quotation marks around the phrases "brush aside", "all the utilities" and "get in line." PWSA St. C-4 at 7:10-13. I wish to be clear that those phrases did not appear in my direct testimony.

personal experience posting terminating notices", and (2) "because PWSA is a municipal authority and PWSA simply does not have the internal collections infrastructure in place at investor owned utilities."[4] Ultimately, Ms. Quigley recommends that this issue be addressed in the Stage 2 proceeding, and offers that, in the interim, "PWSA is willing to develop and implement a new process whereby residential customers scheduled for termination will be contacted by telephone on the morning of the scheduled service termination."[5]

Q: How do you respond?

A: First, I understand from counsel that all legal arguments with respect to the applicability and requirements of section 56.94 (procedures immediately prior to termination) will be fully addressed in briefing.

Regarding Ms. Quigley's assertion that there has been a "recent uptick in violence", I note simply that she does not cite to any empirical evidence indicating that this is true.[6]

I also disagree with Ms. Quigley's assertion that PWSA's safety concerns are "unique from other utilities", and that it should therefore be excused from complying with the regulatory requirement. As I noted above, Ms. Quigley makes two points in support of that view, and I will respond to each in turn. First, while Ms. Quigley's personal experience posting termination notices is certainly a valuable asset for PWSA, this experience does not make PWSA unique in its perspective – nor is it particularly relevant to determining whether PWSA must comply with the requirements in the regulation. The perspective of experienced customer service leaders from the various public utilities play a prominent and important role in shaping Commission policies,

---

[4] PWSA St. C-4R at 10:20-22, 11:8-9.

[5] PWSA St. C-4R at 12:18-25.

[6] Appendix A, UNITED to PWSA IX-1 & IX-2.

practices, and regulations. This particular regulatory requirement (the provision of personal contact immediately prior to termination) has been in place for many years, and was informed by substantial input from public utilities, along with the equally valuable perspective of consumers, lawmakers, regulators, and other stakeholders. Again, while I appreciate Ms. Quigley's experience, I respectfully submit that the Commission has already weighed the various risks against the critical need to prevent unauthorized or potentially dangerous utility terminations when it promulgated the regulation, and that PWSA must comply with those requirements. In fact, as I referenced in my direct testimony, the Commission just recently finalized substantial revisions to Chapter 56, which do not include any changes to the requirement in section 56.94 that utilities attempt to make personal contact with an adult occupant immediately prior to performing a residential termination.[7]

Moreover, Ms. Quigley's claim that PWSA's safety concerns are unique because PWSA is a municipal authority misses the entire point of bringing PWSA under the jurisdiction and oversight of the Commission. It is my understanding that PWSA was brought under the Commission's jurisdiction precisely because the legislature wanted it to comply with the Commission's policies and practices, which are carefully balanced to protect the broad public interest – including the rights of consumers and the operational needs of utilities.[8] As to the Commission's termination regulations, the Commission was clear in both its Tentative and Final

---

[7] See Pittsburgh UNITED St. C-1 at 15, n. 19; see also Rulemaking to Amend the Provisions of 52 Pa. Code, Chapter 56 to Comply with the Amended Provisions of 66 Pa. C.S. Chapter 14, Docket No. L-2015-2508421, Final Rulemaking Order, (order entered Feb. 28, 2019).

[8] 66 Pa. C.S. § 3202; see also Final Implementation Order at 3 ("Act 65 expressly defines the proceedings in which stakeholders are expected to participate to achieve the goals of Chapter 32. That is, the Commission is certain about the end-state regulatory paradigm for PWSA. Section 3202 of the Public Utility Code provides that it will be subject to Commission regulation in the same manner as a public utility; there is no need to conduct informal collaborative proceedings to explore this point.")

Implementation Orders in this proceeding that "PWSA will follow the Commission's termination procedures found at 52 Pa. Code §§ 56.81-56.131."[9] I see no justifiable reason here to allow PWSA to circumvent this clear regulatory requirement.

Q: Ms. Quigley opines that your experience and perspective as the former Director of the Bureau of Consumer Services "is not formed through 'on-the-ground' personal experience and does not provide instructive information for PWSA to consider when trying to craft a path forward which addresses the safety concerns that I have raised."[10] She also concludes that you have never considered or designed policies to protect the safety of utility employees.[11] How do you respond?

A: Ms. Quigley is correct that I have not personally performed a residential service termination, and that I approach my analysis from the perspective of a former regulator. But she is wrong to conclude that I have never had to "consider and/or design policies and procedures to safeguard the safety of employees being asked to perform service terminations."[12] I spent three decades as a regulator, specializing in analyzing, implementing, and enforcing consumer-related laws, regulations, and policies. In this time, I conducted and supervised countless field reviews of utility operations, and met with dozens upon dozens of utility personnel at all levels to understand the challenges associated with termination procedures from the utility's perspective. I have helped design regulatory solutions that fairly balanced the multitude of interests, including the interests of public utilities, and certainly have and continue to consider the safety of utility employees in analyzing policy and in making recommendations.

---

[9] Final Implementation Order at 18-19; Tentative Implementation Order at 9-11.
[10] PWSA St. C-4R at 8:3-6.
[11] PWSA St. C-4R at 9:5-8.
[12] PWSA St. C-4R at 9:5-8.

I respect Ms. Quigley's personal experience in handling these issues and PWSA's concern, but the utility perspective is not the only important perspective in establishing termination policies and procedures. Regulators must see an issue from all perspectives, and weigh any competing interests to protect the public interest. And, as a former regulator, I believe it is critical for utilities to follow the carefully crafted regulations which govern utility terminations. Again, it is my understanding that PWSA was brought under the Commission's jurisdiction precisely because it would require PWSA to revise its current policies and practices to conform with the Commission's regulations.[13] Attempting personal contact at a residence immediately prior to termination is an important regulatory requirement that can prevent the unauthorized termination of service and can avoid undue harm to vulnerable Pittsburgh residents.[14] Again, I have seen no evidence that there is anything unique about PWSA that would warrant deviation from this critically important and carefully balanced regulatory requirement.

Q: Ms. Quigley offers that PWSA could institute a telephone call in place of attempting to make personal contact with an adult at the property immediately prior to termination.[15] Is this an adequate substitute to the personal contact requirement in section 56.94?

A: No. Low income households, which are disproportionately likely to face involuntary loss of service, often lack access to stable telecommunications service[16]– which makes this form of notice particularly ineffective. But even for those who do have access to stable telecommunications service, a telephone call is an inadequate substitute for in-person contact. These days, many

---

[13] 66 Pa. C.S. § 3202; see also Final Implementation Order at 3, 18-19.

[14] See Pittsburgh UNITED St. C-1 at 13:9 to 14:8.

[15] PWSA St. C-4R at 12:15 to 13:3.

[16] See Pittsburgh UNITED St. 2 at 69: 14-15; see also In the Matter of Bridging the Digital Divide for Low Income Consumers, Joint Comments of Pennsylvania's Low Income Individuals, Service Providers, Organizations, and Consumer Rights Groups, FCC Docket Nos. WC 17-287, 11-42, & 09-197 (filed Jan. 24, 2018).

consumers are reticent to answer calls from an unknown number – and for good reason. The number of solicitation and robocalls that consumers receive have dramatically increased in recent years, including utility-related scams where the caller pretends to have important information about the consumer's utility service – or that the consumer's service is at risk of termination.[17] I do not believe that a phone call is an effective substitute for a final attempt at in person contact at the premises immediately before service is terminated. This last effort to put eyes on the consumer before shutting off their service is a critical back-stop to prevent unauthorized or dangerous termination of service.

Discontinuance of Service to Leased Premises Act

Q: Please summarize Ms. Quigley's rebuttal testimony regarding PWSA's policies for compliance with the Discontinuance of Service to Leased Premises Act (DSLPA).

A: Broadly speaking, Ms. Quigley confirms my concern that, as a condition to allowing a tenant to become a named customer after their landlord fails to pay for service – an option which is explicitly available to consumers under DSLPA[18] – PWSA requires the tenant to assume liability for at least some portion of the landlord's debt.[19] She attempts to explain that PWSA's assumption of liability requirement is justified because "PWSA always maintains debt with the property – regardless of whether the property is tenant-occupied or whether a new owner takes

---

[17] See Tara Siegel Bernard, Yes, Its Bad. Robocalls, and Their Scams, Are Surging, NY Times (May 6, 2018), https://www.nytimes.com/2018/05/06/your-money/robocalls-rise-illegal.html; see also FTC, Lights Out on Robocall Shop that Pitched Energy Savings (Mar. 20, 2016), https://www.consumer.ftc.gov/blog/2016/03/lights-out-robocall-shop-pitched-energy-savings (discussing lawsuit against companies using messages such as " "This is an urgent call about your energy bill."); FTC, Empower Yourself Against Utility Scams (Sept. 17, 2018).

[18] 66 Pa. C.S. § 1527(d) ("Any tenant of a residential building or mobile home park who has been notified of a proposed discontinuance of utility service pursuant to section 1523 (relating to notices before service to landlord discontinued) **shall have the right to agree to subscribe for future service individually** if this can be accomplished without a major revision of distribution facilities or additional right-of-way acquisitions.").

[19] See PWSA St. C-4R at 18-21.

over the property."[20] She notes that this process is "similar to other municipal authorities."[21] Because the debt remains with the property, and the tenant retains the option to make monthly in-person payments (which I will address in a moment), Ms. Quigley characterizes PWSA's assumption of liability requirement as a "voluntary" choice that the tenant can willingly make to exercise their rights under DSLPA.[22] Ms. Quigley further notes that the tenant is only required to accept liability for debts incurred "while the tenant occupies the property."[23] In other words – from the time they moved into the property, including the period of time that the landlord was responsible for paying the bill but didn't pay.

For those seeking to avoid assumption of liability for the landlord's debts, and still prevent termination of their water service as a result of a landlord's nonpayment, PWSA requires tenants to make an in-person payment at PWSA's main office during normal business hours.[24] Ms. Quigley continues to justify this onerous and burdensome requirement "as an important anti-fraud measure" – which she claims is necessary to prevent landlords from posing as their tenants to surreptitiously make payments on the tenant's behalf.[25]

In sum, Ms. Quigley's argument is that tenants have two options when their landlords stop paying for water service: (1) travel downtown once a month during business hours to make an in-person cash or check payment, or (2) assume liability for the debts of the landlord that have accrued since the tenant moved into the property. She argues that these options present tenants with a voluntary choice, and concludes that PWSA's policies are, therefore, already consistent with my

---

[20] PWSA St. C-4R at 18:10-17.
[21] PWSA St. C-4R at 19:6.
[22] PWSA St. C-4R at 19:8-10, 20:13-14.
[23] PWSA St. C-4R at 19:19-20.
[24] PWSA St. C-4R at 21:15 to 22:23.
[25] PWSA St. C-4R at 22:1-9.

recommendation that PWSA not require tenants to accept liability for the landlord's debt or require a landlord's signature to exercise their rights under DSLPA.[26]

Q: How do you respond?

A: I already explained at length in direct testimony why PWSA's current DSLPA processes are inadequate to protect tenants as required by the provisions of the Act. In short, DSLPA provides the tenant with the option of either becoming a customer *or* continuing service by making ongoing payments on future service.[27] PWSA, through its policies and practices, has made both options untenable by adding burdensome and unjust conditions: To avoid termination of critical water and wastewater service as a result of their landlord's nonpayment, the tenant must either accept liability for debt which is not theirs as a condition to becoming a customer on a forward-going basis or travel to downtown Pittsburgh during business hours each month to make an in person payment. This is not a "voluntary" choice, as Ms. Quigley repeatedly asserts, and forces tenants – who are already harmed by the actions of their landlord – to decide between two unreasonable alternatives which are, fundamentally, inconsistent with the requirements of DSLPA. Nothing in Ms. Quigley's rebuttal testimony has caused me to change my previous analysis of PWSA's current DSLPA processes or my recommendations related thereto. I will not attempt to reiterate that testimony here, but stand firmly on my original analysis.

That said, I would nevertheless like to specifically respond to Ms. Quigley's assertion that PWSA's current approved tariff rules – which allow debt to attach to the property, similar to other

[26] PWSA St. C-4R at 21:12-14.

[27] Pittsburgh UNITED St. C-1 at 23-28; 66 Pa. C.S. § 1527 (a)-(d).

municipal authorities – provide justification for PWSA to disregard the clear mandates of DSLPA.[28] I have three specific points to make in response to this suggestion.

First, Ms. Quigley's reference to PWSA's "Commission approved tariffs" should be disregarded.[29] I understand from counsel that, as part of the Joint Settlement approving PWSA's tariffs, PWSA agreed that its compliance with DSLPA would be subject to further investigation in the Compliance Plan proceeding.[30] Indeed, there were well over a dozen issues in the tariff proceedings that were deferred for further investigation and resolution as part of this Compliance Plan proceeding.[31] Given that compliance with DLSPA is one of those issues, PWSA's current tariff describing their landlord/tenant policy is merely a placeholder until the issue is finally determined in the context of this proceeding.

Second, Ms. Quigley's suggestion that PWSA's process for assigning debt to tenants is justified because it is "similar to other municipal authorities" is irrelevant to the overarching question in this proceeding: Whether PWSA's policies and practices are compliant with the Commission's regulations. As I noted earlier in my testimony, it is my understanding that PWSA was brought under the Commission's jurisdiction and oversight with the express purpose of ensuring that its policies and practices would conform to the Commission's statutory and regulatory framework – not to continue its policies and practices which otherwise conflict with this established framework.

Third, the fact that PWSA's tariff requires debt to stay with the property is a legacy of their past practices and relates to their ability as a municipal utility to place a lien on property for unpaid

---

[28] PWSA St. C-4R at 18:10-17.
[29] See PWSA St. C-4 at 18:11-12.
[30] See RD at 36.
[31] See RD at 35-37.

bills. This policy remains subject to dispute, as it is in conflict with Chapter 14 of the Public Utility Code and Chapter 56 of the Commission's regulations, which detail how a customer and applicant are defined and when debts may be demanded from an applicant as a condition to receiving service.[32] However, regardless of whether PWSA continues to require debt to run with a property, tenants have clear and unambiguous rights under the DLSPA that allow them to subscribe for utility service on a forward going basis. They cannot be held responsible for any debt the accrued at the property before they exercise this right. While I understand that this issue may be related to ongoing discussions about Chapter 14 and Chapter 56 concerning liability for customers that will be decided in Stage 2, there is a distinction between Chapter 14 liability for customers in general and whether a tenant has the rights under the DLSPA to subscribe for future service which is at issue in this stage of the proceeding. I see no reason why PWSA cannot comply with the DLSPA.

As a final point on DSLPA, I would like to directly respond to Ms. Quigley's continued and unsupported claim that requiring tenants to make in-person payments at PWSA's downtown office is an "important anti-fraud measure." In my time at the Commission, I do not recall any complaints of DSLPA fraud involving landlords posing as their tenants, and Ms. Quigley has been unable to present any evidence to the contrary.[33] Therefore, I continue to believe, as I explained in direct testimony, that PWSA's claims of fraud are purely hypothetical, and unlikely at best.[34] A tenant's rights should not be unnecessarily curtailed based on a hypothetical and unlikely risk of fraud.

---

[32] See, e.g., 66 Pa. C.S. §§ 1403 (definitions of "customer" and "applicant"), 56.35 (payment of outstanding balance), 56.81 (authorized termination of service), 56.83 (unauthorized termination of service).

[33] Attachment A, UNITED to PWSA IX-7.

[34] Pittsburgh UNITED St. 1 at 24-26.

Collections

Q: In your direct testimony, you recommend that PWSA not enter a new contract for collections services until its plan for collections is reviewed and approved by the Commission as part of the Stage 2 proceeding. How did Ms. Quigley respond?

A: Ms. Quigley supported my conclusion that collections issues are part and parcel to PWSA's compliance with Chapter 56, and that these issues should be deferred for further discussion in the Stage 2 workshop process established by the Commission.[35] However, she disagreed with my recommendation that PWSA be prevented from contracting with a new collections agency until the completion of Stage 2.[36] She raises three points of contention with my recommendation: (1) that the Commission does not have the authority to prohibit PWSA from contracting with a new collections agency, provided the terms are consistent with the law and Commission regulations; (2) that the Commission does not "view[] contracting with collections agencies as something that is inherently wrong or should be prohibited"; and (3) that "PWSA has demonstrated a sincere and continuing desire to work with the stakeholders and the Commission collaboratively to ensure that its processes and policies are consistent with Commission regulations."[37]

Q: Do you agree with Ms. Quigley's assessment?

A: Yes and no. I will respond to each of Ms. Quigley's three points in turn.

In response to Ms. Quigley's first argument; I agree that the Commission cannot prohibit PWSA from contracting with a collections' agency, *provided the contractual obligations are consistent with law and Commission regulation.* At this time, there are substantial and fundamental

[35] PWSA St. C-4R at 26:3-9.
[36] PWSA St. C-4R at 26:11-13.
[37] PWSA St. C-4R at 26:11-22, 27:1-2.

disagreements between the parties in this proceeding about the types of collections methods that PWSA is authorized to use pursuant to the Public Utility Code and Commission regulations.[38] These disagreements were extensively addressed in the rate proceeding, and were again addressed in my direct testimony in this proceeding, so I will not attempt to reiterate those arguments here, though I incorporate those arguments herein by reference.[39] It is my understanding that the purpose of this proceeding is for the Commission to review and approve PWSA's comprehensive Compliance Plan, wherein PWSA presents a detailed plan for how it intends to comply with the laws and Commission regulations, and – after developing a comprehensive record to investigate the details of that plan – the Commission reviews the plan and either approves or modifies the proposed plan to fit within the confines of the law and Commission regulations and policies. To date, PWSA has not submitted any details about its collections policies which would allow the Commission to assess whether PWSA's proposed plan is aligned with the law and Commission regulations and policies. PWSA should not put the cart before the horse: Before entering a contract for collections services, PWSA should ensure that its plan is fully developed, vetted, and approved. If PWSA were to sign a new contract for collections services before these substantial areas of disagreement are resolved, it could result in substantial costs to ratepayers if PWSA were to later substantially modify or withdraw from that contract as a result of determinations made in the Stage 2 proceeding.[40]

---

[38] Pittsburgh UNITED C-1 at 31:8-22.

[39] Pittsburgh UNITED C-1 at 31:8-22 (incorporating by reference specific sections of Pittsburgh UNITED St. 2 and Pittsburgh UNITED St. 3, which were duly admitted to the record in PWSA's base rate proceeding, into this proceeding).

[40] At the very least, if PWSA insists on entering into a collections contract before its collections practices are approved by the Commission, it should ensure that the contract contains a cancellation or modification provision that would allow the contract to be cancelled or modified if any part of it is found to conflict with the Public Utility Code or regulations.

With regard to Ms. Quigley's second point - that there is nothing inherently wrong with contracting with a collections agency - I also agree with that premise. That is, unless the terms of that contract run contrary to the law and Commission regulations. As I just noted, there continues to be substantial disagreement about the parameters within which PWSA may engage the services of a collections agency. Until those disagreements are resolved, prudence suggests that PWSA should not enter a contract with a new collections agency, which may have terms that contradict the Commission's regulatory requirements.

Finally, with regard to Ms. Quigley's third point, I once again agree with the overarching assertion: PWSA has demonstrated a desire and expressed an intent to work collaboratively with the Commission and stakeholders to develop its collections plan. However, this declaration seems at odds with PWSA's insistence that it be allowed to contract with a new collections agency before the outstanding compliance issues are resolved. If PWSA were to engage in a contract before resolving these disputes, it may undermine the collaborative progress PWSA has made to date. The point of a collaborative process, in this context, is to work together to achieve a mutually agreeable collections plan that the Commission and parties agree is compliant with the law and Commission regulations.

Low Income Assistance Programs

Q: In your direct testimony, you raised concerns that the Low Income Assistance Advisory Committee "does not meet with sufficient frequency to appropriately inform the development of PWSA's Plan within an appropriate timeframe," and recommended that

PWSA create a LIAAC sub-committee which meets more frequently to allow for a more thorough review of the relevant data.[41] How did Ms. Quigley respond?

A: Ms. Quigley rejects my recommendation to create a LIAAC subcommittee, arguing it would "divert resources away from PWSA evaluating its own programs and making its own determinations about what to recommend in the next rate case."[42] Ms. Quigley notes that PWSA has hired a consultant to further assess its low income assistance programming and develop its plan.[43]

Q: How do you respond?

A: Ms. Quigley appears to miss the point of my recommendation, which was to allow PWSA to gather insight from key stakeholders – which each serve as part of the LIAAC – to help inform PWSA's ultimate plan before the plan is filed with the Commission and subject to litigation through the base rate proceeding.[44] According to her rebuttal testimony, "PWSA is anticipating filing its next rate case early in 2020 with new rates anticipated to go into effect early in 2021."[45] Currently, PWSA's LIAAC is only required to meet quarterly,[46] and I understand from counsel that the next meeting is scheduled for June 3, 2019 – just a week after hearings in this proceeding are scheduled to conclude. In total, the LIAAC will meet just three times before PWSA anticipates filing its next base rate proceeding and, thus, must file its comprehensive low income assistance program plan consistent with the terms of the settlement.[47] Instead of limiting the opportunities

---

[41] Pittsburgh UNITED St. 1 at 44-45.
[42] PWSA St. C-4R at 33.
[43] PWSA St. C-4R at 32-33.
[44] See RD at 23-24.
[45] PWSA St. C-4R at 33.
[46] See RD at 23.
[47] Id.

for PWSA to reach consensus with critical stakeholders, I believe PWSA should be engaging regularly with stakeholders to avoid further protracted litigation over the universal service program plan in PWSA's rate case, which comes at a cost to PWSA, the Commission, the parties to the proceeding, and to PWSA's ratepayers. Thus, I continue to recommend that PWSA engage more frequently with the LIAAC in developing its comprehensive low income assistance program plan, and suggest that the use of a sub-committee would be an effective way to leverage the expertise of the Committee and to minimize future litigation over detailed aspects of PWSA's proposed plan.

Lead Remediation Program

Q: You recommend that PWSA develop a program for low- and moderate-income customers to restore property damage caused by service line replacements, with a focus on damage that interferes with customers' mobility or other basic needs.[48] How does Mr. Weimar respond to your testimony?

A: Mr. Weimar states that PWSA's funds should be directed to lead service line removal rather than "replacing private landscaping."[49] He also states that 99 percent of lead service line replacements conducted by PWSA in 2019 used a trenchless method, most of which have "no" impact on private property.[50] Mr. Weimar also notes that customers who are concerned about property impacts can opt out of private-side lead service line replacement.[51]

Q: Do you agree with Mr. Weimar's response?

A: No. First, I want to clarify that my recommendation was for PWSA to "develop a program, to be presented in PWSA's next base rate proceeding, to restore or pay for property damage caused

[48] Pittsburgh UNITED St. C-1 at 49-50.
[49] PWSA St. C-1R at 50.
[50] PWSA St. C-1R at 50.
[51] PWSA St. C-1R at 50.

by lead service line replacements for low and moderate income customers, particularly property damage that interferes with customer' mobility or other basic needs."[52] Mr. Weimar distorts my recommendation, suggesting I have am asking PWSA foot the bill for private landscaping costs. To the contrary, I have suggested that PWSA design an appropriate program for property repair, targeting those most in need and for property damage that interferes with mobility and other basic needs. I am not talking about shrubbery and flower beds.

Also, the size of such a program would be limited. If PWSA presently conducts 99 percent of service line replacements using a trenchless method, as Mr. Weimar describes, only 1 percent of replacements are performed using more invasive replacement methods.[53] A targeted property restoration program directed to low- and moderate-income customers who are part of this 1 percent or are some of the few who suffer property damage from a trenchless replacement would be extremely limited in scope. Meanwhile, there are substantial benefits to ensuring that these customers' mobility-related property is restored (e.g., repairing walkways, stairs, driveways), including an increased likelihood that these customers will consent to having their private-side lead service lines removed.[54]

I also find it troubling that PWSA's response to a customer's concerns about property damage would be to accept that they may opt out of a private-side service line replacement. If a customer opts out of a private-side replacement, and that lead line is not removed, both PWSA and

---

[52] Pittsburgh UNITED St. 1 at 51:8-11.

[53] PWSA St. C-1R at 50; Pittsburgh UNITED St. 4 at 8-9 (describing replacement methods).

[54] Pittsburgh UNITED St. C-1 at 49-50.

that customer lose. A dangerous pipe stays in the ground and the customer remains at risk for lead exposure.[55]

I continue to recommend that PWSA develop a program to assist the small subset of uniquely vulnerable low and moderate income customers who are unable to afford to restore critical mobility-related property that may be damaged through lead service line replacement. Such a program would be modest and consistent with PWSA's obligation to provide safe and reasonable service.

Q: Does this conclude your Surrebuttal Testimony?

A: Yes.

[55] See Pittsburgh UNITED St. C-3 at 19-21.

APPENDIX A: Interrogatory Responses

Interrogatories of Pittsburgh UNITED to PWSA

UNITED IX-1

UNITED IX-2

UNITED IX-7

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IX in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED IX-1 See PWSA St. C-4 at 7:1-3. Please provide a copy of any and all research, reports, statistics, analysis, or other documents relied on by Ms. Quigley in concluding that there is a "recent uptick in violence (to include here in Pittsburgh)."

Response: Ms. Quigley relied on her personal experience as a city of Pittsburgh resident. The most recent violent incident covered by national media occurred at the Tree of Life synagogue on October 27, 2018 where eleven people were killed and seven were wounded. This incident has been referred to as "the deadliest terror attack on Jews in U.S. history." See https://en.wikipedia.org/wiki/Terrorism_in_the_United_States. In response, the mayor of Pittsburgh has declared war on guns, supporting three ordinances currently pending in Pittsburgh's city council that would ban assault weapons; ban ammunition, accessories, and gun modifications for semi-automatic guns; and create an extreme risk protection order to seize guns from people who could cause harm to themselves or others. These measures are being aggressively opposed. In Ms. Quigley's experience, incidents like this and the resulting political consequences are occurring more frequently across the nation and, as a result, Ms. Quigley believes it is more prudent than ever to ensure that PWSA is taking all actions possible to ensure the safety of its employees in light of current times.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: May 16, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IX in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED IX-2 See PWSA St. C-4 at 7:1-3. *Is it Ms. Quigley's assertion that* there has been an "uptick in violence (to include here in Pittsburgh)" against utility workers specifically? Please explain why or why not, and provide a copy of any and all research, reports, statistics, analysis, or other documents which support Ms. Quigley's conclusion.

Response: No. See response to UNITED IX-1.

Response Provided by: Julie Quigley, Director of Administration
The Pittsburgh Water and Sewer Authority

Dated: May 16, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IX in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED IX-7	See PWSA St. C-4 at 22:1-3. Please provide a copy of any and all research, analysis, reports, studies, complaints, or other documents which support Ms. Quigley's assertion that PWSA's in-person requirement for tenants exercising their rights under DSLPA is "an *important anti-fraud measure*."
Response:	Ms. Quigley's assertion is expounded on in PWSA St. C-4R at 22:3-7. She is not in possession of any research, analysis, reports, studies, or complaints that support this assertion.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	May 16, 2019

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

SUPPLEMENTAL REBUTTAL TESTIMONY OF MITCHELL MILLER

ON BEHALF OF

PITTSBURGH UNITED

August 14, 2019

Topics Addressed:

Lead Remediation Program

PREPARED SUPPLEMENTAL REBUTTAL TESTIMONY OF MITCHELL MILLER

Q: Please state your name, occupation, and business address.

A: Mitchell Miller. I provide consulting services regarding utility programs that promote the public interest, with a focus on low income households. My address is 60 Geisel Road, Harrisburg, PA, 17112.

Q: Did you previously submit testimony in this proceeding?

A: Yes. I submitted direct testimony, pre-marked as Pittsburgh UNITED Statement C-1, and surrebuttal testimony, pre-marked as Pittsburgh UNITED Statement C-1SR.

Q: In the time since you submitted written direct and surrebuttal testimony, have some of the issues been deferred to Stage 2 of this proceeding?

A: Yes. I understand from counsel that, on May 13, 2019, the parties to this proceeding filed a Joint Expedited Motion for Extension of Commission-Created Deadlines ("Joint Motion"). On May 15, 2019, the Commission granted the requested relief and moved the following issues to Stage 2 of the Compliance Plan litigation: (1) residential service termination issues; (2) collections issues; and (3) issues related to PWSA's compliance with the Discontinuance of Service to Leased Premises Act. Thus, although I addressed these issues in my direct and surrebuttal testimony, they have since been deferred to Stage 2.

Q: Please identify the specific pages and lines of your direct testimony that address those issues being deferred to Stage 2.

A: My direct testimony was pre-marked as Pittsburgh UNITED Statement C-1. In that testimony, I addressed residential termination of service issues at page 9, line 12 through page 21, line 2. I addressed collection issues in that same testimony at page 31, line 5 through page 35,

line 6. I addressed issues related to PWSA's compliance with the Discontinuance of Service to Leased Premises Act at page 21, line 3 through page 31, line 4.

Q: Please identify the specific pages and lines of your surrebuttal testimony that address those issues being deferred to Stage 2.

A: My surrebuttal testimony was pre-marked as Pittsburgh UNITED Statement C-1SR. In that testimony, I addressed residential termination of service issues at page 2, line 8 through page 7, line 8. I addressed collection issues in that same testimony at page 12, line 1 through page 14, line 16. I addressed issues related to PWSA's compliance with the Discontinuance of Service to Leased Premises Act at page 7, line 9 through page 11, line 19.

Q: What is the purpose of your supplemental testimony?

A: To provide updates about developments that have occurred since I submitted my written direct and surrebuttal testimony and to respond to the supplemental testimony of Robert Weimar,[1] offered on behalf of PWSA, regarding PWSA's lead remediation programs. In particular, my testimony addresses PWSA's adoption of an income-based reimbursement program for the replacement of private-side lead service lines and describes how the program will disadvantage Pittsburgh's low and moderate income residents. My lack of response to any specific recommendation or position of Mr. Weimar or another witness does not indicate that I am either in agreement with or opposed to that recommendation.

Q: How is your testimony organized?

A: Initially, I explain why PWSA's income-based reimbursement program will not ensure adequate, efficient, safe, reliable, and reasonable service to customers. PWSA's approach will likely result in fewer lead service lines being replaced—particularly at the homes of low and

[1] PWSA St. C-1SD.

moderate income customers—and higher administrative costs than the approach recommended by Pittsburgh UNITED. Specifically, I recommend that the Commission deny PWSA's income-based reimbursement program and adopt the recommendation of Pittsburgh UNITED witness Gregory Welter that would require PWSA to replace all private-side lead service lines at no direct cost to customers.[2]

In the event that the Commission rejects this recommendation, I alternatively suggest three substantive changes to the income-based reimbursement program that would mitigate, *though not eliminate*, some of the more significant barriers to participation. First, I recommend that, rather than reimbursing customers, PWSA should pay its share of replacement costs directly to the contractors performing replacements. Second, when assessing eligibility for financial support to replace private-side lead service lines at rental properties, I recommend that PWSA use the incomes of tenants, rather than landlords. Third, I recommend that PWSA be required to adopt a specific and robust outreach program to help partially overcome the obstacles inherent to an income-based reimbursement program.

Finally, in addition to these three substantive requirements, I also offer a procedural recommendation. If the Commission approves PWSA's reimbursement program, it should also require PWSA to file an implementation plan with the Commission which details the process for administration of the program and associated costs.

Q: Does another witness describe PWSA's lead service line replacement program to date?

A: Yes, Pittsburgh UNITED expert Gregory Welter describes PWSA's lead service line replacement program and broader lead remediation efforts in his direct testimony.[3]

[2] Pittsburgh UNITED St. C-2, at 14-21.
[3] Id. at 8-13.

Q: Has PWSA made any recent changes to its lead service line replacement policy?

A: On July 26, 2019, the PWSA Board revised its lead service line replacement policy, creating a new program to reimburse residents who replace their private-side lead service lines after January 1, 2019.[4] This program would require customers to determine whether their home has a private-side lead service line, initiate contact with PWSA, complete an income verification, contract for the replacement with a private company, pay the private company in full for the replacement at an average cost of $5500, and apply to PWSA for reimbursement before PWSA will provide a reimbursement.

Pursuant to PWSA's proposed policy, reimbursement would be offered on an income-based sliding scale as follows:

Income Level	**Reimbursement Amount**	**Average Expected Customer Contribution, *after Reimbursement***
< 300% of the Federal Poverty Level (FPL)	100% of the cost of the replacement	$0
301-400% of the FPL	75% of the cost of the replacement	$1,375
401-500% of the FPL	50% of the cost of the replacement	$2,750
> 500% of the FPL	$1,000 stipend[5]	$4,500

Q: How many customers will be eligible for this income-based reimbursement program?

A: To my knowledge, PWSA has not conducted a comprehensive inventory, so it does not have a reliable estimate of the number of customers who have private-side lead service lines.[6]

[4] RAW-C-46 ¶ 10.
[5] Id. ¶ 10.d.
[6] Pittsburgh UNITED St. C-2, at 30-32; see PWSA St. C-1SD, at 23-24.

However, for budgeting purposes, PWSA estimates that between 8,000 and 20,000 customers will receive reimbursements through this program.[7]

Q: In your opinion, is the income-based reimbursement program an effective approach to replacing private-side lead service lines?

A: No. In my judgment, PWSA's approach is likely to result in fewer lead service lines being replaced than if PWSA offered to replace all private-side lead service lines at no direct cost to customers. The income-based reimbursement program will also result in expenditures of ratepayer funds on additional administrative costs, rather than the removal of lead service lines.

Q: In your opinion, why will the income-based reimbursement program replace fewer lead service lines than if PWSA offered to replace all private-side lead service lines at no cost to individual customers?

A: PWSA's proposed reimbursement program would be significantly less effective than a no-cost replacement program because most of the affected households cannot afford the upfront cost and are thus unlikely to take advantage of the program. The average cost of a private-side lead service line replacement is $5,500.[8] As I've explained in previous testimony, Pittsburgh's low and moderate income customers are simply unable to pay the thousands of dollars required for a lead service line replacement.[9] A substantial portion of PWSA customers most likely could not afford anything close to the amount that PWSA would require up front.[10] Pittsburgh has a lower than

[7] Appendix A, 1, Pittsburgh UNITED XII-15 Att. A.
[8] RAW-C-46 ¶ 3.2.
[9] See Pittsburgh UNITED St. C-1, at 47-48.
[10] The Federal Reserve reports that roughly 40% of adults in the United States cannot afford an unexpected $400 expense, and 22% of adults cannot cover their currently monthly bills – let alone pay for an average up-front cost of $5,500 to replace a lead service line. See Bd. of Governors of the Fed. Reserve Sys., Report on the Economic Well-Being of U.S. Households in 2017 - May 2018, https://www.federalreserve.gov/publications/2018-economic-well-being-of-us-households-in-2017-dealing-with-unexpected-expenses.htm (last visited Aug. 12, 2019); see also Adrian D. Garcia, Bankrate, Survey: Most Americans Wouldn't Cover a $1K Emergency with Savings (Jan. 16, 2019), https://www.bankrate.com/banking/savings/financial-security-january-2019/.

average median income[11] and a higher than average percentage of residents whose income is at or below the poverty level.[12] To expect those families to come up with $5,500 to pay up front for a service line replacement is not only unrealistic; indeed, in my experience, it simply will not happen. This is especially true for PWSA's low income customers who already cannot afford their current bills.[13] Simply put, PWSA's promise of a future reimbursement is meaningless for those who cannot afford to front the costs of replacement and wait for reimbursement.[14] Obtaining a loan is also not an option for many low and moderate income consumers. As a group, low income consumers have less access to capital than wealthier customers, and often face unreasonable terms and conditions when attempting to access loans.[15]

I recognize that Mr. Weimar states that "PWSA established a tiered cost reimbursement policy . . . so that those with the greatest financial need are fully reimbursed for the replacement."[16] However, by distributing this program's assistance through reimbursements, PWSA effectively and disproportionately excludes low income customers from participating. The outcome is

[11] Pittsburgh's median income is $44,092, compared to $57,652 nationally. See U.S. Census Bureau, 2013-2017 American Community Survey 5-year Estimates, https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml (Pittsburgh), https://www.census.gov/quickfacts/fact/table/US/PST045218 (national) (last visited Aug. 12, 2019).

[12] 22% of Pittsburgh residents have income that is at or below poverty level (100% FPL), compared to 13.1% across the state and 14.6% nationally. See U.S. Census Bureau, 2013-2017 American Community Survey 5-year Estimates: Selected Economic Characteristics, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF (Pittsburgh), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF (Pennsylvania), https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF (national) (last visited Aug. 12, 2019). PWSA has previously estimated that 28% of its service territory has an income which is at or below 150% FPL. See Rate Case Pittsburgh UNITED St. 2, at 11:6-9 (incorporated by reference at Pittsburgh UNITED St. C-1, at 9).

[13] See Rate Case Pittsburgh UNITED St. 2, at 11:4-12:15, 16:13-18:16 (incorporated by reference at Pittsburgh UNITED St. C-1, at 9).

[14] PWSA recognizes that customers making below 150% of the FPL could have difficulty even coming up with the money to pay their monthly water bill which is why it provides financial assistance to these households. See Rate Case Pittsburgh UNITED St. 2, at 18-19 (incorporated by reference at Pittsburgh UNITED St. C-1, at 9).

[15] See Rob Levy & Joshua Sledge, Ctr. for Fin. Servs. Innovation, A Complex Portrait of Small Dollar Credit Consumers, at 3 (2012), https://www.fdic.gov/news/conferences/consumersymposium/2012/A%20Complex%20Portrait.pdf.

[16] PWSA St. C-1SD, at 31.

perverse: the customers most in need of assistance are the least likely to get it. This program unreasonably disadvantages low and moderate income customers. Because the poverty rate among black and Latinx Pittsburghers is about double that of white residents, the policy is also likely to disproportionately affect communities of color in PWSA's service area.[17]

Q: Are there any other aspects of the income-based reimbursement program that will adversely affect customer participation?

A: Yes. PWSA's income-based reimbursement program places several hurdles between customers and lead service line replacements. Customers must determine whether their home has a private-side lead service line, initiate contact with PWSA, complete income verification, contract for the replacement with a private company, pay for the replacement, and apply for reimbursement. Each of these hurdles reduces the likelihood that customers will complete the process. These steps, individually and in aggregate, are particularly burdensome for low-income customers.

Low income customers are unlikely to even check for a lead service line if they think they will have to front thousands of dollars out of pocket to begin the process of replacing it. As described by Mr. Welter, it can be difficult and confusing for customers to determine whether or not their residence has a private-side lead service line,[18] and, even if they know that their private-side pipes are made of lead, they may feel powerless to do anything about it given their inability to afford to front the costs.

Additionally, the time required to locate a contractor, schedule a replacement, complete the income verification process, and apply for a reimbursement also poses a significant obstacle for

[17] Public Source, Let's Talk About Race, https://projects.publicsource.org/pittsburgh-race/data.html (noting that Pittsburgh's poverty rate for black, Hispanic, and white residents are 34%, 30%, and 16%, respectively); see also Pittsburgh UNITED St. C-3, at 7-8, 13.

[18] Pittsburgh UNITED St. C-2SUPP-R, at 3-4.

customers—especially for consumers with inflexible work schedules, such as low-wage and/or hourly workers.

Importantly, PWSA has not provided sufficient information about how it plans to verify income. For example, PWSA does not indicate whether it will accept a customer's verbal self-certification of income or whether it will require documentation. While self-certification would pose fewer barriers, a verification requirement would create significant administrative burden. Low income customers often lack ready access to the documents required to verify their income. Even if a household does have access to documentation, providing a copy of that documentation to PWSA can prove to be difficult for low income households, as many do not have access to the internet, a copier, a printer, a scanner, or a fax machine to allow them to obtain and transmit the documentation to PWSA. A low income customer juggling multiple jobs and childcare responsibilities, navigating public transportation, and lacking a home computer and a scanner with internet access might have difficulty finding the time and energy needed to jump through all of the hoops in PWSA's income-based reimbursement program.

Q: Do any of PWSA's other lead service line replacement programs require income verification?

A: Yes, under the Community Environmental Project (CEP), customers with incomes below 250% of the federal poverty line are eligible for free private-side lead service line replacements, up to a total expenditure by PWSA of $1.8 million.[19] Customers must apply for the replacement and submit information required for income verification. Whatever portion of the $1.8 million PWSA does not spend by November 2020 PWSA will pay to the Pennsylvania Department of Environmental Protection as a fine.[20]

[19] RAW-C-46 ¶ 4.2.b.
[20] Pittsburgh UNITED St. C-3, at 39.

Q: Please describe the level of customer participation in the CEP.

A: PWSA began conducting outreach for the CEP in September 2018.[21] Since then, PWSA has expended only 13% of the funding allocated for this program ($233,897.50 of $1.8 million).[22] PWSA's expenditures to date indicate that it could replace a total of 569 private-side lead service lines through this program,[23] yet it has only conducted 74 replacements.[24]

While PWSA is also planning on investigating the composition of or replacing the private-side service lines at the residences of another 116 income-eligible customers, this will result in at most a total of 190 lead service line replacements.[25]

PWSA does not know how many of its customers who earn below 250% of the poverty line have private-side lead service lines; however, it is likely considerably more than the 190 customers PWSA has enrolled so far.

At present, the CEP program is undersubscribed. The fact that PWSA has had difficulty enrolling low income customers in a program that offers free lead service line replacements does not bode well for its ability to convince low income customers to sign up for a program that requires them to pay thousands of dollars up front for a replacement.

[21] Appendix A, 3, UNITED II-4
[22] PWSA St. C-1SD, at 32-33.
[23] PWSA has replaced 74 lines at a cost of $233,897.50 in CEP-eligible expenses, or $3,160 per line. PWSA St. C-1SD at 32-33. With $1.8 million and per line costs at $3,160, PWSA could perform 569 replacements.
[24] PWSA St. C-1SD, at 32.
[25] Of the 269 customers PWSA has enrolled, PWSA has yet to investigate the service line composition at 84 homes (269 – 185 = 84). At the 185 residences where PWSA has performed investigations, 79 investigations revealed non-lead service lines, and PWSA performed private-side replacements at 74 residences, leaving at most 32 additional residences where PWSA may have found lead but not yet performed replacements (185 – 79 – 74 = 32). Thus, of the 269 qualifying customers, there are 116 homes (84 + 32) that may yet receive lead service line replacements. See id.

Q: Does PWSA's neighborhood-based lead service line replacement program require income verification?

A: No. Through the neighborhood-based program, when PWSA replaces a public-side lead service line, it also replaces the connected private-side lead service line at no cost to customers, regardless of income.

Q: Please describe the level of customer participation in PWSA's neighborhood-based lead service line replacement program.

A: PWSA has conducted thousands of private-side lead service line replacements through the neighborhood-based program.[26] PWSA reports that 92% of customers contacted through the neighborhood-based program have authorized PWSA to perform private-side replacements.[27] Although PWSA can continue to improve its outreach efforts under this program, those efforts—mailing, calling, canvassing, and allowing customers to sign up when they see their neighbors' service lines being replaced—provide a template for generating high levels of customer participation.[28] Unfortunately, it is a template that cannot be effectively deployed in the income-based reimbursement program, which requires customers to initiate replacements and does not have a geographic or neighborhood component to the replacements.

Q: In your opinion, how will the income-based reimbursement program affect tenants?

A: PWSA reports that 32,514 of its 70,073 residential customer accounts are rental properties.[29] For rental properties, it appears that PWSA will use landlords' income to determine the reimbursement rate, rather than tenants' income.[30] Whereas a low or moderate income tenant

[26] Pittsburgh UNITED St. C-2, at 11.
[27] Rate Case PWSA St. 1-R, at 32-33.
[28] See LTIIP at 53-54.
[29] Appendix A, 5, UNITED VI-1; RAW-C-44, at 1.
[30] RAW-C-46 ¶ 10 (creating income-based reimbursement program for "homeowner[s]").

may qualify for a full or significant reimbursement, this is not as likely for a landlord who is able to afford to purchase a rental property. Furthermore, landlords who do not live at a residence and who do not drink its water regularly are less like to be willing pay thousands of dollars for a lead service line replacement. In my view, it seems apparent that landlords would be more likely to participate if PWSA offered free private-side lead service line replacements.

Q: In addition to being less effective, you testified above that the income-based reimbursement program will create additional administrative costs. What are these costs?

A: PWSA will need to expend time and resources to determine the amount of reimbursement customers are entitled to receive. For instance, PWSA must conduct income verifications to establish which income bracket the applicant falls into. PWSA estimates that these administrative expenses will total $8 to $20 million and increase lead service line replacement costs by $1,000 per line, a nearly 20% increase on the average replacement cost of $5,500 per line.[31] These administrative expenditures could fund between 1,454 and 3,636 additional private-side lead service line replacements.

Q: Will PWSA realize any cost savings from the income-based reimbursement program?

A: PWSA's cost savings estimates have been a moving target throughout this proceeding. PWSA initially estimated the savings from its income-based reimbursement program to be $12 to $25 million compared to funding the full cost of private-side replacements.[32] Its latest estimate dropped that range to between $8 and $18 million.[33] These anticipated savings derive from the portion of replacement costs borne by customers with incomes over 300% of the federal poverty line, minus the millions of dollars of additional administrative costs created by the program.

[31] Appendix A, 1, UNITED XII-15 Att. A; RAW-C-46 ¶ 3.2.
[32] Id.; PWSA St. C-1SD, at 31-32.
[33] Appendix A, 2, PWSA Revised Cost Estimate.

Because the lead service line replacement program generates public health benefits that redound to the benefit of the entire community, not just the individual customer, a more reasonable approach would be to socialize those costs by recovering them through rates.[34] This would also have the advantage of avoiding the additional administrative costs created by the income-based program.

Additionally, PWSA appears to have calculated its cost savings by assuming that the same number of customers will receive private-side lead service line replacements regardless of whether it offers no-cost replacements or partial, income-based reimbursements.[35] This assumption is fundamentally flawed. As I describe above, adoption of the income-based program is likely to drive down customer participation, particularly among the 53% of PWSA residential customers whose incomes fall below 300% of the poverty line.[36] Therefore, the "savings" achieved by the income-based program will come, in substantial part, by leaving more lead service lines in the ground. Just as the benefits of removing lead are shared by all, so too are the costs of failing to fully remediate lead contamination. As I stated in earlier testimony:

> Several studies have shown that lead exposure contributes to increased need for health care, increased need for special education, decreased lifetime earnings, decreased tax base, and increased crime. Adults suffering from lead exposure may experience decreased lifetime earnings as a result of their own exposure, as well as decreased productivity as a result of caring for lead-poisoned children. Conversely, lead remediation programs—including lead service line replacement programs—yield substantial benefits. A 2016 return-on-investment analysis conducted in Michigan found that a $600 million investment in lead remediation would pay for itself in approximately three years, suggesting that lead remediation is a common-sense economic investment with considerable public health benefits. A 2017 report estimated that removing lead service lines nationwide from the homes of children born in 2018 would protect more than 350,000 children and yield $2.7 billion in future benefits, including $2.2 billion in higher lifetime earnings.[37]

[34] See Rate Case Pittsburgh UNITED St. 2-R, at 2-7 (incorporated by reference at Pittsburgh UNITED St. C-1, at 9).
[35] See Appendix A, 1, UNITED XII-15 Att. A.
[36] PWSA St. C-1SD, at 30-31.
[37] Rate Case Pittsburgh UNITED St. 2-R, at 5-6 (incorporated by reference at Pittsburgh UNITED St. C-1, at 9).

PWSA's cost estimates do not account for the social and economic harms of increased lead exposure, nor the social and economic benefits of lead service line removal.

Q: Shouldn't PWSA try to minimize the cost to ratepayers of its lead service line replacement programs?

A: Not exclusively. Infrastructure projects must be evaluated for both cost and performance. In my opinion, the savings from the income-based reimbursement program are not worth the likely significant reduction in program performance. Significantly more customers, particularly low and moderate income customers, will be left with lead service lines, and PWSA will spend millions of dollars on administrative costs, rather than removal of lead service lines. This program is penny wise, pound foolish. It is not a reasonable use of ratepayer funds.

Q: Have you reviewed UNITED witness Gregory Welter's recommended approach for replacing all private-side lead service lines in PWSA's system?[38]

A: Yes.

Q: Would you expect customer participation to be higher or lower under this approach compared to PWSA's income-based reimbursement program?

A: Higher. The approach recommended by Mr. Welter differs from the income-based reimbursement program in that PWSA would initiate replacements by contacting eligible customers, and it would offer free replacements rather than partial reimbursements. This approach lacks many of the obstacles to replacement created by the sliding-scale program.

[38] Pittsburgh UNITED St. C-2, at 21:5-25:18.

Q: Would the approach recommended by Mr. Welter require PWSA to perform income verifications or calculate replacement cost estimates?

A: No. Mr. Welter's recommendation would extend PWSA's existing programs, and so, to my knowledge, would not require PWSA to create any new administrative systems. PWSA estimates that administrative costs under a program offering to replace all private-side lead service lines for free would be about half as much as under the income-based reimbursement program.[39]

Q: Do you agree with Mr. Weimar's contention that PWSA's lead service line replacement efforts are not required by the Public Utility Code and that "water quality is the province of the PA Department of Environmental Protection"?[40]

A: I am informed by counsel that these are legal arguments that will be addressed in briefing. I will note, however, that PWSA has an obligation under the Public Utility Code to provide safe service to its customers,[41] that PWSA's own Compliance Plan states that the Commission has asserted joint jurisdiction with DEP over water quality,[42] and that the Commission has exercised that jurisdiction to approve two settlements imposing requirements on utilities for lead remediation—most recently in PWSA's 2018 rate case.[43]

---

[39] Appendix A, 1, UNITED XII-15 Att. A (estimating $20 million in administrative costs to replace 20,000 lead service lines under the income-based reimbursement program and $11.4 million under a universal private-side replacement program).
[40] PWSA St. C-1SD, at 26.
[41] 66 Pa. C.S. § 1501.
[42] PWSA Compliance Plan, at 119.
[43] See Pa. PUC v. PWSA, Docket No. R-2018-3002645, Final Order, at 11-14 (order entered Feb. 27, 2019); see also Petition of The York Water Company for an Expedited Order Authorizing Limited Waivers of Certain Tariff Provisions and Granting Accounting Approval to Record Costs of Certain Customer-Owned Service Line Replacements to the Company's Service Account, Docket No. P-2016-2577404, Order, at 7-10 (order entered Mar. 8, 2017).

Q: If PWSA is permitted to continue the income-based reimbursement program, do you have any recommendations for improving it?

A: Yes. Although I recommend that PWSA not pursue this program, I have three substantive recommendations for improving the program if PWSA continues with implementation. I also have a procedural recommendation to ensure that the Commission can review critical program details before the program begins. To be clear, these alternative recommendations will make a bad idea just a little better, but will not fully remove the barriers that this program will create.

My first and most critical recommendation is that PWSA should not be permitted to structure this program as a reimbursement program. Without this critical change, I do not believe this is a viable program. PWSA should pay contractors directly for PWSA's share of replacement costs, rather than reimbursing customers for their expenses. While it would not remove all of the barriers to participation, this approach would make the program more successful, as it would ease the most significant barrier to participation. For the lowest income customers, this approach would have a far greater benefit because it would allow them to avoid out-of-pocket expenditures altogether.[44] In addition, customers who qualify for a partial reimbursement would no longer have to pay the full cost of replacement up front. Again, while this would make PWSA's program better, I continue to believe that the best solution would be to replace all lead service lines at no cost to the consumer.

Second, for private-side lead service line replacements at rental properties, PWSA should assess eligibility for sliding-scale support based on the tenants' income, not the landlords' income. PWSA uses tenant income to assess eligibility for the CEP.[45] And for good reason. Landlords are

[44] These customers would still have to pay to restore any of their property damaged during the replacement, as PWSA will not cover these costs. See Pittsburgh UNITED St. C-1, at 49-50.
[45] Rate Case Pittsburgh UNITED St. 2, Appendix B-84, UNITED I-3 (incorporated by reference at Pittsburgh UNITED St. C-1, at 9).

more likely than their tenants to fall within higher income brackets. Since non-resident landlords do not regularly drink the water at their rental properties, they lack the same incentive as tenants to seek the replacement of lead service lines. Consequently, PWSA should make it as easy and inexpensive as possible for landlords to participate in this program, particularly landlords of properties with low income tenants.

Third, PWSA should adopt a robust outreach program to encourage customer participation in the income-based reimbursement program. Consistent with my previous testimony, I recommend that PWSA canvass low income neighborhoods where lead service lines have been identified to inform customers about the income-based program and encourage their participation.[46] PWSA should also consult with the Community Lead Response Advisory Committee and Low Income Assistance Advisory Committee regarding additional outreach strategies, and should include a specific line-item in its program budget to conduct targeted outreach in the affected communities.

Finally, in addition to the three substantive recommendations, I recommend that the Commission require PWSA to file an implementation plan that details the process for administration of the program and associated costs, as well as a proposed budget outlining each of those costs. This plan should be subject to Commission review and approval. PWSA has not put forth any details for how the program will operate, which raises important questions that should be answered before it is allowed to pour substantial resources into the program's implementation. For example, it is unclear how PWSA will calculate income, the time-frame or method for reimbursement, and the requirements customers must meet in order to qualify for reimbursement. These details should not be implemented without Commission oversight and approval. Indeed, all

[46] Pittsburgh UNITED St. C-1, at 46; Pittsburgh UNITED St. C-3, at 40.

programs which regulated utilities operate are generally subject to this sort of inquiry to ensure that the mechanics of the program are just and reasonable, cost-effective, and otherwise compliant with the Public Utility Code. This program should be no different.

Q: Does this conclude your supplemental testimony?

A: Yes.

Appendix A

UNITED XII-15 ..... Appendix A, 1

August 9, 2019 Revised Cost Estimate ..... Appendix A, 2

UNITED II-4 ..... Appendix A, 3

UNITED VI-1 ..... Appendix A, 5

Estimated Cost of Private Side Service Line Replacements 2020-2026

Program	Total Number Private Side[1]	Scenario 1			Scenario 2		
		PWSA pays for the entire Private Side			PWSA pays for the entire Private Side when replacing Public, Cost Sharing Otherwise		
		Construction Cost ($ M)[1]	Engineering, Overhead, etc. ($ M)[2]	Total ($ M)	Total Construction ($ M)	Admin ($ M)[3]	Total ($ M)
Relay and Emergency	6,600	35.9	12.6	48.5	48.5	0.0	48.5
Private Only	8,000	48	4.8	52.8	35.3	8.0	43.3
	20,000	114	11.4	125.4	83.9	20.0	103.9
LSLR	2,000	11	3.9	14.9	9.9	2.0	11.9
			Range	116 189		Range	104 164

1. From presentation
2. 35% engineering, CM, PM for PWSA Construction, 10% administration for reimbursements
3. Includes $1000 per location

Estimated Cost of Private Side Service Line Replacements 2020-2026

Program	Total Number Private Side[1]	Scenario 1			Scenario 2		
		PWSA pays for the entire Private Side			PWSA pays for the entire Private Side when replacing Public, Cost Sharing Otherwise		
		Construction Cost ($ M)[1]	Engineering, Overhead, etc. ($ M)[2]	Total ($ M)	Total Construction ($ M)[3]	Admin ($ M)[4]	Total ($ M)
Relay and Emergency	6,600	36.3	12.7	49.0	49.0	0.0	49.0
Private Only	8,000	44	4.4	48.4	34.4	8.0	42.4
	20,000	110	11.0	121.0	86.0	20.0	106.0
LSLR	2,000	11	3.9	14.9	10.4	2.0	12.4
			Range	112 185		Range	104 167

1. $5,500 per private side location
2. 35% engineering, CM, PM for PWSA Construction, 10% administration for reimbursements
3. 53.3% of population < 300% FPL, 12.1% of population 301-400% FPL and 9.0% of population 410-500% FLP
43. Includes $1000 per location

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-4 How does PWSA promote, target, or otherwise recruit participants for its Private Lead Line Replacement Community Environmental Project? Please provide a copy of all written correspondence and/or marketing materials used to inform consumers about the availability of PWSA's Private Lead Line Replacement Community Environmental Project.

Response: PWSA's outreach for the CEP program has continued to evolve since outreach first started in September 2018. Components to the outreach include:

- Dollar Energy Fund, who administers PWSA's CAP and CEP programs, asks customers who are calling for CAP or winter moratorium if they are interested in getting their lead line replaced, and follows up with those that are;
- PWSA Lead Help Desk personnel discuss the option with customers who call about lead issues and are not otherwise in a lead service line replacement program work order area;
- PWSA includes information about the program in every PWSA monthly newsletter that is mailed to a distribution list, posted on our website and promoted via social media;
- PWSA includes information about the program in every monthly bill insert that is mailed to all customers
- PWSA discusses the CEP program at every community group meeting that is attended (14 to date in 2019 and 60 attended in 2018) and it is described in the CAP flyer distributed during these meetings.
- Described in the lead exceedance brochure that was mailed to every water customer (service and mailing address) on January 31, 2019. Brochures and posters were also mailed to all the following organizations in Pittsburgh:
  - Public and private schools or school boards
  - Women, Infants and Children (WIC) and Head Start Programs
  - Public and private hospitals and medical clinics
  - Pediatricians
  - Family planning clinics
  - Local welfare agencies
  - Licensed child care centers
  - Public and private preschools
  - Obstetricians-Gynecologists and Midwives

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

- Listed on special posters and flyers for the Lead Service line Replacement Program which are being provided to the same organizations listed above that are in or near the project areas.

See UNITED-II-4 Attach A through F for samples of PWSA's customer facing materials.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

Request: UNITED VI-1	See UNITED III-18. How many residential customer accounts are currently identified as "tenant occupied"?
Response:	Currently, PWSA has 32,514 accounts identified as tenant occupied in the billing system.
Response Provided by:	Julie Quigley, Director of Administration The Pittsburgh Water and Sewer Authority
Dated:	March 26, 2019

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

DIRECT TESTIMONY OF GREGORY WELTER

ON BEHALF OF

PITTSBURGH UNITED

April 5, 2019

Topics Addressed:

Lead Remediation Program

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	: : :	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	: : :	Docket No.	P-2018-3005037 P-2018-3005039

VERIFICATION

I, Gregory Welter, PE, BCEE, hereby state that the facts set forth by me in the foregoing documents:

- Pittsburgh UNITED Statement C-2, the Direct Testimony of Gregory Welter on Behalf of Pittsburgh UNITED
- Pittsburgh UNITED Statement C-2SR, the Surrebuttal Testimony of Gregory Welter on Behalf of Pittsburgh UNITED
- Pittsburgh UNITED Statement C-2-SUPP-R, the Supplemental Rebuttal Testimony of Gregory Welter on Behalf of Pittsburgh UNITED

are true and correct to the best of my knowledge, information, and belief, and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements made herein are subject to the penalties of 18 Pa. C.S. § 4904 (relating to unsworn falsifications to authorities).

Gregory Welter, PE, BCEE
Witness on behalf of Pittsburgh UNITED

August 20, 2019

PREPARED DIRECT TESTIMONY OF GREGORY WELTER, PE, BCEE

I. Introduction

Q: Please state your name, occupation, and business address.

A: Gregory Welter. I am a licensed professional engineer and Technical Manager with O'Brien & Gere Engineers, Inc., 4201 Mitchellville Rd., #500, Bowie, MD 20716.

Q: Briefly outline your education and professional background.

A: I received a B.S. in Civil Engineering from Catholic University of America in 1971 and an M.S. in Sanitary Engineering from the University of Michigan in 1973. I have 44 years of experience as a professional engineer, during which I have developed expertise in lead corrosivity management strategies, water distribution system design and management, as well as water system emergency planning. I am registered as a professional engineer in Washington, D.C., and I am Board Certified as an Environmental Engineer by the American Academy of Environmental Engineers and Scientists.

Q: Please describe your professional experience related to lead in drinking water.

A: For the last dozen years I have had significant involvement in advising clients and conducting research on various aspects of management of lead contamination in drinking water. My principal clients in this area have included District of Columbia Water and Sewer Authority (DC Water), Providence Water Supply Board, and the Water Research Foundation, a leading nonprofit funder for drinking water and wastewater research. For DC Water, I have performed various support activities as part of my firm's management of the utility's lead service line replacement program. Representative activities included supervising audits of records of lead service line replacements as reported to regulatory officials; recommending practices for lead service line replacement protocols (such as flushing protocols and selection of lead-certified

household water filtration equipment for mitigation of post-replacement lead effects); and preparation of programmatic reports to regulatory agencies and to the DC Water Board of Directors.

In Providence, I have conducted support activities for the Water Supply Board's lead management program, including data analysis for an initial treatment strategy for lead reduction by means of pH adjustment; analysis of lead service line replacements and their impacts; facilitation of an "expert panel" to advise on lead management strategies; and design and supervision of a multi-year pipe loop study on orthophosphate treatment.

For the Water Research Foundation, I was the principal investigator on a research project on assessment of galvanic corrosion potential resulting from partial lead service line replacements, and a member of a Project Advisory Committee for a research project on internal lining and coating technologies as strategies for lead service line replacement implementation.[1] A more complete description of my educational and work experience, as well as a complete list of my publications, is attached.[2]

By virtue of my training, education, experience, research, and knowledge of relevant literature, I consider myself to be an expert on lead corrosivity management in drinking water distribution systems.

Q: Have you testified in any proceeding before the Pennsylvania PUC?

A: Yes. I testified on behalf of Pittsburgh UNITED in Public Utility Commission v. Pittsburgh Water and Sewer Authority, Nos. R-2018-3002645 and R-2018-3002647. I

[1] Gregory Welter et al., Water Research Found. Rep. No. 4349, Galvanic Corrosion Following Partial Lead Service Line Replacement (2013), http://www.waterrf.org/Pages/Projects.aspx?PID=4349; Stephen Randtke et al., Water Research Found. Rep. No. 4351, Evaluation of Lead Service Line Lining and Coating Technologies (2017), http://www.waterrf.org/Pages/Projects.aspx?PID=4351.
[2] Appendix A.

incorporate that testimony by reference.[3] My testimony in that proceeding was duly entered into the record on November 14, 2018, and was filed with the Secretary's Bureau on the same day. I am advised by counsel that PWSA agreed in the Joint Settlement to the Rate Case that it would not object to the admission of "any testimony, documents, or answers to interrogatories exchanged throughout the course of [the rate] proceeding."[4]

To avoid excessive duplication of the information I provided in the Rate Case, I am incorporating my Rate Case testimony here by reference and will cite, with particularity, relevant sections of that prior testimony and the accompanying appendices to provide additional information, data, or context for my direct testimony in this proceeding.

Q: For whom are you testifying in this proceeding?

A: Pittsburgh UNITED.

Q: What is the purpose of your testimony?

A: Pittsburgh UNITED intervened in this proceeding to ensure that PWSA's lead remediation program provides residential customers with safe water service. Accordingly, Pittsburgh UNITED asked me to evaluate the design and implementation of PWSA's lead remediation program proposed in the Compliance Plan and Long-Term Infrastructure Improvement Plan (LTIIP), including whether PWSA is taking steps necessary to minimize the risk of lead exposure to its customers from service line corrosion.

Q: How is your testimony organized?

---

[3] See Pittsburgh UNITED St. 4; Pittsburgh UNITED St. 4-SR. See also 52 Pa. Code § 1.33(a) (incorporation by reference); id. § 5.407(a). I am advised by counsel that, pursuant to section 5.407, Pittsburgh UNITED agrees to supply copies of this testimony if so required by the ALJs or the Commission.

[4] See PUC v. PWSA, Docket Nos. R-2018-3002645, -3002647, Recommended Decision, at 31 ¶ H.3 (order entered Jan. 17, 2019).

A: I begin by describing PWSA's response to increased lead concentrations in the drinking water it distributes. I then analyze the design and implementation of PWSA's lead remediation program for 2020 to 2026, including its lead service line replacement plans.

I conclude that while the Compliance Plan and LTIIP state that PWSA aims to eliminate "all lead service lines" from its system by 2026, PWSA has not proposed a plan capable of achieving that goal. I have four recommendations PWSA should adopt to minimize the risk of lead exposure to its customers.

First, PWSA should commit to replacing, and actually replace, all lead service lines in its system as soon as practicably possible. Although PWSA has said it will remove all lead service lines, its statements on this issue are misleading because PWSA is really discussing its intention to replace only all public-side lead service lines. Private-side lead service lines can also release lead to drinking water and should be replaced to protect customers. In its public discussion of its intentions for lead service line replacement, PWSA should be candid and make it clear when its intentions do not include replacement of the private side. Just because PWSA does not consider itself to be the owner of the private side, PWSA should not make it sound like replacement of the public side is replacement of the entire lead service line, with no qualification.

PWSA should develop and implement a plan to remove all public- and private-side lead service lines. In its 2017 report "Focusing on the Future," and again in the Compliance Plan, PWSA lists as the first of its primary goals to "Protect Public Health and the Environment."[5] Presumably, this goal is the objective of any of PWSA's lead abatement activities. However, implementing a strategy that does not include abatement of the entire lead service line, including the "private" side, will not be effective in reaching this goal.

[5] PWSA, Focusing on the Future 3 (Nov. 2017), https://pgh2o2030.com/focusing-on-the-future; Compliance Plan, at 8.

Second, when PWSA replaces small diameter water mains between now and 2026, PWSA should replace any lead service line—public-side or private-side—connected to those mains. PWSA already plans to replace all public-side lines connected to such mains, but it has yet to decide whether to include private-side lead service lines in this program. Including private-side lead service lines is the only way to avoid partial lead service line replacements, which can cause lead levels to rise sharply in customers' tap water. Replacing private-side lead service lines through this program is also an efficient way to maximize the amount of lead PWSA removes from the ground.

Third, PWSA should extend its current neighborhood-based lead service line replacement program past 2020. Eliminating this program, as the Compliance Plan and LTIIP propose, will leave a major gap in PWSA's lead service line replacement efforts. PWSA has offered no other plan for replacing the lead service lines—public-side and private-side—not removed by the small diameter water main program. Extending the neighborhood-based program is the most efficient way for PWSA to replace lead service lines missed by the small diameter water main replacement program. As such, it is an essential supplement to that program.

Fourth, PWSA should develop a plan for compiling a reliable inventory of the service line materials in its distribution system, including estimates of the number and location of public- and private-side lead service lines. The utility cannot replace lead pipes until it knows where they are located. PWSA must improve its inventory if it is to find and replace the lead service lines carrying water to its customers.

I also have several recommendations regarding lead service line replacements conducted by PWSA's Operations Department, PWSA's post-replacement filter and inspection procedures, and PWSA's water meter replacement program.

II. PWSA's Response to Elevated Lead Levels in Drinking Water

Q: How does lead enter drinking water distributed by PWSA?

A: When drinking water leaves PWSA's treatment plant, it does not contain measurable levels of lead.[6] Lead enters PWSA's drinking water primarily through corroding lead service lines. Service lines are pipes that connect water mains to the internal plumbing of a residence. Drinking water flowing through service lines chemically reacts with the interior surfaces of metal pipes. This reaction can cause those surfaces to deteriorate in a process called corrosion.[7]

Service lines installed in Pittsburgh before 1950 were often made of lead.[8] When lead pipes corrode, lead is released into drinking water by either dissolving into the water or dislodging from the pipes and remaining in particulate form. That lead then flows to taps inside customers' homes.

Because of the serious, well-documented health risks from drinking lead-contaminated water, as described in the testimony of Pittsburgh UNITED expert Dr. Lanphear,[9] in 1986, the federal government banned the use of lead pipes in potable water supply systems and domestic plumbing.[10] Although lead infrastructure is no longer being added to PWSA's distribution system, thousands of legacy lead service lines remain in use.

Q: How does PWSA monitor lead levels in the drinking water it distributes?

A: Federal and state law require PWSA to conduct sampling for lead in household tap water.[11] PWSA must collect at least 100 tap water samples from homes that are most at risk for

---

[6] Compliance Plan, at 119.
[7] Other mechanisms of lead release are generally much less significant than lead service lines as a source. They include: (1) release of lead from internal scale on galvanized pipe in a home's interior plumbing that is downstream of a lead service, even a removed lead service line; (2) lead as a component of older brass plumbing fixtures; and (3) lead-based solder that was used historically in joining copper pipe.
[8] See Appendix B, 5, UNITED I-6.
[9] Pittsburgh UNITED St. C-3, at 5-10.
[10] 42 U.S.C. § 300g-6.
[11] 40 C.F.R. § 141.86; 25 Pa. Code § 109.1103(g)(2).

elevated lead levels, which means homes that are served by a lead service line or contain interior lead plumbing.[12] Because monitoring in recent years has detected high levels of lead, PWSA has been required to increase the frequency of its sampling. It is presently required to conduct two sets of household compliance sampling each year, in two six-month semesters: January through June, and July through December.[13]

For each six-month monitoring period, PWSA must analyze the samples collected to determine whether more than 10 percent of them have lead concentrations greater than 15 parts per billion (ppb).[14] That 15 ppb threshold is known as the lead "action level," because an exceedance of this level triggers certain response "actions" the utility must implement to remain in compliance with the federal Lead and Copper Rule.[15] The lead action level, as described in Dr. Lanphear's testimony, is not a safety or health-based standard.[16] It is a technology-based standard that treated water should be able to attain, set in the regulatory development of the Lead and Copper Rule. It is simply a threshold above which PWSA is required to take additional steps to address lead levels in its drinking water.

Q: Have PWSA's monitoring results exceeded the lead action level?

A: Yes. As the table below shows, PWSA has equaled or exceeded the lead action level in five of the last six monitoring periods. In the most recent monitoring period, 10 percent of samples had lead concentrations above 20 ppb.

[12] 40 C.F.R. § 141.86(a)(3), (c); 25 Pa. Code § 109.1103(a)(1)(v), (g)(2).
[13] See 40 C.F.R. § 141.86(d); 25 Pa. Code § 109.1103(a)(1), (c).
[14] 40 C.F.R. § 141.80(c)(1), (3).
[15] Id. § 141.2.
[16] Pittsburgh UNITED St. C-3, at 11.

Table 1: PWSA Lead Monitoring Results 2016 to Present[17]

Sampling Period	Lead concentration at 90th percentile
January 1 – June 30, 2016	22 ppb
July 1 – December 31, 2016	18 ppb
January 1 – June 30, 2017	15 ppb
July 1 – December 31, 2017	21 ppb
January 1 – June 30, 2018	10 ppb
July 1 – December 31, 2018	20 ppb

Q: What conclusions do you draw from these monitoring results?

A: The lead concentrations at the 90th percentile are high. These data show that PWSA has not effectively controlled the release of lead from pipes in its system.

Q: How has PWSA responded to high lead levels in its drinking water?

A: PWSA is primarily responding to these elevated lead levels in two ways. First, PWSA is modifying its corrosion control treatment system. Second, PWSA is replacing lead service lines in its system.[18] These actions are mandated by the Lead and Copper Rule and a November 2017 Consent Order issued by the Pennsylvania Department of Environmental Protection (DEP).[19]

Q: What is corrosion control treatment?

A: Utilities adjust the chemistry of water to minimize its corrosivity to lead-containing infrastructure. In many cases this is accomplished by adding chemicals (corrosion inhibitors) to drinking water to minimize the release of lead from pipes. One common corrosion inhibitor is orthophosphate. Orthophosphate reduces the release of lead into drinking water by promoting the

[17] Press Release, PWSA, PWSA Releases December 2018 Lead Compliance Test Results (Jan. 18, 2019), http://www.pgh2o.com/release?id=7790.

[18] PWSA has taken other actions, as well, such as flushing chemical scales and biofilm, offering customers free sampling kits, and providing filters to customers under certain circumstances. Appendix B, 16, UNITED I-28; Pittsburgh UNITED St. C-3, at 17.

[19] 40 C.F.R. §§ 141.80(d), 141.84; Appendix C, 11-15, Consent Order and Agreement, In The Matter Of Pittsburgh Water and Sewer Authority regarding Violations of the Pennsylvania Safe Drinking Water Act and the Rules and Regulations Promulgated Pursuant Thereto Regarding the Lead and Copper Rule ¶¶ 3(b)-(e) (Nov. 17, 2017) (hereinafter "Consent Order").

formation of a stable protective scale on the interior surfaces of lead pipes. This scale allows for the incorporation of lead into the scale itself rather than the release of dissolved lead into the water. The scale also stabilizes particulate lead to prevent its release.

Q: How is PWSA changing its corrosion control treatment system?

A: In 2014, PWSA switched its primary corrosion control treatment chemical from soda ash to caustic soda, but it did so without seeking approval from DEP as required by law.[20] PWSA advised DEP of the change after the fact, in February 2016, which prompted DEP to begin an investigation.[21] In its response, DEP ordered PWSA to perform a study to determine how to optimize its corrosion control treatment system.[22] As a result of that study, in April 2018, DEP authorized PWSA to add orthophosphate to its drinking water as its method of corrosion control treatment.[23] PWSA began adding orthophosphate to its water on April 2, 2019.[24]

Q: What else is PWSA doing to respond to high lead levels in its drinking water?

A: PWSA is also replacing lead service lines. PWSA's 2016 exceedance of the lead action level triggered a requirement under the Lead and Copper Rule to replace seven percent of its public-side lead service lines within one year.[25] When PWSA first began replacing lines in 2017, it replaced only the portion of the lead service line that runs between the water main in the street and the curb box (what PWSA refers to as the "public side"). PWSA was not replacing the portion of the lead line between the curb box and the water meter (what it calls the "private side"). Replacing only part of a lead service line and leaving the rest in the ground is known as a

[20] Appendix C, 3, Consent Order ¶ G; see also 25 Pa. Code §§ 109.501(b), 109.1105(a).
[21] Pittsburgh UNITED St. 4, Appendix D, 5, Kay Frederick, Pa. Dep't Envtl. Prot., Notice of Violation Issued to PWSA (Feb. 18, 2016).
[22] Appendix C, 3, Consent Order ¶ H.
[23] UNITED IV-20 Attach. A, at 1 (from Rate Case).
[24] Press Release, PWSA, Orthophosphate Treatment Upgrade Underway (Apr. 2, 2019), http://lead.pgh2o.com/orthophosphate-treatment-upgrade-underway/.
[25] See 40 C.F.R. § 141.84(a), (b)(1).

"partial replacement." Partial replacements are unsafe because they can disturb the protective scale inside lead service lines and cause tap water lead levels to spike for months.[26] Although partial replacements are disfavored by public health experts, the Allegheny County Health Department, and, increasingly, by utilities,[27] PWSA's decision to perform partial replacements unfortunately did not violate the limited minimum requirements of the Lead and Copper Rule.[28] PWSA suspended partial lead service line replacements in June 2017 after post-replacement testing revealed elevated lead levels at several homes.[29]

Since 2018, PWSA has conducted most of its lead service line replacements through a neighborhood-based program. Using historical records and inspection results, PWSA identifies homes in contiguous multi-block areas that are likely to have public-side lead service lines.[30] PWSA then issues work orders directing contractors to replace eligible lead service lines in those areas.[31] PWSA's service line replacement work in 2019 and 2020 will be funded primarily by nearly $50 million in loans and grants from PennVEST.[32]

Through this program, PWSA offers to replace private-side lead service lines at no direct cost to customers whenever it replaces a public-side lead service line.[33] This policy reduces the frequency of partial replacements. PWSA will not, however, replace a private-side lead service line if the public-side service line is not made of lead.[34] In other words, PWSA does not replace "private-side-only lead service lines" as part of its neighborhood-based program.

---

[26] Infra p. 22-24.
[27] See infra p. 23.
[28] See id. § 141.84(d).
[29] PWSA, PWSA to Temporarily Suspend Partial Lead Line Replacements (June 2, 2017), http://lead.pgh2o.com/pwsa-to-temporarily-suspend-partial-lead-line-replacements/.
[30] LTIIP, at 27.
[31] Id.; see also RAW C-24.
[32] PWSA St. C-1, at 56-57.
[33] See LTIIP Appendix C.
[34] See id.; Appendix B, 21, UNITED VII-6; Appendix B, 22, UNITED VII-7.

PWSA's Operations Department also conducts lead service line replacements in response to main and service line leaks.[35] When a lead service line leaks, PWSA's current policy is to replace the public-side lead service line and offer to replace the private side at no cost to the customer.[36] PWSA has not committed to extending this policy beyond 2019.[37]

By November 2020, PWSA also expects to replace the private-side lead service lines of about 200 low-income customers through its Community Environmental Project, a $1.8 million program mandated by the DEP Consent Order.[38]

Q: How many lead service lines are in PWSA's system?

A: PWSA estimates that there were more than 12,000 public-side lead service lines in its system when it first exceeded the lead action level in mid-2016.[39] As discussed further below, infra p. 30-32, this estimate is subject to considerable uncertainty. PWSA has not attempted to estimate the number of private-side lead service lines in its system.[40]

Since 2017, PWSA has replaced over 2,000 public-side lead service lines.[41] In 2019 and 2020, PWSA estimates, its neighborhood-based program will replace 2,800 to 3,400 full lead service lines and 600 to 1,000 public-side-only lead service lines.[42]

Q: Is PWSA still required to replace lead service lines?

A: Yes. The Lead and Copper Rule and DEP Consent Order require PWSA to replace seven percent of the public-side lead service lines in its system each year, until PWSA's tap water sampling results fall below the lead action level for two consecutive six-month monitoring

---

[35] LTIIP, at 28.
[36] LTIIP Appendix C, at 2-3.
[37] PWSA St. C-1, at 58.
[38] See Appendix C, 17-18, Consent Order ¶ 4(c); Press Release, PWSA, Nearly $2 Million Remains Available for Free On-Demand Lead Line Replacements (Mar. 14, 2019), http://pgh2o.com/release?id=7807.
[39] See LTIIP, at 28.
[40] See Pittsburgh UNITED St. 4, Appendix B, 33, UNITED IX-8.
[41] See PWSA St. C-1, at 53.
[42] See id. at 56-57; RAW C-24.

periods.[43] Because PWSA's test results from the second half of 2018 exceeded the lead action level, PWSA must replace at least seven percent of its public-side lead service lines in 2019.[44] If either of its 2019 six-month monitoring test results exceeds the lead action level, that seven percent replacement obligation will continue in 2020.

Q: Do the Compliance Plan and LTIIP propose changes to PWSA's lead service line replacement program?

A: Yes. PWSA is proposing to discontinue its neighborhood-based replacement program after completing PennVEST-funded replacements in 2020.[45] Between 2020 and 2026, PWSA will conduct most lead service line replacements through its small diameter water main replacement program.[46] When PWSA replaces a main, it will also replace all of the public-side service lines, lead and non-lead, connected to that main.[47] PWSA is accelerating replacement of small diameter water mains to reduce service disruptions from main breaks.[48] PWSA's Operations Division will also continue replacing public-side lead service lines in response to leaks.[49]

Q: Has PWSA selected the small diameter water mains it will replace through its accelerated program?

A: PWSA has chosen small diameter water mains for replacement in 2020.[50] These mains are located in the same areas as those covered by the 2019 neighborhood-based lead service line replacement program.[51]

---

[43] See 40 C.F.R. § 141.84(a), (b)(1); Appendix C, 15, Consent Order ¶ 3(e)(ii).
[44] See Appendix C, 15, Consent Order ¶ 3(e)(ii).
[45] Appendix B, 24, I&E PS-30; PWSA St. C-1, at 56, 58.
[46] LTIIP, at 28; PWSA St. C-1, at 56.
[47] PWSA St. C-1, at 56.
[48] LTIIP, at 18.
[49] Id. at 28.
[50] PWSA St. C-1, at 63; RAW C-25.
[51] PWSA St. C-1, at 63.

PWSA has not yet chosen small diameter water mains for replacement between 2021 and 2026.[52] PWSA plans to select mains for those years through a prioritization scoring scheme.[53] Before PWSA can implement this scheme, it must first complete a two-year project to add information about its small diameter water mains to its Geographic Information System database.[54]

Q: Please summarize PWSA's current and proposed lead service line replacement programs.

A: The following table summarizes the lead service line replacement programs I have just described.

Program	Timing	Description
Neighborhood-Based Program	2019 and 2020	Replaces up to 3,400 full lead service lines and up to 1,000 public-side-only lead service lines in seven neighborhoods
Accelerated Small Diameter Water Main Replacement Program	2020 to 2026	Replaces public-side lead service lines on about 130 miles of small diameter water mains; no decision on whether to also replace private-side lead service lines
Operations Department	Ongoing	Replaces lead service lines in response to leaks
Community Environmental Project	Expires Nov. 2020	Replaces 200 private-side lead service lines for low-income customers

Q: What are your recommendations with respect to the lead service line replacement programs described in the Compliance Plan and LTIIP?

A: I have four recommendations. **First**, PWSA should commit to replacing, at no direct cost to customers, all lead service lines in its system—including all private-side lead service lines.

[52] Id.
[53] LTIIP, at 20-23; Appendix B, 17, UNITED IV-3.
[54] PWSA St. C-1, at 63; Appendix B, 6, UNITED I-8.

Second, PWSA should replace private-side lead service lines when it replaces small diameter water mains and the public-side service lines that connect to them. **Third**, PWSA should extend its neighborhood-based replacement program to enable the utility to replace lead service lines not covered in its small diameter water main replacement program. **Fourth**, PWSA should develop a plan for compiling a reliable estimate of the number and location of lead service lines in its system.

III. Replacement of All Lead Service Lines

Q: What is your recommendation with respect to the overall scope of PWSA's lead service line replacement plans?

A: PWSA's lead service line replacement programs should be designed and implemented to ensure the replacement of all lead service lines in PWSA's system. This should be accomplished as soon as practicably possible. However, regardless of the time frame for accomplishment, the methods used must leave no lead behind.

Q: Do the Compliance Plan and LTIIP propose plans for replacing all lead service lines in PWSA's distribution system?

A: No. PWSA has not proposed a plan for replacing all lead service lines in its system. It has not committed to replacing all private-side lead service lines, and it has not set forth a plan for finding and removing all public-side lead service lines. I discuss the gaps in PWSA's programs and plans in more detail below, infra p. 26-27.

Q: But the Compliance Plan sets a "goal of eliminating all lead service lines from the system by 2026."[55] Isn't that sufficient?

[55] Compliance Plan, at 120.

A: No. When the Compliance Plan describes PWSA's goal of replacing "all lead service lines" in the system, it is referring only to public-side lead service lines. PWSA has not decided to replace all private-side lead service lines in its system.[56]

For instance, PWSA's 2018 neighborhood-based program did not conduct replacements at residences with private-side-only lead service lines.[57] Its 2019 neighborhood-based program will exclude these lines as well.[58] In addition, PWSA has not decided whether to replace private-side lead service lines during its small diameter water main replacement program.[59]

Q: Do you have any recommendations with respect to how PWSA communicates to customers its current goal of replacing all public-side lead service lines?

A: Yes. I recommend PWSA change its goal to replacement of all lead service lines, including all private-side lead service lines.

But if PWSA retains its current, more limited goal, it should at least be transparent and candid with its customers about the scope of its proposed program. PWSA has made the claim that it will replace "all lead service lines," not just in the Compliance Plan and LTIIP,[60] but also in customer-facing documents and in statements to the press.[61] For instance, in "Pittsburgh's Water Future: 2030 and Beyond," PWSA writes, "By 2030, we will have removed all lead service lines, ensuring a safe, healthy future for Pittsburgh children and families."[62] This claim is

[56] PWSA St. C-1, at 54, 58-59.
[57] See LTIIP Appendix C; Appendix B, 22, UNITED VII-7.
[58] See Appendix B, 21, UNITED VII-6.
[59] PWSA St. C-1, at 54-55, 63-64.
[60] Compliance Plan, at 120; LTIIP, at 17; see also Appendix B, 4, UNITED I-5.
[61] See, e.g., PWSA, Currents 2 (Feb. 2019), available at http://pgh2o.com/newsletters ("The additional resources will be used to make sure we maintain our infrastructure and get ahead of the curve on important repairs–including replacing all of our lead service lines."); Bob Bauder, PWSA customers in Pittsburgh may experience discolored water, Tribune-Review (Mar. 18, 2019), https://triblive.com/local/pittsburgh-allegheny/pwsa-to-begin-flushing-water-hydrants-in-preparation-for-the-addition-of-lead-inhibitor/ (quoting Mr. Weimar as stating, "Our long-term goal is to remove all lead service lines from the system.").
[62] RAW C-6, at 3.

particularly disturbing because, as I explain below, infra p. 18-19, private-side lead service lines release lead to drinking water just like public-side lead service lines. It is misleading to tell Pittsburgh residents that PWSA plans to remove all lead service lines. It is also misleading to say that its current plans, which will not address all private-side lead service lines, "ensur[e] a safe, healthy future for Pittsburgh children and families."

PWSA should make clear that its goal refers only to public-side lead service lines and that PWSA is planning to allow a significant number of private-side lead service lines to continue to carry water to its customers. PWSA should also be candid with the public about the limited efficacy of replacing only the "public" portion of a lead service line.

Q: If orthophosphate will lower lead levels in PWSA's drinking water, why do you recommend that PWSA replace all lead service lines in its system?

A: Replacing all lead-containing infrastructure is the only long-term solution to preventing the release of lead to drinking water. The addition of orthophosphate is neither an immediate nor permanent fix. Indeed, the corrosion control study final report PWSA submitted to DEP concluded that "[a]dding orthophosphate does not completely control lead release in the water system" and recommended continuing lead service line replacements "even with control strategies in place" to attain a goal of making the water system "lead-free."[63]

PWSA recently began adding orthophosphate to its water.[64] Eventually, orthophosphate will promote the formation of a protective scale on the interior of surfaces of service lines, but that protective scale does not form overnight. It will likely take about a year to bring lead levels consistently below the lead action level, and several years before orthophosphate's benefits are

[63] UNITED IV-18 Attach. B, at 112 (from Rate Case). Although this exhibit was designated as confidential during the rate case proceeding, I am advised by counsel that PWSA has removed that designation for this proceeding.
[64] Press Release, PWSA, Orthophosphate Treatment Upgrade Underway (Apr. 2, 2019), http://lead.pgh2o.com/orthophosphate-treatment-upgrade-underway/.

fully realized and lead release from PWSA's pipes is stabilized. This process has been documented by DC Water through its Lead and Copper Rule compliance monitoring results in the years after orthophosphate treatment was implemented in its system.[65]

Even after lead levels stabilize, changes to PWSA's water treatment or to the chemistry of its source water could have unanticipated adverse effects on lead corrosion. Washington, D.C., and Flint, Michigan, offer recent examples of changes to treatment methods or source water that produced elevated concentrations of lead in drinking water for sustained periods of time. Federal and state regulations and guidance describe how utilities should plan for water treatment or source changes to avoid such unanticipated adverse effects.[66] These kinds of mistakes, however, continue to happen, and the risk remains as long as significant sources of lead remain in the distribution infrastructure. Similarly, surface vibrations from construction activity in a customer's street or yard can disrupt the protective scale on service lines and cause lead to be released into drinking water.[67]

As long as lead service lines remain part of PWSA's system, there is the potential that they will leach lead into customers' drinking water. Replacement is necessary and reasonable, and the only way to ensure that a lead service line will no longer release lead. That is why Lansing, Michigan and Madison, Wisconsin replaced all lead service lines in their systems, and why Flint and York Water Company are in the process of doing so as well.[68] PWSA should join

---

[65] See DC Water, Lead Levels in the District are Historically Low, https://www.dcwater.com/regulatory-lead-testing (noting that orthophosphate was added to the system beginning in 2004 and linking to Lead and Copper Rule monitoring results from 2005 to present); Tech. Expert Working Grp., Discussion of Washington Aqueduct Dalecarlia Pipe Loop Results 1, Attach. A (Feb. 25, 2014), https://archive.epa.gov/region03/dclead/web/pdf/tewg022514.pdf (graphs showing pipe loop lead concentrations from March 2005 to January 2014).

[66] 40 C.F.R. § 141.82(f); 35 Pa. C.S. § 721.7(a).

[67] LSLR Collaborative, Disturbing Lead Service Lines, https://www.lslr-collaborative.org/disturbing-lead-service-lines.html.

[68] Madison Water Utility, Information for utilities on lead service replacement, https://www.cityofmadison.com/water/water-quality/lead-service-replacement-program/information-for-utilities-on-lead-service; Michael Gerstein,

these and numerous other cities and utilities in adopting the goal of complete lead service line replacement.[69]

Q: Why does PWSA treat private-side lead service lines differently from public-side lead service lines?

A: The Lead and Copper Rule does not require utilities to replace service lines that the utility does not own.[70] PWSA disclaims ownership of private-side service lines.[71] For that reason, when PWSA wants to replace a private-side lead service line, it must first get the customer's permission.[72]

Q: Why should PWSA replace private-side lead service lines at no direct cost to customers?

A: There is no basis in engineering or public health for treating private-side lead service lines differently from public-side lead service lines. Private-side lead service lines corrode in the same manner as public-side lead service lines. They are an equal potential source of lead to drinking water. For this reason, as explained by Dr. Lanphear, they present the same risk to public health as public-side lead service lines.[73] A replacement program that removes all public-side lead service lines, but not all private-side lead service lines, has not minimized or eliminated the risk of lead release to drinking water.

Utility-funded replacements are necessary to ensure the removal of private-side lead service lines. PWSA estimates that it costs $7,500 to replace a private-side lead service line.[74]

Lansing replaces city's final lead service line, The Detroit News (Dec. 14, 2016), https://www.detroitnews.com/story/news/local/michigan/2016/12/14/lansing-lead-service-line/95435604/.

[69] Environmental Defense Fund, Community and utility efforts to replace lead service lines, https://www.edf.org/health/recognizing-community-efforts-replace-lsl.

[70] 40 C.F.R. § 141.84(d); see also PWSA St. C-1, at 58.

[71] PWSA Rules & Regulations § 506.1.

[72] PWSA St. C-1, at 59.

[73] Pittsburgh UNITED St. C-3, at 21.

[74] PWSA St. C-1, at 62; Appendix B, 8, UNITED I-12.

That estimate strikes me as high.[75] Nevertheless, whatever the exact cost, many of PWSA's customers cannot afford several thousand dollars to replace a lead service line, as explained by Pittsburgh UNITED expert Mr. Mitchell Miller.[76] Landlords, in particular, may be unwilling to undertake this expense for the benefit of their tenants.

Even subsidizing customers' private-side lead service line replacements is likely to be ineffective. In 2018, PWSA offered to reimburse customers who replaced their private-side lead service lines before the end of the year, but as of September 6, 2018 it knew of only 155 customers who had done so.[77] As Mr. Miller explains, many customers—particularly those with low and moderate income—cannot afford to pay the cost of a lead service line replacement either up front or with financing.[78] In the District of Columbia, DC Water offered financial incentives, loans, and extended repayment terms for private-side replacement, but only about 10 percent of customers elected to pay for replacement of their private-side lead service line at the same time DC Water replaced the public-side.[79] The participation rate in Providence, Rhode Island, under similar circumstances, was about two percent.[80]

It is also far more efficient for PWSA to replace private-side lead service lines at the same time it replaces nearby public-side lead service lines. PWSA can take advantage of economies of scale in a way that makes its replacements much less expensive than one-off replacements arranged independently by customers.

---

[75] See Pittsburgh UNITED St. 4, at 25-31 (explaining that $6,000 is a reasonable estimate for the cost of replacing a full lead service line).
[76] Pittsburgh UNITED St. C-1, at 47-48.
[77] LTIIP Appendix C, at 2; Appendix B, 25, UNITED IX-12 (from Rate Case).
[78] Pittsburgh UNITED St. C-1, at 47-48.
[79] Pittsburgh UNITED St. 4, Appendix D, 7, Gregory Welter, Pipe coating or lining as alternative strategies for lead service line replacement, AWWA Water Quality & Tech. Conf. 5 (2016).
[80] Richard Gell & Michelle McEntire, Strategies for Implementation of Full Lead Service Replacement Program, Tifft Water Supply Symp. 12 (2016), http://nysawwa.org/docs/pdfs/1474903108.pdf.

Replacing private-side lead service lines also makes good sense from a regulatory liability perspective. Lead corrosion from private-side lead service lines can trigger exceedances of the Lead and Copper Rule's action level, as it did recently in Braddock, Pennsylvania.[81] PWSA could replace all of its public-side lead service lines and still find itself back where it started in 2016, facing mandatory measures under the Lead and Copper Rule and a potential lapse in public confidence.

Finally, it is important to note that the vast majority of private-side lead service lines were installed over 70 years ago.[82] The customers who now receive water through those lead service lines played no role in the decision to install them. And, due in part to an aggressive misinformation campaign by the lead industry, accurate information about the harmful effects of lead service line corrosion was not widely available to homeowners in the early and mid-1900s.[83] During the time that nearly all "private" side lead services were installed, lead was the pipe material that the Pittsburgh water utility listed as the default on its forms for recording service pipe material.[84] Given that the utility assumed ownership responsibility for the service line from the curb box to the main,[85] and it certainly was in a position to object to lead if that was not its preference, it is reasonable to assume that the utility considered lead to be an appropriate material to use. Many utilities at the time, including Philadelphia's, actually required lead to be

[81] Margaret J. Krauss, Braddock Already Replaced its Public Water Lines, So What Can It Do About Lead Levels? WESA (Nov. 6, 2018), https://www.wesa.fm/post/braddock-already-replaced-its-public-water-lines-so-what-can-it-do-about-lead-levels.
[82] Appendix B, 7, UNITED I-9.
[83] Appendix C, 28, Richard Rabin, The Lead Industry and Lead Water Pipes: "A Modest Campaign", 98 Am. J. Pub. Health 1584 (2008).
[84] See Pittsburgh UNITED St. 4, Appendix C, 5, Confidential UNITED II-1 Attach. BB, at 23. Although this exhibit was designated as confidential during the rate case proceeding, I am advised by counsel that PWSA has removed that designation only to the extent it applied to the information cited here.
[85] See PWSA Rules & Regulations § 506.1.

used in service lines.[86] So it is not reasonable to argue that homeowners should have known better.

For all of these reasons, I recommend that PWSA replace all private-side lead service lines at no direct cost for any customers who authorize such replacements.

IV. Private-Side Lead Service Lines and the Small Diameter Water Main Replacement Program

Q: Has PWSA decided whether to replace private-side lead service lines through its small diameter water main replacement program?

A: No. As I mentioned above, PWSA will replace all public-side service lines (lead and non-lead) connected to the small diameter water mains it replaces between 2019 and 2026.[87] PWSA has yet to decide, however, whether it will also replace private-side lead service lines connected to the mains it replaces.[88]

Q: Why should PWSA include private-side lead service lines in its small diameter water main replacement program?

A: PWSA should replace private-side lead service lines through its small diameter water main replacement program for the same reasons I recommend that PWSA replace all private-side lead service lines in its system. It is the most efficient way to remove as much lead from the ground as possible. It would be a wasted opportunity for PWSA to open up a street, excavate and remove the public-side service line, and seal everything back up without removing the private-side lead service line. The marginal cost of replacing a private-side lead service line as part of the replacement of the water main and public-side service line is much lower than if PWSA or the

[86] Irina Zhorov, How we ended up with lead piping and why removing it will be hard, WHYY (Feb. 29, 2016), https://whyy.org/articles/how-we-ended-up-with-lead-piping-and-why-removing-it-will-be-hard/#v=onepage&q&f=false.
[87] PWSA St. C-1, at 56.
[88] Id. at 63-64.

homeowner were to arrange a subsequent, one-off replacement of the private-side lead service line.

There is another critical reason that PWSA should replace private-side lead service lines during small diameter water main replacements: it is the only way to avoid imposing on customers a significant number of partial lead service line replacements.

Q: You testified that public health experts and others disfavor replacing only a portion of a lead service line. Supra p. 10. Why is that?

A: Partial replacements are not effective in reducing drinking water lead exposure. Lead concentrations in drinking water often spike when utilities remove the public-side of a service line and leave the private-side lead service line in place. Replacing the public-side service line physically disturbs the private-side lead service line, shaking loose lead-containing scales from the pipe's interior, which then flow to the household tap.[89] The rise in lead levels caused by partial replacements can be dramatic and last for months.[90] Even after the immediate increase in lead subsides, the lead release rate is still comparable to what it was prior to the removal of part of the lead pipe, so the public health benefit of a partial service line replacement is at best questionable.[91] EPA's Science Advisory Board observed that partial replacements "have not been shown to reliably reduce drinking water lead levels in the short term, ranging from days to months, and potentially even longer."[92]

[89] Pittsburgh UNITED St. 4, Appendix D, 8. Benjamin Trueman et al., Evaluating the Effects of Full and Partial Lead Service Line Replacement on Lead Levels in Drinking Water, 50 Envt'l Sci. Tech. 7389, 7389 (2016).
[90] Id. at 7394.
[91] Id. at 7394-95.
[92] EPA Science Advisory Board, Evaluation of the Effectiveness of Partial Lead Service Line Replacements 1 (2011), https://www.epa.gov/dwstandardsregulations/science-advisory-board-evaluation-effectiveness-partial-lead-service-line.; see also Order, Public Utility Comm'n, Petition of York Water Company, Docket No. P-2016-2577404, at 6 (Mar. 2, 2017) (stating that a "'partial lead service line' replacement may not significantly reduce the lead level at the customer's tap, but may temporarily increase lead at the customer's tap").

The negative effects of partial service line replacements are well documented in scientific literature.[93] In 2017, the Allegheny County Health Department's Lead Task Force concluded that "Water Systems should not conduct partial lead line replacements given the risk that they pose to the public."[94] The Department currently prohibits plumbers from replacing the private-side portion of a lead service line when the public side is left in place.[95] These health risks are discussed further in Dr. Lanphear's testimony.[96]

Although the Lead and Copper Rule does not prohibit partial lead service line replacements, EPA has raised questions about their efficacy.[97] Utilities are increasingly recognizing the public health risks and lack of benefits that result from partial service line replacements and are choosing not to conduct them.[98]

PWSA's own experience with partial replacements bears out these concerns. Its initial raft of partial replacements in 2017 caused elevated lead levels and a public outcry, and PWSA temporarily suspended them.[99] PWSA's alleged failures to adhere to the Lead and Copper Rule's notification and post-replacement sampling requirements when conducting these partial replacements are the basis for criminal charges recently filed by the Pennsylvania Attorney

---

[93] See, e.g., Pittsburgh UNITED St. 4, Appendix D. 8, Trueman et al., supra note 89, at 7393-95; Mary Jean Brown & Stephen Margolis, Lead in Drinking Water and Human Blood Lead Levels in the United States, 61 CDC Morbidity & Mortality Wkly. Rep. 6-7 (2012), https://www.cdc.gov/mmwr/pdf/other/su6104.pdf.

[94] Allegheny Cty. Health Dep't Lead Task Force, Final Report and Recommendations 32 (2017), http://www.p4pittsburgh.org/pages/allegheny-county-health-department-lead-task-force.

[95] Allegheny County, Plumbing Program, https://www.alleghenycounty.us/HealthDepartment/Programs/Plumbing/Plumbing-Program.aspx.

[96] Pittsburgh UNITED St. C-3, at 19-21.

[97] EPA Office of Water, Lead and Copper Rule Revisions White Paper 8-9 (2016), https://www.epa.gov/dwstandardsregulations/lead-and-copper-rule-revisions-white-paper.

[98] For example, Flint, Michigan cannot perform partial lead service line replacements as part of its ongoing lead service line replacement program. Settlement Agreement ¶ 17, Concerned Pastors for Social Action v. Khouri, No. 16-10277 (E.D. Mich.), ECF No. 147-1 (Mar. 27, 2018).

[99] PWSA, PWSA to Temporarily Suspend Partial Lead Line Replacements (June 2, 2017), http://lead.pgh2o.com/pwsa-to-temporarily-suspend-partial-lead-line-replacements/.

General.[100] PWSA still performs partial lead service line replacements under some situations, and its monitoring data show that they continue to cause post-replacement lead spikes.[101]

Q: Why would excluding private-side lead service lines from the small diameter water main replacement program cause partial service line replacements?

A: PWSA will replace all public-side service lines attached to the water mains it removes through this program. If PWSA does not offer to replace private-side lead service lines attached to these public-side service lines, many customers, particularly low-income customers, will not replace those private-side lead service lines on their own. This will result in partial service line replacements.

Q: How many partial replacements would this policy cause?

A: It is impossible to predict the exact number because PWSA does not have an accurate inventory of the private-side lead service lines in its system, and it has not yet selected all of the small diameter water mains it will replace during this program.[102] However, PWSA will replace about 130 miles of small diameter water main between 2020 and 2026, and it expects to encounter several thousand lead service lines—public-side and private-side—during those replacements.[103] This policy, therefore, could cause a significant number of partial replacements.

Q: Do the effects of a partial lead service line replacement differ depending on whether it is conducted on a full lead service line or a private-side-only lead service line?

A: No. The potential for physical disruption of the lead scale on a private-side lead service line is the same regardless of whether the public-side service line removed was made of lead or

[100] Press Release, Office of the Attorney General, Attorney General Josh Shapiro Files 161 Criminal Charges Against Pittsburgh Water & Sewer Authority (Feb. 1, 2019), https://www.attorneygeneral.gov/taking-action/press-releases/attorney-general-josh-shapiro-files-161-criminal-charges-against-pittsburgh-water-sewer-authority/.
[101] Pittsburgh UNITED St. C-3, at 19-20.
[102] See Pittsburgh UNITED St. 4, Appendix B, 33, UNITED IX-8; PWSA St. C-1, at 63.
[103] Appendix B, 1, UNITED I-1; Appendix B, 2, UNITED I-2; Appendix B, 9, UNITED I-13; LTIIP, at 28.

some other material. That is why, whenever PWSA replaces a public-side service line (lead or non-lead) during the replacement of a small diameter water main, PWSA should also replace the private-side lead service line to which it connects.

Q: Can partial lead service line replacements still cause spikes in lead levels after orthophosphate has caused a protective scale to form on pipes' interior surfaces?

A: Yes. Partial replacements can disrupt that protective scale. Other utilities have recognized this risk. For instance, even though Philadelphia's and Detroit's drinking water has tested below the lead action level in recent years, the Philadelphia Water Department and Detroit Water and Sewerage Department both replace private-side lead service lines at no cost to customers when they remove water mains.[104] PWSA should follow suit and replace private-side lead service lines during its small diameter water main replacement program even after orthophosphate stabilizes lead levels in drinking water.

Q: How much would it cost to replace private-side lead service lines through the small diameter water main replacement program?

A: PWSA has already included the cost of replacing private-side lead service lines in its budget for the small diameter water main replacement program.[105] The cost of replacing private-side lead service lines makes up a relatively small portion of the overall program costs, which exceed $800 million.[106]

[104] Philadelphia Water Department, Programs for Lead Line Replacement, https://www.phila.gov/water/wu/drinkingwater/lead/Pages/programs.aspx; Detroit Water and Sewerage Department, Residential Lead Service Line Replacement Program, https://detroitmi.gov/departments/water-and-sewerage-department/programs-and-initiatives/making-detroit-lead-safe/residential-lead-service-line-replacement-program.
[105] Appendix B, 8, UNITED I-12; Appendix B, 10, UNITED I-14.
[106] LTIIP, at 29; see also Appendix B, 8, UNITED I-12 (estimating the cost of replacing a private-side lead service line at $7,500).

V. Continuing the Neighborhood-Based Replacement Program

Q: You testified that PWSA's lead programs, if implemented as described in the Compliance Plan and LTIIP, will not replace all lead service lines in PWSA's distribution system. Supra p. 14. Which lead service lines in PWSA's system will not be replaced?

A: PWSA's proposal does not provide for the replacement of two major categories of lead service lines. The first is private-side lead lines left behind by PWSA's neighborhood-based replacement program. PWSA's neighborhood-based program skips over residences that have private-side-only lead service lines. PWSA estimates that its 2018 neighborhood-based program left about 500 private-side-only lead service lines in the neighborhoods where it performed replacements and that its 2019 neighborhood-based program will skip over about 1,400 more.[107] PWSA does not have a strategy for replacing these private-side-only lead service lines.

Second, PWSA's small diameter water main replacement program will remove only those lead service lines connected to the approximately 130 miles of main replaced by 2026.[108] However, lead service lines are also attached to the approximately 590 miles of small diameter water main that PWSA will not replace before 2026.[109] PWSA does not expect to remove all of the remaining hundreds of miles of small diameter water main for another three decades.[110] PWSA holds out the "potential" for a future contract to replace public-side lead service lines not removed through the accelerated small diameter water main replacement program.[111] But PWSA does not indicate when or how it would decide to perform these replacements. PWSA currently

---

[107] Appendix B, 21, UNITED VII-6; Appendix B, 22, UNITED VII-7.
[108] Appendix B, 1, UNITED I-1; PWSA St. C-1, at 56; see LTIIP, at 28.
[109] See Appendix B, 1, UNITED I-1; LTIIP, at 18
[110] Margaret J. Krauss, PWSA Rolls Out New Infrastructure Program That Could Take Three Decades To Complete, WESA (Mar. 22, 2019), https://www.wesa.fm/post/pwsa-rolls-out-new-infrastructure-program-could-take-three-decades-complete.
[111] LTIIP, at 28; see also Appendix B, 3, UNITED I-4 ("[T]here may need to be some smaller lead service line replacement projects to replace one-off lead service lines.").

lacks a reliable estimate of the number and location of its public-side lead service lines, and it has not explained how it would find the public-side lead service lines missed by the small diameter water main replacement program. PWSA's failure to explain how it will replace lead service lines not connected to small diameter water mains is a significant gap in the Compliance Plan and LTIIP, which are supposed to set out PWSA's comprehensive strategy for providing safe and reliable service to its customers.

Q: How should PWSA address lead service lines in its system that will not be removed under the Compliance Plan and LTIIP?

A: PWSA plans to eliminate its neighborhood-based lead service line replacement program after it completes the current round of PennVEST-funded replacements in 2020.[112] In order to remove all lead service lines from PWSA's system, I recommend that PWSA extend its neighborhood-based replacement program beyond 2020.

It is likely that the small diameter water main replacement program represents a cost-effective strategy for lead service line replacement, but only if the replacements include the entire service line, not just the portion in public space. However, it will need to be supplemented with a program specifically targeted at lead service lines for PWSA to achieve its stated goal of "[p]rotect[ing] [p]ublic [h]ealth."[113] The neighborhood-based program represents an efficient approach to locating and removing lead service lines not replaced through the small diameter water main replacement program. By mobilizing to one part of the city and replacing all of the lead service lines in that area, the neighborhood-based approach takes advantage of economies of scale. And if properly coordinated together, the small diameter water main replacement program and the neighborhood-based program can result in lead services lines being eliminated in entire

[112] Appendix B, 24, I&E PS-30; PWSA St. C-1, at 56, 58.
[113] Compliance Plan, at 8.

sections of the city, rather than leaving scattered lead services throughout. Again, leaving no lead behind.

Continuing the neighborhood-based program will also enable PWSA and its customers to benefit from the hard-won lessons PWSA learned through administering the program in 2018 and 2019. For example, PWSA states that it "undertook significant efforts to review its 2018 lead service line replacement program and develop strategies for lowering the costs in 2019."[114] These strategies bore some fruit as contractor bids for the 2019 neighborhood-based program came in about $3,000 per line lower than for the 2018 program.[115]

As Dr. Lanphear points out, another advantage of retaining the neighborhood-based program is the ability to prioritize lead service line replacements in the parts of PWSA's service area where customers are most vulnerable to lead exposure.[116]

Q: Would maintaining a neighborhood-based lead service line replacement program interfere with the small diameter water main replacement program?

A: No. Replacements could be scheduled so that small diameter water main replacement crews are not working in the same area at the same time as neighborhood-based replacement crews. For efficiency, PWSA could exclude lead service lines from the neighborhood-based program when those lines connect to small diameter water mains that PWSA expects to replace by 2026. PWSA has experience with this approach. The small diameter water mains PWSA will replace in 2020 were carved out from areas covered by the 2019 neighborhood-based program.[117]

Q: Do you have any other recommendations for how PWSA should implement an extended neighborhood-based replacement program?

---

[114] PWSA St. C-1, at 62.
[115] Id.; see also id. at 56.
[116] Pittsburgh UNITED St. C-3, at 27.
[117] PWSA St. C-1, at 63.

A: Yes. I agree with Dr. Lanphear's recommendation that PWSA should engage in aggressive and extensive community outreach aimed at minimizing the number of customers who refuse to authorize PWSA to conduct free private-side lead service line replacements.[118] When a customer refuses a private-side lead service line replacement, it not only puts the current residents at risk of lead exposure; it also puts anyone who may move into that home in the future at risk.

In addition, consistent with my recommendation that PWSA replace all lead service lines in its system, I recommend that PWSA broaden eligibility for its neighborhood-based program to include customers with private-side-only lead service lines. Expanding the eligibility in this fashion, however, will not address the nearly two thousand private-side-only lead service lines skipped by the 2018 and 2019 neighborhood-based programs.[119] PWSA should also offer financial assistance to customers who want to replace these lead service lines.

VI. Inventory of Service Line Materials

Q: What is the purpose of an inventory of service line materials?

A: It is best practice for utilities to determine the material composition of all service lines in their systems. A reliable inventory of service line construction materials is a critical component of a utility's response to high lead levels. An accurate estimate of the total number of lead service lines in the distribution system helps define the scope of the problem facing the utility. Knowing the locations of lead service lines enables the utility to design the most efficient program for removing them. It also allows the utility to inform customers who may have lead

[118] PWSA St. C-3, at 23.
[119] Appendix B, 21, UNITED VII-6; Appendix B, 22, UNITED VII-7.

service lines so that those customers can take action, such as using tap water filters, to protect themselves from lead exposure.[120]

Q: What steps has PWSA taken to compile an inventory of service line materials?

A: PWSA has used three methods to assess the composition of its service lines for its more than 300,000 residential customers: examination of historical records, curb box inspections, and excavations.[121] PWSA has digitized historical records documenting the material composition of public- and private-side service lines.[122] Since 2017, PWSA has also conducted about 17,500 curb-box inspections.[123] During these inspections, a digital camera is sent down the curb box to take pictures of the service line. If the pictures show a bulbous "wiped joint," the service line is lead.[124] Finally, PWSA excavates service lines prior to replacement to verify their composition.[125] PWSA adds information gleaned from each of these methods to a map on its public website.[126]

Q: Does PWSA have a reliable inventory of service line materials?

A: No. PWSA does not have a reliable estimate of the number or the locations of lead service lines in its system. While PWSA estimates that it has 10,100 public-side lead service lines in its system,[127] all three methods PWSA uses to assess service line materials are significantly flawed.

---

[120] Pittsburgh UNITED St. C-3, at 42-43.
[121] LTIIP, at 5, 27; Appendix B, 12, UNTED I-20.
[122] PWSA, Community Lead Response: Lead Map, http://lead.pgh2o.com/your-water-service-line/planned-water-service-line-replacement-map/.
[123] See PWSA St. C-1, at 53.
[124] Appendix B, 15, UNITED I-25; Brian Conway, What Pittsburgh homeowners need to know about curb box inspections for lead service lines, Public Source (July 20, 2017), https://www.publicsource.org/what-pittsburgh-homeowners-should-know-about-curb-box-inspections-for-lead-service-lines/.
[125] Appendix B, 12, UNITED I-20.
[126] PWSA, Community Lead Response: Lead Map, http://lead.pgh2o.com/your-water-service-line/planned-water-service-line-replacement-map/.
[127] Appendix B, 23, I&E PS-23.

PWSA has digitized a large number of historical records, but they are incomplete and often inaccurate.[128] For instance, PWSA estimates that 23 percent of historical records identify private-side service lines as non-lead when they are in fact made of lead.[129] Historical records require field verification by other means.

Curb box inspections, though relatively inexpensive, are usually inconclusive. About two-thirds of the 17,500 curb box inspections PWSA has performed could not determine whether a wiped joint was present on the service line. During these inspections, crews could not access the curb box or, once they accessed the curb box, the service line was too degraded to see if there was a wiped joint.[130] Even when crews can access the curb box and get a clear image of the service line, the inspection only yields a definitive result if it finds a wiped joint. The absence of a wiped joint does not necessarily mean that the service line is not lead. As a result, curb box inspections cannot definitively determine that a service line is not made of lead.[131] About 15,500 of the 17,500 curb box inspections PWSA performed did not provide a firm answer as to whether the service line was made of lead.[132]

Pre-replacement excavations reliably determine service line composition, but PWSA has performed only a few thousand excavations.[133] PWSA has not deployed this method more widely because PWSA says that excavations at the curb box typically have to cut through pavement, which increases restoration costs.[134]

---

[128] PWSA, Community Lead Response: Lead Map, http://lead.pgh2o.com/your-water-service-line/planned-water-service-line-replacement-map/.
[129] Appendix B, 20, UNITED VII-1.
[130] Appendix B, 14, UNITED I-24; Appendix B, 15, UNITED I-25.
[131] Appendix B, 15, UNITED I-25.
[132] Appendix B, 14, UNITED I-24; Appendix B, 15, UNITED I-25.
[133] See Appendix B, 12, UNITED I-20.
[134] Id.

Two other aspects of PWSA's inspection policies limit the completeness and reliability of its inventory. First, PWSA has not made any attempt to estimate the number of private-side lead service lines in its system, as it has for public-side lead service lines.[135] Second, PWSA does not schedule curb box inspections on service lines when historical records indicate that the public-side service line is not made of lead.[136] This approach is flawed. It prevents PWSA from uncovering "false negatives" among its public-side records—historical records that incorrectly identify service lines as non-lead. It also cuts short investigation of many private-side lead service lines that might be made of lead.

Q: Why should PWSA inventory private-side service lines?

A: There are likely several thousand private-side lead service lines in PWSA's service area. These lead service lines are an equal potential source of lead contamination. If PWSA does not know where these lines are, it cannot replace them; and, if customers do not know that they receive drinking water through such lines, they are less likely to take actions to protect themselves. PWSA's estimate that about a quarter of historical records incorrectly identify private-side lead service lines as non-lead underscores the importance of promptly and accurately verifying the composition of these pipes.[137]

Q: Does the Compliance Plan or LTIIP propose a strategy for developing a reliable inventory of service line materials?

A: No. Neither the Compliance Plan nor LTIIP indicates how PWSA will improve its inventory.

[135] See Pittsburgh UNITED St. 4, Appendix B, 33, UNITED IX-8.
[136] Pittsburgh UNITED St. 4, Appendix B, 4, UNITED II-15; Pittsburgh UNITED St. 4, Appendix B, 6, UNITED II-19; Pittsburgh UNITED St. 4, Appendix B, 26, UNITED VIII-6.
[137] Appendix B, 20, UNITED VII-1.

Q: Has PWSA offered any other information about its plans for improving its inventory?

A: Mr. Weimar states that PWSA is evaluating various methods to complete its inventory.[138] PWSA expects to finalize this evaluation in Fall 2019.[139] In the meantime, PWSA has suspended curb box inspections.[140] It has also recently started recording service line material when it replaces water meters.[141] The Lead and Copper Rule and DEP Consent Order require PWSA to submit to DEP a supplemental "materials evaluation" for all residential service lines by December 31, 2020.[142]

Q: What are your recommendations regarding PWSA's inventory of service line materials?

A: PWSA should promptly propose a strategy for completing its inventory so that it can be reviewed by the public and the Public Utility Commission. The inventory methods PWSA adopts should provide a complete and reliable estimate of the material composition of all public- and private-side service lines, regardless of the information listed on historical records. The inventory should enable PWSA to estimate the number of public- and private-side lead service lines and their locations. I support Dr. Lanphear's recommendation to extend the term of the Community Lead Response Advisory Committee and recommend that PWSA consult with the advisory committee on formulating a plan for completing its inventory.[143]

PWSA should also consider making broader use of hydro-excavation or vacuum excavation. These two methods can be effective tools for verifying the composition of service

[138] PWSA St. C-1, at 53.
[139] Appendix B, 18, UNITED IV-20.
[140] Appendix B, 19, UNITED IV-23.
[141] Appendix B, 13, UNITED I-22.
[142] 40 C.F.R. § 141.186(a); Appendix C, 13-14, Consent Order ¶ 3(c)(iii).
[143] Pittsburgh UNITED St. C-3, at 27-28.

lines. PWSA indicates that hydro-excavations are costlier in Pittsburgh because PWSA must cut through hardscaping around the curb box more often than in other cities.[144] PWSA could still use these methods at locations where there isn't hardscaping near the curb box. At locations where there is hardscaping near the curb box a potential solution to this problem would be to avoid hardscaping by performing hydro-excavations closer to residences, outside of the hardscape. This approach would likely involve "slot excavation," using the same technology for limited disturbance. The cost of a hydro-excavation that does not need to cut through hardscaping is likely similar to the cost of a curb box inspection.[145]

PWSA's failure to articulate a strategy for developing a reliable inventory of service line materials is a serious gap in the Compliance Plan and LTIIP. Inventories play a central role in the design and implementation of effective lead service line replacement programs. For instance, PWSA's assertion that its small diameter water main replacement program will remove most, if not all, public-side lead service lines is premised on PWSA's estimate of the total number of public-side lead service lines in its system.[146] PWSA's incomplete and unreliable inventory calls that assertion into question. You cannot replace lead service lines if you don't know where they are.

VII. Operations Department Replacements, Post-Replacement Procedures, and Water Meter Replacements

Q: Do you have any other recommendations related to PWSA's proposals for lead remediation described in the Compliance Plan and LTIIP?

[144] Appendix B, 12, UNITED I-20.
[145] See Pittsburgh UNITED St. 4, Appendix D, 6, City of Flint's Paragraph 30 Evaluation (Feb. 8, 2018), filed in Concerned Pastors for Social Action v. Khouri, No. 16-10277 (E.D. Mich.), ECF No. 172-4 (July 12, 2018) (indicating that each hydro-excavation costs the City of Flint $280); Pittsburgh UNITED St. 4, Appendix B, 7, UNITED II-21(f) (indicating that each curb box inspection costs PWSA $190).
[146] See LTIIP, at 28.

A: Yes, I have additional recommendations related to lead service line replacements conducted by PWSA's Operations Department in response to leaks, PWSA's post-lead service line replacement procedures, and PWSA's meter replacement program.

Q: What are your recommendations related to lead service line replacements conducted by PWSA's Operations Department?

A: When a public-side service line or the main to which it connects leaks, PWSA's Operations Department must often replace it on short notice. Under current policy, if the private-side is made of lead, PWSA seeks authorization from the property owner to replace it at no direct cost.[147] PWSA avoids partial replacements under these circumstances by having a contractor available to perform the private-side replacement on the day after the public-side replacement.[148]

PWSA has not decided whether it will continue private-side replacements under these circumstances beyond 2019.[149] PWSA should continue its current policies and practices for Operations Department replacements in order to efficiently remove the most lead infrastructure possible and to avoid the harmful health effects of partial lead service line replacements.

Q: What are your recommendations related to PWSA's post-lead service line replacement procedures?

A: I recommend that PWSA continue to provide filters certified for effective lead reduction and replacement cartridges to all customers who receive lead service line replacements.[150] Filters help protect customers from temporary increases in drinking water lead levels that can occur after lead service line replacements, including full lead service line replacements. PWSA will

[147] LTIIP Appendix C, at 2-3.
[148] Appendix B, 11, UNITED I-16.
[149] Id.
[150] PWSA St. C-1, at 62-63; Pittsburgh UNITED St. C-3, at 28, 34.

reconsider its filter distribution policy after 2020.[151] However, post-replacement lead level increases are still possible after the introduction of orthophosphate. Consequently, for the reasons described by Dr. Lanphear, PWSA should retain its current post-replacement filter policy.[152]

I also recommend that, during private-side lead service line replacements and water meter replacements, PWSA should conduct visual inspections for interior galvanized pipe at customers' residences. At homes with galvanized interior plumbing, lead that leached from the service line over many decades can collect in a scale that coats the inside of the galvanized pipes.[153] After the lead service line is replaced, the interior plumbing releases that residual lead unpredictably. Such galvanized pipes may be readily observed in unfinished basements when interior work is being done as part of a private-side lead service line replacement or water meter replacement. Customers who have galvanized interior pipes should be warned that they have a continued risk of ongoing elevated lead exposure, even following a full service line replacement. These customers should be prioritized for outreach to ensure they complete their water sampling. This inspection and notification could be readily incorporated into PWSA's service line replacement procedures because contractors already must enter the home to replace the private-side service line or meter, and the notification could be added to the written information PWSA leaves behind after a replacement.

Finally, post-lead service line replacement sampling sometimes reveals sustained, elevated lead levels. When lead levels remain above 5 ppb (the threshold suggested by Dr. Lanphear) for more than one month after a lead service line replacement, PWSA should assist

[151] PWSA St. C-1, at 62-63.
[152] Pittsburgh UNITED St. C-3, at 34.
[153] EPA Science Advisory Board, Evaluation of the Effectiveness of Partial Lead Service Line Replacements 11 (2011), https://www.epa.gov/dwstandardsregulations/science-advisory-board-evaluation-effectiveness-partial-lead-service-line.

residents with inspecting their interior plumbing and identifying potential sources of lead exposure, such as galvanized pipes, lead solder, or brass fixtures.[154] For instance, DC Water conducts such interior inspections when high lead concentrations are detected in sampling of homes that have had full lead service line replacements.

Q: What are your recommendations related to PWSA's water meter replacement program?

A: PWSA plans to replace 50,000 water meters in the next five years.[155] For homes that have lead service lines, those replacements have the potential to disrupt the lead-containing scale on the service lines or interior galvanized plumbing and cause a spike in lead levels. Consequently, when PWSA replaces a water meter in a home with a lead service line or visible galvanized interior pipes, it should notify the customer and provide them with a water filter certified for lead reduction and replacement cartridges. PWSA should continue to provide cartridges until water sampling shows consistently low lead levels.[156]

VIII. Conclusion

Q: Please summarize your conclusions and recommendations.

A: PWSA has taken significant steps in designing and implementing an effective lead service line replacement program. However, more ambitious and specific strategies are needed to achieve PWSA's stated primary goal of protecting public health. Specifically, the proposal set out by the Compliance Plan and LTIIP has important deficiencies and can be improved in the following ways:

[154] Pittsburgh UNITED St. C-3, at 30.
[155] Appendix B, 13, UNITED I-22.
[156] Pittsburgh UNITED St. C-3, at 46.

- PWSA should commit to replacing all lead service lines in its system, including all private-side lead service lines.
- If PWSA does not commit to replacing all lead service lines in its system, it should stop claiming to the public that it plans to do so. It should clearly explain that it does not intend to replace all private-side lead service lines in its system and that these lines present a risk to public health.
- PWSA should replace private-side lead service lines at no direct cost to customers whenever it replaces the small diameter water mains that they connect to.
- PWSA should continue its neighborhood-based replacement program so that it can replace lead service lines not removed through its small diameter water main replacement program.
- PWSA should propose a plan for compiling a reliable and complete inventory of its service lines. As part of that plan, PWSA should consider making more frequent use of hydro-excavations and/or vacuum excavations. PWSA should extend the term of the Community Lead Response Advisory Committee and consult it regarding its inventory plans.
- PWSA should continue replacing private-side lead service lines at no direct cost to customers when its Operations Department replaces a water main or public-side service line in response to a leak.
- PWSA should continue offering free filters and replacement cartridges to customers who receive lead service line replacements.

- During private-side lead service line replacements and water meter replacements, PWSA should inspect interior plumbing for galvanized pipe and notify customers if it finds plumbing made of that material.
- If drinking water lead levels exceed 5 ppb more than one month after a lead service line replacement, PWSA should assist the homeowner in identifying potential causes such as lead-containing interior plumbing or fixtures.
- When PWSA replaces a water meter at a home with a lead service line or interior galvanized plumbing, PWSA should provide the customer with a water filter certified for lead removal and replacement cartridges.

Q: Does this conclude your direct testimony?

A: Yes. I reserve the right to supplement my testimony based on subsequent information provided by PWSA or other parties.

APPENDIX A

Resume of Gregory Welter, PE, BCEE

Gregory J. Welter, PE, BCEE

Technical Manager 1

TECHNICAL EXPERTISE

Water system emergency planning security – vulnerability assessments

Water distribution system design and management

PROJECT ASSIGNMENT

Water Quality

YEARS OF EXPERIENCE

44

EDUCATION

MS/1973/Sanitary Engineering; University of Michigan

BS/1971/Civil Engineering; Catholic University of America

PROFESSIONAL REGISTRATIONS

Professional Engineer: DC

Board Certified Environmental Engineer (BCEE): American Academy of Environmental Engineers

SPECIAL TRAINING

American Water Works Association (AWWA) J100 Risk Analysis and Management for Critical Asset Protection (RAMCAP): Risk and Resilience Management for Water and Wastewater Systems

American Society of Civil Engineers (ASCE) / California Emergency Management Agency (Cal-EMA) / Applied Technology Council (ATC) Post-Disaster Safety Evaluations (ATC-20 and ATC-45)

National Incident Management System (NIMS) Certifications: ICS 100 and 200, NIMS 700, and NRF 800

Mathematical Modeling of Natural Water Systems, Manhattan College

Mr. Welter has 44 years of professional engineering experience and is currently responsible for planning, directing, and supervising major, complex and diverse projects. For the last several years, Mr. Welter has had a particular involvement in development of lead corrosivity management strategies, including services to the Providence Water Supply Board, the Water Research Foundation, and the District of Columbia Water and Sewer Authority (DC Water). Results of that work have been published in technical journals (e.g., Journal AWWA, Environmental Science & Technology).

REPRESENTATIVE PROJECTS

Providence Water Supply Board, Water Quality Studies, Providence, RI, Task Manager – Coordinated several tasks for Providence Water in its efforts to better control lead corrosivity of its finished drinking water. Tasks have included:

- *Coordination of an Expert Panel* that has been convened pursuant to the consent order between Providence Water and the Rhode Island Department of Health (RIDOH), including preparation of briefing packages, facilitation of the meetings, and preparation of post-meeting documentation.
- *Supervision of pilot-scale pipe loop experiment* for assessment of phosphate addition at high pH. Pipe loop experiments were conducted on field harvested lead pipes taken from the Providence system, and were preserved and conditioned using protocols developed for the experiment.
- *Assistance to Providence Water* in preparation of periodic reports to RIDOH, including two annual reports from the Expert Panel, monthly reports on consent order activities, and the request to RIDOH for modification of finished water characteristics (*i.e.* restoration of higher pH to 10.2).
- *Supervision of two field monitoring activities* to document the effect of raised finished water pH, which included intensive sequential sampling at eight residences, and monitoring at two fixed location PRS monitoring stations.
- *Development of protocol for demonstration* of efficacy of high volume premise flushing as a lead abatement strategy.
- *Conducting process modeling review of carbon dioxide injection system*, specifically investigation of the interaction between lime dosing and dissolved inorganic carbon

(DIC) addition resulting in unanticipated carbonate scaling and minimal DIC increase.

Water Research Foundation – Mr. Welter has been engaged in several research projects for the Water Research Foundation, in most instances as Principal Investigator. Two research projects have been on management of lead service lines. In support of both projects, we coordinated field harvesting of lead service lines from Providence and Washington, DC. Protocols were developed for LSL harvesting, and for condition preservation during shipment.

Impact of Galvanic Corrosion on lead release following partial lead service line replacement (WRF project 4349) – Principal Investigator on research project to investigate methods of partial LSLRs and methods to minimize potential for post-replacement increases in lead. Project was commissioned by WaterRF in order to resolve conflicting conclusions reached in prior sponsored research projects. Project includes establishment of experimental test rigs of lead and copper pipe and alternate transition coupling materials, with parallel tests in Washington, DC, and at Washington University at St. Louis. Participating utilities are DC Water and Providence Water (RI).

Evaluation of Lead Service Line Lining and Coating Technologies (WRF project 4351) - Project Advisory Committee (PAC) member for investigation of lining and coating technologies as an alternative strategy for lead service line replacement. Principal objective of the strategy would be to accomplish effective remediation of the full service line, rather than partial replacement only of the publicly owned portion. Technologies investigated, which have been successfully implemented in Europe, include lining with polyethylene terephtahalate (PET) tubing, and coating with epoxy or poly urea.

Guidance for Decontamination of Water System Infrastructure (WRF project 2981) - Conducted literature research and laboratory experiments on chemical approaches to decontamination of various water types, including field harvested unlined iron pipe.

DC Water and Sewer Authority (DC Water), Lead Service Line Replacement (LSLR) Program Management, Task Manager – Provided special task assistance to the LSLR program for issues research, regulatory reviews, development of presentations for DC Water Board review and for public outreach meetings, and customer outreach procedures. Coordinated field harvesting of lead service lines for pilot plant test rigs at the Washington Aqueduct.

Washington Suburban Sanitary Commission, Patuxent Water Treatment Plant Facility Plan, Laurel, MD, Task Manager – Conducted hydrologic analysis of Patuxent River as source for existing and upgraded water treatment plant. Modeled historical water availability from the source to compare capital costs of upgraded treatment facilities from this source at varying capacities against marginal operating costs to treat and deliver water from alternate source.

AWARDS

Winner of the 2011 American Water Works Association (AWWA) Best Paper Award, "Cross-Sector Emergency Planning for Water Providers and Healthcare Facilities," January 2010

PRESENTATIONS, PUBLICATIONS, AND PAPERS

Welter, G.J., 2016, Pipe coating or lining as alternative strategies for lead service line replacement, AWWA Water Quality and Technology Conference, 2015.

Welter, G.J., M. Schock, S. Miller, R Razza, and D. Giammar, 2015, Pipe loop studies of orthophosphate addition for control of lead release in high pH, low DIC waters, AWWA Water Quality and Technology Conference, 2015.

Masters, S., G.J. Welter, and M. Edwards, 2015, Seasonal variations in lead release to potable water, Environmental Science and Technology,

Welter, G.J., D.E. Giammar (Washington University), and M. Schmelling (DC Water). 2013. Impact of Galvanic Corrosion on Lead Release Following Partial Lead Service Line Replacement. Webinar presented by the Water Research Foundation.

Wang, Y., M. Vrajesh, G.J. Welter, and D.E. Giammar. 2013. Effect of Connection Methods on Lead Release from Galvanic Corrosion. American Water Works Association Journal 105(7).

Welter, G.J. 2011.Emergency Water Supply Planning for the National Capital Region. Journal of Emergency Management 9(6): 17-28

Appendix B

Interrogatory Responses

UNITED I-1 ..... Appendix B, 1

UNITED I-2 ..... Appendix B, 2

UNITED I-4 ..... Appendix B, 3

UNITED I-5. ..... Appendix B, 4

UNITED I-6. ..... Appendix B, 5

UNITED I-8. ..... Appendix B, 6

UNITED I-9 ..... Appendix B, 7

UNITED I-12 ..... Appendix B, 8

UNITED I-13 ..... Appendix B, 9

UNITED I-14 ..... Appendix B, 10

UNITED I-16 ..... Appendix B, 11

UNITED I-20 ..... Appendix B, 12

UNITED I-22 ..... Appendix B, 13

UNITED I-24 ..... Appendix B, 14

UNITED I-25 ..... Appendix B, 15

UNITED I-28 ..... Appendix B, 16

UNITED IV-3 ..... Appendix B, 17

UNITED IV-20 ..... Appendix B, 18

UNITED IV-23 ..... Appendix B, 19

UNITED VII-1 ..... Appendix B, 20

UNITED VII-6. ..... Appendix B, 21

UNITED VII-7 ..... Appendix B, 22

I&E PS-23 ..... Appendix B, 23

I&E PS-30 ..... Appendix B, 24

Rate Case UNITED IX-12 ..... Appendix B, 25

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-1 How many miles of small diameter water main does PWSA anticipate replacing each year between 2019 and 2026? (See LTIIP at 18, 28)

Response: Section 2.6.1 of the LTIIP discusses the acceleration of the small diameter water main replacement program in order to accelerate the removal of lead service lines. See below for the miles of main assumed in order to develop the budgets provided in Table 2-8 of the LTIIP.

Project	Construction Year	Miles of Water Main Planned	Miles of Water Main Accelerated
2019 SDWMRP	2020	2	2
2020 SDWMRP	2020	10	10
2021 SDWMRP	2021	10	21
2022 SDWMRP	2022	10	21
2023 SDWMRP	2023	10	21
2024 SDWMRP	2024	10	21
2025 SDWMRP	2025	10	21
2026 SDWMRP	2026	10	21

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

Response of Pittsburgh Water and Sewer Authority ("PWSA") to the Interrogatories of the Pittsburgh United, Set I in Docket No. M-2018-2640802 and Docket No. M-2018-2640803

Request: UNITED I-2	Please explain how PWSA estimated the number of lead service lines to be replaced each year between 2019 and 2026 through the small diameter water main program. (LTIIP at 28, Table 2-7.)
Response:	Data was compiled from previous Lead Service Line Replacement ("LSLR") work order areas to determine a baseline estimate of how many miles of main would needed to be replaced to meet the LSLR goal. Historically, the 32 work orders resulted in approximately 90.2 service lines per mile of main and 45.4% of the public service lines included in the work orders identified as lead. Utilizing these values, we can expect that the Small Diameter Water Main Replacement Plan ("SDWMRP") would replace 40.9 public lead service lines per mile of main replacement. To achieve 10,000 LSLR's in 12 years would require completion of approximately 850 LSLR per year. Based on the value of 40.9 LSLR/Mile Main, the joint contracts would be required to replace 20.8 miles of main per year.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-4	Please describe the "minor (as required) LSLR programs" PWSA may operate after 2019. (See LTIIP at 28.)
Response:	As the total percent of lead service lines decreases in the system, it will be more difficult to meet the goal of 40.9 line service line replacements per mile of water main replaced. Therefore, there may need to be some smaller lead service line replacement projects to replace one-off lead service lines.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-5	Does PWSA expect that lead service line replacements conducted through the small diameter water main program and by Operations in response to leaks will result in the replacement of all residential public-side lead service lines in its system by 2026? (See LTIIP at 28; PWSA St. No. 1 at 54) If not, has PWSA estimated the number of public-side lead service lines that will remain at the end of 2026?
Response:	The goal is to replace all lead service lines by 2026 through the Small Diameter Water Main Replacement Program and possibly some smaller lead service line replacement contracts. PWSA will update this goal on a yearly basis.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-6	Please explain why PWSA is proposing to conduct most lead service line replacements between 2020 and 2026 through the small diameter water main program instead of through maintenance or expansion of its existing LSLR Program. (See LTIPP at 28, Table 2-7) Please provide any reports or analysis underlying this proposal, including any analysis of the pros and cons of using the small diameter water main program to replace lead service lines instead of maintaining or expanding the LSLR Program.
Response:	A majority of the lead service lines ("LSLs") are associated with mains that have not been replaced. LSLs were mostly installed prior to the 1940s. This coincides with water mains that were constructed of unlined cast iron. These mains frequently experience low water due to tuberculation of the main as well as brittle failure. Therefore, it is economically responsible to replace the main at the same time as the service line. Pavement restoration accounts for approximately 20% of the construction cost. In most instances, the street must be repaved curb to curb as part of the lead service line replacement. Replacing the LSL also requires tapping the main. As these mains are already brittle, tapping the main again can increase the chance of future breaks. Capping the old LSL at the main provides a point for potential leaks and water loss. Therefore, it is prudent to replace the water main at the same time as a majority of these mains have reached the end of their design life.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-8	When does PWSA expect to complete the upgrade to its Geographic Information System (GIS) to include main break, main age, and main material? (PWSA St. No. C-1 at 63) Can PWSA calculate small diameter water main selection criteria scores before this GIS update is complete? (PWSA St. No. C-1 at 63; LTIIP at 20-23)
Response:	As noted on Page 62 of PWSA St. No. C-1, PWSA plans to undertake a 2-year upgrade to its Geographic Information System (GIS) to include main break, main age and main material to provide a more robust prioritization model. PWSA cannot calculate small diameter water main selection criteria on all water mains in the system until the GIS is upgraded. Until that time, PWSA can only prioritize within its current pool of water mains currently identified for replacement.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-9	Please provide any information PWSA has regarding water main age as a predictor of the presence or absence of lead service lines connected to that main.
Response:	Based on the historical records, lead service lines are more prevalent prior to the 1940s. Starting in 1978, the public service line was replaced to the curb box when the water main was replaced. Therefore, any water main from the 1940s and earlier likely has a higher probability of having lead service lines connected to it.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-12	How did PWSA develop its budget estimates for the small diameter water main program? (See LTIIP at 29, Table 2-8.) For each year of the budget (2019-2026), please indicate the portion of the budget attributable to lead service line replacements.
Response:	PWSA assumes the following for construction cost: $550/LF water main including public side replacement, $7500/private side replacement plus contingency. On top of the construction cost, PWSA assumes 5% Planning, 10% Design, 5% Construction Management, 7% Construction Inspection, 2% Design Services During Construction, and 5% Project Management.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-13	Do the budget estimates for the small diameter water main program (see LTIIP at 29, Table 2-9) include PWSA's estimate for the cost of replacing private-side lead service lines connected to public-side service lines removed as part of the small diameter water main program? If so, how many private-side lead service lines does the budget assume PWSA will replace each year for 2019 – 2026?
Response:	PWSA assumes private side replacement at a rate of 40.9/mile. The number of lead service lines to be replaced per year under the Small Diameter Water Main Replacement Program are as noted in Table 2-7 of the LTIIP.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-14	What does PWSA expect the average cost of a public-side lead service line replacement to be under the small diameter water main program? What does PWSA expect the average cost of a private-side lead service line replacement to be if PWSA were to include those service lines in its small diameter water main program?
Response:	The cost of the public service line replacement is covered under the per foot cost for water main replacement for planning level estimates. PWSA assumed $7500/private side replacement for planning level estimates.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set 1 in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-16

When PWSA replaces a public-side lead service line because that line or the main to which it is attached leaks or breaks:

A. Please describe the process for seeking customer authorization to replace a corresponding private-side lead service line.
B. When a customer grants authorization, how long, on average, after the public-side replacement does it take for that customer's private-side lead service line to be replaced?
C. .Please describe any steps PWSA has taken to reduce the delay between replacement of the public-side and private-side lead service lines.
D. For all measures described in response to subsection (c), please indicate whether PWSA intends to continue these measures between 2020 and 2026.

Response:

A. Once PWSA Operations understands that a lead service line may be involved, the Lead Help desk is notified. Lead Help attempts to call the customer the same day they are notified. If the homeowner cannot be reached by phone, a Field Liaison visits the location the following day to attempt contact.
B. With customer authorization, PWSA's process is to replace the private side the day after PWSA Operations replaces the public side. Unless weather or other conditions prevent it, the customer will be placed on temporary water between the public and private side work being completed so a partial replacement does not result.
C. When developing the contract for these private side contracts PWSA included a requirement for the contractor completing the work to mobilize within 4 hours if necessary. PWSA also implemented the procedures discussed above for customer outreach related to getting authorization to complete the work.
D. At this time the PWSA Board of Directors has only authorized these private side replacements through the end of 2019.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-20	Has PWSA evaluated hydro-excavation as a method for determining the composition of service lines? If so, please describe that evaluation and any conclusions PWSA reached as a result.
Response:	PWSA uses both convention and hydro-excavation for service line verifications during the lead service line replacement construction. PWSA does not excavate to determine the composition of service lines otherwise due to the large costs associated with the street and sidewalk restoration required based on the location of the majority of curb stops within the City of Pittsburgh. Other locations around the country who have use hydro-excavation as a low cost material verification method have curb stops located in 'green spaces' which does not require the disturbance or replacement of concrete and asphalt.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
*Docket No. M-2018-2640802 and Docket No. M-2018-2640803***

Request: UNITED I-22	Has PWSA begun to create an inventory of private-side service lines in its system? If no, does PWSA plan to do so?
Response:	PWSA maintains an inventory of both public and private side service line material. The current inventory is based on historic records, material verification and replacement, Curb Box Inspection Results and data collected during PWSA's meter replacement program. The meter replacement program, started at the end of 2018, will involve the replacement of 50,000 residential meters over the next 5 years, during which PWSA will record the service line material entering and exiting the meter. The material is being logged using a tablet application allowing seamless incorporation into PWSA's GIS. This information will be used to update the web map on PWSA's website on a monthly basis, starting in April 2019.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-24 Please indicate what percentage of curb box inspections conducted since June 30, 2016 were inconclusive. Please provide percentages for both public-side and private-side service lines.

Response:

CBI Results (2016 – 2018)		
Material	**Public**	**Private**
Lead	1,925	1,693
Non-Lead	3,202	3,037
Inconclusive (Unknown, cannot locate, not accessible)	12,504	12,901

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-25 Please explain why PWSA is reconsidering curb box inspections as a method to identify the material composition of service lines.

Response: With the CBI program, service line material is determined by locating and cleaning the curb box/stop and inserting a small camera down the box to determine material type. A lead line is identified as having an indicative bulb-type "wipe joint" - this wipe-joint is the method in which the lead line was attached to the valve. Non-lead lines are typically identified by the fittings observed in the curb box.

In instances where non-lead is identified at the curb box, PWSA cannot state with certainty that the entire service line is not lead. This is because the curb stop (with new tail pieces) may have been replaced, but other portions of the service line may still be lead material.

The CBI may not be successful for the following reasons:

- Inability to locate curb box (labeled as "cannot locate" in records)
- Curb box damaged such that equipment cannot access the curb stop (labeled as "not accessible" in records)
- Line degraded and cannot determine material type (labeled as "unknown" in records)

As such, the only CBI data that can be relied on is where lead is identified, which during the 2018 CBI program (Work Orders B01 – B08) occured in about 9.6 percent of the public side locations and about 8.7 percent of the private side locations

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-28 If lead levels do not "plunge" as PWSA expects following the introduction of orthophosphate (Compliance Plan at 120), what steps will PWSA take to bring lead levels down?

Response: The approach to lead control at the residential and commercial end users within the PWSA water service area is multi-faceted due to multiple mechanisms by which lead may be released in water. The three main activities used to accomplish this objective (lead control) are:

- Lead service line replacement program
- Orthophosphate addition
- Flushing of chemical scales and biofilms

PWSA will continue to implement all three activities along with the comprehensive monitoring of the water quality parameters. Based on collected field data, the scale of the program may be changed and each of these three activities adjusted (i.e. flushing locations, orthophosphate dosage) in effort to minimize presence of lead in drinking water.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-3 Fully explain the basis for PWSA's decision to allocate a weight of 5% to lead service line density in its prioritization model for the small diameter water main replacement program (LTIIP at 21-23, Table 2-3.), and provide all analysis and documents underlying that decision.

Response: When PWSA replaces SDWM, it evaluates various factors, not only lead service lines. Other factors include, but are not limited to, how many people are affected, if there is a sensitive customer base (such as a nursing home), etc. Knowing the 2020 SDWMP, 10 miles total, would be focused on areas of high densities of LSL, the 2019 SDWMP, 2.5 miles total, focused on other factors such as population served, vulnerability to breaks, and fire flow deficiencies. Note that the prioritization model referenced in the LTIIP was for the 2019 SDWMP only and a new prioritization model will be developed as part of the Water Distribution System Master Plan and will be implemented once the GIS system is upgraded.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-20	When does PWSA expect to select a method or methods for completing the inventory of its residential service line connections? (PWSA St. 1, at 53.)
Response:	PWSA anticipates finalizing the evaluation by the fall of 2019.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-23	Is PWSA currently conducting curb box inspections? (See PWSA St. 1, at 53.) If so, how many additional curb box inspections does PWSA plan to conduct and when will those inspections be completed?
Response:	PWSA has temporarily suspended the curb box inspection program while the evaluation discussed above is ongoing.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VII in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VII-1 PWSA has found that "approximately 9% of its historical records incorrectly identify a public-side service line as non-lead." (Rate Case PWSA St. 1-R, at 27.) Does PWSA have any information regarding the accuracy of its historical records as to private-side service lines? If so, please provide that information.

Response: Based on the performed verifications to date, approximately 23% of historical records incorrectly identify a private-side service line as non-lead.

Response Provided by: Robert A. Weimar, Executive Director, The Pittsburgh Water and Sewer Authority
Daniel T. Duffy, P.E.*, PMP, Lead Service Line Replacement Project Manager
Consultant (East Woods Associates, LLC) for
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VII in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VII-6 Please confirm that PWSA estimates that there are approximately 1,400 private-side-only lead service lines located in the work order areas for the 2019 Lead Service Line Replacement Program. (See Community Lead Response Advisory Committee March 4, 2019 Meeting Power Point, at 18.)

Response: In the 2019 Work Order areas, there are 2,994 locations with a public side non-lead historical record that are not presently in the program; and of these, it is estimated that 1,112 would have private lead.

Additionally, of the 2019 work order areas where PWSA verifies the status of the line (i.e. excavate and find non-lead on the public side), it is estimated that about 14 percent, or 303, would be private-side-only lead service lines.

Response Provided by: Robert A. Weimar, Executive Director, The Pittsburgh Water and Sewer Authority
Daniel T. Duffy, P.E.*, PMP, Lead Service Line Replacement Project Manager
Consultant (East Woods Associates, LLC) for
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VII in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VII-7 Please provide PWSA's estimate for the number of private-side-only lead service lines located in the work order areas for the 2018 Lead Service Line Replacement Program. (See Community Lead Response Advisory Committee March 4, 2019 Meeting Power Point, at 18.)

Response: In the 2018 Work Order areas, there were 1,051 locations with a public side non-lead historical record that were not included in the program; and of these it is estimated that 410 would have private lead

In addition, in 2018, 118 locations in the program were verified non-lead on the public side and lead on the private side of the service lines.

Response Provided by: Robert A. Weimar, Executive Director, The Pittsburgh Water and Sewer Authority
Daniel T. Duffy, P.E.*, PMP, Lead Service Line Replacement Project Manager
Consultant (East Woods Associates, LLC) for
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Bureau of Investigation and Enforcement,
Set I&E-PS-22 through I&E-PS-42
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: I&E-PS-23	Does PWSA have an estimate of the number of lead service lines still remaining in its system? If yes, please provide the estimate. If not, please indicate what action(s) PWSA must undertake in order to produce an estimate.
Response:	Based on the March 31, 2018 Updated Materials Evaluation Report, there were approximately 12,218 public side lead service lines in the system. Since the beginning of 2018 (and through February 1, 2019), 2,134 public side service lines have been replaced leaving around 10,100 remaining.
Response Provided by:	Robert A Weimar, Executive Director Dan Duffy, P.E.*, PMP Lead Service Line Replacement Project Manager Consultant for The Pittsburgh Water and Sewer Authority
Dated:	Robert A Weimar, Executive Director

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Bureau of Investigation and Enforcement,
Set I&E-PS-22 through I&E-PS-42
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: I&E-PS-30	Reference the response to I&E-RR-1 Attachment A. Lead Service Line Replacement appears to end as a separate capital spending line Item in 2019. Please confirm that spending for LSLRs occurs thereafter under the Small Diameter Water Main Replacement line item.
Response:	Confirmed.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	February 28, 2019

Response of Pittsburgh Water and Sewer Authority ("PWSA") to the Interrogatories of the Pittsburgh United, Set IX in Docket No. R-2018-3002645 and Docket No. R-2018-3002647

Request: UNITED-IX-12: How many customers does PWSA expect to seek reimbursement for the cost of replacing private-side lead service lines between July 1, 2016 and December 31, 2018? Is there a maximum number of customers who can receive reimbursement through this program? (See UNITED II-1 Att. BBB, at 2; UNITED II-70.)

Objection: PWSA filed objections to this request September 10, 2018 on the grounds that it is; (1) beyond the scope of this proceeding and irrelevant; and, (2) unreasonably burdensome and require an expensive special investigation. 52 Pa. Code § 5.321(c); 5.361(a)(2), (4). The Commission specifically directed that PWSA's Compliance Plan shall include "a plan to address lead levels. A detailed inquiry of this nature is well beyond the scope of this Tariff proceeding, the purpose of which is to set the rate levels for PWSA and to approve its initial Tariff. Final Implementation Order ("FIO") at 45, Ordering Paragraph 6. PWSA is in the process of developing its Compliance Plan which must be filed by September 28, 2018 and will address these issues.

Notwithstanding these objections, and without waiver thereof, in an effort to be cooperative PWSA provides the following response. This cooperative production is without waiver of PWSA's position that the review of PWSA's lead service line program has been directed by the Commission to occur in its Compliance Plan proceeding.

Response: As of September 6, 2018, approximately 155 customers have replaced their private side lead service line since July 1, 2016 and may seek reimbursement from PWSA.

Response Provided by: Robert A. Weimar, Executive Director
Barry King, P.E., Interim Director of Engineering and Construction
The Pittsburgh Water & Sewer Authority

Dated: September 14, 2018

Appendix C

Other Documents

Consent Order and Agreement, In the Matter of Pittsburgh Water and Sewer Authority regarding Violations of the Pennsylvania Safe Drinking Water Act and the Rules and Regulations Promulgated Thereto Regarding the Lead and Copper Rule (Nov. 17, 2017) ..... Appendix C.1

Richard Rabin, The Lead Industry and Lead Water Pipes: "A Modest Campaign," 98 Am. J. Pub. Health 1584 (2008) ..... Appendix C, 28

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In The Matter Of:

Pittsburgh Water and Sewer Authority	:	Violations of the Pennsylvania Safe
Penn Liberty Plaza 1	:	Drinking Water Act and the Rules and
1200 Penn Avenue	:	Regulations Promulgated Pursuant Thereto
Pittsburgh, PA 15222	:	Regarding the Lead and Copper Rule

CONSENT ORDER AND AGREEMENT

This Consent Order and Agreement is entered into this 17th day of November 2017, by and between the Commonwealth of Pennsylvania, Department of Environmental Protection (Department) and the Pittsburgh Water and Sewer Authority (PWSA).

The Department has found and determined the following:

A. The Department is the agency with the duty and authority to administer and enforce the Pennsylvania Safe Drinking Water Act, Act of May 1, 1984, P.L. 206, *as amended*, 35 P.S. §§ 721.1-721.17 (Safe Drinking Water Act); Section 1917-A of the Administrative Code of 1929, Act of April 9, 1929, P.L. 177, *as amended*, 71 P.S. § 510–17 (Administrative Code); and the rules and regulations promulgated thereunder (Regulations).

B. PWSA is a municipal authority with a business address of Penn Liberty Plaza 1, 1200 Penn Avenue, Pittsburgh, Pennsylvania 15222. PWSA is a "person" and a "supplier of water," as those terms are defined in Section 3 of the Safe Drinking Water Act, 35 P.S. § 721.3, and Section 1 of the Regulations, 25 Pa. Code § 109.1.

C. PWSA leases, operates, and is the permittee of a "public water system" and, more specifically, a "community water system," as those terms are defined in Section 3 of the Safe Drinking Water Act, 35 P. S. § 721.3, and Section 1 of the Regulations, 25 Pa. Code § 109.1.

PWSA's public water system consists of water sources, storage facilities, treatment facilities and a distribution system (System). PWSA provides drinking water through the System to approximately 520,000 people in the Pittsburgh, Pennsylvania area, including approximately 250,000 residential customers. PWSA operates the System pursuant to multiple public water supply permits issued by the Department, and has been assigned Public Water System Identification Number 5020038. The City of Pittsburgh owns the System and leases it to PWSA.

Failure to Treat as Permitted

D. Section 7(a) of the Safe Drinking Water Act, 35 P.S. § 721.7(a), provides that it is unlawful for any person to substantially modify a community water system without first having received a written permit from the Department authorizing such modification. "Substantial modification" includes changes which may affect the quality of water served to the public or may be prejudicial to the public health and safety.

E. Section 109.1105(a) of the Regulations, 25 Pa. Code § 109.1105(a), provides that a person may not substantially modify corrosion control treatment facilities without having obtained appropriate permit approvals from the Department authorizing such modification. Section 109.501(b) of the Regulations, 25 Pa. Code § 109.501(b), provides that a person may not substantially modify a permitted public water system without first obtaining an amended construction permit from the Department pursuant to Section 109.503(b).

F. On July 26, 1995, the Department approved PWSA's corrosion control feasibility study, which identified the use of lime and soda ash as the optimal corrosion control treatment for PWSA's System. PWSA's use of optimal corrosion control treatment is required for compliance with the Regulations under 25 Pa. Code Chapter 109, Subchapter K, Lead and Copper, and was incorporated by reference in Public Water Supply Permit No. 465W001-T1-C1,

as amended, which sets forth the applicable water quality parameters (WQPs) to monitor the effectiveness of PWSA's corrosion control treatment.

G. In April of 2014, PWSA made substantial modification to its corrosion control treatment facilities and to its public water system by substituting caustic soda for soda ash as the primary chemical for corrosion control without first obtaining an amended construction permit from the Department, in violation of Sections 109.501(b) and 109.1105(a) of the Regulations, 25 Pa. Code §§ 109.501(b) and 109.1105(a), and Section 7(a) of the Safe Drinking Water Act, 35 P.S. § 721.7(a). PWSA has informed the Department that in early 2016, it reinstituted the use of soda ash in the System.

H. On April 25, 2016, after learning of PWSA's unauthorized substantial modification to the corrosion control treatment facilities at its System, the Department issued an Administrative Order to PWSA directing the Authority to undertake a number of actions to, among other things: investigate lead levels within the System and evaluate impacts from PWSA's change in corrosion control chemicals; provide public notice to its consumers regarding the change of corrosion control chemicals and measures to evaluate impacts; conduct a feasibility study and develop recommendations for optimization of corrosion control treatment for the System; and submit a final report of the study to the Department with all data and PWSA's recommendations for optimal corrosion control protection within the System.

I. PWSA submitted a corrosion control study plan and schedule on May 24, 2016 pursuant to the Administrative Order. On June 24, 2016, the Department provided PWSA with its comments on the plan and conditionally approved the plan subject to PWSA's incorporation of the modifications discussed in the Department's comment letter dated June 24, 2016. PWSA subsequently submitted to the Department a revised version of the plan dated July 14, 2016,

which incorporated the Department's suggested modifications (Plan). Under the Plan, PWSA was to complete its corrosion control treatment feasibility study by the end of June 2017 and submit the final report and recommendations to the Department by July 30, 2017. As of the date of this Consent Order and Agreement, PWSA has not completed the corrosion control treatment feasibility study required under the Order to develop recommendations for optimal corrosion control within its System. Further, PWSA has not evaluated impacts to the System from its change of corrosion control chemicals as required under the Order. PWSA's failure to complete these activities by June 30, 2017 is in violation of the Department's Order, Section 13(a) of the Safe Drinking Water Act, 35 P.S. § 721.13(a), and Sections 109.4 and 109.1102(b)(3) of the Regulations, 25 Pa. Code §§ 109.4 and 109.1102(b)(3).

J. Section 703(a) of the Regulations, 25 Pa. Code § 109.703(a), provides that public water system facilities approved by written permit from the Department shall be operated in a manner consistent with the terms and conditions of the permit to achieve the level of treatment for which the facilities were designed.

K. From August 26, 2016 until July 27, 2017, PWSA failed to operate the treatment facilities in accordance with Permit No. 465W001-T1-C1, in violation of Section 109.703(a) of the Regulations, by failing to maintain and utilize equipment necessary to feed dry lime for raw water pH adjustment. The Department issued to the Authority Construction Permit No. 0216544 on April 18, 2017, for the installation of liquid lime (calcium hydroxide) as a replacement for the dry lime used for pH control in the raw water. The Department issued to the Authority Operation Permit No. 0217533 on July 10, 2017 to begin using the liquid lime feed system. On July 27, 2017, PWSA instituted liquid lime feed for the System.

Lead Action Level Exceedances 2016

L. PWSA is required, pursuant to the regulations, to conduct regular and specific lead and copper monitoring in order to evaluate the level of these substances in the public drinking water and the effectiveness of the System's corrosion controls.

M. Section 109.1102(a) of the Regulations, 25 Pa. Code § 109.1102(a), establishes an action level for lead at 0.015 mg/L, and provides that the action level is exceeded when the concentration in more than 10% of the tap water samples collected during the monitoring period (known as the 90th percentile amount) is greater than the action level.

N. PWSA conducted lead and copper monitoring of its System between January 1, 2016 and June 30, 2016 and between July 1, 2016 and December 31, 2016. The results showed a lead level of 0.022 mg/L and 0.018 mg/L, respectively, at the 90th percentile, which exceeded the action level for lead. PWSA conducted lead and copper monitoring of its System between January 1, 2017 and June 30, 2017. The results showed a lead level of 0.015 mg/L at the 90th percentile, which equaled but did not exceed the action level for lead.

O. Section 109.1107(d)(1) of the Regulations, 25 Pa. Code § 109.1107(d)(1), requires a system such as PWSA that exceeds the lead action level when conducting lead and copper tap monitoring to initiate lead service line replacement. The first year of lead service line replacement begins on the first day following the end of the monitoring period in which the lead action level was exceeded. For PWSA, this first year of required lead service line replacement began on July 1, 2016, and ended on June 30, 2017.

Failure to Conduct System Materials Evaluation

P. Section 109.1107(a)(6) of the Regulations, 25 Pa. Code § 109.1107(a)(6), requires that a water system that is required to initiate lead service line replacement submit to the

Department within the first three months of the first year of lead service line replacement: evidence that a materials evaluation of the system that meets the requirements of Section 109.1103(g)(1) of the Regulations, 25 Pa. Code § 109.1103(g)(1), has been conducted; a schedule for replacing at least 7% of the lead service lines identified in the materials evaluation; and the initial number of lead service lines in its distribution system and the portions owned by the system based on a materials evaluation.

Q. Section 109.1103(g)(1) of the Regulations, 25 Pa. Code § 109.1103(g)(1), requires water suppliers to complete a materials evaluation that includes the review of:

> (1) plumbing codes, permits and records in the files of the building departments of each municipality served by the system which indicate the plumbing materials that are installed within structures connected to the distribution system;
>
> (2) inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and
>
> (3) existing water quality information indicating locations that may be particularly susceptible to high lead or copper concentrations.

R. As a result of its exceedance of the lead action level, PWSA was required, under 25 Pa. Code § 109.1107(a)(6), to complete a materials evaluation by September 30, 2017 to determine the initial number of lead service lines in its system that would be subject to the 7% lead service line replacement requirements of Section 109.1107(d)(2) of the Regulations, 25 Pa. Code § 109.1107(d)(2), and a schedule for replacing at least 7% of the identified lead service lines. On September 30, 2016, PWSA submitted to the Department a "Lead Service Line Inventory Estimate," stating to the Department that "PWSA does not currently have an accurate material inventory of the approximately 80,000 active service lines in their system." PWSA requested that it be allowed to utilize its Lead Service Line Inventory Estimate to calculate the initial number of lead service line replacements it is required to perform, and the Department

approved this request for the first year of required line replacements only, which ended on June 30, 2017, but found the Lead Service Line Inventory Estimate to be insufficient as a complete materials evaluation. As of September 30, 2016, and since that date, PWSA has failed to submit a materials evaluation of the System that meets the requirements of Section 109.1103(g)(1) of the Regulations, 25 Pa. Code § 109.1103(g)(1), and a lead service line replacement schedule, in violation of Sections 109.1107(a)(6) and 109.1103(g)(1) of the Regulations, 25 Pa. Code §§ 109.1107(a)(6) and 109.1103(g)(1).

Failure to Replace Lead Service Lines

S. Section 109.1107(d)(2) of the Regulations, 25 Pa. Code § 109.1107(d)(2), requires water suppliers that exceed the lead action level to replace annually at least 7% of the initial number of lead service lines in place in their system at the beginning of the first year of replacement. Under Section 109.1107(d)(4) of the Regulations, 25 Pa. Code § 109.1107(d)(4), a water supplier is required to replace the system owned portion of the lead service line.

T. Within the "Lead Service Line Inventory Estimate" it submitted, PWSA estimated that the System had 19,152 lead service lines and therefore PWSA would need to replace at least 1,341 lead service lines prior to June 30, 2017.

U. On June 30, 2017, PWSA reported to the Department that only 415 lead service lines had been replaced of the required 1,341, in violation of Section 109.1107(d)(2) of the Regulations, 25 Pa. Code § 109.1107(d)(2).

Failure to Meet Notice and Sampling Requirements

V. Section 109.1107(d)(4) of the Regulations, 25 Pa. Code § 109.1107(d)(4), requires water suppliers conducting partial lead service line replacements to notify the owner of the other portion of the service line that the water supplier will replace the system-owned portion

of the line, and to offer to replace the privately owned portion of the service line at the owner's expense, unless prohibited by law. If the entire length of service line is not replaced at the same time, the water supplier must: (i) provide notice to the residents of all buildings served by the line at least 45 days prior to commencing partial line replacement with specific information regarding partial replacement and that the system will, at its own expense, collect a sample from each partially-replaced lead service line that is representative of the water in the service line for analysis of lead content within 72 hours after completion of the partial replacement of the service line; and (ii) collect the sample and report the results of the analysis to the owner and the residents served by the line within 3 business days of receiving the results.

W. During the period of 2016-2017, PWSA performed non-emergency partial lead service line replacements of the lines serving at least 60 residences without first providing the residents of these structures at least 45 days advance notice of the Authority's intention to perform a partial line replacement, in violation of Section 109.1107(d)(4) of the Regulations, 25 Pa. Code §109.1107(d)(4). For at least 149 residences, PWSA failed to collect a sample of the water from the structures for analysis within 72 hours of partial replacement of the lead service line, in violation of Section 109.1107(d)(4) of the Regulations, 25 Pa. Code §109.1107(d)(4).

X. The violations described in Paragraphs G, I, K, R, U and W, above, constitute a public nuisance under Section 12 of the Safe Drinking Water Act, 35 P.S. § 721.12, and subject PWSA to a claim for civil penalties under Section 13(g) of the Safe Drinking Water Act, 35 P.S. § 721.13(g).

Y. PWSA has informed the Department that, if and when PWSA meets the lead action level during two consecutive 6-month monitoring periods under the Lead and Copper

Rule Regulations, such that it no longer is required to conduct 7% annual lead service line replacement, PWSA intends to continue to replace lead service lines in accordance with a water main and service line replacement plan that PWSA will establish.

After full and complete negotiation of all matters set forth in this Consent Order and Agreement and upon mutual exchange of covenants contained herein, the parties desiring to avoid litigation and intending to be legally bound, it is hereby ORDERED by the Department and AGREED to by PWSA as follows:

1. Authority. This Consent Order and Agreement is an Order of the Department authorized and issued pursuant to Section 5 of the Safe Drinking Water Act, 35 P.S. § 721.5; and Section 1917-A of the Administrative Code, 71 P.S. § 510-17.

2. Findings.

a. PWSA agrees that the findings in Paragraphs A through Y are true and correct and, in any matter or proceeding involving PWSA and the Department, PWSA shall not challenge the accuracy or validity of these findings.

b. The parties do not authorize any other persons to use the findings in this Consent Order and Agreement in any matter or proceeding.

3. Corrective Action. PWSA shall undertake and complete the following tasks pursuant to the following schedule:

a. For any structure for which PWSA completes a partial lead service line replacement (in which the portion of the lead service line not owned by PWSA remains in service for the structure), PWSA shall report this as a partial lead service line replacement as part of the reporting required by 25 Pa. Code § 109.1107(a)(6) and comply with the advance notification and follow-up testing requirements set forth in 25 Pa. Code § 109.1107(d)(4)(i)-(iii)

for every owner, resident and tenant of the structure. In addition, PWSA shall, for each owner, resident and tenant of the structure:

i. provide (via door hanger notification) an additional advance notification not more than five (5) days and not less than seventy-two (72) hours prior to the initiation of work;

ii. upon initiation of partial lead service line replacement, provide (by in-person delivery or by leaving at the front door of the residence) NSF-certified lead removal filters and replacement cartridges for six (6) months of use;

iii. if initial follow-up testing of the water is not conducted because the resident failed to collect the sample, provide (via door hanger notification) a second notice for follow-up testing; and

iv. if initial follow-up testing of water from the line shows that the lead level exceeds 0.015 mg/L, offer (via door hanger notification with self-addressed postage pre-paid mailer) NSF-certified replacement cartridges for an additional six (6) months of use and provide sample bottles for subsequent follow-up lead testing every three (3) months after partial lead service line replacement until: (a) the lead level in the water from the line is at or below 0.015 mg/L and the water from the line is at or below the pre-replacement lead level, if available; or (b) the resident has failed to return samples on two consecutive sampling opportunities.

v. In the case of emergency water main and service line repairs or replacements, PWSA may, under 25 Pa. Code § 109.1107(d)(4)(i), provide a shorter time period for notification to affected residents. In the case of

emergencies, PWSA shall provide affected residents with as much advance notice as is possible prior to conducting a partial lead service line replacement. If no advance notice is possible, PWSA shall provide concurrent notification to affected residents at the time it performs the partial lead service line replacement. PWSA shall submit documentation to the Department within ten (10) days of the repair or replacement demonstrating the emergency circumstance, which documentation shall also include the date, address and description of repairs or replacements made. Provision of lead filters and cartridges and follow-up testing must still be completed according to the other requirements of Paragraph 3.a., above.

b. i. On or before December 31, 2017, PWSA shall submit to the Department an interim report of the results of the corrosion control treatment feasibility study required within the Plan submitted and approved under Paragraph 4.a. of the Administrative Order. PWSA shall submit a final report in accordance with 25 Pa. Code §§ 109.1102(b)(2)(ii)(A) and 109.1102(b)(3) on or before March 31, 2018. This paragraph supersedes the requirement for PWSA to submit the results and final report of its corrosion control feasibility study by July 30, 2017 as discussed in Paragraph I, above, and required under Paragraph 4.a. of the Administrative Order. All other requirements in Paragraphs 4.a. and 4.b. of the Administrative Order remain in full force and effect. In the event the Department notifies PWSA of any deficiencies in the study, PWSA shall fully address all such deficiencies within the time period requested by the Department until the study is deemed acceptable by the Department's written notice to PWSA.

ii. Within 90 days of the Department's written approval of PWSA's feasibility study, PWSA shall submit to the Department a complete and technically sufficient application for an amended construction permit to construct the optimal corrosion control treatment identified by PWSA's corrosion control study. PWSA shall fully address any deficiencies raised by the Department within the time frame requested.

iii. Within 180 days of the date the Department issues an amended construction permit to PWSA to modify the corrosion control treatment facilities for the System, PWSA shall complete construction of the modifications in accordance with the amended construction permit and submit to the Department a certification of construction to request an amended operation permit. PWSA shall begin operation of the modified corrosion control treatment facilities immediately upon issuance of an amended operation permit by the Department.

iv. Upon commencing operation of the modified corrosion control treatment facilities, PWSA shall conduct two consecutive 6-month periods of follow-up lead and copper tap monitoring at a minimum of one hundred (100) Tier 1 sites. During this time, PWSA also shall conduct monitoring of the applicable corrosion control treatment water quality parameter performance requirements (WQP) every 2 weeks at each entry point within the System and monthly at 25 locations within the distribution system.

v. Within 30 days of the end of the second period of follow-up tap monitoring required under Paragraph 3.b.iv., above, PWSA shall submit to the Department a request for designation of optimal corrosion control treatment

WQP. PWSA shall fully address any deficiencies raised by the Department within the time frame requested.

vi. Following the Department's designation of optimal corrosion control treatment WQP for PWSA's System, PWSA shall continue to conduct WQP monitoring every 2 weeks at each entry point and monthly at 25 locations within the distribution system for a period of one year.

c. i. On or before December 31, 2017, PWSA shall provide the Department with a Data Summary (in a spreadsheet or spreadsheets) from its GIS system utilizing all inspections and records currently in the possession of or accessible to PWSA, which includes scanned historical records (for City-owned service lines), curb box inspections completed through that date, and field studies completed through that date.

ii. On or before March 31, 2018, PWSA shall provide the Department with: (a) an updated materials evaluation containing all of the lead service line information from the Data Summary, as well as any additional lead service line information collected and processed subsequent to the Data Summary; and (b) a lead service line replacement schedule in conformance with the requirements of this Consent Order and Agreement.

iii. On or before December 31, 2020, PWSA shall provide a supplemental materials evaluation to the Department for all residential structures (single family and multi-family) connected to the system for which PWSA has not been able to confirm the absence of lead service lines, based on the sources of information listed in 25 Pa. Code § 109.1103(g)(1)(ii) and (iii), the results of

PWSA's inspection of service lines (including curb box inspections, if technically feasible, and other field studies, if technically feasible), or both. PWSA shall also identify the ownership of all portions of each line.

iv. On or before December 31, 2022, PWSA shall provide a supplemental materials evaluation to the Department for all structures connected to the system, based on the sources of information listed in 25 Pa. Code § 109.1103(g)(1)(ii) and (iii) and any updated information PWSA has developed from other sources.

v. In the event the Department notifies PWSA of any deficiencies in any of the Data Summary or materials evaluation submissions by PWSA under this paragraph, PWSA shall fully address all deficiencies within the time period requested by the Department until the Data Summary or materials evaluation is deemed acceptable by the Department.

d. On or before June 30, 2018, PWSA shall have, since July 1, 2016, replaced at least 1,341 lead service lines in place within the System. If PWSA determines that it has the legal authority and available funding to replace the privately owned portion of lead service lines when it replaces the City-owned portions, PWSA may submit a revised schedule for full line replacements, which the Department will consider in its sole discretion. PWSA waives any right that it may have to challenge the Department's decision in this regard.

e. Lead service line replacements:

i. Unless PWSA has met the 90th percentile lead action level during two consecutive rounds of 6-month monitoring by June 30, 2018, PWSA shall, on or before December 31, 2018, replace at least an additional 7% of the lead service

lines in place within the System, based upon the updated materials evaluation that PWSA is required to submit to the Department by March 31, 2018 and that has been accepted as compliant by the Department pursuant to Paragraph 3.c.

ii. Thereafter, unless and until PWSA has met the 90th percentile lead action level during two consecutive rounds of 6-month monitoring by June 30 of each calendar year, PWSA shall, on or before June 30th of the following calendar year, have replaced at least an additional 7% of the lead service lines within the System, based upon the most recently updated materials evaluation that has been accepted as compliant by the Department pursuant to Paragraph 3.c. To calculate the 7% amount, PWSA shall add the total number of lead service lines identified in the updated materials evaluation and the total number of lead service lines replaced by PWSA since July 1, 2016, and then calculate 7% of that combined total.

iii. If PWSA does meet the 90th percentile lead action level during two consecutive rounds of 6-month monitoring, but thereafter exceeds the 90th percentile lead action level, PWSA shall comply with all applicable requirements of the Regulations.

f. Every three (3) months, beginning on the date three (3) months after the date of this Consent Order and Agreement, PWSA shall provide to the Department a written report, detailing: the progress and status of PWSA's implementation of the Plan submitted pursuant to Paragraph 4.a. of the Administrative Order; repeat public notice and public education tasks; consumer tap notices; 72-hour partial line replacement sample results; and PWSA's compliance with the requirements of this Consent Order and Agreement, including but not

limited to any locations where PWSA has not complied with the provisions of Paragraph 3.a., above. Upon request by the Department, PWSA shall provide, within the time frame requested by the Department, information regarding lead service line replacement activities, including notification to residents; the results of the follow-up lead testing referenced in Paragraph 3.a.iv., above; outreach efforts to obtain follow-up samples; and the status of PWSA's provision of NSF-certified lead removal filters. The requirement for monthly progress reports set forth in Paragraph 4.a. of the Administrative Order is superseded by the reporting requirements contained herein. All other requirements in Paragraphs 4.a. and 4.b. of the Administrative Order remain in full force and effect.

g. PWSA shall provide repeat Tier 2 public notice to its customers within thirty (30) days following each six-month lead sampling event for which PWSA exceeds 0.015 mg/L of lead. This notice is in addition to the public education program required under Section 109.1104 of the Regulations, 25 Pa. Code § 109.1104. The notice shall include the 90th percentile value of the monitoring results, and any updates to the measures PWSA is undertaking under its approved Plan under Paragraph 4.a. of the Administrative Order, including PWSA's progress in conducting its investigation, determining the effect of changes to treatment methods, and developing recommendations for optimization of corrosion control within the System.

h. PWSA shall use adequately and appropriately qualified staff or consultants to perform the corrective actions required under this Consent Order and Agreement.

4. Civil Penalty Settlement.

a. Within thirty (30) days of execution of this Consent Order and Agreement, and subject to the provisions of Paragraphs 4.b. and 4.c., below, PWSA shall pay a civil penalty in the amount of TWO MILLION FOUR HUNDRED THOUSAND DOLLARS ($2,400,000)

for the violations set forth in Paragraphs G, I, K, R, U and W, for the dates set forth above and no others. The payment shall be made by corporate check or the like made payable to the "Commonwealth of Pennsylvania – Safe Drinking Water Fund" and sent to Renee Diehl, Operations Sections Chief, Department of Environmental Protection, 400 Waterfront Drive, Pittsburgh, PA 15222-4745.

b. Community Environmental Project. Up to ONE MILLION EIGHT HUNDRED THOUSAND DOLLARS ($1,800,000) of the civil penalty assessed in this Consent Order and Agreement may be paid by PWSA by performing a Community Environmental Project acceptable to the Department as described below. If the Department does not approve PWSA's proposed Community Environmental Project within ninety (90) days of execution of this Consent Order and Agreement, then PWSA shall pay the unpaid portion of the civil penalty amount pursuant to Paragraph 4.a., above, within one hundred twenty (120) days of execution of this Consent Order and Agreement.

c. Within sixty (60) days of execution of this Consent Order and Agreement, PWSA may submit a detailed proposal for a Community Environmental Project that will result in the distribution, through a suitable third party administrator, of grant money or low-interest loan money to low income homeowners in the PWSA service system to assist these homeowners in their replacement of privately owned lead service lines on their property. No funds utilized under the Community Environmental Project shall be expended for administrative or oversight costs, nor used to fulfill any activity required of PWSA under law. Any funds that have not been utilized to fulfill the purpose of the approved Community Environmental Project within three (3) years from the execution of this Consent Order and Agreement shall be paid to the Department

as civil penalties pursuant to Paragraph 4.a., within sixty (60) days of termination of that time period.

d. PWSA shall not deduct any costs incurred in connection with or in any way associated with the Community Environmental Project described in Paragraph 4 for any tax purpose or otherwise obtain favorable tax treatment for those costs. If requested to do so by the Department, PWSA shall submit an affidavit of the official responsible for the financial affairs of PWSA certifying that PWSA has not deducted or otherwise obtained favorable tax treatment of any of the costs of the Community Environmental Project.

e. PWSA agrees that whenever it publicizes, in any way, the Community Environmental Project, it will state that the Project was undertaken as part of the settlement of an enforcement action with the Department.

f. PWSA shall submit to the Department an affidavit of the official responsible for overseeing the Project every ninety (90) days, beginning upon the approval by the Department of PWSA's proposed Community Environmental Project. The affidavit shall describe the dates and amounts of all funds allocated and distributed pursuant to the approved Project, including but not limited to the locations and funding amounts per location of funds used. PWSA shall provide the Department with any other documentation and information requested by the Department.

5. Stipulated Civil Penalties.

a. In the event PWSA fails to comply in a timely manner with the provisions of Paragraph 3 of this Consent Order and Agreement, PWSA shall be in violation of this Consent Order and Agreement and, in addition to other applicable remedies, shall pay a civil penalty in the amount determined under the following schedule:

i. For any violation of Paragraph 3.a., $500 per violation per residence;

ii. For any violation of Paragraphs 3.b. or 3.c., $250 per day for each violation;

iii. For any violation of Paragraphs 3.d. or 3.e., $200 per month for each line not replaced;

iv. For any violation of Paragraph 3.f., the Department reserves the right to determine and assess appropriate civil penalties based on the circumstances of the violation and the factors enumerated in Section 13(g) of the Safe Drinking Water Act;

v. For any violation of Paragraph 3.g., $250 per day for each violation.

b. Stipulated civil penalty payments shall be payable monthly on or before the fifteenth day of each succeeding month, and shall be forwarded as described in Paragraph 4 (Civil Penalty Settlement), above.

c. Any payment under this paragraph shall neither waive PWSA's duty to meet its obligations under this Consent Order and Agreement nor preclude the Department from commencing an action to compel PWSA's compliance with the terms and conditions of this Consent Order and Agreement. The payment resolves only PWSA's liability for civil penalties arising from the violation of this Consent Order and Agreement for which the payment is made.

d. Stipulated civil penalties shall be due automatically and without notice.

6. Remedies for Failure to Complete Community Environmental Project. In the event that PWSA fails to complete its obligations under the approved Community Environmental

Project referred to in Paragraph 4, PWSA shall pay an additional stipulated penalty in the amount of $5,000. In this event, or if PWSA's operation of the System terminates or is transferred to another entity during the term of the Community Environmental Project, PWSA shall within fifteen (15) days of receipt of written notification from the Department, pay all funds that have not been utilized to fulfill the purpose of the approved Community Environmental Project to the Department as civil penalties pursuant to Paragraph 4.a.

7. Additional Remedies.

a. In the event PWSA fails to comply with any provision of this Consent Order and Agreement, the Department may, in addition to the remedies prescribed herein, pursue any remedy available for a violation of an order of the Department, including an action to enforce this Consent Order and Agreement.

b. The remedies provided by this paragraph and Paragraph 5 (Stipulated Civil Penalties) are cumulative and the exercise of one does not preclude the exercise of any other. The failure of the Department to pursue any remedy shall not be deemed to be a waiver of that remedy. The payment of a stipulated civil penalty, however, shall preclude any further assessment of civil penalties for the violation for which the stipulated penalty is paid.

8. Reservation of Rights. The Department reserves the right to require additional measures to achieve compliance with applicable law. PWSA reserves the right to challenge any action which the Department may take to require those measures.

9. Liability of PWSA. PWSA shall be liable for any violations of the Consent Order and Agreement, including those caused by, contributed to, or allowed by its officers, agents, employees, or contractors. Except as provided in Paragraph 10.c., PWSA also shall be liable for

any violation of this Consent Order and Agreement caused by, contributed to, or allowed by its successors and assigns.

10. Transfer of Site.

a. The duties and obligations under this Consent Order and Agreement shall not be modified, diminished, terminated or otherwise altered by the transfer of any legal or equitable interest in the Water System or any part thereof.

b. If PWSA intends to transfer any legal or equitable interest in the Water System which is affected by this Consent Order and Agreement, PWSA shall serve a copy of this Consent Order and Agreement upon the prospective transferee of the legal and equitable interest at least thirty (30) days prior to the contemplated transfer and shall simultaneously inform the Southwest Regional Office of the Department of such intent.

c. The Department in its sole discretion may agree to modify or terminate PWSA's duties and obligations under this Consent Order and Agreement upon transfer of the PWSA System or any part thereof. PWSA waives any right that it may have to challenge the Department's decision in this regard.

11. Department Consent to Transfer, Assignment or Termination of Lease. During the term of this Consent Order and Agreement, PWSA shall not approve or consent to the transfer, assignment or termination of its lease and operation of the System unless the intended new owner and/or operator of the water system first enters into a consent order and agreement with the Department in which it obligates itself to timely complete all of PWSA's obligations that are required under this Consent Order and Agreement.

12. Correspondence with Department. All correspondence with the Department concerning this Consent Order and Agreement shall be addressed to:

Renee Diehl, Operations Section Chief
Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive
Pittsburgh, Pennsylvania 15222-4745
Telephone: 412.442.4210 Facsimile: 412.442.4242

13. Correspondence with PWSA. All correspondence with PWSA concerning this Consent Order and Agreement shall be addressed to:

Robert Weimar, Interim Executive Director
Pittsburgh Water and Sewer Authority
Penn Liberty Plaza 1
1200 Penn Avenue
Pittsburgh, PA 15222
Telephone: 412-255-2579

PWSA shall notify the Department whenever there is a change in the contact person's name, title, or address. Service of any notice or any legal process for any purpose under this Consent Order and Agreement, including its enforcement, may be made by mailing a copy by first class mail to the above address.

14. Force Majeure.

a. In the event that PWSA is prevented from complying in a timely manner with any time limit imposed in this Consent Order and Agreement solely because of a strike, fire, flood, act of God, or other circumstance beyond the Authority's control and which PWSA, by the exercise of all reasonable diligence, is unable to prevent, then PWSA may petition the Department for an extension of time. An increase in the cost of performing the obligations set forth in this Consent Order and Agreement shall not constitute circumstances beyond PWSA's

control. PWSA's economic inability to comply with any of the obligations of this Consent Order and Agreement shall not be grounds for any extension of time.

b. PWSA shall only be entitled to the benefits of this paragraph if PWSA notifies the Department within five (5) working days by telephone and within ten (10) working days in writing of the date it becomes aware or reasonably should have become aware of the event impeding performance. The written submission shall include all necessary documentation, as well as a notarized affidavit from an authorized individual specifying the reasons for the delay, the expected duration of the delay, and the efforts which have been made and are being made by PWSA to mitigate the effects of the event and to minimize the length of the delay. The initial written submission may be supplemented within ten (10) working days of its submission. PWSA's failure to comply with the requirements of this paragraph specifically and in a timely fashion shall render this paragraph null and of no effect as to the particular incident involved.

c. The Department will decide whether to grant all or part of the extension requested on the basis of all documentation submitted by PWSA and other information available to the Department. In any subsequent litigation, PWSA shall have the burden of proving that the Department's refusal to grant the requested extension was an abuse of discretion based upon the information then available to it.

15. Severability. The paragraphs of this Consent Order and Agreement shall be severable and should any part hereof be declared invalid or unenforceable, the remainder shall continue in full force and effect between the parties.

16. Entire Agreement. This Consent Order and Agreement shall constitute the entire integrated agreement of the parties. No prior or contemporaneous communications or prior

drafts shall be relevant or admissible for purposes of determining the meaning or extent of any provisions herein in any litigation or any other proceeding.

17. Attorney Fees. The parties shall bear their respective attorney fees, expenses and other costs in the prosecution or defense of this matter or any related matters, arising prior to execution of this Consent Order and Agreement.

18. Modifications. No changes, additions, modifications, or amendments of this Consent Order and Agreement shall be effective unless they are set out in writing and signed by the parties hereto.

19. Titles. A title used at the beginning of any paragraph of this Consent Order and Agreement may be used to aid in the construction of that paragraph, but shall not be treated as controlling.

20. Decisions Under Consent Order. Any decision which the Department makes under the provisions of this Consent Order and Agreement, including a notice that stipulated civil penalties are due, is intended to be neither a final action under 25 Pa. Code § 1021.2, nor an adjudication under 2 Pa. C.S. § 101. Any objection which PWSA may have to the decision will be preserved until the Department enforces this Consent Order and Agreement.

21. Dispute Resolution.

a. PWSA may initiate dispute resolution under this paragraph, in response to any decision required of the Department under Paragraphs 3.a., 3.b., or 3.c.

b. To initiate dispute resolution, PWSA shall provide written notice to the Department within ten (10) days of the decision in dispute. PWSA shall have an additional ten days to provide the Department with a written list of objections to the decision in dispute, the

relevant facts, analysis and opinions and other supporting data ("Statement of Position"). The Department shall have twenty (20) days to provide its Statement of Position.

c. Within the twenty (20) day period following receipt of the Department's Statement of Position, the Safe Drinking Water Program Manager and PWSA's representative shall confer in an attempt to resolve the dispute. In the event the parties are unable to resolve the dispute within this period, the Statements of Position shall be provided to the Department's Southwest Regional Director to issue a final decision resolving the dispute.

d. During the pendency of the dispute resolution procedures set forth in subparagraphs b. and c., any obligation to be performed under this Consent Order and Agreement which is the subject of such dispute and any associated activities whose performance is directly dependent upon the resolution of the dispute shall be postponed for a period of time not to exceed the actual time taken to resolve the dispute pursuant to subparagraphs b. and c. or as otherwise agreed by the parties. All other obligations and activities shall be completed in accordance with the terms of this Consent Order and Agreement.

e. Any time period for dispute resolution set forth herein may be extended by written agreement of the parties.

22. Termination. The obligations of this Consent Order and Agreement shall terminate when the Department determines in writing that PWSA has complied with the requirements of Paragraphs 3.a. – 3.d., 3.e.i., 3.e.ii., 4, 5, and 6, and has met the lead action level during two consecutive 6-month monitoring periods.

23. Resolution. Attached hereto as Appendix A is a resolution of the Board of PWSA authorizing its signatories below to enter into this Consent Order and Agreement on its behalf.

IN WITNESS WHEREOF, the parties hereto have caused this Consent Order and Agreement to be executed by their duly authorized representatives. The undersigned representatives of PWSA certify under penalty of law, as provided by 18 Pa. C.S. § 4904, that they are authorized to execute this Consent Order and Agreement on behalf of PWSA; that PWSA consents to the entry of this Consent Order and Agreement as a final ORDER of the Department; and that PWSA hereby knowingly waives its right to appeal this Consent Order and Agreement and to challenge its content or validity, which rights may be available under Section 4 of the Environmental Hearing Board Act, Act of July 13, 1988, P.L. 530, 35 P.S. § 7514; the Administrative Agency Law, 2 Pa. C.S. § 103(a) and Chapters 5A and 7A; or any other provisions of law. Signature by PWSA's attorney certifies only that the agreement has been signed after consulting with counsel.

FOR PITTSBURGH WATER AND SEWER AUTHORITY:

Robert Weimar
Interim Executive Director
Pittsburgh Water and Sewer Authority

David Ries
Attorney for Pittsburgh Water and Sewer Authority

FOR THE COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF ENVIRONMENTAL PROTECTION:

Alan Eichler
Environmental Program Manager
Bureau of Safe Drinking Water

John H. Herman
Regional Counsel

Gail Guenther
Assistant Counsel
Southwest Office of Chief Counsel

RESOLUTION NO. 222 OF 2017

THE PITTSBURGH WATER AND SEWER AUTHORITY
Allegheny County, Pennsylvania

The undersigned, an authorized representative of The Pittsburgh Water and Sewer Authority, hereby certifies that at a meeting held on the 17th day of November, 2017, after due notice, at which a quorum was present, the "Authority Board" unanimously adopted the following Resolution:

> RESOLVED, that The Pittsburgh Water and Sewer Authority (the "Governing Body") shall be, and the same hereby is authorized to execute and enter into the Consent Order and Agreement with the Pennsylvania Department of Environmental Protection. Appropriate officers of the Governing Body are hereby authorized to execute all certifications and documentation required in connection with the Amendment.

I hereby certify that the above Resolution is in full force and effect as of the 17th day of November, 2017.

WITNESS:

Debbie Lestitian
Chair, PWSA Board

216508354

The Lead Industry and Lead Water Pipes "A MODEST CAMPAIGN"

Richard Rabin, MSPH

Lead pipes for carrying drinking water were well recognized as a cause of lead poisoning by the late 1800s in the United States. By the 1920s, many cities and towns were prohibiting or restricting their use. To combat this trend, the lead industry carried out a prolonged and effective campaign to promote the use of lead pipes. Led by the Lead Industries Association (LIA), representatives were sent to speak with plumbers' organizations, local water authorities, architects, and federal officials. The LIA also published numerous articles and books that extolled the advantages of lead over other materials and gave practical advice on the installation and repair of lead pipes. The LIA's activities over several decades therefore contributed to the present-day public health and economic cost of lead water pipes. (*Am J Public Health.* 2008;98:1584–1592. doi:10.2105/AJPH.2007.113555)

SINCE THE CENTERS FOR Disease Control and Prevention began to establish acceptable blood lead levels for young children in the 1960s, the concentration at which blood lead levels have been thought to have significant health effects has steadily declined. That concentration has been reduced from 60 μg/dL to the current level of 10 μg/dL, which was established in 1991.[1] Research conducted in the past few years, however, suggests that there are health effects below that level, and that IQ declines at a faster rate below 10 μg/dL than above.[2,3]

Although lead-based paint is the single most important contributor to elevated blood lead levels in children, if just a few micrograms of lead per deciliter of blood are of concern and if we are to truly prevent the health effects of lead exposure in the United States, then water, as well as other sources of lead, must also be addressed. Water consumption is estimated to contribute, on average, about 10% to 20% of a child's total lead intake, and for infants fed formula, 40% to 60% of their lead exposure.[4]

In the past 2 decades, legislation and regulations at the federal level have helped to reduce water lead concentrations.[5–7] Nevertheless, lead in drinking water continues to be a public health concern. Over the past several years, significantly elevated lead levels in many cities have provoked public outcry. Lead-contaminated water in homes and schools has been detected in Boston, MA[8,9]; Durham, NC[10]; and Camden, NJ,[11] among many others. In Washington, DC, in 2004, there was considerable public concern when more than half the homes with lead service pipes were found to exceed the Environmental Protection Agency's (EPA's) action level of 15 parts per billion.[12] Public interest in this matter is evident from a computer search of general interest and business publications for the period between January 1995 and April 2007 with the terms *water* and *lead pipes* that yielded 220 articles.[13]

Recent US history has been marked by many environmental and public health crises initiated or exacerbated by corporate actors despite knowledge (or reasonable suspicion) that an activity or chemical exposure was particularly hazardous. Childhood lead paint poisoning,[14,15] asbestos-related deaths,[16,17] and tobacco-related diseases and mortality[18] are a few of these. Here I review the evidence that lead pipes for water distribution were installed well after they were considered a public health threat and examine the corporate activities and other factors contributing to their continued use.

BACKGROUND

Although the use of lead pipes for water distribution has a centuries-old history, installation of lead pipes in the United States on a major scale began in the late 1800s, particularly in the larger cities.[19] By 1900, more than 70% of cities with populations greater than 30 000 used lead water lines.[19] Although lead was more expensive than iron (the material of choice until that time), lead pipes had 2 significant advantages over iron ones: they lasted much longer than iron (about 35 years compared with 16) and, because they are more malleable, they could be more easily bent around existing structures.[19]

Concerns about the potential toxicity of lead from water that passes through lead pipes were documented even before lead came into widespread use. In 1859 a collection of articles was published presenting the views of various engineers, physicians, and public health officials. The editor of those articles began by noting the objections raised by residents of New York City and Boston to the introduction of lead for service pipes (the pipes that carry water from the street main to a building) and indoor plumbing:

> In other cities of the United States and of Europe the same feeling has at times more or less agitated the public mind, without leading however, thus far, to any serious modification of the long established practice [of installing lead pipes], that I am aware of, except in Hartford, Conn.[20(p)]

With the large-scale introduction of lead service pipes, numerous public health and newspaper accounts of lead poisoning from drinking water began to appear with increasing frequency. From the late 1800s to the early 1900s, numerous journal articles and reports appeared documenting the dangers to health of lead pipes.[21–28] One published bibliography in 1943 listed more than 100 articles and reports in English on lead poisoning from drinking water.[29] In 1890 the Massachusetts State Board of Health advised the state's cities and towns to avoid the use of lead pipes.[19] By the turn of the century, there was little doubt in the public health community that lead water pipes were to be avoided. By the 1920s, many cities had concluded that the engineering advantages of lead were outweighed by the public health risks, and local and state plumbing codes were revised to prohibit or limit the use of lead in pipes for water distribution.[19,30]

THE LEAD INDUSTRIES ASSOCIATION

The Lead Industries Association (LIA) was formed in 1928 as the lead industry's trade organization. Its membership encompassed both producers and users of lead products and included all the major producers. Lead mining and manufacturing was dominated by just 6 companies (all LIA members) until the 1960s: the National Lead Company, American Smelting and Refining, Anaconda, the Hecla Mining Company, Eagle Picher, and the St Joseph Lead Company.[31] The National Lead Company was by far the largest.[32]

As would be expected of an industrial trade association, a central function of the LIA was to promote the sale of its members' products. Lead pipe, of course, was one of them.

> We are endeavoring to keep abreast of any impending changes in plumbing codes. . . . We have also been investigating the use of lead in service pipe and other applications. We have been accumulating useful information pertaining to lead and expect soon to make it the basis of a modest educational campaign within the limits of the current budget.[33]

Although most of the lead industry's efforts to promote the use of lead in plumbing emphasized the positive (i.e., the advantages of lead over other materials), there clearly was some concern that the potential health hazard of lead pipes could jeopardize the market for lead pipes. In his 1929 report to the membership, the secretary noted that,

> Of late the lead industries have been receiving much undesirable publicity regarding lead poisoning. I feel the association would be wise to devote time and money on an impartial investigation which would show once and for all whether or not lead is detrimental to health under certain conditions of use.[33]

This public alarm over lead exposure can be attributed at least in part to reports in the popular press. In 1924, the *New York Times* reported on a medical conference that highlighted nonindustrial sources of lead, including lead paint.[34] During the Depression, it was not uncommon for poor persons to use old battery casings for fuel, and there were newspaper reports of families being lead poisoned.[35,36]

> *"Water is much more wholesome from earthenware pipes than from lead pipes. For it seems to be made injurious by lead, because white lead paint is produced from it; and this is said to be harmful to the human body."*
>
> *Vitruvius, first-century-BC Roman architect and engineer, De architectura*

Although subsequent LIA reports implied that the secretary primarily had lead paint in mind as the cause of this adverse publicity, the association also felt the need to address the public's concerns regarding lead pipes. For instance, in 1930 the LIA investigated a case of lead poisoning in conjunction with the Charleston Water Works.[37] (The findings of the investigation were inconclusive: lead service pipes had recently been installed, but contamination of the home was possible because the father was a house painter.[38])

From its inception until at least the early 1970s, the lead pipe manufacturers and their association used a wide variety of methods to promote their products, including the publication of numerous educational materials and model standards, attendance at professional meetings, and lobbying of local, state, and federal government agencies. In 1931, the LIA prepared a booklet and a "model" standard for lead pipes.[39] It also published the first edition of the book, *Useful Information About Lead*,[40] which described the many products made of lead. The chapter on plumbing advises that "the best material in a water service, though it may be slightly more expensive at first, is really an economy, and the best material is usually lead."[40(p74)] The exception, it notes, is

> when the water is very soft, or of swampy or peaty origin, that lead should not be used, but under those conditions other metals are also soluble, so lead may be used by adding a little sodium silicate solution to the water, as is done occasionally—or using tin-lined lead pipe.[40(p74)]

The LIA's 1934 annual meeting minutes record an "intensive" effort to reverse the downward trend in the use of lead pipes; contacts are reported with city officials, master plumbers, and plumbing associations. Over the next 2 decades, the LIA continued to promote lead pipes through contacts with plumber organizations and local boards, by lobbying federal agencies, and by publishing newsletters.

The association issued a bulletin for distribution to water works officials. LIA members who produced plumbing supplies made donations to the Plumbing and Heating Industries Bureau. The usefulness of cooperation with that organization was clear:

> As the Bureau was founded to promote the wider use of modern plumbing, it is essential that the role which lead plays in modern plumbing installations be not overlooked. Our cooperation with this Bureau will insure that lead receives ample and proper consideration.[41]

A key part of the campaign to boost sales of lead pipe was the hiring of an agent to, in the words of the LIA secretary,

> work on our behalf and I am pleased to report that the work has more than met with an excellent reception. It has grown so quickly and so strongly that it has reached a stage at which it is really too large a problem for one man working in the Eastern part of the United States alone to handle. We have rekindled an interest on the part of master and journeymen plumbers in the use of lead. We have pointed out to municipalities the risks that they run in advocating substitutes for lead and have received the endorsement of numerous important State master plumbers and journeymen plumbers associations with whom the subject has been discussed. . . Since the first of the year, even greater advances have been made and we firmly believe that in a comparatively short time there will be growing evidence of the advantageous results accuring [sic] to our members from this work.[41]

The report of the LIA's agent, Robert Dick, enumerates the year's specific accomplishments:

> (a) One code approved and put into operation, requiring lead wherever it is advisable to use lead in the plumbing system.
>
> (b) One town enforcing the use of lead throughout plumbing systems although not called for by its code.
>
> (c) Nine cities and towns with revised codes calling for lead throughout. These codes now ready to be submitted to the various councils for adoption.
>
> (d) Forty-eight cities and towns working on revisions to require lead throughout, but with the codes not yet ready for submission to council.
>
> (e) Forty-eight cities and towns in which no immediate action can be taken due either to political or financial conditions, or in a few cases, to opposition to the use of lead.[41]

Although this report does not mention the health-related reasons lead had been losing ground to other plumbing materials, it does discuss the economic pressures brought on by the Depression:

> The present time is a critical time for this work because during the depression years, the plumbing industry has experienced intense competition from the installations of handymen and others not actually engaged in the plumbing business so that the plumbers are now looking for anything that will protect their interests against these outsiders.[41]

Dick went on to explain that requiring the use of lead would be in the interest of professional plumbers because the installation of lead fixtures and pipes required a level of skill that others did not possess. This self-interest on the part of plumbers probably accounts for the reported success that the LIA had in persuading the

numerous plumber organizations to endorse the use of lead. Even into the 1940s, this economic motivation played some role in plumbers' desire to allow or even require lead. In Denver in 1947, when a proposal was made to permit iron and steel for domestic plumbing, the master plumbers organization blamed "self-seeking speculative builders," and one journeyman plumber was quoted as attributing the proposal to an attempt to "move '90-day wonders' and handymen into an industry which protects the health of the community."[42(p77)]

According to the secretary, 1938 was a banner year for the LIA. The association now had 3 representatives working on its Plumbing Promotion Program. Most of their time was taken up that year by attendance at 24 state conventions of master plumbers and by speaking at 19 of them. Outreach materials were produced and distributed to plumbers who were actively attempting to change their local building codes. The association's trade publication, *Plumbers' Forum*, had a mailing list of 22 500. Plans were announced to "work with various housing authorities to have lead specified in the plumbing of . . . large developments."[43] Plumbing code regulations were changed in Pennsylvania (to require lead for plumbing), Massachusetts (removal of the 5-foot limitation on lead), and in dozens of other cities. In this connection, the secretary reminded the members that

> It must be remembered that adoption of laws, as above, is slow work, but once adopted, make a relatively permanent requirement of lead. In many cities, we have successfully opposed ordinance or regulation revisions which would have reduced or eliminated the use of lead. We have prevented elimination of lead work from examinations for plumbers' licenses in New York and other cities, and have introduced license examinations with a lead work requirement in many places where no examinations for lead work were formerly required.[43(pp3–4)]

In cities where lead had fallen out of favor for a number of years, there was the danger that, even if a revised plumbing code reinstated lead as a permitted or required material, there would not be a sufficient number of plumbers trained in its installation and repair. Consequently, the LIA expended some effort to train a labor force skilled in working with lead. Cooperating with the Federal Committee on Apprentice Training, in 1938 the LIA established classes in several cities, including Chicago; Pittsburgh; San Francisco; St Paul, Minnesota; Wilkes-Barre, Pennsylvania; Youngstown, Ohio; and Phoenix. In addition, it began preparation of the section on lead of the *Standard Text on Plumbing*, to be published by the National Association of Master Plumbers.[44]

The pipe manufacturing members of the LIA were also concerned about the failure of lead plumbing, stemming from poor quality goods, and thereby leading to the discontinuation of lead products. In response, the LIA developed a series of standards for various lead plumbing products, including pipes and caulking. According to the LIA secretary, numerous entities adopted these standards, including the American Water Works Association, New York City, and several other cities.[44]

In 1940 several federal agencies including the War and Navy Departments, the Public Buildings Administration, and the US Housing Authority were involved in major construction projects for "defense building." As a result, LIA staff expended much effort in Washington to ensure the inclusion of lead in the specifications for plumbing. Their efforts apparently met with considerable success, because "lead plumbing is now included in many Federal government master specifications where it had been excluded for many years."[45] But because these specifications were only optional, association staff had to make personal visits to many of the federal construction projects to persuade those in charge that lead was preferable to other materials. These efforts were also successful, according to the secretary.

At the same time, the LIA initiated or continued several activities that it expected would have long-term benefits for the lead industry by institutionalizing the use of lead in plumbing nationwide:

> A simplified standard for lead fittings was put into effect at the end of the year. Also the first steps toward obtaining a Commercial Standard for lead pipe, traps and bends and calking lead, promulgated by the National Bureau of Standards, were taken. It is expected that Federal Specifications for lead pipe, traps and bends will follow soon after adoption of the Commercial Standards.[45(p6)]

An initial success was the publication in 1940 by the Bureau of Standards of a new *Plumbing Manual*,[46] which served as the basis for the specification of lead plumbing in federal construction projects. The manual has a cautionary note: "Lead piping in water-supply lines shall not be used unless it has been definitely determined that no poisonous lead salts are produced by contact of lead with the particular water supply."[46(p14)] However, given the numerous factors that could affect a water supply's plumbosolvency, it is not clear how it could be known for certain in advance that

"no poisonous salts" would be dissolved in the water.

By the 1940s, the lead industry had become alarmed at the public's growing wariness of all things lead, including lead pipes:

> There is hardly an outlet for lead to which one can turn today without encountering, in some measure, the question of the lead hazard to the public. So fundamental is this problem to the future welfare of the lead industries and the continued manufacture and use of many important lead products, such as white lead, red lead, litharge, sheet lead and lead pipe that unless some immediate attention is paid to the problem above and beyond what the Association has already accomplished and is currently doing, the opposing forces may grow strong enough to do us injury which it would take years of work to correct.[47]

"I cannot overemphasize [the] importance [of our health and safety work]. The toxicity of lead poses a problem that other nonferrous industries generally do not have to face. Lead poisoning, or the threat of it, hurts our business in several different ways."

Between 1941 and 1949, the LIA reduced its plumbing campaign field staff from three to two. However, it continued its usual promotional work around lead pipes:

> The promotional work in the plumbing and water works field continues as in the past . . . with master and journeyman plumbers, plumbing inspectors, instructors and others, to see that lead is adequately provided for by plumbing codes through the country and to see that plumbers are trained to know how to handle and install lead work.[48(p5)]

In the LIA's 1952 book *Lead in Modern Industry: Manufacture, Applications and Properties of Lead, Lead Alloys, and Lead Compounds*,[49] the industry continued its promotion of lead service lines; more than 1500 copies were sold in the first 2.5 months after publication.[50] However, this edition did not caution the reader (as it did in 1931) about conditions under which lead might not be advisable.

Throughout the 1950s, the LIA continued its outreach to plumbing and related professionals. *Lead*, the LIA's trade journal with a quarterly publication schedule and a distribution list of more than 50000, carried a steady stream of articles on plumbing.[51] The textbook, *Lead Work for Modern Plumbing*,[52] which was first published in 1952, had by early 1956 reached a total distribution of more than 6500.[53]

The theme of a continuous, serious threat to the lead industry because of the public's alarm over the danger of lead exposure is again made explicit a few years later by the LIA's secretary:

> I cannot overemphasize [the] importance [of our health and safety work]. The toxicity of lead poses a problem that other nonferrous industries generally do not have to face. Lead poisoning, or the threat of it, hurts our business in several different ways. While it is difficult to count exactly in dollars and cents, it is taking money out of your pockets every day.[54(p4)]

As before, he is most concerned about lead paint, but he makes clear that lead pipe sales are also at risk:

> There is a law suit now pending in Milwaukee in which an apartment building tenant is suing the owner for $200,000 damages for alleged lead poisoning from water passing through the building's lead service pipe. Success of a suit like this could well mean the end of lead services not only in Milwaukee, but in Chicago and many another city, amounting to thousands of tons of lead a year. We are working with the defense, and although the case does not come to trial for some months, our latest information is most encouraging.[54(p4)]

Promotional activities continued at least until 1972, when the LIA issued the sixth printing of its text *Lead Work for Modern Plumbing*.[52]

THE HISTORICAL CONTEXT

Given the medical and public health view that lead pipes were a clear danger to the public, one may ask how the lead industry could persist, with at least moderate success, in promoting and selling lead water pipes. Several factors contributed. One relates to the lingering doubts among water engineers and water authorities about the risks of lead pipes. Throughout the 19th century, attempts had been made by some physicians to link lead water pipes to cases of severe illness. However, these were met with considerable skepticism by water authorities, most of the medical community, and the general public: not everyone consuming water from lead pipes became sick, many of the symptoms of lead poisoning mimic those of other diseases, and the medical tests for diagnosing lead poisoning were not well developed. However, by the early 20th century, publication of the many medical articles and reports of the previous 20 to 30 years had made a compelling case for a relation between lead water pipes and lead poisoning.[19]

As indicated above, plumbers and water works engineers and officials favored lead pipes for their durability and other practical advantages. In addition, an extensive discussion among water works professionals and officials at their meetings and in their publications

clearly indicates that many of them were not as convinced as their counterparts in the public health community that lead water pipes were an unacceptable health hazard.[55–63] This divided opinion can be seen in articles in professional journals, plumbing texts, and publications of more general interest. For example, the author of an article in the *Journal of the American Water Works Association* in 1938 believed the dangers of lead pipes to be exaggerated:

> Lead ions seem to have a bad reputation, although some of it is not deserved when it comes to the traces found in most purified water supplies. If the very small amounts which persons ingest by drinking water and eating food, were as harmful as some people believe them to be, there would be many more cases of lead poisoning than are known to occur.[57(p248)]

In 1934 and again in 1945, the *American City*, a magazine reporting on general and technical developments in the urban environment, approvingly reported on the installation and longevity of lead service pipes.[64,65]

On the other hand, Harold Babbitt, a professor of sanitary engineering, strongly opposed the use of lead water pipes:

> Lead is sufficiently soluble in water to offer a real menace to health and for this reason its use in contact with potable water should be restricted if not prohibited. Tests by the Massachusetts State Board of Health have shown lead content as high as 3 to 5 parts per million in natural waters and an increase of 50 to 100 per cent, and even more after the water has been standing in lead pipe. Since 0.5 parts per million is considered dangerous to health, the use of lead in water pipe or in contact with potable water should be prohibited.[63(p267)]

A common, middle point of view was that lead pipes should not be installed where the water supply was "soft" (lacking in certain minerals, primarily magnesium and calcium) or high in carbonic acidic (carbon dioxide dissolved in water).[55,56,59,61] The LIA's Robert Ziegfeld also advanced this argument but suggested that conditions that affected lead would also attack other metals. (He neglected to mention, however, that other metals, such as iron and copper, are not as toxic as lead.[62]) Another argument in favor of the use of lead pipes was that over time a thin coating forms on the interior pipe surface that prevents further corrosion. Furthermore, various chemicals could be added to the water to reduce the acidity. However, research and experience from the mid-1800s to the early 1900s in the United States and Great Britain provided considerable evidence that many other factors as well (not often discussed by water works professionals) could influence the plumbosolvency of a water supply.[19] In other words, whereas a water supply that is hard or alkaline is less likely to result in an unhealthy concentration of lead, such a result may occur because of other factors. An example was provided by a 1928 study of several towns and cities in Illinois that had very hard water. In that study, lead levels ranged from 0.02 to 0.50 parts per million (1.3 to 33 times the modern EPA standard).[66]

The lead industry also benefited from the absence, at the federal level, of the regulation of environmental health hazards. As several authors have noted, before the 1960s, the federal government did not play an active role in protecting the public from environmental or occupational hazards.[67–70] In the Progressive Era of the first 2 decades of the 20th century, the federal government's legitimate role was to investigate hazards and recommend solutions to the responsible industry but not to legislate changes. In her investigations of the occupational hazards in several industries, including those with lead exposure, Alice Hamilton (a pioneer in occupational medicine in the United States) highlighted serious health hazards and made recommendations for their abatement but did not suggest legislative interference.[67] The next 4 decades marked a period of even less government activism, as manufacturers were assumed to investigate and control the hazards that they created.[67] The public health disasters of asbestos and lead paint, noted above, can be seen as products of this laissez faire era.

Another factor impeding a greater focus on lead pipes was the much greater concern regarding infectious diseases compared with the attention paid to environmental toxins in the first half of the 20th century.[71] Prevention of water-borne diseases was a particular focus of attention for professionals who designed and installed domestic plumbing. Some indication of this greater concern about communicable disease can be seen from a computer search of *American Journal of Public Health* articles. The search terms *water* and *cross-connection* (a common cause of infectious disease from drinking water) yielded 20 articles for the 1930 to 1950 period, whereas *lead pipes* yielded only 3. Indeed, at least 1 of the National Lead Company's advertisements promoted lead pipes as providing a more "sanitary" water supply.[72]

CONTINUED USE OF LEAD PIPES

The year 1930 is often given as the date after which few lead water pipes were installed in the

United States,[19,30] and this downward trend was almost certainly the case. However, the reports and meeting minutes of the LIA cited above indicate that it had some success in slowing, and even in some cases reversing, that movement. Evidence of continued installation of lead pipes comes from other sources as well. The plumbing codes of some major cites, including Boston[73,74] (JE Richardson, Boston Water and Sewer Commission, personal communication, January 29, 2007); Milwaukee, WI[54]; Philadelphia, PA[74]; Denver, CO[42]; and Chicago, IL,[43,75] still called for lead many years, even decades, beyond 1930. Besides these major cities, there is much suggestive evidence, both direct and indirect, that the installation of lead water pipes continued on a significant scale throughout the United States well beyond 1930. Cities and states usually based their plumbing codes on 1 of 3 model codes: the Building Officials and Code Administrators' (BOCA) plumbing code, the International Council of Building Officials' Uniform Plumbing Code, and the Southern Building Code Congress' Standard Plumbing Code. All 3 listed lead as an acceptable material for water distribution for several decades beyond 1930 (until 1981, 1988, and 1977, respectively).[76–82]

Of course, the listing of lead as a permitted material in plumbing codes does not, by itself, mean that it actually continued to be used on a large scale. However, the LIA itself confirmed such use of lead pipes for water distribution. At a 1963 symposium on lead, the LIA's Robert Ziegfeld stated that one of the principal uses of lead in construction was pipes for water distribution. "Pipe and extruded products" consumed 20 000 tons in 1962.[83]

In 1984 the EPA conducted a survey of 153 public water systems across the country to determine the extent of the use of lead pipes.[75] Most (91) of the systems in the survey had populations of over 100 000. Of the municipalities surveyed, 112 (73%) indicated that they had in the past installed lead service lines, and 5 specifically stated that lead had been permitted well beyond 1930. Seven systems answered that they currently (as of 1984) used whatever their code permitted. Chicago acknowledged that it still sanctioned the installation of lead service pipes. With passage of the Safe Drinking Water Act Amendments of 1986,[5] installation of lead water pipes was finally prohibited nationwide.

The number of lead service lines installed in US cities since the 1920s probably cannot be estimated with any degree of certainty. In the EPA's 1984 survey, approximately 30% of the respondents could not offer any estimate of the number of lead service lines remaining in their cities. Nevertheless, it can be stated that with so many large cities that continued to permit the use of lead pipes, such as Boston; Chicago; San Diego, CA; Philadelphia; and Milwaukee among others, the number is likely quite significant.

DISCUSSION

Although most cities in the United States were moving away from lead water pipes by the 1920s, it appears that this trend was not universal. National model plumbing codes approved lead into the 1970s and 1980s, and most water systems based their regulations on those codes. Federal guidelines and specifications also sanctioned lead pipes at least into the 1950s. Water system engineers were debating the pros and cons of lead at least into the 1940s. Perhaps most telling was the active campaign carried on by the lead and pipe manufacturers' trade organization, the LIA. To maintain sales of lead pipe, the LIA lobbied the government at all levels and targeted the people who both designed and installed water distribution systems with outreach and educational material and other resources. The association carried on its promotional campaign into the 1970s.

As noted in the introduction, recent research strongly suggests that lead exposure has health effects of public health significance below the level of concern designated by the Centers for Disease Control and Prevention. Indeed, no threshold for the effects of lead on cognition has yet been identified.[84] The number of children potentially affected is quite high. More than one quarter (25.6%) of children aged 1 to 5 years in the United States had a blood lead level at 5 μg/dL or higher in 1994 according to the third National Health and Nutrition Examination Survey.[85] Several recent studies also point to serious health effects in adults at very low blood lead levels, including cancer,[86] cardiovascular disease,[86,87] peripheral arterial disease,[88] and death from all causes.[86] Therefore, although lead-based paint is the most significant source of childhood lead exposure, and occupational exposure is the main source for adults, we will have to address the contribution of water if we are to make acceptable progress in further reducing blood lead levels.

Although the number of lead service lines and other water distribution pipes installed as a result of the influence of the LIA and its pipe manufacturing members cannot be quantified, it is surely substantial. The American Water Works Association conducted a national survey to estimate the cost of replacing lead service lines.[89] The average cost per replacement was $3200, with a range of $750 to $16 000. The Washington, DC, water authority appropriated $300 million to replace 23 000 lead service lines, plus some portion of 27 000 lines of unknown material.

Despite a voluminous literature on the dangers of lead water pipes, and based on such knowledge, a national trend to restrict and prohibit the use of lead for water distribution, the lead industry continued its promotion and sale of lead pipes for several decades. Note also that the LIA and its corporate members carried out a similar campaign to promote lead paint long after its hazards became known[14,15] and are currently defending themselves against lawsuits by dozens of cities and states.[90,91] In fact, at least two LIA members, the National Lead Company and Eagle Picher, manufactured both lead paint and lead pipes. Although the use of these products has long since ended, our cities and towns, and society as a whole, are still paying the price. ■

About the Author

The author is an activist in occupational and environmental health.

Requests for reprints should be sent to Richard Rabin, MSPH, 8 Sawin Street, Arlington, MA 02474 (e-mail: rick.rabin@state.ma.us.

This article was accepted April 25, 2007.

Acknowledgments

I thank my wife, Meryl Becker, for her very helpful suggestions for this article.

Human Participant Protection

No protocol approval was needed for this article.

References

1. *Preventing Lead Poisoning in Young Children.* Atlanta, GA: Centers for Disease Control and Prevention; 1991.

2. Canfield RL, Henderson CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 μg per deciliter. *N Engl J Med.* 2003;348:1517–1526.

3. Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. *Environ Health Perspect.* 2005;113:894–899.

4. US Environmental Protection Agency. Lead in drinking water—basic information. Available at: http://www.epa.gov/safewater/lead/basicinformation.html#tapwater. Accessed February 22, 2007.

5. Safe Drinking Water Act Amendments of 1986, Pub L No. 99-339; Dec. 8, 1986.

6. Lead Contamination Control Act of 1988, Pub L No. 100-572; Oct. 31, 1988.

7. US Environmental Protection Agency. Drinking water regulations: maximum contaminant level goals and national primary drinking water regulations for lead and copper. *Fed Regist.* 1991;53:110.

8. Lead confirmed in school water. *Boston Globe.* June 1, 1988:1.

9. Concerns raised on lead levels. *Boston Globe.* November 17, 2005. Available at: http://www.boston.com/news/local/massachusetts/articles/2005/11/17/concerns_raised_on_lead_levels/. Accessed February 6, 2007.

10. Lead found in schools' water. *The News & Observer.* August 25, 2006. Available at: http://www.newsobserver.com/114/story/478853.html. Accessed February 6, 2007.

11. Camden parents urge action on water taint. *Star-Ledger.* August 15, 2002:19.

12. Lead levels in water misrepresented across US. *Washington Post.* October 5, 2004. Available at: http://www.washingtonpost.com/wp-dyn/articles/A7094–2004Oct4.html. Accessed February 6, 2007.

13. Thompson Gale Co. General Reference Center Gold. Available at: http://www.gale.com. Accessed April 25, 2007.

14. Rabin R. Warnings unheeded: a history of child lead poisoning. *Am J Public Health.* 1989;79:1668–1674.

15 Markowitz G, Rosner D. 'Cater to the children': the role of the lead industry in a public health tragedy, 1900–1955. *Am J Public Health.* 2000;90:36–46.

16. Brodeur P. *Expendable Americans.* New York, NY: Viking Press; 1974.

17. Brodeur P. *Outrageous Misconduct: The Asbestos Industry on Trial.* New York, NY: Pantheon; 1985.

18. Barbera F. A tobacco lawsuit primer. *Slate.* Available at: http://www.slate.com/id/1005187. Accessed February 20, 2007.

19. Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2006.

20. Kirkwood JP. *Collection of Reports and Opinions of Chemists in Regard to the Use of Lead Pipe for Service Pipe, In the Distribution of Water for the Supply to Cities.* New York, NY: Hosford and Company; 1859.

21. Swann A. On lead poisoning from service pipes, in relation to sterility and abortion. *Br Med J.* 1889;(Feb 16):352. Cited by: Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2006.

22. Swann A. A national danger: lead poisoning from service pipes. *Lancet.* 1892;(July 23):194–195. Cited by: Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2006.

23. Stainthorpe WW. Observations of 120 cases of lead absorption from drinking-water. *Lancet.* 1914;(July 25):213–215. Cited by: Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2006.

24. Milligan E. Correspondence. *Br Med J.* 1931;(August 1):222–223. Cited by: Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2006.

25. Massachusetts State Board of Health. *Thirtieth Annual Report of the State Board of Health of Massachusetts.* Public Document No. 34. Boston, MA: Wright & Potter; 1899.

26. Massachusetts State Board of Health. *Thirty-First Annual Report of the State Board of Health of Massachusetts.* Public Document No. 34. Boston, MA: Wright & Potter; 1900

27. Greene R. Observations on the occurrence of lead in Boston drinking-water. *Boston Med Surg J.* 1889; 121:533–534. Cited by: Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2006.

28. Oliver T. *Lead Poisoning in Its Acute and Chronic Forms.* London, England: Young J. Pentland; 1891.

29. Brous FA. *Bibliography and Survey on Lead Poisoning, With Particular Reference to Packaging.* New York, NY: Packaging Institute; 1943.

30. US Environmental Protection Agency. Lead in drinking water—actions you can take to reduce lead in drinking water. Available at: http://www.epa.gov/safewater/lead/lead1.html. Accessed February 22, 2007.

31. *The Hour of Lead.* Washington, DC: Environmental Defense Fund; 1992.

32. Brown PB. Life without Dutch Boy. *Forbes.* 1981;128:40,42. Cited by: The *Hour of Lead.* Washington, DC: Environmental Defense Fund; 1992.

33. Secretary's Report. Report presented at: Lead Industries Association; May 29, 1929; New York, NY.

34. *New York Times.* December 31, 1924;6. Cited by: *The Hour of Lead.* Washington, DC: Environmental Defense Fund; 1992.

35. Fee E. Public health in practice: an early confrontation with the "silent epidemic" of childhood lead paint poisoning. *J Hist Med Allied Sci.* 1990;45:570–606.

36. If your children chew paint. *Scientific American.* December, 1933:291.

37. Secretary's Report. Report presented at: Lead Industries Association; December 12, 1930; New York, NY.

38. Commissioners' meetings. Report presented at: Charleston Water Works; September 11, 1929, to November 15, 1930; Charleston, SC.

39. Secretary's Report. Report presented at: Lead Industries Association; September 30, 1931; New York, NY.

40. *Useful Information About Lead.* New York, NY: Lead Industries Association; 1931.

41. Report of the Secretary. Report presented at: Lead Industries Association; June 5, 1934; New York, NY.

42. Plumbers maintain lead should be used in Denver. *Plumbing Heating J.* 1947;(Jan):77–78.

43. Secretary's Report. Report presented at: Lead Industries Association; November 28, 1938; New York, NY.

44. Secretary's Report. Report presented at: Lead Industries Association; May 16, 1939; New York, NY.

45. Annual Meeting. Report presented at: Lead Industries Association; September 22, 1941; New York, NY.

46. Building Materials and Structures, Report BMS66, Plumbing Manual. Washington, DC: National Bureau of Standards, US Department of Commerce; 1940.

47. Executive Committee Meeting. A safety and hygiene program for the Lead Industries Association. Report presented at: Lead Industries Association; December 28, 1945; New York, NY.

48. Annual Meeting. Report presented at: Lead Industries Association; May 9, 1947; New York, NY.

49. *Lead in Modern Industry.* New York, NY: Lead Industries Association; 1952.

50. Annual Meeting. Report presented at: Lead Industries Association; April 9–10, 1953; New York, NY.

51. Annual Report for the Year 1955. New York, NY: Lead Industries Association; 1955.

52. Borcina D, ed. *Lead Work for Modern Plumbing.* New York, NY: Lead Industries Association; 1952.

53. Report of the Secretary. Report presented at: Lead Industries Association; April 2, 1956; New York, NY.

54. Annual Report for 1959. New York, NY: Lead Industries Association; 1959.

55. Baylis JR. Prevention of corrosion and "red water." *J Am Water Works Assoc.* 1926;15:619.

56. Downer TB. Protective treatment of ferrous pipe. *J Am Water Works Assoc.* 1933;25:612–613.

57. Negus SS. Physiological aspects of mineral salts in public water supplies. *J Am Water Works Assoc.* 1938;30:248–251.

58. Chase ES. Applicability of various service line materials. *J Am Water Works Assoc.* 1939;31:1323–1331.

59. Ruchhoft CC, Kachmar JF. Study of solubility of two lead salts in dilute solutions with special reference to the lead hazard in drinking water. *J Am Water Works Assoc.* 1942;34:85.

60. Plum S. *Plumbing Practice and Design.* New York, NY: John Wiley & Sons; 1943.

61. Fairhall LT. Toxic contaminants of drinking water. *J N Engl Water Works Assoc.* 1941;55:400–410.

62. Ziegfeld RL. Conditions covering the installation of lead service pipe. *J N Engl Water Works Assoc.* 1940;54:1–15.

63. Babbitt HE. *Plumbing.* New York, NY: McGraw-Hill Book Co; 1928.

64. The life of lead water services. *American City.* 1934;45(April):9.

65. Lead service pipe installed at Yonkers. *American City.* 1945;60(August):90

66. Rees OW, Elder AL. The effect of certain Illinois waters on lead. *J Am Water Works Assoc.* 1928;15:714–724.

67. Graebner W. Occupational hazards and professional behavior. In: Bayer R, ed. *The Health & Safety of Workers: Case Studies in the Politics of Professional Responsibility.* New York, NY: Oxford University Press; 1988.

68. Donovan A. Health and safety in underground coal mining, 1900–1969. professional conduct in a peripheral industry. In: Bayer R, ed. *The Health & Safety of Workers: Case Studies in the Politics of Professional Responsibility.* New York, NY: Oxford University Press; 1988.

69. Ozonoff D. Failed warnings: asbestos-related disease and industrial medicine. In: Bayer R, ed. *The Health & Safety*

of Workers: Case Studies in the Politics of Professional Responsibility. New York, NY: Oxford University Press; 1988.

70. Rosner D, Markowitz G. 'A gift of God'? the public health controversy over leaded gasoline during the 1920s. In: Rosner D, Markowitz G. *Dying for Work: Workers' Safety and Health in the Twentieth Century.* Bloomington: Indiana University Press; 1989.

71. Warren C. *Brush with Death: A Social History of Lead Poisoning.* Baltimore, MD: The Johns Hopkins University Press; 2000.

72. Advertisement: Lead helps guard your health. National Lead Company. (In: *National Geographic*; 1923).

73. Boston Water and Sewer Commission. Lead service maps and information. Available at: http://www.bwsc.org/water_sewer_sys/Lead/lead_maps/lead_service.asp. Accessed February 14, 2007.

74. Philadelphia Water Department. Our water quality. Available at: http://www.phila.gov/water/Water_Quality.html. Accessed February 14, 2007.

75. US Environmental Protection Agency. Lead product utilization survey of public water supply distribution systems throughout the United States. Washington, DC; 1984.

76. The BOCA Plumbing Code. Sec. P-405.0 Piping System Materials 1975. Country Club Hills, IL: Building Officials and Code Administrators (BOCA); 1975.

77. The BOCA Basic Plumbing Code. Sec. P-405.0 (30–76). Country Club Hills, IL: Building Officials and Code Administrators (BOCA); 1976.

78. The BOCA Basic Plumbing Code. Sec. P-404 0 Piping System Materials 1981. Country Club Hills, IL: Building Officials and Code Administrators (BOCA); 1981.

79. Uniform Plumbing Code. Sec. 1004—Materials 1985. Whittier, CA: International Council of Building Officials; 1985.

80. Uniform Plumbing Code. Sec. 1004—Materials 1988. Whittier, CA: International Council of Building Officials; 1988.

81. Standard Plumbing Code. Sec. 1212—Water Distribution Pipe, Tubing and Fittings 1975. Birmingham, AL: Southern Building Code Congress Incorporated; 1975.

82. Standard Plumbing Code. Sec. 1212—Water Distribution Pipe, Tubing and Fittings 1977. Birmingham, AL: Southern Building Code Congress Incorporated; 1977.

83. Ziegfeld R. Importance and uses of lead. *Arch Environ Health.* 1964;8:202–212.

84. American Academy of Pediatrics, Committee on Environmental Health. Lead exposure in children: prevention, detection, and management. *Pediatrics.* 2005;116:1036–1046.

85. Bernard SM. Should the Centers for Disease Control and Prevention's childhood lead poisoning intervention level be lowered? *Am J Public Health.* 2003;93:1253–1260.

86. Schober SE, Mirel LB, Graubard BI, Brody DJ, Flegal KM. Blood lead levels and death from all causes, cardiovascular disease, and cancer: results from the NHANES III mortality study. *Environ Health Perspect.* 2006;114:1538–1541.

87. Menke A, Muntner P, Batuman V, Silbergeld EK, Guallar E. Blood lead below 0.48 μmol/L (10 μg/dL) and mortality among US adults. *Circulation.* 2006;114:1338–1394.

88. Navas-Acien A, Selvin E, Sharrett AR, Calderon-Aranda E, Silbergeld EK, Guallar E. Lead, cadmium, smoking, and increased risk of peripheral arterial disease. *Circulation.* 2004;109:3196–3201.

89. US Environmental Protection Agency. Summary of a workshop. Lead Service Line Replacement Workshop; October 26–27, 2004; Atlanta, GA. Available at: http://www.epa.gov/safewater/lcrmr/pdfs/summary_lcrmr_review_lead_line_replacement_workshop_10-26-04.pdf. Accessed June 3, 2008.

90. Alliance for Healthy Homes. Case Summaries. Available at: http://www.afhh.org/an/aa_pv/aa_legal_remedies_lawsuits_cases_pv.htm. Accessed on May 21, 2007.

91. Rabin R. The Rhode Island lead paint lawsuit: where do we go from here? *New Solutions.* 2006;16:353–363.

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

SURREBUTTAL TESTIMONY OF GREGORY WELTER

ON BEHALF OF

PITTSBURGH UNITED

May 17, 2019

Topics Addressed:

Lead Remediation Program

PREPARED SURREBUTTAL TESTIMONY OF GREGORY WELTER, PE, BCEE

Q: Please state your name, occupation, and business address.

A: Gregory Welter. I am a licensed professional engineer and Technical Manager with O'Brien & Gere Engineers, Inc., 4201 Mitchellville Rd., #500, Bowie, MD 20716.

Q: Did you previously submit testimony in this proceeding?

A: Yes. I submitted Direct Testimony, pre-marked as Pittsburgh UNITED Statement C-2, in which I offered recommendations for improving PWSA's lead remediation program.

Q: What is the purpose of your surrebuttal testimony?

A: The purpose of my surrebuttal testimony is to respond to the Rebuttal Testimony of Robert Weimar, offered on behalf of PWSA, regarding PWSA's lead remediation program. My lack of response to any specific recommendation or position of Mr. Weimar or another witness or party does not indicate that I am either in agreement with or opposed to that recommendation or position.

Q: How is your testimony organized?

A: First, I respond to Mr. Weimar's comments regarding PWSA's transition to full compliance with the Commission's regulatory requirements and his assertion that the Commission lacks authority to address lead contamination in PWSA's drinking water. Then, I turn to Mr. Weimar's statements regarding my recommendations that PWSA replace all lead service lines in its system, extend its neighborhood-based lead service line replacement program, and develop a comprehensive inventory of service line materials. Finally, I assess the draft lead service line replacement policy that Mr. Weimar indicates PWSA may soon adopt.

Q: What is your response to Mr. Weimar's testimony that PWSA needs time to come into compliance with the Commission's requirements?[1]

A: The lead crisis facing PWSA is longstanding and urgent. Although any changes to PWSA's current approach will take time to implement, immediate action is necessary to address pressing health concerns. The earlier PWSA creates a comprehensive plan for removing all lead service lines, the more efficiently it will be able to achieve that goal. However, almost three years after PWSA first exceeded the lead action level, its lead remediation policy is still missing foundational elements, including a commitment to replacing all private-side lead service lines and a plan for developing an accurate, complete service line inventory.

Q: What is your response to Mr. Weimar's testimony that the Commission lacks jurisdiction over water quality issues and so cannot order PWSA to implement your recommendations related to lead remediation?[2]

A: I have been informed by counsel that the Commission requires PWSA to provide safe, adequate, and reasonable service to its customers. I am also informed by counsel that this is a legal argument that UNITED will address in briefing.

Q: Please summarize Mr. Weimar's testimony regarding your recommendation that PWSA replace all lead service lines in its system, including all private-side lead service lines.

A: Mr. Weimar reiterates that "PWSA's goal is to remove all lead service lines it owns."[3] Since PWSA has disclaimed ownership of private-side service lines, this means that PWSA

[1] PWSA St. C-1R, at 4-6.
[2] PWSA St. C-1R, at 47.
[3] PWSA St. C-1R, at 47.

intends to replace all public-side lead service lines, but does not plan to replace all private-side lead lines.

With respect to public-side lead service lines, my direct testimony explained that PWSA has not set forth a plan for finding and replacing all public-side lead service lines by 2026 (the date set forth in the LTIIP). This is because (a) the small-diameter water main replacement program will not replace all public-side lead service lines in the system, (b) PWSA is ending the neighborhood-based lead service line replacement program in 2020, and (c) PWSA does not have a plan for developing a comprehensive inventory of lead service lines.[4] Mr. Weimar's rebuttal testimony does not address these issues. Accordingly, PWSA has not provided a plan to remove all public-side lead lines by 2026.

With respect to private-side lead service lines, I have two principal points. First, the literature has shown that replacing only the public side of the lead service line has little benefit long term, and in the short term makes the lead release significantly worse. Past experience is that the spike in lead following a partial replacement lasts for several months, and may never fall significantly below the original pre-replacement levels. Second, I am not convinced of Mr. Weimar's contention that the orthophosphate treatment is an adequate substitute for replacement of the private-side service lines. Mr. Weimar states that PWSA's use of orthophosphate for corrosion control will mitigate the health concerns from private-side lead service lines that PWSA does not replace.[5] I agree that orthophosphate treatment will reduce the amount of lead that leaches from lead service lines to customers' tap water, after the treatment forms a stable

[4] Pittsburgh UNITED St. C-2, at 26-27, 30-32.
[5] PWSA St. C-1R, at 47.

scale on the interior of lead pipes. But it could take up to a year for orthophosphate to drive significant reductions in tap water lead levels.[6]

Moreover, as I explained in my direct testimony, no chemical corrosion control treatment system (including orthophosphate) offers a permanent solution to lead corrosion from public- or private-side lead service lines.[7] Construction in the street or changes to source water or corrosion control treatment can disrupt the protective scale inside customers' pipes, releasing lead to drinking water. This is why I recommend that PWSA implement the long-term solution of replacing all lead service lines at no direct cost to customers through a combination of PWSA's small-diameter water main replacement program and neighborhood-based lead service line replacement program.[8]

Also, on the issue of the public/private side replacement, I want to repeat my recommendation that PWSA should be frank in its communications about the program. It should not make unqualified reference to service line replacements where, in the context of the communication, it really means replacement of the public portion.

Q: How does Mr. Weimar respond to your recommendation to extend the neighborhood-based lead service line replacement program beyond 2020?

A: Mr. Weimar states that, once tap water monitoring results fall below the lead action level, the Lead and Copper Rule and Pennsylvania Department of Environmental Protection (DEP) Consent Order will no longer require PWSA to replace lead service lines.[9] Mr. Weimar cites the absence of this obligation as the reason PWSA will end its neighborhood-based program after

[6] Pittsburgh UNITED St. C-2, at 16-17.
[7] Pittsburgh UNITED St. C-2, at 16-17.
[8] Pittsburgh UNITED St. C-2, at 27-29.
[9] PWSA St. C-1R, at 51.

2020 and conduct lead service line replacements primarily through the small-diameter water main replacement program, which he describes as a more cost-effective program.[10]

Q: What is your response?

A: The fact that, at some point, the Lead and Copper Rule and DEP Consent Order may no longer require PWSA to replace lead service lines is not a reason for PWSA to terminate the neighborhood-based lead service line replacement program. If fewer than ten percent of tap water samples exceed the lead action level of 15 parts per billion, that does not mean that customers with lead service lines are no longer at risk of exposure to unsafe levels of lead in their drinking water. Dr. Lanphear in his direct testimony explains that the lead action level is not a health-based standard, and I've described how lead can be released from service lines to drinking water even after orthophosphate takes effect.[11]

PWSA's plan to rely primarily on the small-diameter water main replacement program to remove lead service lines will not adequately address these continued risks. Even on the accelerated schedule proposed in the LTIIP, PWSA will replace only about 130 miles of the over 700 miles of small-diameter water mains in its system by 2026.[12] This program will not replace lead service lines on the several hundred miles of small-diameter water mains not removed by 2026.

I agree that inclusion of lead service line replacement in the context of the small-diameter main replacement program is a cost-effective approach for dealing with a substantial part of the problem, but it needs to be complemented with the neighborhood-based program to accomplish the entire objective.[13] Indeed, PWSA estimates that replacing a private-side lead service line

[10] PWSA St. C-1R, at 51.
[11] Pittsburgh UNITED St. C-3, at 11; Pittsburgh UNITED St. C-2, at 16-17.
[12] Pittsburgh UNITED St. C-2, at 26.
[13] Pittsburgh UNITED St. C-2, at 27-28.

costs the same, regardless of whether it is performed through the neighborhood-based program or the small-diameter water main replacement program.[14] PWSA should operate the small-diameter water main replacement and neighborhood-based programs in tandem to eliminate lead service lines from its system.

In addition, as I noted in my direct testimony, PWSA may be overestimating the cost of private-side lead service line replacements at $7,500 per line.[15] For instance, a recent news article quoted three PWSA customers who reported replacing their private-side lead service lines for less than $3,500 each.[16] PWSA has made some progress in bringing its replacement costs down, and it should keep exploring ways to continue that progress.

Q: What is your response to Mr. Weimar's testimony that "there will be lead remaining at some locations despite the best efforts of PWSA" because PWSA will not perform replacements at residences that are not owner-occupied or where the owner does not respond to PWSA's request for consent to replace the private-side lead service line?[17]

A: I agree with that statement, though it is incomplete. These policies, required by the rate case settlement, are valuable because they reduce the number of partial lead service line replacements performed by PWSA. When PWSA cannot obtain consent to replace a private-side lead service line, it is better to leave the whole line in place than to perform a partial replacement and expose residents to a spike in lead levels.

Although these policies could result in some public-side lead service lines remaining in the system, a much bigger obstacle to PWSA's goal of replacing all public-side lead service lines

[14] PWSA St. C-1, at 62; UNITED St. C-2, Appendix B, 8, UNITED I-12.
[15] Pittsburgh UNITED St. C-2, at 19.
[16] Lacretia Wimbley & Rich Lord, Where's my money? PWSA customers want reimbursement for private lead line replacements, Pittsburgh Post-Gazette (May 8, 2019), https://tinyurl.com/y5ncuvcx.
[17] PWSA St. C-1R, at 47.

is PWSA's lack of a plan for finding and replacing those lines. In addition, PWSA's refusal thus far to commit to replacing all private-side lead service lines threatens to leave a significant number of lead service lines in place.

Q: How does Mr. Weimar respond to your recommendation that PWSA develop a comprehensive inventory of service line materials?

A: Mr. Weimar states that PWSA will present a plan for completing its inventory of residential service lines to DEP in June of 2019.[18]

Q: Does this response address your recommendation?

A: No. PWSA offers no details on the content of this plan. The inventory of service line materials is a critical component of PWSA's response to elevated lead levels. PWSA's current inventory is incomplete and inaccurate.[19] Meanwhile, PWSA has ceased conducting curb box inspections, and Mr. Weimar rejects my recommendation to make broader use of vacuum excavation and hydro-excavation.[20] Yet, the Compliance Plan, LTIIP, and PWSA's testimony contain no information on how PWSA will complete the inventory.[21]

Q: Mr. Weimar indicates that PWSA is considering adopting a new lead service line replacement policy. Please summarize the policy.[22]

A: The draft policy sets out a framework for PWSA's lead service line replacements and, if approved by PWSA's Board, will supersede the existing policy adopted in 2018 and attached to the LTIIP. The draft policy would continue PWSA's current policy of replacing private-side lead service lines at no direct cost to customers whenever PWSA replaces a connected public-side

[18] PWSA St. C-1R, at 60.
[19] Pittsburgh UNITED St. C-2, at 30-32.
[20] PWSA St. C-1R, at 61.
[21] Pittsburgh UNITED St. C-2, at 32.
[22] RAW/C-31.

service line. Importantly, this policy would offer, at no direct cost to customers, replacements of private-side lead service lines connected to any public-side service line (lead or non-lead) removed during the small-diameter water main replacement program.[23] Finally, it adds a provision granting PWSA discretion to perform a partial lead service line replacement if replacing the private-side lead service line "is not technically feasible, the residence is unsafe from a structural or sanitary condition, or will result in excess expense."[24]

Q: What is your opinion of the policy?

A: I support PWSA's proposal to continue offering to replace private-side lead service lines at no direct cost to customers when PWSA replaces public-side service lines, as I recommended in my direct testimony. However, I do have some concerns about the policy.

This policy reflects the fact that PWSA has not committed to replacing all private-side lead service lines. For instance, this policy does not provide for the replacement of private-side-only lead service lines through the neighborhood-based lead service line replacement program. This means that PWSA contractors will mobilize to neighborhoods and replace all public-side lead service lines and connected private-side lead service lines, but they will leave in place private-side lead service lines not connected to public-side lead service lines. This approach is inefficient and leaves lead in the ground. PWSA should amend the policy to include the replacement of these private-side-only lead service lines.

I also recommend that the provision allowing PWSA to conduct partial replacements for technical, sanitary, or financial reasons be construed narrowly and applied sparingly. Only under exceptional circumstances should PWSA conduct a partial replacement at the home of a customer who is willing to authorize PWSA to replace their private-side lead service line. For

[23] RAW/C-31 ¶ 4.2.d.
[24] RAW/C-31 ¶ 3.

instance, it would be quite unusual for there to be a serious structural condition at a residence that would prevent PWSA from performing a safe and effective private-side lead service line replacement.[25]

Q: Do you have any concerns if the Board rejects the draft policy?

A: I will be deeply concerned if PWSA rejects the draft policy, if that rejection limits support for private-side lead service line replacements. In particular, if PWSA does not offer to replace private-side lead service lines encountered during the small-diameter water main replacement program, it will end up performing a significant number of partial replacements, especially at the homes of low-income customers.[26] This would have serious and dangerous health consequences, as Dr. Lanphear and I both discussed in our direct testimony. Also, given the limited long-term efficacy of a partial replacement, reducing support for private-side lead service line replacements would call into question whether the primary objective of PWSA's lead service line replacement program is promoting public health.

Q: Does this conclude your surrebuttal testimony?

A: Yes.

[25] In addition, the draft policy suggests that when PWSA replaces a public-side service line in response to a leak, it will only replace a connected private-side lead service line if the public-side is also lead. RAW/C-31 ¶ 4.2.c. PWSA's current policy is to replace a private-side lead service line during a lead response regardless of whether the public-side lead service line is lead or non-lead. UNITED VII-5. I recommend that PWSA maintain its current policy to avoid partial replacements. I am informed by counsel that PWSA has edited the draft policy to clarify that its current policy still applies, which would be consistent with my recommendation, though I have yet to review the revised version.

[26] Pittsburgh UNITED St. C-2, at 21-25.

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

SUPPLEMENTAL REBUTTAL TESTIMONY OF GREGORY WELTER

ON BEHALF OF

PITTSBURGH UNITED

August 14, 2019

Topics Addressed:

Lead Remediation Program

PREPARED SUPPLEMENTAL REBUTTAL TESTIMONY OF GREGORY WELTER, PE, BCEE

Q: Please state your name, occupation, and business address.

A: Gregory Welter. I am a licensed professional engineer and Technical Manager with OBG part of Ramboll, 4201 Mitchellville Rd., #500, Bowie, MD 20716.

Q: Did you previously submit testimony in this proceeding?

A: Yes. I submitted direct testimony, pre-marked as Pittsburgh UNITED Statement C-2, and surrebuttal testimony, pre-marked as Pittsburgh UNITED Statement C-2SR.

Q: What is the purpose of your supplemental testimony?

A: This testimony responds to the supplemental testimony of Robert Weimar, offered on behalf of PWSA, regarding recent developments relating to PWSA's lead remediation programs. In particular, my testimony addresses PWSA's adoption of an income-based reimbursement program for the replacement of private-side lead service lines. My lack of response to any specific recommendation or position of Mr. Weimar or any other witness does not indicate that I am either in agreement with or opposed to that recommendation.

Q: How is your testimony organized?

A: First, I explain why PWSA's recently adopted income-based reimbursement program does not satisfy my previous recommendation that PWSA replace all public- and private-side lead service lines in its system. I recommend that PWSA adopt a policy of replacing any lead services in the private space using its own contracts rather than using the income-based reimbursement program. PWSA should include private-side-only lead service lines in its neighborhood-based program and extend that program beyond 2020 when it is currently set to

expire. Then, I address PWSA's recent lead monitoring results, in which PWSA logged its fifth exceedance of the lead action level in three years.

I. Income-Based Reimbursement Program

Q: *Please describe PWSA's lead service line replacement program to date.*

A: Since 2018, PWSA has run a neighborhood-based lead service line replacement program. Through that program, PWSA creates work orders for contiguous multi-block areas and replaces the lead service lines it finds within those areas. Specifically, PWSA replaces the public side of the line (i.e., the portion of the service line that runs between the water main in the street and the curb box) if it is made of lead. If the private side of the line (i.e., the portion of the service line that runs between the curb box and the water meter) is also made of lead, PWSA replaces it at no direct cost to the customer. PWSA does not offer a no-cost replacement for private-side-only lead service lines (i.e., lines where the private side of the service line is made of lead but the public side of the service line is not). I describe PWSA's lead service line replacement program and broader lead remediation efforts in more detail in my direct testimony.[1]

Q: Is PWSA changing its lead service line replacement program in the future?

A: Yes. In 2020, PWSA expects to discontinue the neighborhood-based lead service line replacement program and instead conduct most lead service line replacements through its small-diameter water main replacement program.[2] Under that program, PWSA will select certain small-diameter water mains for replacement. When PWSA replaces a main, it will simultaneously replace all public-side service lines connected to that main. PWSA will also

[1] Pittsburgh UNITED St. C-2, at 9-13.
[2] Id. at 12, 27.

replace any private-side lead service lines connected to those public-side lines at no direct cost to the customer.[3]

In addition, on July 26, 2019, PWSA's Board adopted a revised lead service line replacement policy. The revised policy, if approved by the Commission, will establish an income-based reimbursement program. PWSA is offering to reimburse customers on a sliding scale depending on their income for the cost of replacing a private-side lead service line.[4] (To be clear, the income-based reimbursement program is applicable only to customer-initiated replacements. Costs of replacement of private-side service lines affected by the small-diameter water main program remain fully covered by PWSA.)

Q: How do customers know if they are eligible for the income-based reimbursement program?

A: A customer would need to determine if they have a private-side lead service line at their home. PWSA has an online map that allows the public to view PWSA's service line materials records for addresses in its service area.[5] The map, however, is based on PWSA's inventory, which, as I've explained in previous testimony, is incomplete and inaccurate.[6] Customers can also perform a visual inspection and scratch test on their service line to determine if it's lead, though they'd need to be able to locate the exposed portion of the service line in their homes and interpret the results.[7] Tap water testing is not a reliable method to determine whether a home has

[3] Id. at 12; RAW-C-46 ¶ 4.2.d.
[4] RAW-C-46 ¶ 10; PWSA St. C-1SD, at 30-32.
[5] PWSA, Lead Map, http://lead.pgh2o.com/your-water-service-line/planned-water-service-line-replacement-map/.
[6] Pittsburgh UNITED St. C-2, at 29-32.
[7] LSLR Collaborative, Identifying Service Line Material, https://www.lslr-collaborative.org/identifying-service-line-material.html.

a lead service line because lead release from service lines is not consistent from one day to the next.[8]

Q: How does the income-based reimbursement program fit in with PWSA's other lead service line replacement programs?

A: The income-based reimbursement program offers assistance to customers who arrange for replacement of a private-side lead service line at their residence when that line is not scheduled to be replaced by PWSA's other programs.

Q: For how many customers is the income-based reimbursement program the only option for receiving PWSA's assistance in replacing a private-side lead service line?

A: PWSA is budgeting for 8,000 to 20,000 replacements through this program.[9] PWSA, however, doesn't know how many customers would qualify for this program because it doesn't know how many customers have private-side lead service lines.[10] It is apparent, however, from the significant gaps in PWSA's existing lead service line replacement programs that the income-based reimbursement program will be the only option to receive replacement assistance for thousands of customers.

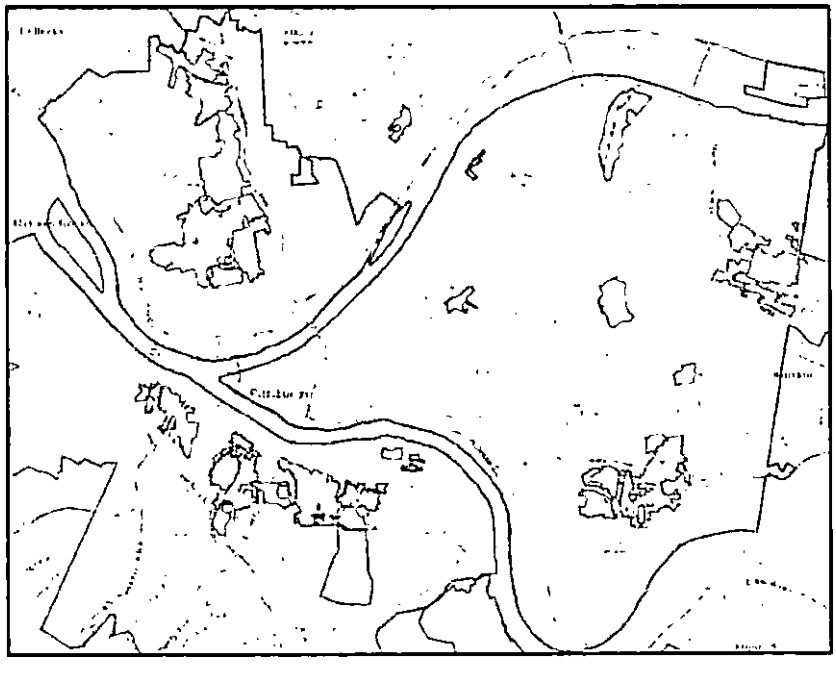
PWSA's small-diameter water main replacement program will replace private-side lead service lines along 138 miles of water mains by 2026.[11] PWSA's system, however, has about 720 miles of small-diameter water mains.[12] Therefore, PWSA will not remove lead service lines along the other approximately 580 miles of water mains. PWSA estimates that, on average, each mile of small-diameter water main has 40.9 private-side lead service lines connected to it.[13]

---

[8] See RAW-C-44, at 6 (declining to use water testing as a means for confirming the absence of residential lead lines).
[9] Pittsburgh UNITED St. C-1SUPP-R, Appendix A, 1, UNITED XII-15 Attach. A.
[10] Pittsburgh UNITED St. C-2, at 29-32.
[11] Pittsburgh UNITED St. C-2, Appendix B, 1, UNITED I-1.
[12] LTIIP, at 18.
[13] Pittsburgh UNITED St. C-2, Appendix B, 9, UNITED I-13.

PWSA's neighborhood-based program will not fill the gaps in the small-diameter water main replacement program. The map below outlines and lightly shades PWSA's service area. The outlined and darker shaded portions within PWSA's service area are the parts of the city where PWSA's neighborhood-based program will perform replacements until its 2020 termination. The map makes apparent that large sections of the city will not receive replacements through this program. In addition, PWSA does not replace private-side-only lead service lines through the neighborhood-based program, and it has skipped nearly two thousand such lines located in the program's work order areas.[14] PWSA has no plans to go back and replace those lines; so, unless they're scheduled for replacement under the small-diameter water main program, those customers' only option for replacement assistance is the income-based reimbursement program.

Figure A: Areas Served by the Neighborhood-Based Program[15]



[14] Pittsburgh UNITED St. C-2, at 29.
[15] PWSA, Lead Map, http://lead.pgh2o.com/your-water-service-line/planned-water-service-line-replacement-map/.

Q: Does the addition of the income-based reimbursement program address your recommendation from your previous testimony that PWSA replace all lead service lines in its system?[16]

A: No. The income-based reimbursement program is not an effective approach to replacing private-side lead service lines for at least three reasons.

First, the program provides financial assistance to customers through reimbursements. Requiring customers to pay thousands of dollars for lead service line replacements up front will reduce participation, particularly among low-income customers, as explained by Pittsburgh UNITED expert Mitchell Miller.[17]

Second, structuring the program as a partial subsidy that will pay for only a portion of replacement costs for customers with incomes over 300% of the federal poverty line is likely to deter many customers from enrolling. PWSA estimates that about 47% of its customers would qualify for only a partial reimbursement under this program.[18] For instance, a customer who makes between 301% and 400% of the federal poverty line, in addition to fronting the entire cost of a $5,500 replacement, would not be reimbursed for 25% of the cost, or $1,375. My experience with partial subsidy programs in Washington, DC and Providence, Rhode Island suggests that requiring customers to pay for the replacement, even in part, is likely to result in low participation. As I previously testified:

> In the District of Columbia, DC Water offered financial incentives, loans, and extended repayment terms for private-side replacement, but only about 10 percent of customers elected to pay for replacement of their private-side lead service line at the same time DC Water replaced the public-side. The participation rate in Providence, Rhode Island, under similar circumstances, was about two percent.[19]

[16] Pittsburgh UNITED St. C-2, at 14-21.
[17] Pittsburgh UNITED St. C-1SUPP-R, at 5-6.
[18] PWSA St. C-1SD, at 30-31.
[19] Pittsburgh UNITED St. C-2, at 19 (footnotes omitted). DC recently enacted an ordinance, creating new lead service line replacement initiatives. DC Water, New Lead Service Line Replacement Assistance Programs,

Research by Drs. Yanna Lambrinidou and Marc Edwards has found that, in DC and Providence, customers' concern with cost was a key factor in their decision not to contract for private-side lead service line replacements.[20] Participation rates varied by income and race. High-income and white customers were more likely than low-income and black customers to pay for private-side lead service line replacements when the utility replaced a public-side service line.[21] Relatedly, participation rates were markedly higher in DC's northwest quadrant, the city's wealthiest.[22] While the DC and Providence programs did not offer to cover the full cost of replacement, they suggest that the 47% of PWSA's customers who will have to contribute some amount of money to lead service line replacement are unlikely to participate in PWSA's program at high rates.

Third, the income-based reimbursement program is not an efficient way to conduct private-side lead service line replacements. The program will fund replacements at the residences of customers who happen to apply for reimbursement. These replacements cannot be readily coordinated with other nearby lead service line replacements or with scheduled street-disturbing utility work. Nor will replacements through the income-based reimbursement program be targeted in neighborhoods with the highest concentrations of families most vulnerable to lead exposure. Such haphazard, one-off replacements lose out on the economies of scale that would be generated by a more systematic approach.

---

https://www.dcwater.com/new-lead-service-line-replacement-assistance-programs. I am not aware of data on customer participation from these new programs.

[20] Appendix A, Yanna Lambrinidou & Marc Edwards, Improving Public Policy Through Qualitative Research: Lessons from Homeowners About Lead Service Line Replacement Under the Federal Lead and Copper Rule 45-46 (Presentation at American Public Health Association Annual Meeting, Nov. 4, 2013).

[21] Id. at 47-48.

[22] Pittsburgh UNITED St. 4, Appendix D, 7, Gregory Welter, Pipe Coating or Lining as Alternative Strategies for Lead Service Line Replacement, AWWA Water Quality & Tech. Conf. 5 (2016).

Q: What do you recommend as an alternative to the income-based reimbursement program?

A: I recommend that PWSA eliminate the income-based reimbursement program and instead offer to replace all private-side lead service lines in its system at no direct cost to customers. The most efficient way to replace all public- and private-side lead service lines would be to continue the neighborhood-based program beyond 2020 and operate it in tandem with the small-diameter water main replacement program. The neighborhood-based program should also be expanded to provide free replacements of private-side-only lead service lines, including in previous work order areas of the neighborhood-based program where PWSA skipped over those lines. In most cases, a private-side-only lead service line is the product of a partial replacement by the utility at some point in the past. On a basis of environmental equity and justice, there is no reason for customers with private-side-only lead service lines to be offered less favorable terms for replacement than customers with full or public-side-only lead service lines. The neighborhood-based program also has the advantage of enabling PWSA to target replacements in parts of the city with families most at risk from lead exposure.[23]

II. PWSA's Tap Water Monitoring Results, January-June 2019

Q: Please describe PWSA's most recent tap water lead monitoring results.

A: PWSA monitoring conducted pursuant to the Lead and Copper Rule for the sixth-month period between January and June 2019 found lead concentrations of 17.5 parts per billion at the 90th percentile of samples.[24] This is PWSA's fifth exceedance of the lead action level of 15 parts per billion.[25]

[23] Pittsburgh UNITED St. C-3, at 27.
[24] PWSA St. C-1SD, at 23.
[25] See Pittsburgh UNITED St. C-2, at 8 (listing PWSA's four previous exceedances of the lead action level).

Q: How has the addition of orthophosphate affected lead release from service lines in PWSA's system?

A: Regardless of whether orthophosphate has started to take effect as Mr. Weimar claims,[26] PWSA has yet to control lead release from its service lines. Although PWSA began adding orthophosphate in April of this year,[27] it could take more than a year for orthophosphate to be fully effective at controlling corrosion.[28] I support use of orthophosphate as a cost-effective corrosion inhibitor for lead abatement; however, orthophosphate is not a silver bullet for the problem of lead corrosion. As long as there are significant potential sources of lead (and in particular lead service lines), there is the distinct potential that a future unintended change in water quality could result in serious episodes of lead release. Also, it remains possible that the protective scale on the interior of lead service lines could be disrupted by physical disturbance or through changes in source or treated water chemistry. Removal of lead service lines is the only way to eliminate their risk to customers.[29]

Q: Does this conclude your testimony?

A: Yes.

[26] PWSA St. C-1SD, at 23.
[27] Id.
[28] Pittsburgh UNITED C-2, at 16-17.
[29] Id.

Appendix A

Lambrinidou and Edwards, Improving Public Policy Through Qualitative Research, 141st APHA Annual Meeting and Expo (2013)

Improving Public Policy Through Qualitative Research

Lessons from Homeowners about Lead Service Line Replacement Under the Federal Lead and Copper Rule

Yanna Lambrinidou, PhD
Marc Edwards, PhD
Virginia Tech

141st APHA Annual Meeting and Expo • Nov. 2-6, 2013 • Boston, MA

Appendix A

Presenter Disclosures

Yanna Lambrinidou

The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No relationships to disclose

Outline

- EPA Lead and Copper Rule (LCR) of 1991
- Health Concerns about Partial Lead Service Line (LSL) Replacement
- Our study
- Policy implications

How would you feel if…

- A federal law made you responsible for protecting yourself and your family from an environmental hazard, but this law and your responsibility were never fully explained to you?
- And, making an informed decision about what protective measures to take required technical information no one gave you?
- And, fulfilling this responsibility required a significant amount of your own money?
- And, your failure to fulfill this responsibility had the potential to cause serious health harm, especially to fetuses, infants, and young children in your home?

EPA LCR of 1991



Ancient Rome

- 312 BC: Romans note high death rate of slaves involved in production of lead drinking-water pipe

- 2nd century BC: "Lead makes the mind give way"

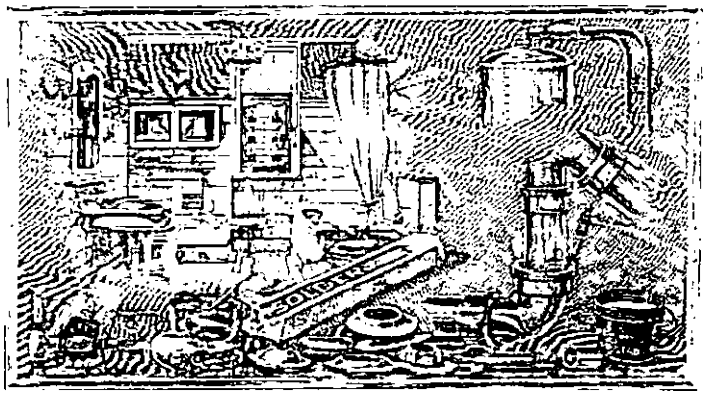
  Dioscorides, ancient Greek physician, pharmacologist, and botanist



Image source: http://upload.wikimedia.org/wikipedia/commons/3/36/Lead_pipe_-_Bath_Roman_Baths.jpg

19th-20th Century US

"Lead helps to guard your health" (National Lead Company, 1923)



"Lead helps to guard your health." The illustration for an ad in the November 1923 *National Geographic*, one of a series by the National Lead Company.

"Empires Perish, But Lead Pipe Lasts" (National Lead Company, 1922)



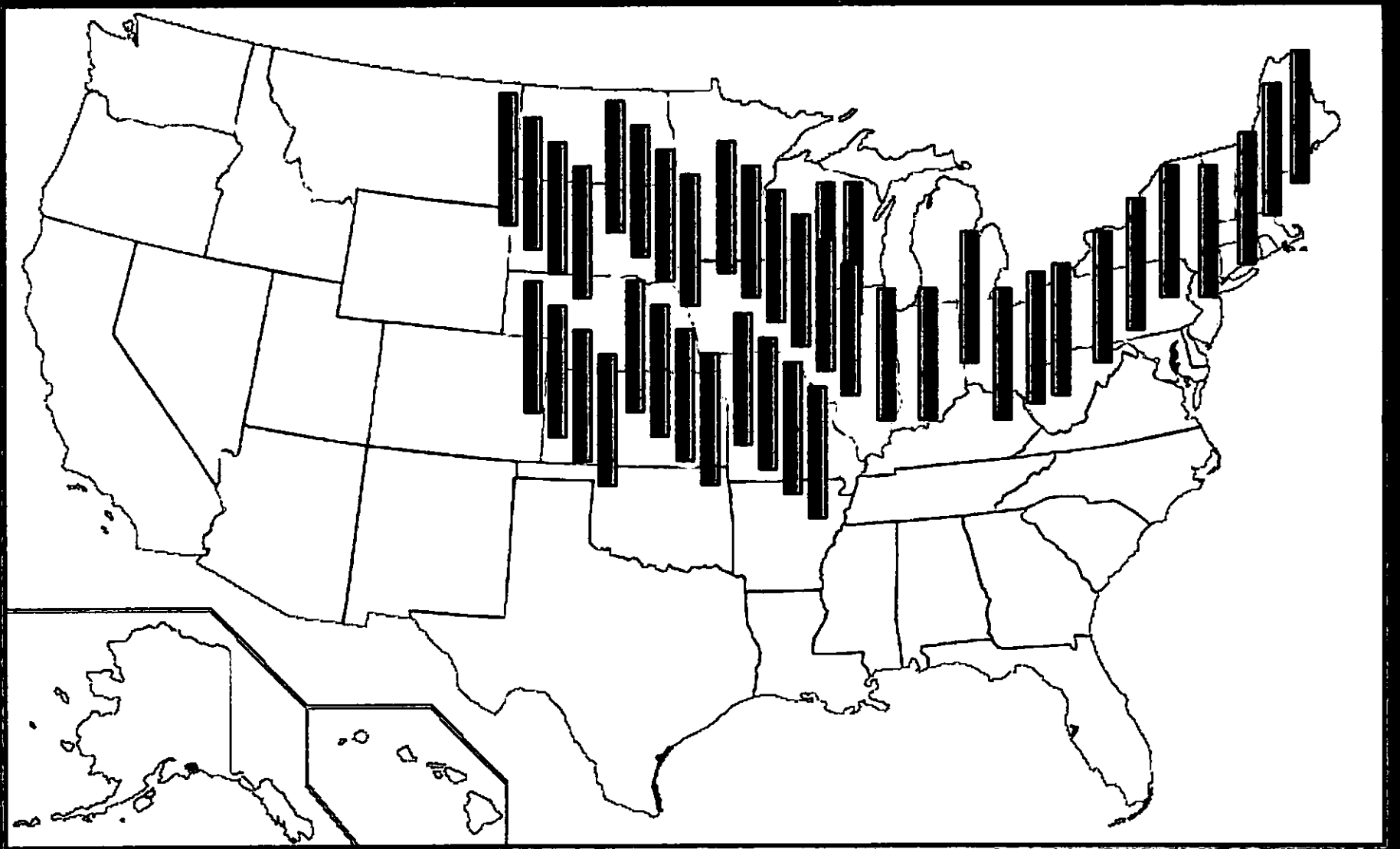
Empires Perish, But Lead Pipe Lasts

Image sources: http://www.ebay.com/itm/1922-AD-National-Lead-Company-empires-perish-but-lead-pipe-lasts-/200809382559; http://scienceblogs.com/worldsfair/2007/04/04/everything-old-is-new-again-le/

Appendix A

Pittsburgh UNITED Statement C-2SUPP-R, Gregory Welter

1991 EPA estimate: 10 million lead service lines (LSLs) in US



Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26477-78. Image source: http://www.youngfarmers.org/practical/training-and-helpful-organizations/

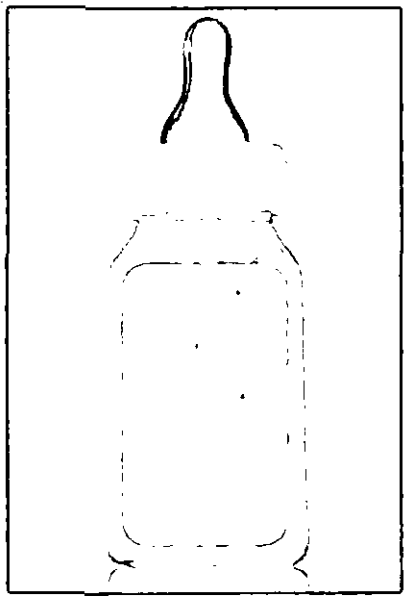
* Late 1800s-early 1900s: Journal articles and reports from Great Britain and the US documenting lead poisonings from drinking water

* By the 1920s: Many US cities and states had begun revising plumbing codes to ban or limit the use of LSLs

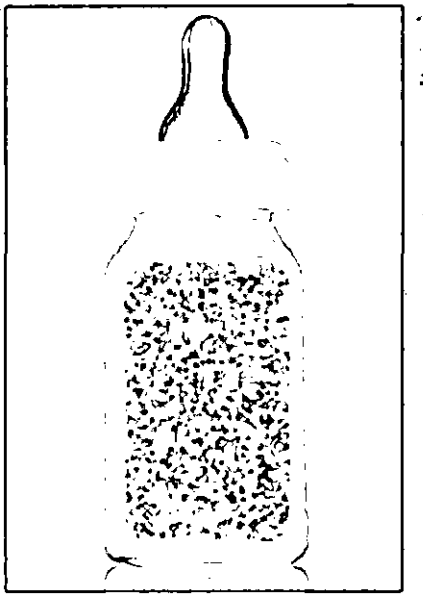
Troesken, 2006, *The Great Lead Water Pipe Disaster.*
Rabin, 2008, "The Lead Industry and Lead Water Pipes," *American Journal of Public Health.*

1983

Ryu, J. E., Ziegler, E. E., Nelson, S. E., and Fomon, S. J. 1983. Dietary intake of lead and blood lead concentration in early infancy. *American Journal of Diseases of Children* 137:886–891.



Iowa City, IA



1986

- EPA estimate: Every year over 250,000 children "are exposed to lead in drinking water at levels high enough to impair their intellectual and physical development."
- 1986: Federal ban on lead service lines

Shenon, P. 1990. Despite Law, Study Finds, Water in US Schools May Contain Lead. *New York Times* (11/1). US Department of Agriculture. 2000. *Selecting and Renovating an Old House: A Complete Guide*, p. 13. Toronto, ON: General Publishing Company, Ltd.

1987 EPA Benefit Analysis

Children's health benefits

+ Increased lifetime earnings ($268.1 million)
+ Avoided medical expenses ($27.6 million annually)
+ Reduced compensatory education costs ($81.2 million annually)

$108.8 million (annually) + $268.1 million (lifetime)

Adult health benefits

Saved medical expenses (e.g., hypertension, heart attaches, strokes, death)

$291.9 million annually

Plumbing materials corrosion damage reduction

$525.3 million annually

Conclusion: Projected benefits exceed costs by about 4:1 (net annual monetized benefits about $800 million)

Appendix A

Levin, R. 1987. Reducing Lead in Drinking Water: A Benefit Analysis [Draft Final Report]. US EPA (EPA-230-09-86-019).

Some lead outside of water utility's control

Some lead deemed under the "control" of consumers

representative of levels at the tap. However, EPA concludes that Congress did not authorize the Agency to hold public water systems liable for tap levels to the extent they are due to conditions in the distribution system which are outside the system's control.

also be reconciled with the statutory definition of public water system which, as EPA has discussed, precludes the Agency from holding public water systems responsible for contaminant levels at the tap which enter drinking water due to conditions in the distribution system which are beyond the system's control. The existing definition of MCL recognizes this fact by excluding "contaminants added to the water under circumstances controlled by the user." § 141.2. However, to the

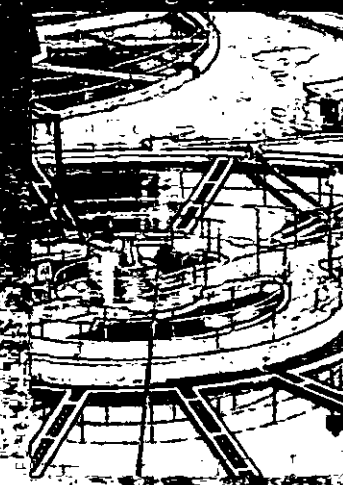
Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26477-78 Appendix A

Lead Action Level (LAL)

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

The LCR requires water utilities to:

1. Treat drinking water in a way that minimizes its ability to corrode lead pipes



+

2. Monitor drinking water by capturing *worst-case* lead levels *at the tap* under normal water use conditions

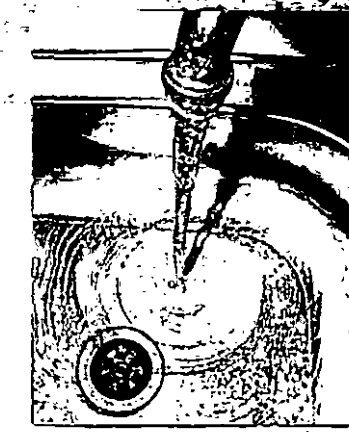
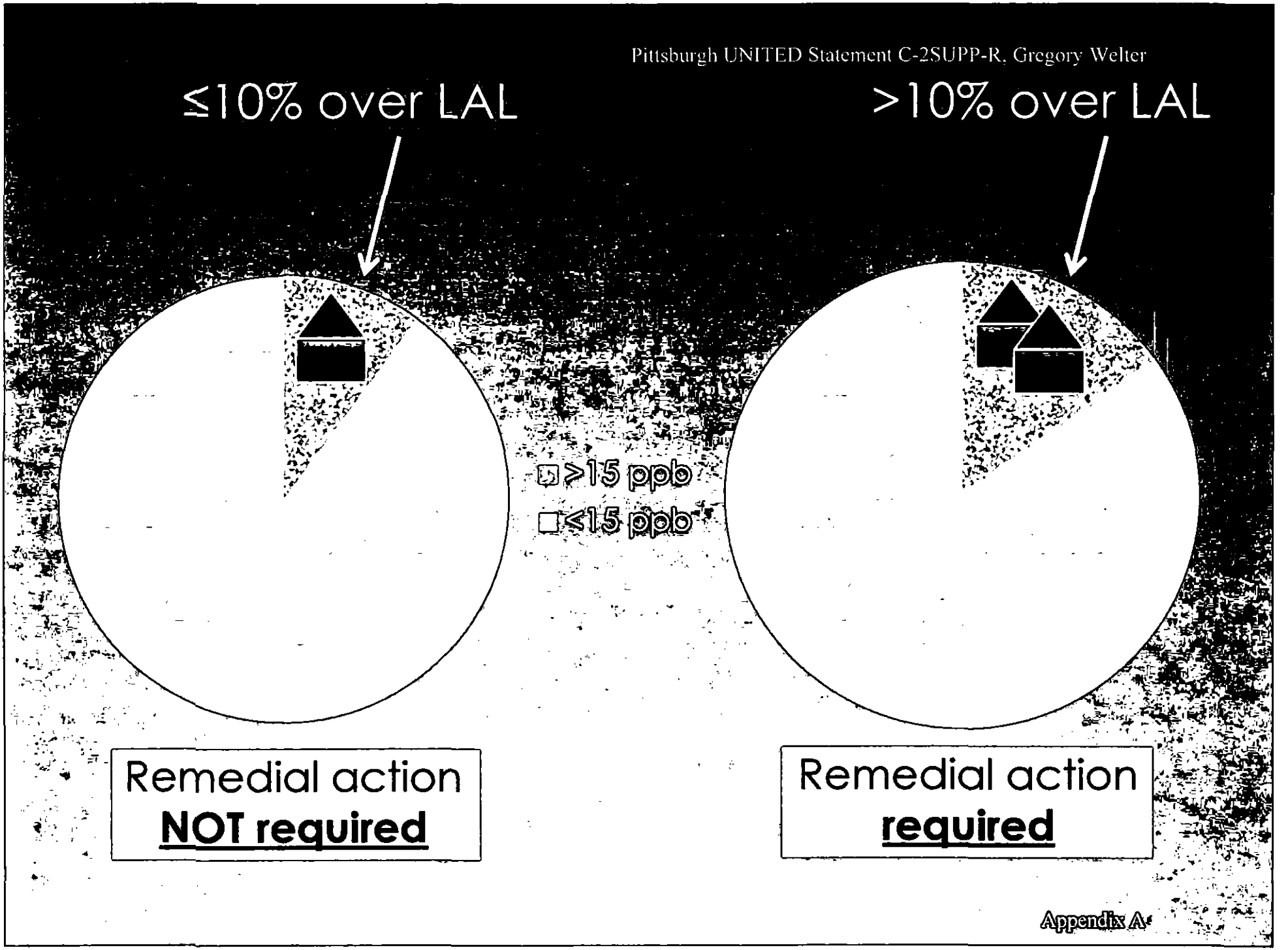


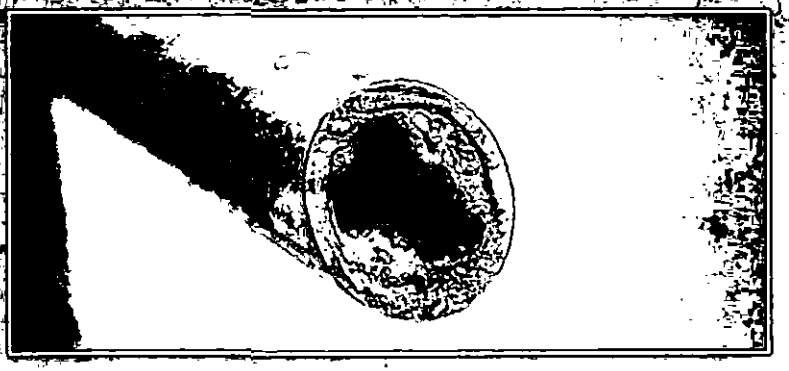
Image sources: http://www.faqs.org/photo-dict/phrase/715/water-treatment-plant.html; http://ligress.wordpress.com/tag/green/

Pittsburgh UNITED Statement C-2SUPP-R, Gregory Welter

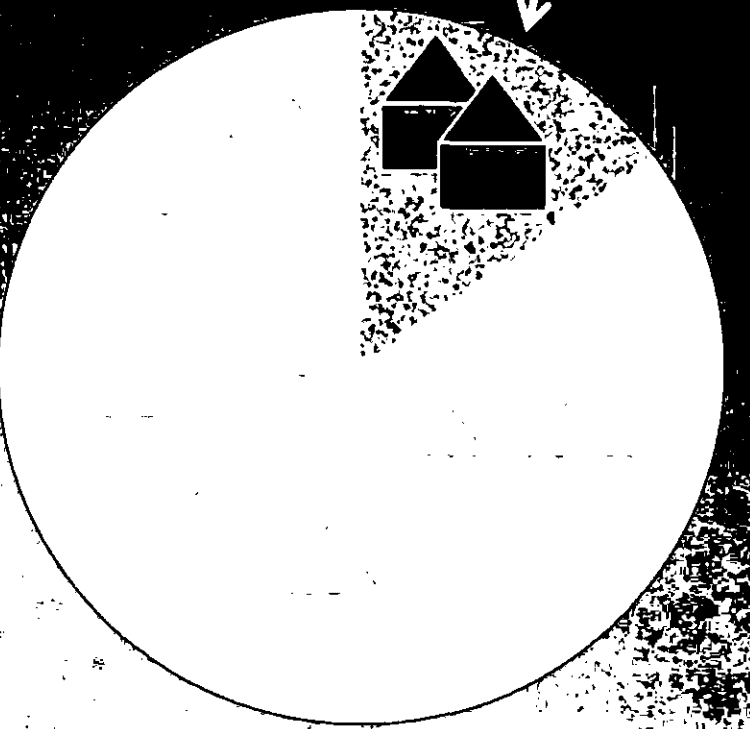


Appendix A

* Source water treatment
* Corrosion control optimization
* Public education
* **Lead service line replacement**



>10% over LAL

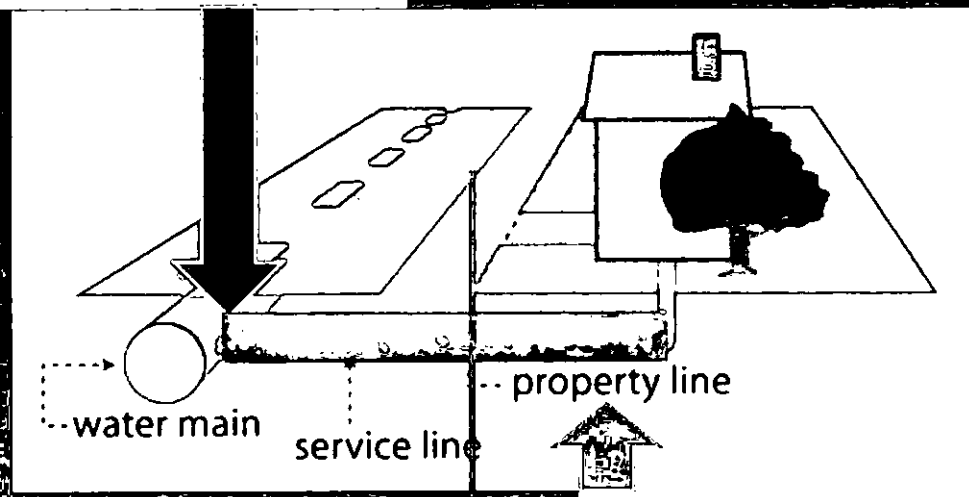


Remedial action **required**

Image source: http://www.easywater.com/blog/2012/01/10/remove-lead-from-water/

Whose pipe, whose lead, whose responsibility?

Owned by water utility



Owned by homeowner

Image source: http://www.dcwater.com/lead/replacement_program.cfm

* 1991 LCR: Broad definition of LSLR requirement => mandatory *full* LSL replacement

* 1994 Water industry lawsuit:

American Water Works Association
v.
EPA

2000 Revision: Narrow definition of LSLR requirement => mandatory *partial* LSL replacement

- Mandatory LSL replacement under the LCR was formalized as a:

SHARED RESPONSIBILITY

between water utilities and homeowners:

- Water utilities => *required* to replace the portion of the LSL they owned
- Homeowners => *given the option* to pay for private-side replacement

Based on AWWA/EPA survey of 90 utilities

1% of water utilities
own a LSL fully

20% of water utilities
own no part of a LSL

79% of water utilities
own a part of a LSL

Sandvig, A. and P. Kwan. 2007. Minimizing Lead Spikes. *Opflow* 33(9):16-19 ◦ Kaplan, S. and C. Hiar. 2012. Toxic Taps: Lead is Still the Problem. Investigative Reporing Workshop, http://investigativereportingworkshop.org/investigations/toxic-taps/story/toxic-taps-lead-is-still-the-problem/

Health Concerns about Partial LSL Replacement

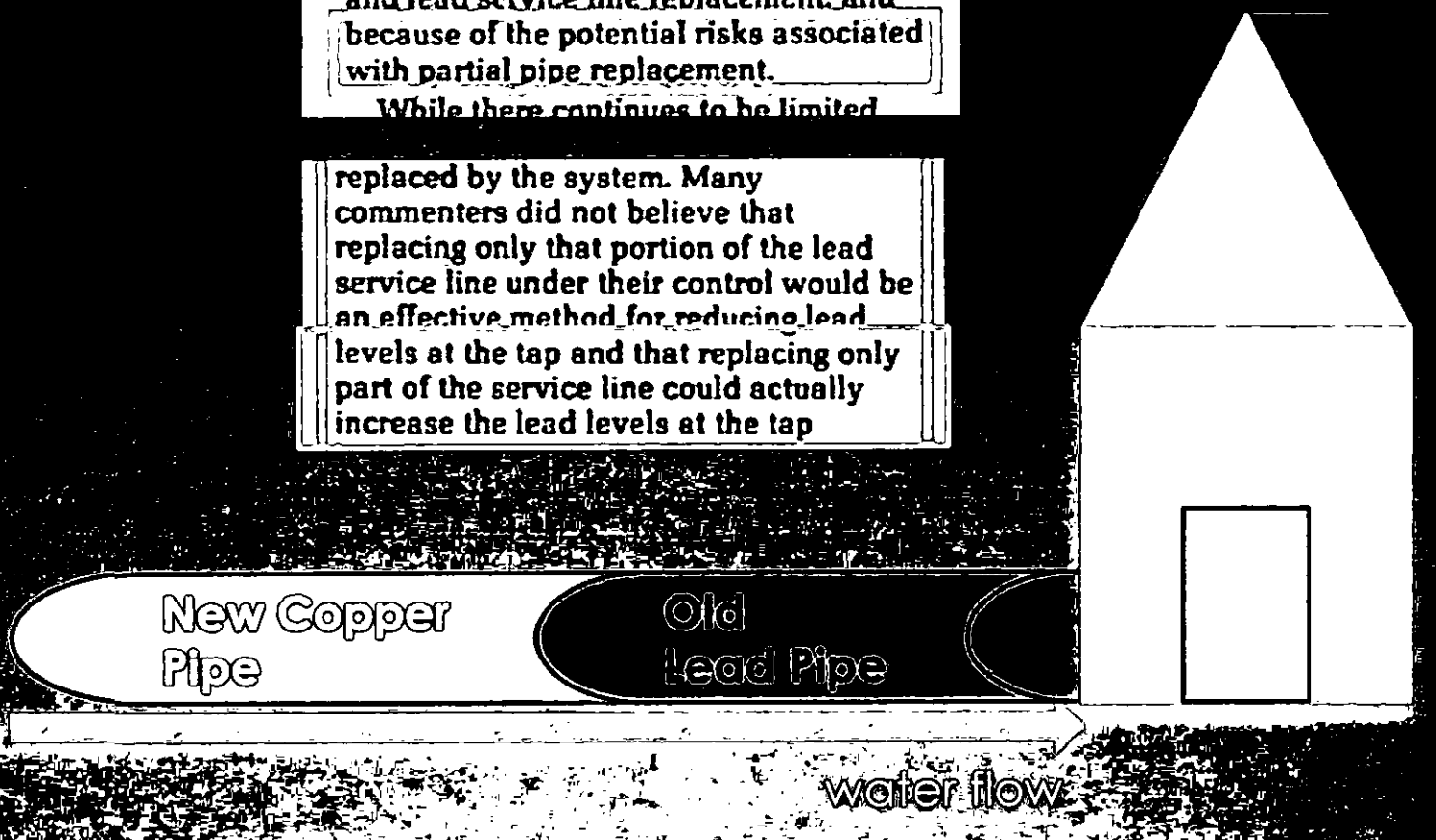
Appendix A

Pittsburgh UNITED Statement C-2SUPP-R, Gregory Welter

EPA knew about risks of partial LSL replacement *before* promulgating the LCR

and lead service line replacement, and because of the potential risks associated with partial pipe replacement. While there continues to be limited

replaced by the system. Many commenters did not believe that replacing only that portion of the lead service line under their control would be an effective method for reducing lead levels at the tap and that replacing only part of the service line could actually increase the lead levels at the tap



Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26503 & 26505

Appendix A

	Study Finding	EPA's Interpretation
EPA 1991c AWWA 1990 Britton & Richards 1981	69 homes: Occasionally, **increased** and **erratic** lead levels observed. In some cases, **no low lead measurements** were obtained, despite satisfactory pH control.	Focused only on one case study in the paper that took place in a town with satisfactory pH control and rare lead-in-water problems. **Concluded that lead increases after PLSLR are only temporary** and can be minimized, if not prevented, when water corrosivity is optimally controlled. Asserted that corrosion control in this case was "poor" when in fact the *authors note the opposite.*
	9 homes: **Temporary increases** (1-2 weeks) in lead levels after PLSLR in chlorinated water	**Concluded that increases are short-lived, but also acknowledged the presence of an "effective passivation film."** Did not raise questions about lead leaching in the absence of such film.
	4 homes: "**Very little change in lead levels ... and some increases** *in some cases*" **in chlorinated water**	**Contended that the findings were not relevant** to the LCR because all pre-PLSLR values were below 15 ppb, and the LCR *does not require LSLR in low lead homes.*

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

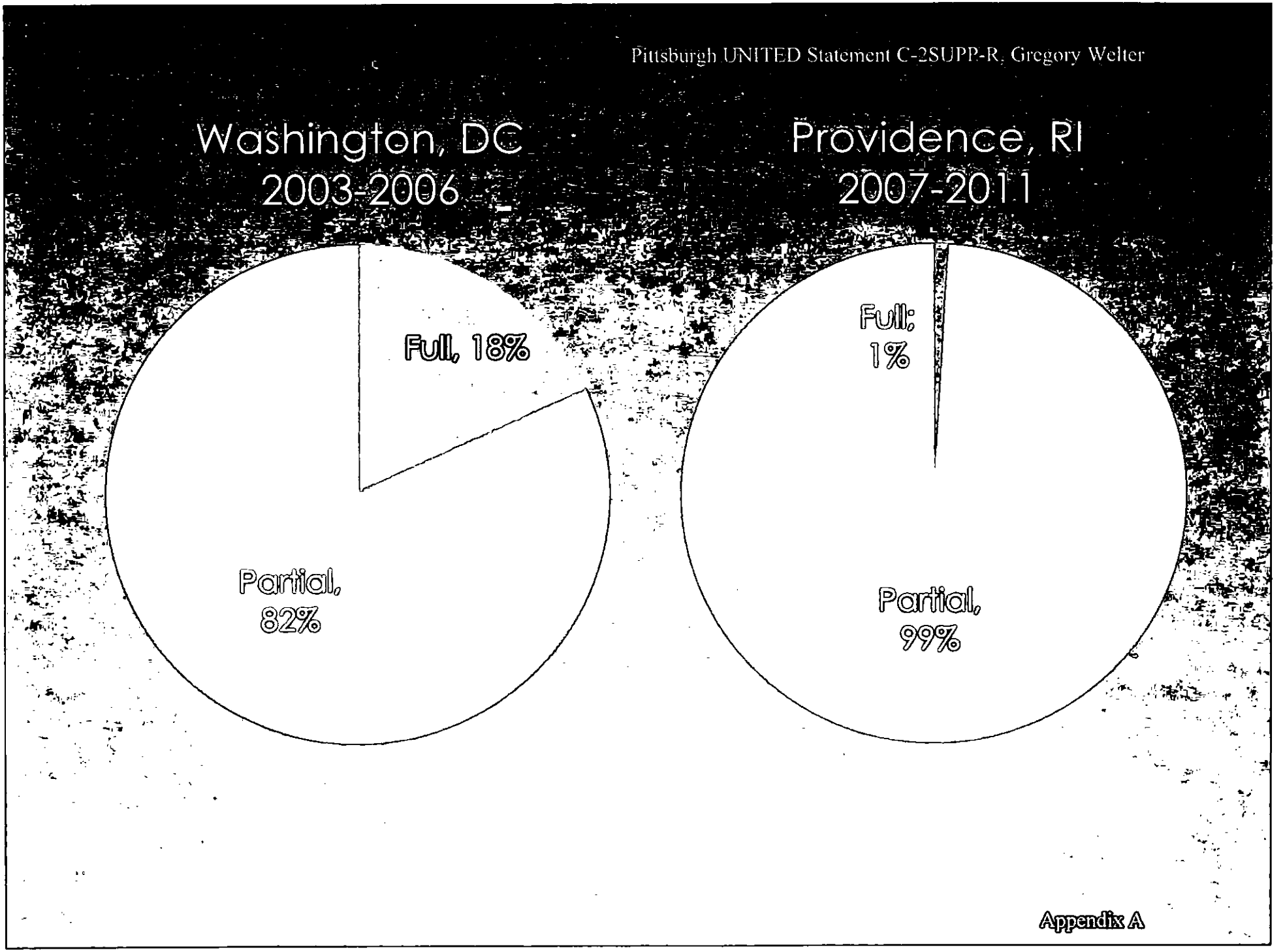
Deposition corrosion of old lead

- 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

1991 EPA

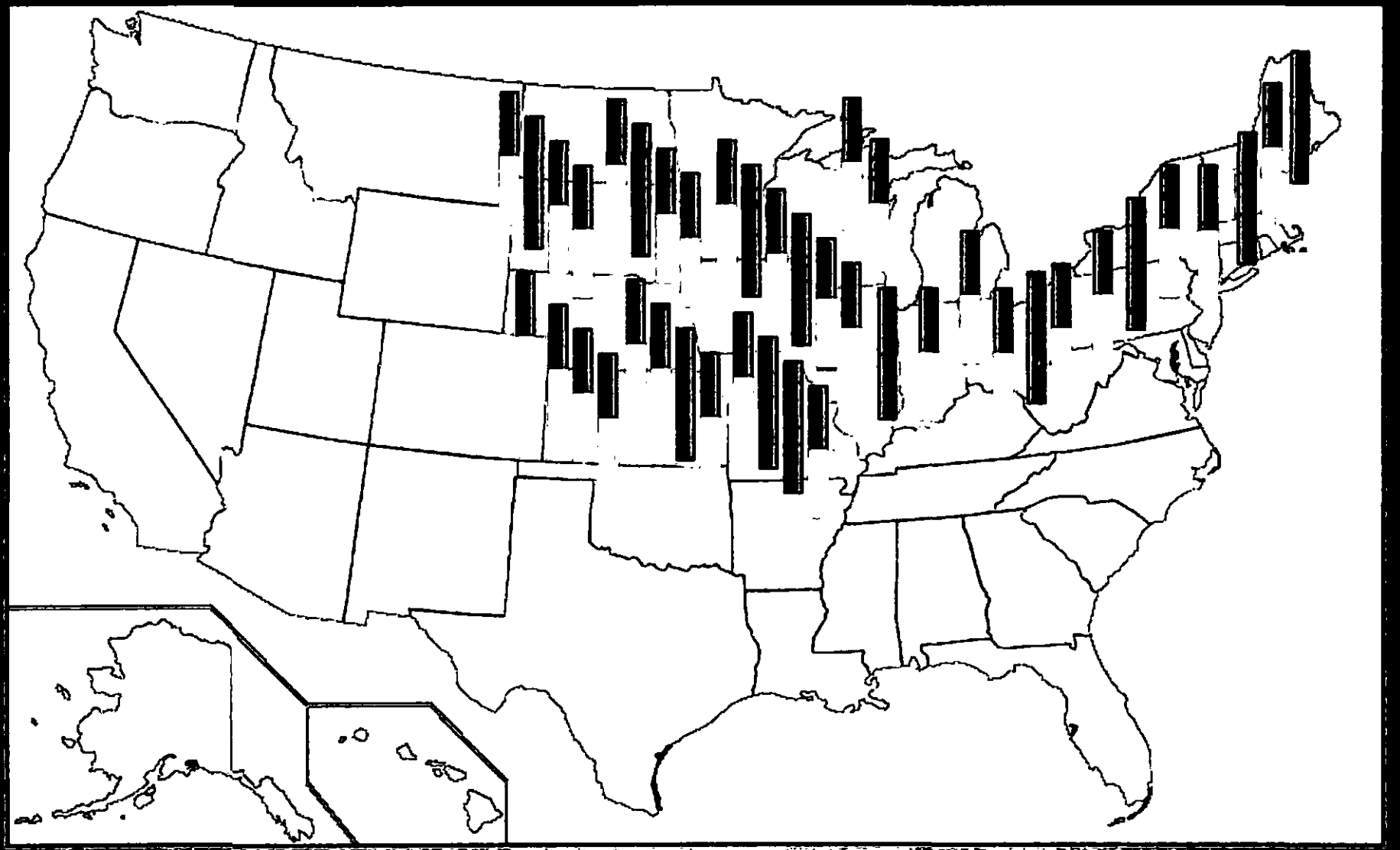
* Homeowners will pay for full LSL replacement

Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26505 & 26506


Washington, DC
2003-2006
Full, 18%
Partial, 82%
Providence, RI
2007-2011
Full; 1%
Partial, 99%

Appendix A

Estimate: >38,000 mandatory partial LSL replacements in US



Kaplan, S. and C. Hiar. 2012. Toxic Taps: Lead is Still the Problem. Investigative Reporting Workshop, http://investigativereportingworkshop.org/investigations/toxic-taps/story/toxic-taps-lead-is-still-the-problem/. Image source: http://www.youngfarmers.org/practical/training-and-helpful-organizations/

1991 EPA

* Homeowners will pay for full LSL replacement
* Any amount of lead reduction will make water safer
* Spikes in lead, if they occur at all, will be temporary and will decrease over time

Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26505 & 26506 Appendix A

Pittsburgh UNITED Statement C-2SUPP-R, Gregory Welter

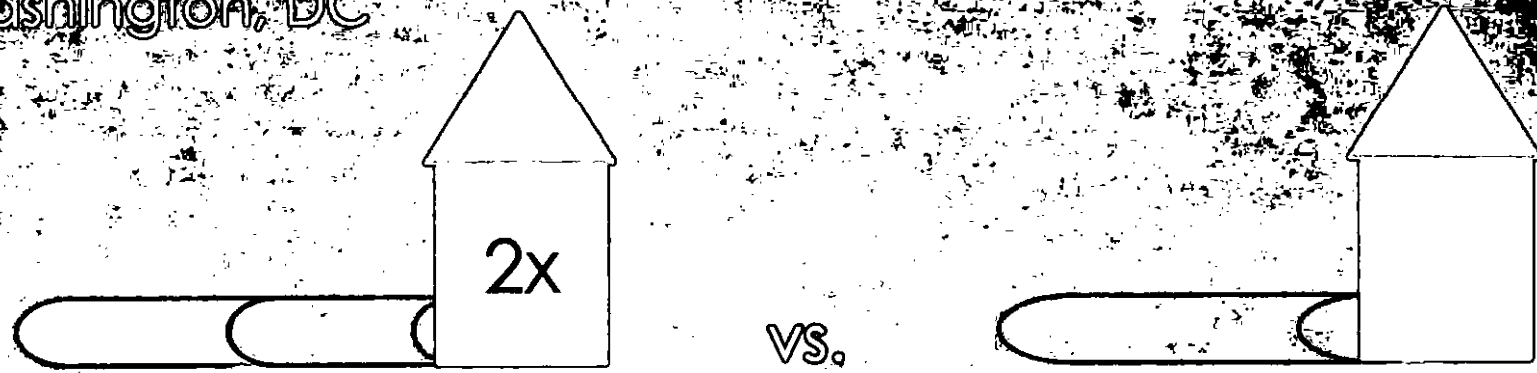
* By 2005: General consensus in water industry that partial LSL replacement "did not reduce water lead levels and might substantially increase them."
* To date: Numerous studies have shown that partial LSL replacement is sometimes followed by lead spikes that can result from galvanic corrosion between old lead and new copper. These spikes can pose acute toxicity risks and can last for weeks, months, and even years, despite corrosion control "optimization."

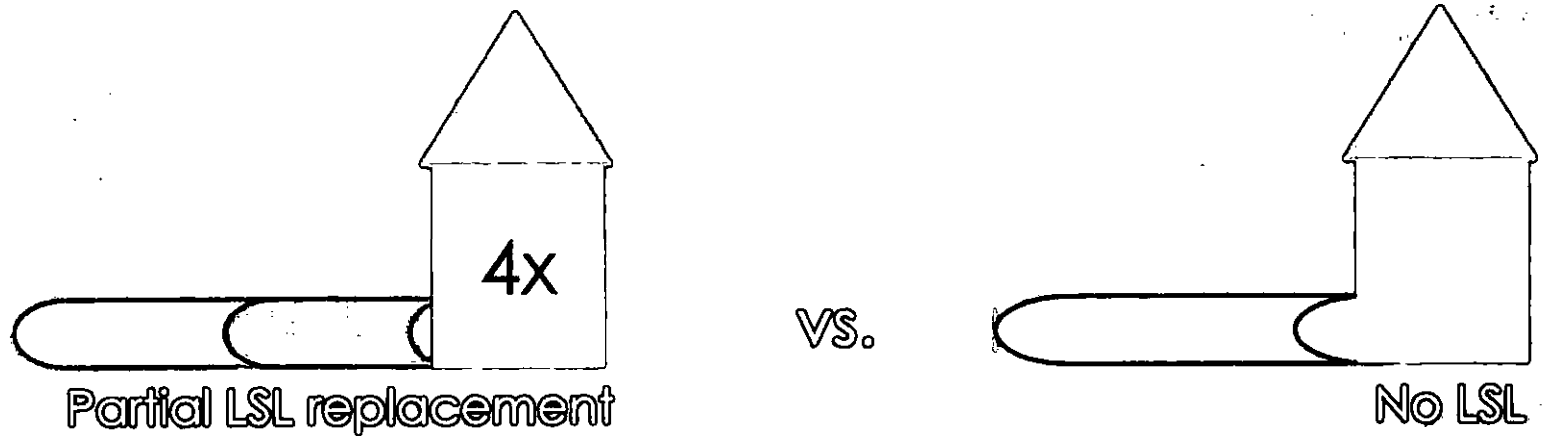
Congressman Brad Miller, US House of Representatives Committee on Science and Technology, Subcommittee on Investigations and Oversight, Letter to US EPA Administrator Lisa P. Jackson, 10/5/2010.

2011 CDC study

Brown MJ, Raymond J, Homa D, Kennedy C, Sinks T. Association Between Children's Blood Lead Levels, Lead Service Lines, and Water Disinfection, Washington, DC, 1998-2006. *Environ Res*. 2011;111(1):67–74.

Washington, DC



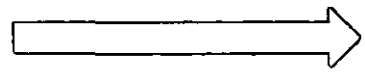


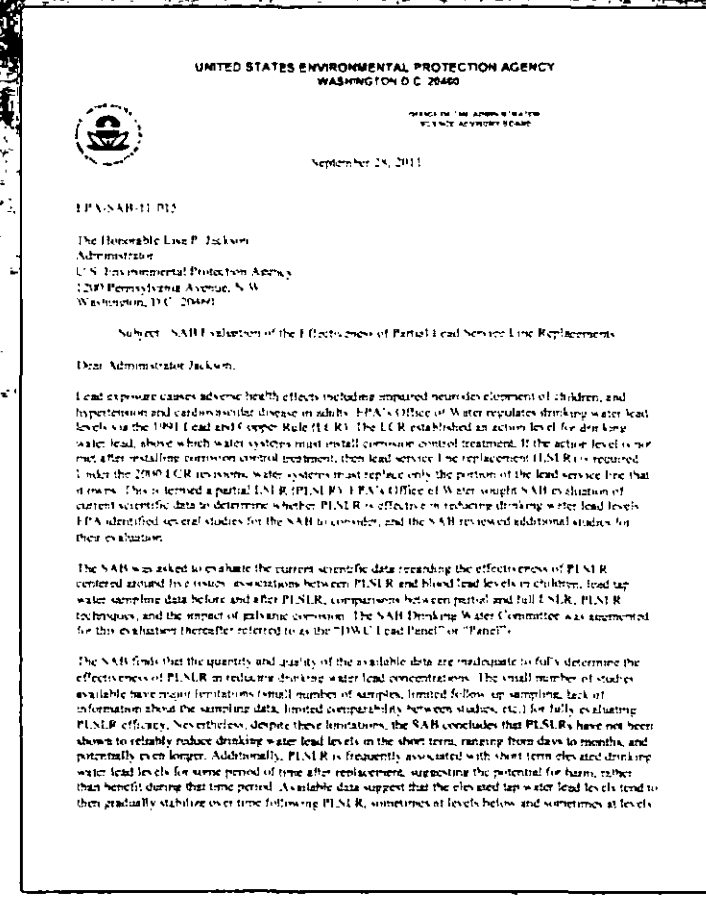
Appendix A

2011 EPA Science Advisory Board report

US EPA Science Advisory Board. SAB Evaluation of the Effectiveness of Partial Lead Service Line Replacements (EPA-SAB-11-015), 9/28/11.

* "...the SAB concludes 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."





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON D C 20460

September 28, 2011

EPA-SAB-11-015

The Honorable Lisa P. Jackson
Administrator
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Subject: SAB Evaluation of the Effectiveness of Partial Lead Service Line Replacements

Dear Administrator Jackson,

Lead exposure causes adverse health effects including impaired neurodevelopment of children, and hypertension and cardiovascular disease in adults. EPA's Office of Water regulates drinking water lead levels via the 1991 Lead and Copper Rule (LCR). The LCR established an action level for drinking water lead, above which water systems must install corrosion control treatment. If the action level is not met after installing corrosion control treatment, then lead service line replacement (LSLR) is required. Under the 2000 LCR revisions, water systems must replace only the portion of the lead service line that it owns. This is termed a partial LSLR (PLSLR). EPA's Office of Water sought SAB evaluation of current scientific data to determine whether PLSLR is effective in reducing drinking water lead levels. EPA identified several studies for the SAB to consider, and the SAB reviewed additional studies on their own initiative.

The SAB was asked to evaluate the current scientific data regarding the effectiveness of PLSLR 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; and the impact of galvanic corrosion. The SAB Drinking Water Committee was augmented for this evaluation (hereafter referred to as the "DWC Lead Panel" or "Panel").

The SAB finds 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 have many 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 concludes 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. Available data suggest that the elevated tap water lead levels tend to then gradually stabilize over time following PLSLR, sometimes at levels below, and sometimes at levels

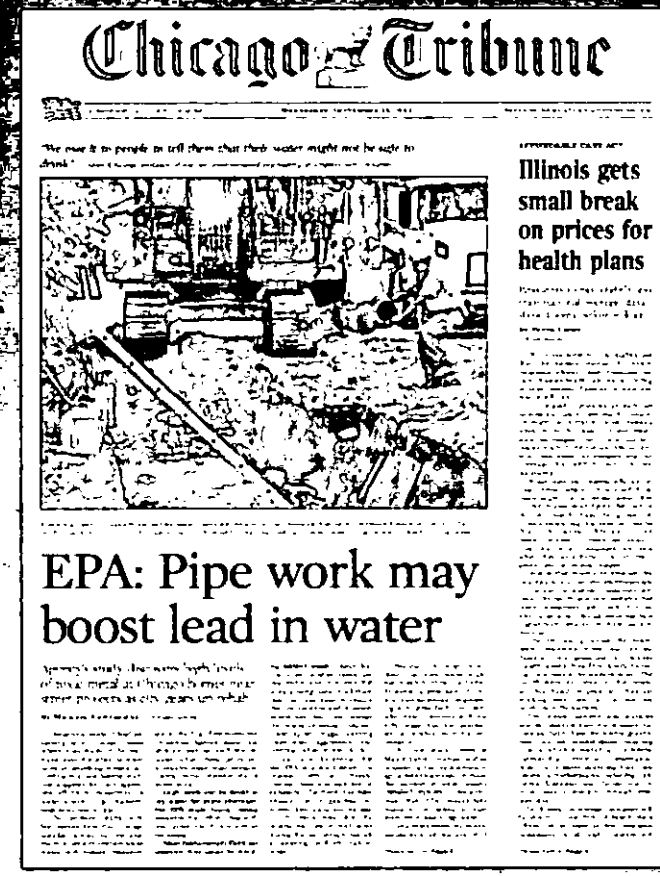
Appendix A

2013 EPA study

Del Toral, M. A., A. Porter, and M. R. Schock. Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study. *ES&T*. 2013;47(16):9300-9307.

Chicago, IL

* "Highest lead levels at homes with prior disturbances to LSL
* "High lead levels can be found in tap water for years afterward, the EPA study found [...] Most homeowners likely are unaware they could be drinking tainted water."



Chicago Tribune

Illinois gets small break on prices for health plans

EPA: Pipe work may boost lead in water

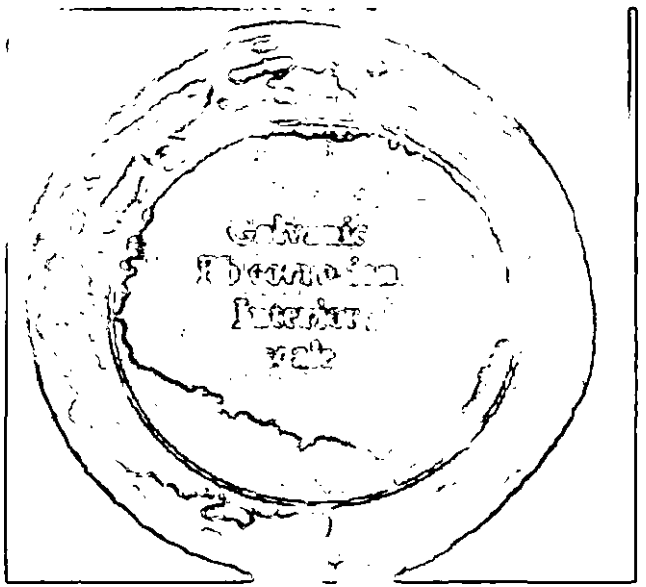
Appendix A

1991 EPA

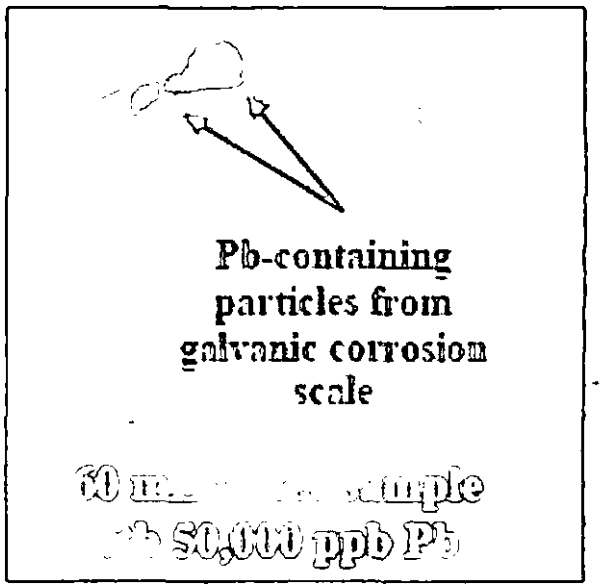
- ~~Homeowners will pay for full LSL replacement~~
- ~~Any amount of lead reduction will make water safer~~
- ~~Spikes in lead, if they occur at all, will be temporary and will decrease over time~~
- Short-term exposure to lead immediately after replacement is preferable to long-term exposure

Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26505 & 26506 Appendix A

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



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

1991 EPA

- ~~Homeowners will pay for full LSL replacement~~
- ~~Any amount of lead reduction will make water safer~~
- ~~Spikes in lead, if they occur at all, will be temporary and will decrease over time~~
- ~~Short-term exposure to lead immediately after replacement is preferable to long-term exposure~~
- Utilities will inform residents about short-term risk "to ensure that increased exposures do not occur"

Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26505 & 26506 Appendix A

Our Study

Appendix A

Archival and qualitative research to explore:

Q1. Homeowner experiences with the "shared responsibility" regime of the LCR

Q2. Why most homeowners opt out of private-side LSL replacement when it is "in their interest" to have their LSL fully replaced

Q3. If utility recommendations about precautions consumers can take after partial LSL replacement are effective at protecting public health

Homeowner Interviews

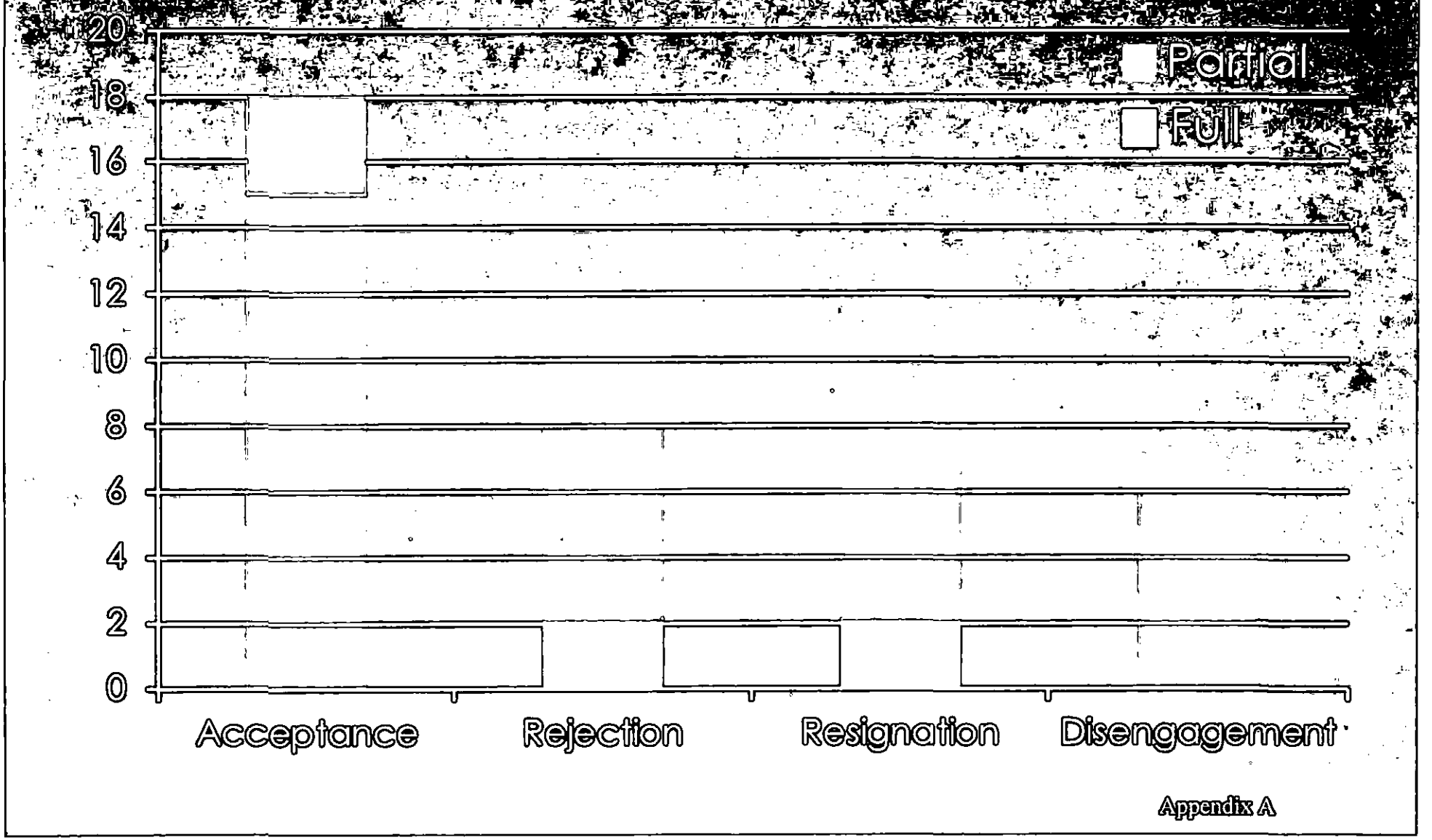
Type of LSLR

	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**

Q1 - Homeowner experiences with LCR's "shared responsibility" regime



Appendix A

Acceptance

* MJ: I remember thinking, "Oh my God, I just bought this house. Now I have to spend another $3,000.00 to do that." *[Laughter]* Like, "Oh my gosh, homeownership. Here we go!" [...] It was convenient to do it at that time because they were redoing the whole street [...] Two, I knew for health reasons it was important to do that and three, for the resale value of the house.

* MC: Actually—I'm glad my husband's not here, he'll yell at me—I said "Let's replace the whole line," and he said, "No, that's ridiculous. It's gonna be too much." He didn't send the letter back, and when they actually came here, I was hysterical. I was like "What, are you crazy? Of course we're gonna change it, are you nuts?" He said "Oh they're gonna dig up the whole beautiful front yard?" I said "Great! Let 'em dig it up!"

* PP: In the case of our house, it needed to be replaced. Therefore, they had me sign an agreement to do that, and I did and that work was completed. [...] I don't think there was a choice in how you could achieve it, I think. I would have to go back and reread all of the documentations to know whether it was optional or not. I never considered it optional because it's a public safety thing.

Rejection

* JL: There wasn't any information about potential health risks of a [...] partial placement, or even if the partial placement was actually working to mitigate the problem at all. It was just presented as a very like *a fait accompli*. [...] *[Laughter]* [The utility's information] informed me what they were doing, but it didn't help me make any informed decisions.

* JB: [...] telling people you have a "choice" between "safe water" and "unsafe water," is there a choice there? Nobody *chooses* unsafe water. *Nobody chooses unsafe water.* [...] They really didn't have a choice and that's why [some homeowners] accepted unsafe water. That was the option – either get unsafe water or you pay and you get safe water. That's not a choice.

SS: It's like me telling [the power utility] that the power line feeding the house is down, and them saying, "Oh no, it's not our responsibility. We're only responsible for the wires outside on the main pole in the yard." It didn't make any sense. There was nothing I could do about it 'cuz these guys weren't gonna act at all. We just left it at that because there's no sense in banging your head against the wall.

Resignation

- MC: I understood that, of course, it would be a health benefit for a full replacement. Again, the cost was still prohibitive. It ended up being another source of irritation.

- AM: At the time, part of what I was thinking was wow, [the LSL replacement program is] really good, but thanks a lot! -- it doesn't help me too much, since I already have all this other lead on the other half. Then I said, huh, I guess [...] we should consider doing the other half. I wasn't too thrilled with that they weren't doing it all.

- DW: To me it was kind of foolish in the first place to do a partial, because if you're leaving some lead—I suppose you would collect less lead, but lead is lead. I mean, the partial kind of didn't make sense to me, in the first place. [...] Of course, I kind of, like the cynic that I am, assume that [...] we live in a litigious society, that [the utility people] were perhaps protecting themselves, and they would cut [their replacement] as short as wherever they could say it was my responsibility. Is it better to have partial replacement? I suppose, but, would I rather have full replacement? Yeah.

Disengagement

- FM: All I knew was that having the city do [a partial replacement], that would happen with my inaction, and that anything else would require my action [signing a contract, etc.], and that's something that I didn't even consider.

- CM: I didn't feel the risk was such that I would consider the full replacement [...]. [I understood that some "tolerable" lead may still be left in there.] Just like there's natural unemployment rate, something like that. [...] [If the lead that's left in the ground were too much] some type of regulatory entity would make sure that—if not the utility, some type of independent body would be looking out for these types of issues, yes.

- MM: I know [lead in water] poses a health risk. I thought... – this may be an erroneous assumption – but I thought in [my town] that basically we were okay because it was never really raised [...] as [...] a serious health issue..., that what they were doing in [my town] was kind of "normal maintenance," given the age of the water pipe system and the fact that the pipes were lead.

Q2. Homeowner "opt out" reasons in relation to private-side LSL replacement

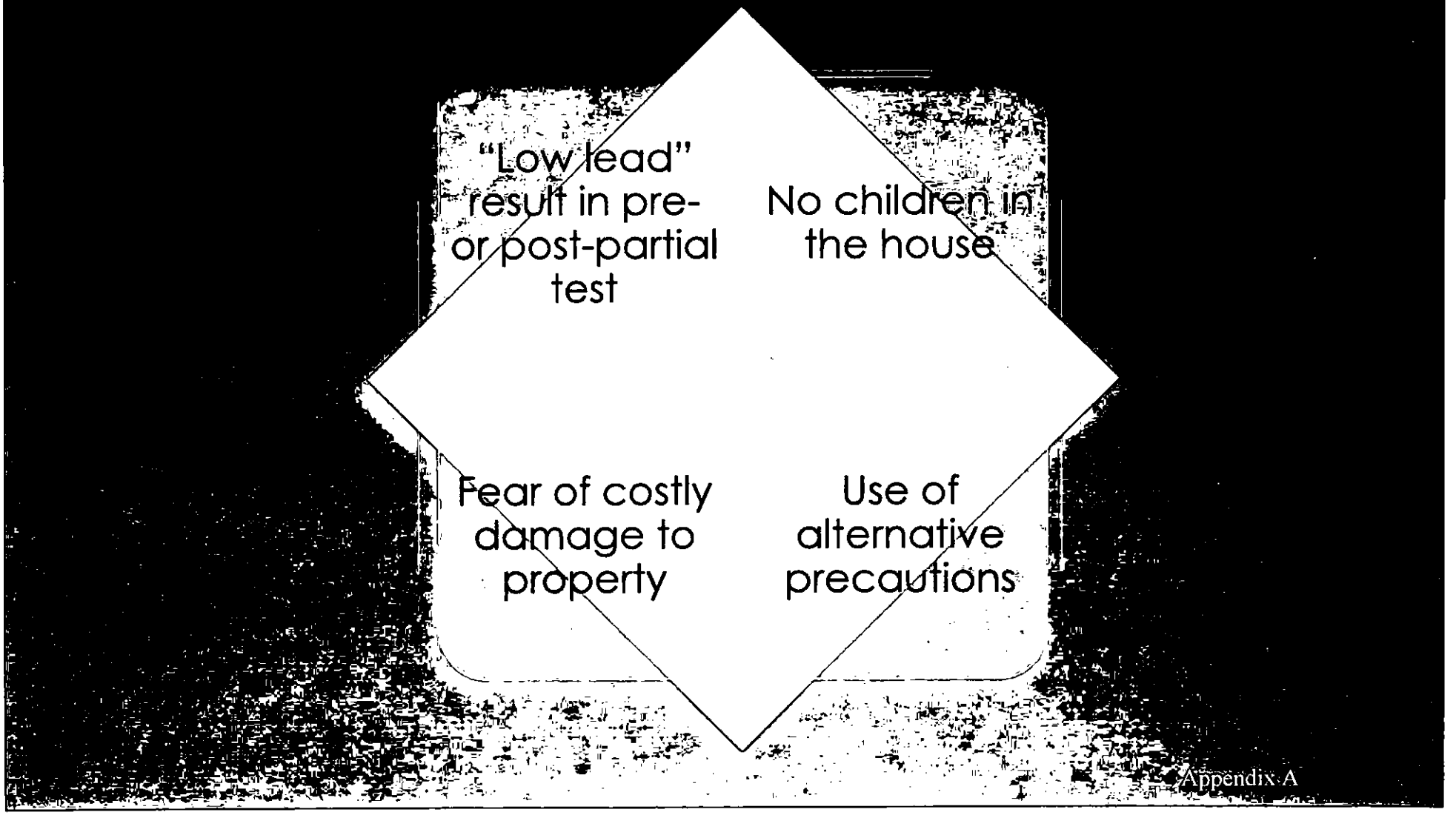
COST

Recalled estimate range: $1,000-$7,000. Cost concern across income levels.

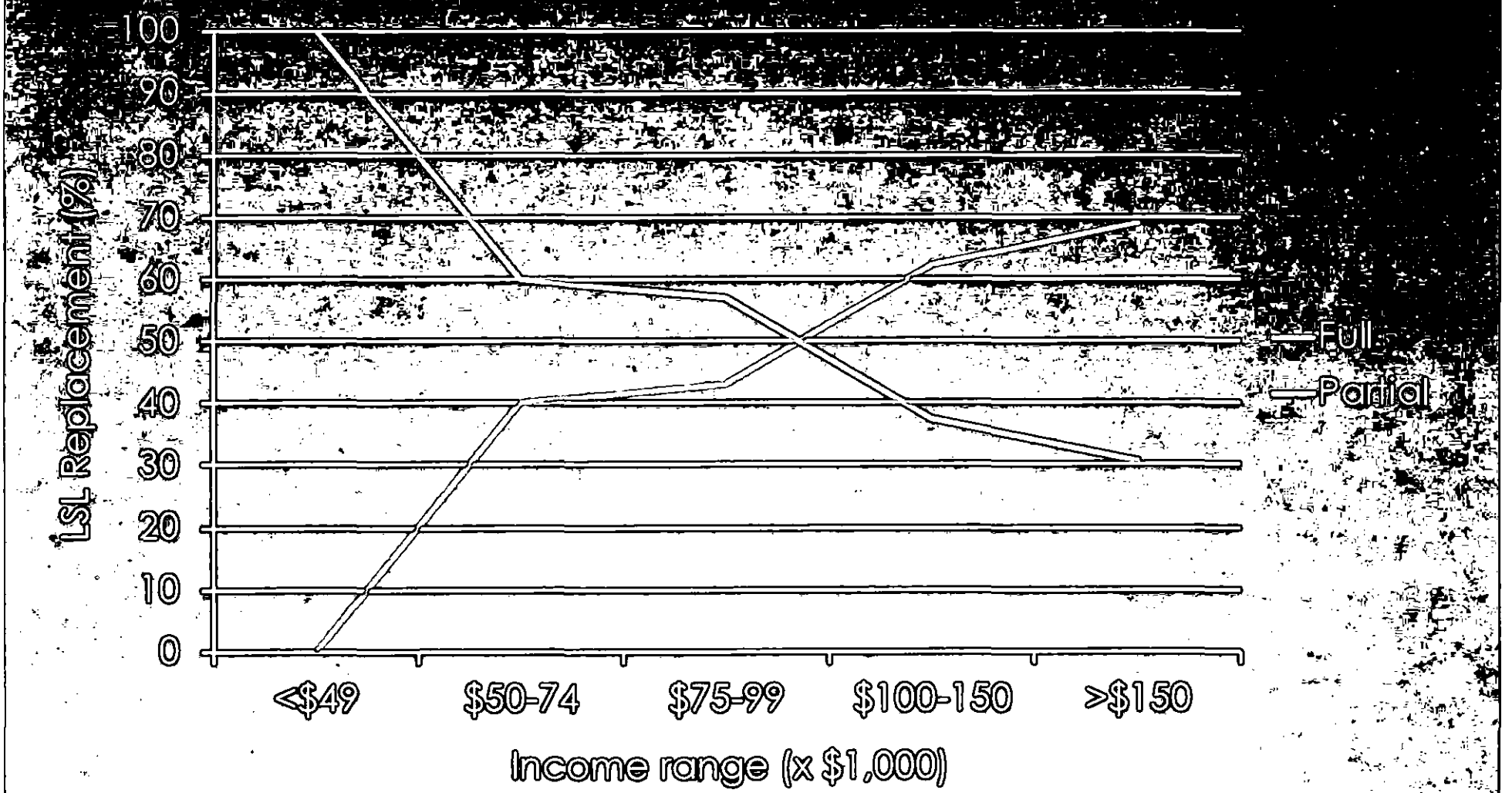
If cost covered by utility:

- 80% would agree to full LSL replacement
- 20% would agree to a full LSL replacement if it were recommended for preventing *known* (rather than speculative) health harm

Given the financial burden of full LSL replacement, homeowners who opted for a partial LSL replacement took into consideration other relevant factors as well:

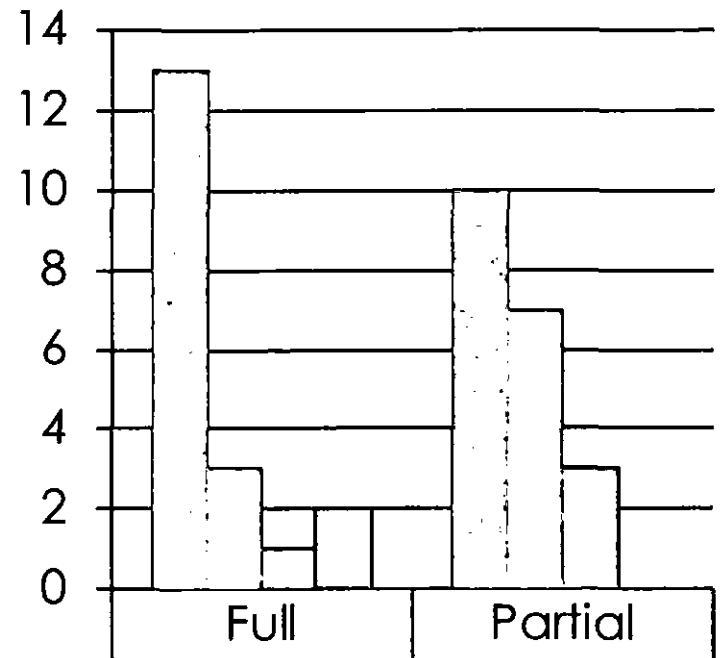


Type of LSLR by Income Level



Appendix A

Type of LSLR by Race



	Full	Partial
White/Caucasian	13	10
Black/African American	3	7
Hispanic/Latino	1	3
Other	2	

Homeowner critique of utility notification materials

- Overemphasis on logistics
- Focus on separation of responsibility between water utility and homeowner
- Feeling of being left alone to figure out what to do
- *50% of homeowners with a partial LSL replacement said that if the short- and long-term health risks of partial replacement had been spelled out more clearly, they would have been more inclined to opt for a full LSL replacement (or, at least, consider it more seriously)*

* RR: In fact, I was a little frustrated at the type of letter. Again, it came out as sort of a—the tone was not very helpful for somebody who was not involved in construction shall we say. In fact it was rather forceful. Again, it was sort of the "cover your butt attitude" of like, "Listen, we're only responsible for what comes up to your door, and then you're responsible for everything after that." It was a very kind of mean letter, which I think actually dissuaded some of my neighbors from replacing their lines. They kind of felt like, oh, this is my responsibility, and I don't know if I can dig everything up, things like that.

CM: It was very detailed. It's just like a lot of technical jargon and drawings and things like that. Kind of like they're—again, this is my view. I think they overwhelm you with information that's almost lawyerly, if you will, so that they can—"OK, we told you everything, what the risks may be." There's some fine print, maybe not, but they overwhelm you with information. Of course, I think they also provide numbers for you to call and things like that, but I didn't find it that useful in terms of educating people, so that's where my bias is. I'm more into you make sure that they understand, not that I give you all the information. That's how I felt about it, and I still feel about it mostly today.

Q3. Are utility recommendations for precautions after partial LSL replacement adequately health protective?

Trends:

- No precautions immediately after replacement, or
- 1-time flush only to clean out pipes

Widespread use of long-term precautionary measures (e.g., filtering, flushing, use of bottled water), but more as continuation of pre-existing efforts to address broad range of water-quality concerns, and less as protection against lead from partial LSLR. Measures not always adequate for lead removal.

1991 EPA

- Homeowners will pay for full LSL replacement
- Any amount of lead reduction will make water safer
- Spikes in lead, if they occur at all, will be temporary and will decrease over time
- Short-term exposure to lead immediately after replacement is preferable to long-term exposure
- Utilities will inform residents about short-term risk "to ensure that increased exposures do not occur"

Federal Register, Vol. 56, No. 110, June 7, 1991, p. 26505 & 26506

Conclusions

* Rather than working as a remedy, the LCR's LSL replacement requirement places many consumers at risk of increased exposure to lead. This is largely due to a lack of proper public education about legal and technical aspects of the requirement, as well as the high cost of private-side LSL replacement.

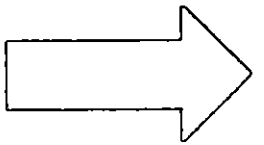
  A majority of homeowners do understand that a full LSLR is in their interest (for health or other reasons).

  Income and race seem to influence homeowner acceptance of the LCR's "shared responsibility" regime and selection of full versus partial LSLR. This suggests that the LCR's LSLR requirement might unwittingly perpetuate environmental injustice.

  Homeowners who decline a full LSLR do not always take appropriate or adequate precautions against lead in water following partial LSLR.

The responsibility that the LSL requirement assigns to homeowners does not promote informed decision-making or thoughtful consideration of different potential alternatives. Rather, it attempts to achieve quick homeowner compliance with private-side LSL replacement, leaving many consumers without a choice but to accept the possibility of worsened contamination.

Legally sanctioned
SHARED
RESPONSIBILITY



Legally sanctioned
ABDICATED
RESPONSIBILITY

Policy Implications

Appendix A

EPA LCR Revisions: Recommendations

- A new LSLR requirement
  - Mandates full LSL replacement and does not place it out of the reach of homeowners who cannot afford it
- A new notification requirement
  - Corrects and updates information about a) lead in water, b) the benefits of full LSLR replacement, and c) the short- and long-term risks of partial LSLR
  - Discusses all options for effective protection against lead in homes with partial LSLR
  - Informs consumers in homes with a partial LSL about the health risks involved and methods to avoid them

The Catch?

Appendix A

Based on 2011 AWWA survey of 805 utilities:

Pittsburgh v. PWSA, GD-17-011, Exhibit No. C-2SUPP-R, Gregory Welter

69% of water utilities own no part of a LSL (up from 20% 4-5 years earlier)



Kaplan, S. and C. Hiar. 2012. Toxic Taps: Lead is Still the Problem. Investigative Reporting Workshop, http://investigativereportingworkshop.org/investigations/toxic-taps/story/toxic-taps-lead-is-still-the-problem/ • http://goldcoasttickets.com/blog/index.php/2011/12/16/last-minute-holiday-gift-ideas-part-iii-of-iii-chicago-theater-tickets/26206

We Thank

- All the homeowners in Washington, DC and Providence, RI who agreed to participate in our study
- The Public Health Law Research (PHLR) program of the Robert Wood Johnson Foundation (RWJF)
- DC Water and Sewer Authority (DC Water)
- Our colleague Ralph Scott

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

DIRECT TESTIMONY OF BRUCE LANPHEAR, M.D., M.P.H.

ON BEHALF OF

PITTSBURGH UNITED

April 5, 2019

Revised May 6, 2019

Topics Addressed:

Lead Remediation Program

PREPARED DIRECT TESTIMONY OF BRUCE LANPHEAR, M.D., M.P.H.

Q: Please state your name, occupation, and business address.

A: Bruce Lanphear. I am currently a Professor on the Faculty of Health Sciences at Simon Fraser University and a Clinician Scientist at the Child and Family Research Institute at British Columbia Children's Hospital. My business address is Blusson Hall, 8888 University Drive, Burnaby, BC V5A 1S6, Canada.

Q: Briefly outline your educational and professional background.

A: I am a medical doctor. I received my M.D. in 1986 from the University of Missouri at Kansas City. I completed an internship at the University of Arkansas for Medical Sciences from 1986-87 and a fellowship in general academic pediatric research at the University of Rochester School of Medicine from 1992-95. Since 1989 I have been certified by the American Board of Medical Specialties, with a specialization in general preventative medicine and public health. I also received a Master of Public Health degree from the Tulane School of Public Health and Tropical Medicine in 1988.

Since completing my academic training, I have served as a member of numerous public health agencies and task forces, including the Science Advisory Board for Evaluating the Hazards of Partial Water Line Replacement for the U.S. Environmental Protection Agency (EPA) and the Peer-Review Panel for the National Toxicology Program of the U.S. Department of Health and Human Services Monograph on Health Effects of Low-Level Lead. I was a member of two National Academies of Sciences Committees: "Ethical Consideration for Research on Housing-Related Health-Hazards Involving Children" and "Contaminated Drinking Water at Camp Lejeune." In June 2017 I was consulted by the Allegheny County Lead Task

Force, which was charged with developing strategies for addressing childhood lead exposure in the County.

I have served as an editorial board member for several scientific journals, including PLoS Medicine and Environmental Health Perspectives. A more complete description of my educational and work experience, as well as a complete list of my publications, is included at Appendix A.

Q: Please describe the focus of your work over the past 20 years.

A: My research focuses on quantifying and preventing health effects in children that result from exposures to toxic chemicals, such as lead. My original research includes over 40 studies on lead exposure and lead poisoning, including a study funded by the Centers for Disease Control and Prevention on the primary prevention of exposure to lead, for which I served as principal investigator, and a study funded by the National Institute of Environmental Health Sciences on the neurobehavioral effects of low-level lead exposure in children, for which I also served as principal investigator. Currently, I am senior investigator for a study examining fetal and early childhood exposures to lead and other prevalent environmental neurotoxins. I have written and presented extensively on the sources and health effects of lead exposure, including for the recent American Academy of Pediatrics Lead Policy Statement (2016).

By virtue of my medical and public health training, my clinical work, my research, and my knowledge of pertinent scientific literature, I am often considered by my peers to be an expert on the sources and effects of lead exposure, particularly in children.

Q: Have you testified in any proceeding before the Pennsylvania PUC?

A: Yes. I provided direct and surrebuttal testimony in the Pittsburg Water and Sewer Authority's (PWSA's) rate case proceeding, PUC v. PWSA, Docket Nos. R-2018-3002645,

3002647 ("Rate Case"). My testimony in that proceeding was duly entered into the record on November 14, 2018, and was filed with the Secretary's Bureau on the same day. I am advised by counsel that PWSA agreed in the Joint Settlement to the Rate Case that it would not object to the admission of "any testimony, documents, or answers to interrogatories exchanged throughout the course of [the rate proceeding]."[1]

To avoid excessive duplication of the information I provided in the Rate Case, I am incorporating my Rate Case testimony here by reference and will cite, with particularity, relevant sections of that prior testimony and the accompanying appendices to provide additional information, data, or context to my direct testimony in this proceeding.[2]

Q: For whom are you testifying in this proceeding?

A: I am testifying on behalf of Pittsburgh UNITED.

Q: What is the purpose of your testimony?

A: Pittsburgh UNITED intervened in this proceeding to ensure, among other things, that PWSA's lead remediation program for 2020-2026 will provide safe drinking water to all residential customers. My testimony focuses on the dangers of lead contamination and the health implications of PWSA's lead remediation program.

Q: How is your testimony organized?

A: My testimony is divided into five sections. In the first section, I discuss the sources and effects of lead exposure. In the second section, I discuss the risks of lead exposure in Pittsburgh. In the third section, I provide a brief overview of PWSA's lead remediation program, as

[1] See PUC v. PWSA, Docket Nos. R-2018-3002645, -3002647, Recommended Decision, at 31 ¶ H.3 (order entered Jan. 17, 2019) [hereinafter Recommended Decision].

[2] See Pittsburgh UNITED St. 5; Pittsburgh UNITED St. 5-SR. See also 52 Pa. Code § 1.33 (incorporation by reference). I am advised by counsel that Pittsburgh UNITED agrees to supply copies of this testimony if so required by the ALJs or the Commission. See 52 Pa. Code § 5.407.

described in PWSA's Compliance Plan and Long-Term Infrastructure Improvement Plan (LTIIP). In the fourth section, I evaluate the health implications of PWSA's lead remediation program and offer three recommendations PWSA should adopt to better protect its customers from lead exposure:

(1) PWSA should commit to replacing all lead service lines in its system by 2026. This will avoid dangerous partial replacements and eliminate a major source of lead exposure. To aid in the replacement of all lead service lines, PWSA should offer private-side lead service line replacements at no direct cost to customers and maintain a neighborhood-based lead service line replacement program.

(2) PWSA should prioritize lead service line replacements for children, pregnant women, black people, and low-income individuals—residents who are particularly vulnerable to lead exposure—by analyzing blood lead levels in children, drinking water lead levels, water main ages, parcel ages, and demographic data, and selecting areas for replacement where the concentration of these factors is highest.

(3) PWSA should improve its current water filter distribution policies—including by offering free filters to customers whose tap water samples are above 5 parts per billion and by boosting outreach efforts for all filter policies—and maintain these policies through 2026.

I also offer recommendations relating to PWSA's post-replacement policies, Community Environmental Project, meter replacement program, and lead service line inventorying efforts.

In the fifth and final section, I summarize my conclusions and recommendations.

I. Sources and effects of lead exposure

Q: Please describe how drinking water serves as a source of lead exposure.

A: Drinking water is a serious and significant source of lead. Exposure to lead from drinking water is due to the presence of lead-containing water infrastructure, particularly in older homes and cities. Lead can enter drinking water through the corrosion of plumbing materials, including lead pipes and fixtures.[3]

Lead exposure can occur by drinking or cooking with contaminated water. Infants may be exposed by ingesting formula prepared with lead-contaminated tap water. Lead can also pass from a mother to a developing fetus and from a nursing mother to her baby through breastmilk.

Drinking water has become a more important source of lead as exposures to lead in paint and gasoline have been reduced.[4] EPA states that there is a "quantitatively consistent relationship between blood lead and lead in drinking water for infants, children, and adults."[5] That finding is confirmed by multiple studies concluding that lead-contaminated water contributes to children's blood lead levels even after accounting for lead in paint, dust, and soil, and other factors.[6]

---

[3] Pittsburgh UNITED St. 5, Appendix D, 1, Ronnie Levin et al., Lead Exposures in U.S. Children, 2008: Implications for Prevention, 116 Envtl. Health Persp. 1285, 1287 (2008).

[4] See Pittsburgh UNITED St. 5, Appendix D, 2, Patrick Levallois et al., The Impact of Drinking Water, Indoor Dust and Paint on Blood Lead Levels of Children Aged 1-5 Years in Montréal (Québec, Canada), 24 J. Exposure Sci. & Envtl. Epidemiology 185, 185 (2014); Appendix D, 5, Allegheny Cty. Lead Task Force, Final Report & Recommendations 5 (2017).

[5] 56 Fed. Reg. 26,460, 26,470 (June 7, 1991).

[6] See, e.g., Gerard Ngueta et al., Use of a Cumulative Exposure Index to Estimate the Impact of Tap Water Lead Concentration on Blood Lead Levels in 1- to 5-Year-Old Children (Montréal, Canada), 124 Envtl. Health Persp. 388 (2016), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4786982/; Pittsburgh UNITED St. 5, Appendix D, 4, Bruce P. Lanphear et al., Environmental Lead Exposure During Early Childhood, 140 J. of Pediatrics 40, 44 (2002) [hereinafter Lead Exposure During Early Childhood].

Q: Please describe other major sources of lead exposure.

A: Other major sources of lead exposure are the ingestion of lead-contaminated dust and soil, primarily due to the presence of lead-based paint and legacy lead gasoline emissions.[7]

Q: Are blood lead levels an accurate measure of lead exposure?

A: Blood lead levels of young children are generally a reliable indicator of ongoing lead exposure. However, blood lead levels can underestimate the adverse health impacts of lead for the population at large for two reasons. First, infants less than six months old are not routinely tested for blood lead levels, even though they are the most vulnerable subset of the population for ingestion of lead-contaminated tap water, as I discuss below. Second, the majority of lead absorbed by the body (more than 70%) is stored in a person's bones (i.e., not in the blood). As a result, measuring blood lead levels may not fully capture a person's lifetime exposures.

Q: Are certain populations particularly vulnerable to lead exposure?

A: Yes. An individual's level of exposure to lead varies based on age and other factors. Developing fetuses, infants, and children are uniquely vulnerable to lead toxicity because their brains are still developing and growing.

Rapidly growing tissues are more vulnerable to lead and other toxicants. Lead interferes with the formation of nerve connections, which are formed during brain development. Developing fetuses and newborns do not have fully developed blood-brain barriers, which make their brains more susceptible to lead. Children are also more exposed to lead than adults because of their normal developmental behavior, including crawling and hand-to-mouth activity. Children who have iron or calcium deficiency also more readily absorb lead. This is because lead

[7] Lead Exposure During Early Childhood, supra note 6, at 40; Nat'l Toxicology Program, U.S. Dep't of Health & Human Servs., Health Effects of Low-Level Lead 13 (2012), https://ntp.niehs.nih.gov/ntp/ohat/lead/final/monographhealtheffectslowlevellead_newissn_508.pdf.

mimics iron and calcium in the way it is absorbed in the gastrointestinal tract. Moreover, some evidence indicates that black children are more efficient at absorbing calcium and, by mimicry, lead.[8] This greater absorption partially accounts for the 50% higher blood lead concentrations in black children, even after accounting for myriad sources of lead in their environments.

Infants are especially vulnerable to lead-contaminated drinking water because their primary interaction with their environment is what they drink.[9] For infants consuming formula, EPA has concluded that tap water may account for more than 85% of their total lead exposure.[10] Infants also absorb lead more efficiently than adults, particularly lead from drinking water; infants can absorb 40-50% of water-soluble lead they ingest compared with 3-10% for adults.[11] Young children also have a greater risk of exposure from lead-contaminated water because, pound for pound, they drink more water than older children and adults.

Other factors make certain children and adults particularly vulnerable to lead exposure. Because the majority of lead is stored in bones, where it can remain for years, lead can be released during times of physiological change, including stress, pregnancy, lactation, fractures, and menopause. The concentration of lead in a woman's blood, for instance, increases by about 30% after menopause.[12]

People who live in older homes and poorly maintained rental housing are at increased risk for higher blood lead concentrations, as are people with nutrient-deficient diets.[13] Black people and people of low-income backgrounds are also at higher risk for elevated blood lead

---

[8] Lead Exposure During Early Childhood, supra note 6, at 40, 46.
[9] Pittsburgh UNITED St. 5, Appendix D, 5, Michael W. Shannon & John W. Graef, Lead Intoxication in Infancy, 89 Pediatrics 87, 89-90 (1992).
[10] 56 Fed. Reg. at 26,470.
[11] U.S. Dep't of Health & Human Servs., Toxicological Profile for Lead 156 (2007), http://www.atsdr.cdc.gov/toxprofiles/tp13.pdf.
[12] Id. at 354-56.
[13] Nat'l Toxicology Program, supra note 7, at 17.

levels because they are more likely to be living in older, poorly maintained housing that contains residual lead paint and older pipes and plumbing fixtures that are more likely to contain lead.[14]

Q: What are the health effects of lead exposure?

A: Lead is toxic to the central nervous and cardiovascular system. It damages numerous organ systems and causes permanent, irreversible injuries to children's developing brains. Even at low levels of exposure, lead is harmful to both children and adults. There is no safe level of exposure to lead.

Lead can pass from a mother's lead stores and blood to her unborn baby, increasing the risk that the baby will be born too early or too small. Lead exposure has also been associated with an increased incidence of miscarriages and delays in the time to achieve pregnancy.[15] One case control study showed that the odds of miscarriage nearly doubled for every 5 micrograms per deciliter (µg/dL) increase in maternal blood lead concentration.[16]

Childhood lead exposure has been associated with a wide array of irreversible neuropsychological and developmental effects. Increased blood lead levels can result in lower IQs, diminished academic achievement, increased risk of attention-related disorders, and increased risk of problem behaviors, like conduct disorder. These associations occur even at low blood levels (below 5 µg/dL).[17] Blood lead levels of 10 µg/dL and lower are also associated with stunted growth and impaired hearing.

---

[14] Appendix D, 12, Allegheny Cty. Lead Task Force, at 12; Lead Exposure During Early Childhood, supra note 6, at 45-46.

[15] Pittsburgh UNITED St. 5, Appendix D, 6, Marc Edwards, Fetal Death and Reduced Birth Rates Associated with Exposure to Lead-Contaminated Drinking Water, 48 Envtl. Sci. & Tech. 739, 739-46 (2014); Pittsburgh UNITED St. 5, Appendix D, 7, Motao Zhu et al., Maternal Low-Level Lead Exposure and Fetal Growth, 118 Envtl. Health Pers. 1471, 1471-75 (2010).

[16] Pittsburgh UNITED St. 5, Appendix D, 8, Victor H. Borja-Aburto et al., Blood Lead Levels Measured Prospectively and Risk of Spontaneous Abortion, 150 Am. J. Epidemiology 590, 590-97 (1999).

[17] Nat'l Toxicology Program, supra note 7, at xviii.

Childhood lead exposure can have lifelong effects. Children with elevated blood lead levels may never reach the same peak cognitive ability later in life as children with lower exposure to lead.[18] There is some evidence that lead exposure is a risk factor for developing Alzheimer's disease.[19]

Adults exposed to lead can also experience adverse health impacts. Chronic lead exposure in adults can result in increased blood pressure (or hypertension) and chronic kidney disease. Adult lead exposure has been associated with increased risk of cardiovascular problems, decreased cognitive function, and increased incidence of tremors.[20]

In sum, the scientific evidence confirms that there is no safe level of lead exposure, and that blood lead level reference values used by public-health agencies and organizations—such as EPA's lead action level, discussed below—should not be interpreted as establishing a safe, health-based level of lead exposure. Even low levels of lead exposure can cause death from cardiovascular disease and diminish IQ levels. These risks increase sharply with increased lead exposure.

Q: Are the effects of lead exposure cumulative?

A: Yes. The adverse effects of lead exposure build up over time. There is evidence that, while both acute exposures and cumulative lead exposure adversely affect childhood brain development, cumulative lead exposure over time is a stronger predictor of long-term adverse outcomes than short-term peak exposure to lead. For example, children's blood lead levels measured at ages 5-6 were more strongly associated with adverse health impacts than peak blood

---

[18] Pittsburgh UNITED St. 5, Appendix D, 9, Bruce P. Lanphear, The Impact of Toxins on the Developing Brain, 36 Annual Rev. Pub. Health 211, 218-19 (2015) [hereinafter The Impact of Toxins].
[19] Id. at 219.
[20] Pittsburgh UNITED St. 5, Appendix D, 10, Bruce P. Lanphear et al., Low-Level Lead Exposure and Mortality in U.S. Adults: A Population-Based Cohort Study, 3 Lancet Pub. Health e177, e182-83 (2018); Pittsburgh UNITED St. 5, Appendix D, 11, Simoni Triantafyllidou & Marc Edwards, Lead (Pb) in Tap Water and in Blood: Implications for Lead Exposure in the United States, 42 Crit. Rev. Envtl. Sci. & Tech. 1297, 1319 (2012).

lead levels measured during early childhood (ages 0-2), suggesting that lead exposure throughout childhood—not just early peak exposure—significantly affects negative health outcomes.[21]

II. Lead exposure in Pittsburgh

Q: Are Pittsburgh residents at risk of lead exposure from drinking water?

A: Yes. PWSA's tap water testing results over the past three years show consistently high levels of lead. Under the federal Lead and Copper Rule, PWSA must collect and test at least 100 tap water samples from a qualifying pool of residential homes every six months.[22] Samples are then analyzed to determine the 90th percentile level of lead concentrations. EPA has set a lead action level at 15 parts per billion (ppb).[23] An exceedance of that level triggers additional requirements under the Lead and Copper Rule.[24]

The results of PWSA's most recent six-month testing periods are as follows:

Monitoring Period	90th Percentile Lead Level (ppb)
January-June 2016	22
July-December 2016	18
January-June 2017	15
July-December 2017	21
January-June 2018	10
July-December 2018	20

Table A: PWSA's Recent Monitoring Results Under the Lead and Copper Rule[25]

[21] Pittsburgh UNITED St. 5, Appendix D, 12, Christopher J. Brubaker et al., The Influence of Age of Lead Exposure on Adult Gray Matter Volume, NeuroToxicology 3-4 (2010).
[22] 40 C.F.R. § 141.86(c), (d)(1).
[23] Id. §§ 141.2, 141.80(c)(1).
[24] Id. § 141.2; Pittsburgh UNITED St. C-2, at 7-8, 11-12.
[25] Press Release, PWSA, PWSA Releases December 2018 Lead Compliance Test Results (Jan. 18, 2019), http://www.pgh2o.com/release?id=7790.

PWSA's tap water testing results have exceeded or equaled the lead action level of 15 ppb for five of the last six testing periods.

EPA's lead action level of 15 ppb is not a health-based standard.[26] There is no safe level of exposure to lead.[27] Even chronically elevated blood lead levels below 5 μg/dL have been associated with antisocial, disruptive, and violent behaviors, with increased risk of criminal arrests, and with significant developmental and neuropsychological effects in children.[28] The risk of lead exposure from drinking water to Pittsburgh residents, particularly children and other vulnerable populations, is unacceptably high.

Q: Please describe Pittsburgh residents' overall risk of lead exposure.

A: Pittsburgh residents continue to be exposed to uncontrolled and persistently high levels of lead in their drinking water. PWSA's water lead levels have routinely exceeded the 15-ppb lead action level, as noted above, and remain high, with the most recent six-month monitoring result reaching 20 ppb. A recent analysis shows that PWSA is the second largest water system in the nation to have exceeded EPA's action level.[29]

Pittsburgh residents' high risk of lead exposure from their drinking water is particularly troubling because these residents are already exposed to other sources of lead, such as lead-contaminated dust and soil. As I discuss above, older homes and poorly maintained rental housing are more likely to contain lead pipes and plumbing fixtures and residual lead paint and dust. Pittsburgh has a significant number of old homes and rental homes. As the following map

---

[26] Pittsburgh UNITED St. 5, Appendix D, 13, EPA Office of Water, Lead and Copper Rule Revisions White Paper 11-12 (2016) (confirming that the lead action level is not health based and recommending that EPA establish a health-based benchmark for lead in drinking water); Pittsburgh UNITED St. 5, Appendix D, 14, Adrienne Katner et al., Weaknesses in Federal Drinking Water Regulations and Public Health Policies That Impede Lead Poisoning Prevention and Environmental Justice, 9 Envtl. Just. 1, 3 (2016).

[27] EPA Office of Water, supra note 26, at 11.

[28] The Impact of Toxins, supra note 18, at 218-21.

[29] Kristi Pullen Fedinick, What's in Your Water? An Updated Analysis (Sept. 14, 2018), https://www.nrdc.org/experts/kristi-pullen-fedinick/whats-your-water-updated-analysis.

shows, a large proportion of Pittsburgh's housing stock was built before 1950, when lead service lines and lead-based paint were still frequently used:[30]

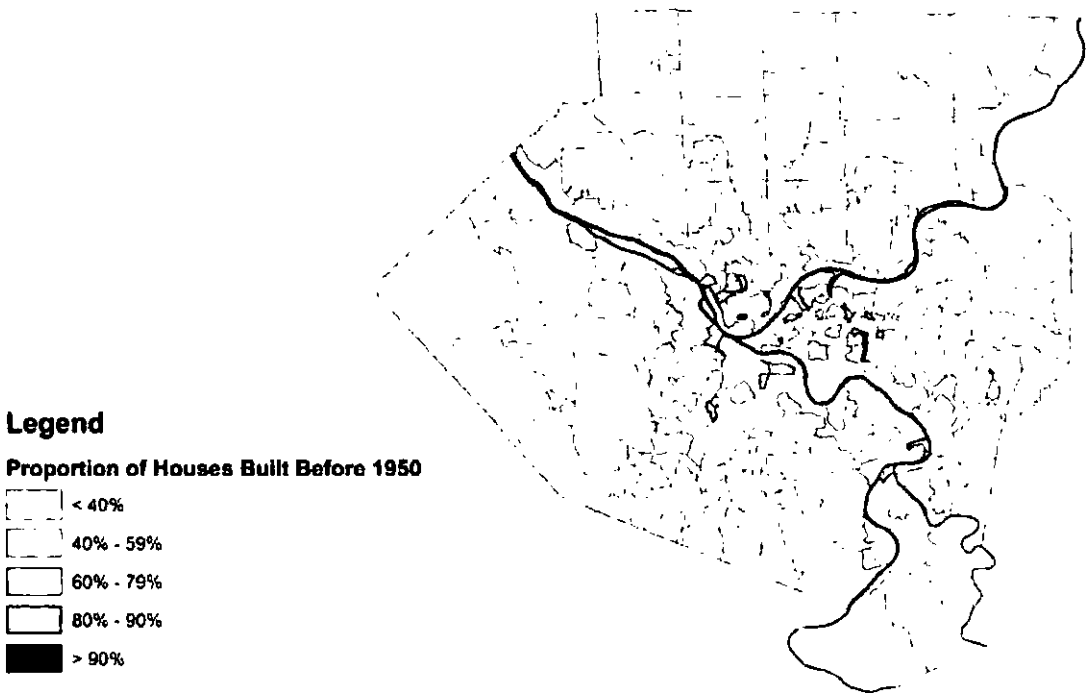


Figure A: Allegheny County Census Tract Housing Built Before 1950[31]

Less than half of Pittsburgh housing units are owner occupied.[32] Additionally, due to significant industrial activity since the early 1800s, Allegheny County has areas with higher levels of lead in soil.[33] These factors compound Pittsburgh residents' high risk of lead exposure from drinking water because the effects of lead exposure are cumulative. Supra pp. 9-10.

[30] Appendix D, 10, Allegheny Cty. Lead Task Force, at 10 (noting that, in Allegheny County, 41% of homes were built before 1950); Pittsburgh UNITED St. C-2, at 6, 20-21.
[31] Allegheny Cty. Health Dep't, Allegheny County Census Tract: Housing Built Before 1950, http://www.alleghenycounty.us/uploadedFiles/Allegheny_Home/Health_Department/Programs/Special_Initiatives/Lead/Housing-Built-Before-1950.pdf.
[32] U.S. Census Bureau, QuickFacts: Pittsburgh City, Pennsylvania, https://www.census.gov/quickfacts/fact/table/pittsburghcitypennsylvania/PST045217.
[33] Appendix D, 11, Allegheny Cty. Lead Task Force, at 11.

Pittsburgh also has large low-income and minority populations, who face a particularly high risk of lead exposure. The median household income in Pittsburgh between 2013 and 2017 was $44,092, with 22% of Pittsburgh residents living in poverty.[34] About a quarter of Pittsburgh's population is black.[35] These residents are more likely to live in Pittsburgh's many old homes and rental homes and to have a heightened risk of elevated blood lead levels as a result. Supra pp. 7-8.

The threat posed by ongoing lead exposure for Pittsburgh residents is borne out by the blood lead levels of Pittsburgh children. A recent report from the Allegheny County Health Department put the confirmed rate of elevated blood lead level (≥ 5 µg/dL) for children younger than 6 years old in Allegheny County at about 2% in 2016 and 2017;[36] 1- to 3-year-old children would undoubtedly have a higher rate and, as I discuss above, these blood lead levels likely underestimate ongoing lead exposure for the broader population.[37] Moreover, as the following map shows, there are neighborhoods within Pittsburgh and Allegheny County where the proportion of blood lead levels is much higher:

[34] U.S. Census Bureau, supra note 32.
[35] Id.
[36] Allegheny Cty. Health Dep't, Lead Exposure in Allegheny County 8 (2018), https://www.alleghenycounty.us/uploadedFiles/Allegheny_Home/Health_Department/Programs/Special_Initiatives/Lead/Lead-paper-9-6-final.pdf.
[37] See Lead Exposure During Early Childhood, supra note 6, at 46.

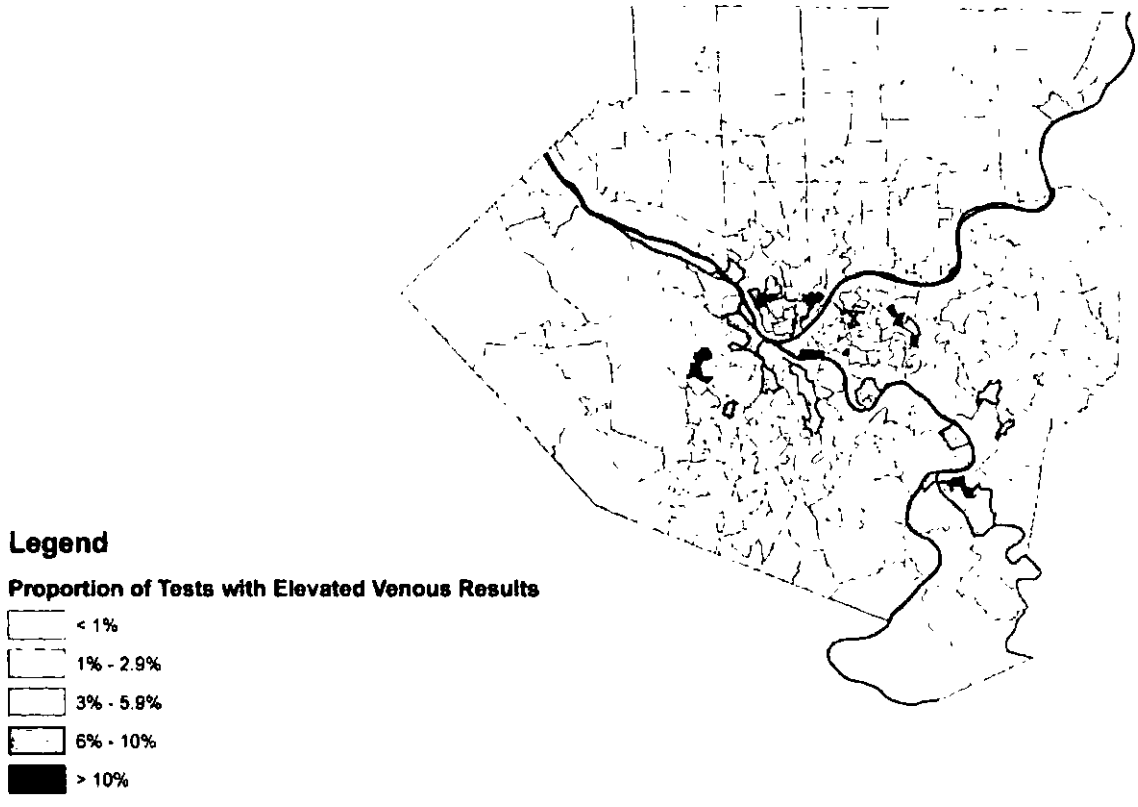


Figure B: Allegheny County Census Tracts
2015 - 2017 Proportion of Blood Lead Level Tests With Venous Results ≥ 5 µg/dL
(Children 6 Years And Younger)[38]

Some of the highest blood lead level rates occur in neighborhoods directly north, south, and west of downtown Pittsburgh, and fall within PWSA's service area.[39]

The presence of these lead exposure risk factors and the data on children's blood lead levels indicate that Pittsburgh residents, and particularly certain neighborhoods and vulnerable populations, are at serious risk of lead exposure. In the next section, I describe PWSA's current and proposed efforts to address the risk of lead exposure from drinking water.

[38] Allegheny Cty. Health Dep't, Allegheny County Census Tracts 2015 - 2017 Proportion of Blood Lead Level Tests with Venous Results ≥ 5 µg/dL (Children 6 Years and Younger), http://www.alleghenycounty.us/uploadedFiles/Allegheny_Home/Health_Department/Programs/ Special_Initiatives/Lead/2017-Proportion-of-Blood-Lead-Level-Tests-with-Venous-Results.pdf.

[39] See Lead Exposure in Allegheny County, supra note 36, at 9.

III. Overview of PWSA's lead remediation program

Q: How many lead service lines are in PWSA's system?

A: PWSA estimates that there were 12,218 lead service lines in its system as of June 2016.[40] This estimate refers to the public side of the service line, i.e., the portion of the service line on the street side of the curb box, lying primarily beneath public property. It does not include the private side of the service line, i.e., the portion of the service line on the residence side of the curb box, lying primarily beneath private property. According to PWSA, it only owns the public side of the service line, and thus, its lead remediation efforts have generally focused on public-side service lines.[41]

Taking into account the approximately 2,000 lead service line replacements PWSA has conducted, see infra, PWSA now estimates that it has around 10,100 public-side lead service lines remaining in its system.[42] As Pittsburgh UNITED expert Gregory Welter explains, however, this estimate is subject to considerable uncertainty.[43]

Q: What steps is PWSA currently taking to minimize its customers' exposure to lead released from the lead service lines in its system?

A: Following its exceedance of the lead action level in 2016 and an Administrative Order issued by the Pennsylvania Department of Environmental Protection, PWSA began implementing a lead remediation program.[44] The program includes the replacement of lead service lines.[45] As Mr. Welter describes, PWSA initially replaced only public-side lead service

[40] See LTIIP, at 28.
[41] See, e.g., PWSA St. C-1, at 58-59.
[42] Appendix B, 2, I&E PS-23.
[43] Pittsburgh UNITED St. C-2, at 11, 30-32.
[44] See generally Pittsburgh UNITED St. C-2, Appendix C, 1 to C, 27, Consent Order and Agreement, In the Matter of Pittsburgh Water and Sewer Authority Regarding Violations of the Pennsylvania Safe Drinking Water Act and the Rules and Regulations Promulgated Thereto Regarding the Lead and Copper Rule (Nov. 17, 2017) [hereinafter Consent Order].
[45] PWSA St. C-1, at 51.

lines, which resulted in a number of harmful "partial replacements."[46] Partial service line replacements remove a public-side service line while leaving a private-side lead service line in the ground, and can lead to significant spikes in lead levels. In June 2017, PWSA suspended this detrimental practice.[47]

Since 2018, PWSA has conducted most of its lead service line replacements through a neighborhood-based replacement program.[48] Under that program, PWSA selects areas made up of several contiguous blocks of homes and replaces the public-side lead service lines in those areas.[49] If both sides of the service line are made of lead, PWSA offers to simultaneously replace the private side of the service line at no direct cost to the customer.[50] In 2018, PWSA replaced 2,050 public-side lead service lines and 1,324 private-side lead service lines.[51]

PWSA will continue its neighborhood-based lead service line replacement program in 2019 and into 2020. PWSA expects to replace another 4,400 public-side lead service lines and 3,400 private-side lead service lines through this program, and estimates that there will be about 6,000 public-side lead service lines remaining.[52]

Through the Community Environmental Project, PWSA will conduct 200 private-side lead service line replacements for customers who are at or below 250% of the federal poverty level by November 2020.[53]

---

[46] Pittsburgh UNITED St. C-2, at 9-10.
[47] Id. at 10.
[48] Id.
[49] Id.
[50] Id.
[51] PWSA St. C-1, at 53.
[52] See id. at 56-57; LTIIP, at 28.
[53] PWSA St. C-1, at 56; see Press Release, PWSA, Nearly $2 Million Remains Available for Free On-Demand Lead Line Replacements (Mar. 14, 2019), http://pgh2o.com/release?id=7807.

After a lead service line replacement, PWSA provides the customer with a free tap water sampling kit, water filter, and replacement filter cartridges.[54] PWSA also provides a free tap water sampling kit to anyone who requests one,[55] and free pre-replacement water filters and replacement cartridges to certain eligible customers.[56]

PWSA is in the process of establishing an optimized corrosion control treatment program.[57] It began adding orthophosphate, a new chemical treatment to better control the release of lead from pipes into drinking water, to its system on April 2, 2019.[58]

Q: Is PWSA proposing changes to its lead remediation program for 2020 through 2026?

A: Yes. PWSA expects to terminate its neighborhood-based lead service line replacement program at the end of 2019.[59] Beginning in 2020, PWSA plans to conduct most lead service line replacements through its small diameter water main replacement program.[60] Under this program, PWSA plans to replace approximately 6,000 public-side lead service lines between 2020 and 2026, at a rate of 625 to 1,250 lines a year.[61] PWSA's Operations Department expects to replace an additional 50 to 175 public-side lead service lines each year in response to leaks in water mains or service lines.[62] PWSA also indicates that it may relax or terminate some of its filter distribution and post-replacement policies.[63]

---

[54] PWSA St. C-1, at 62-63; see Appendix B, 20, UNITED IV-17.
[55] PWSA, Request a Lead Test Kit, http://lead.pgh2o.com/resources/request-a-lead-test-kit/.
[56] Recommended Decision, supra note 1, at 13-14 ¶ C.1.a.iv(a)-(b).
[57] PWSA St. C-1, at 48-49.
[58] Press Release, PWSA, Orthophosphate Treatment Upgrade Underway (Apr. 2, 2019), http://lead.pgh2o.com/orthophosphate-treatment-upgrade-underway/.
[59] PWSA St. C-1, at 58; id., RAW/C-10, at 15-16; Appendix B, 3, I&E-PS-30.
[60] LTIIP, at 28.
[61] Id.
[62] Id.
[63] PWSA St. C-1, at 62-63; Appendix B, 20, UNITED IV-17.

Q: Do you recommend any changes to PWSA's lead remediation program for 2020 through 2026?

A: Yes. As proposed, PWSA's lead remediation program for 2020 through 2026 does not adequately reduce lead exposure from drinking water. To better protect the health of its customers, I recommend that PWSA: (1) commit to replacing all lead service lines in its system by 2026; (2) prioritize lead service line replacements for those customers who are at higher risk of and more vulnerable to lead exposure; and (3) improve its current water filter distribution policies and maintain those policies through 2026. I also recommend changes to PWSA's post-replacement policies, its Community Environmental Project, its meter replacement program, and its lead service line inventorying efforts. I describe each recommendation in detail in the next section.

IV. Health implications of PWSA's lead remediation program

A. Scope of PWSA's replacement programs

Q: Which service lines does PWSA intend to include in its lead service line replacement programs for 2020 through 2026?

A: Although PWSA has publicly stated that its goal is to replace "all lead service lines" by 2030 and possibly 2026,[64] PWSA Executive Director Robert Weimar has since clarified that PWSA's goal refers to public-side lead service lines only.[65] PWSA has not yet committed to replacing private-side lead service lines as part of any replacement program for 2020 through 2026, nor has it decided what costs, if any, customers will bear for any private-side replacements.[66]

[64] Compliance Plan, at 120; PWSA St. C-1, RAW/C-6, at 3.
[65] PWSA St. C-1, at 54.
[66] See id. at 58.

Q: What concerns, if any, do you have about the potential exclusion of private-side lead service lines from PWSA's replacement programs for 2020 through 2026?

A: I am concerned that PWSA's exclusion of private-side lead service lines from its replacement programs will result in partial replacements and will leave lead pipes in the ground, creating substantial and ongoing public health risks to Pittsburgh residents.

As noted above, a partial replacement occurs when a public side of a service line is replaced but the private, lead side of the service line remains in the ground. If PWSA were to exclude private-side lead service lines from future replacement programs, it would inevitably have to conduct many partial replacements, as Mr. Welter explains.[67] Partial replacements endanger public health because the public-side replacement can disrupt the protective scale inside pipes that helps to prevent the water from leaching lead.[68] Since the private-side lead service line is still in use, lead may be released into the water, causing spikes in water lead levels and posing serious health risks to the resident.[69] These spikes can last for several months, increasing a resident's risk of lead exposure.[70] In contrast, a full line replacement is much less likely to cause lead spikes and is therefore more health protective.[71] Post-replacement sampling data submitted by PWSA customers confirm that partial replacements (which PWSA still performs in some situations) are less health protective than full line replacements, as illustrated by the following graphs:

[67] Pittsburgh UNITED St. C-2, at 22-25.
[68] Pittsburgh UNITED St. 5, Appendix D, 16, Benjamin F. Trueman et al., Evaluating the Effects of Full and Partial Lead Service Line Replacements on Lead Levels in Drinking Water, 50 Envtl. Sci. & Tech. 7389, 7389, 7393 (2016).
[69] See id. at 7393-94.
[70] Id.; see also Pittsburgh UNITED St. C-2, at 22-24.
[71] Trueman et al., supra note 68, at 7394.

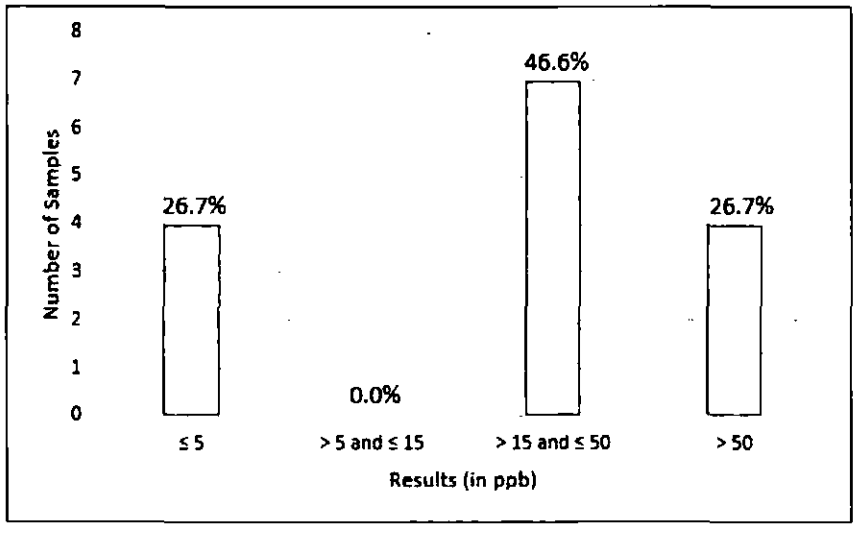


Figure C: Post-Replacement Samples Taken Within One Week of Partial Replacement[72]

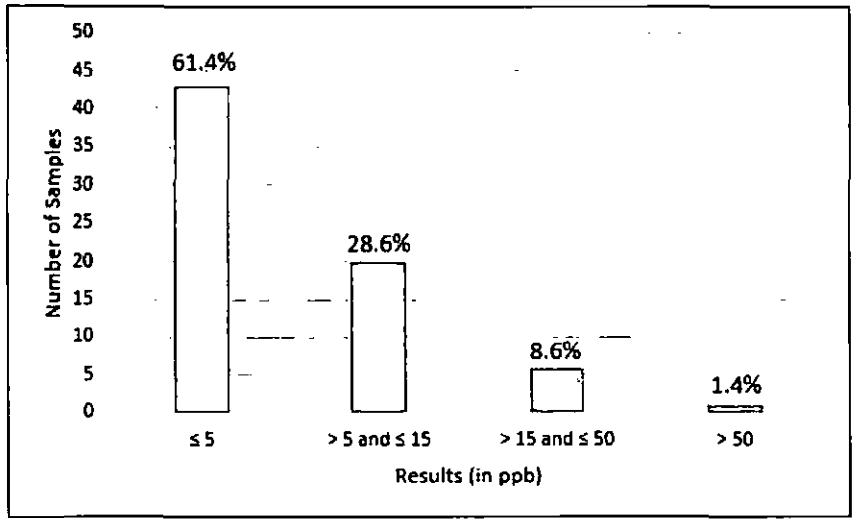


Figure D: Post-Replacement Samples Taken Within One Week of a Full Replacement[73]

[72] This graph reflects and reconciles data taken from Confidential UNITED II-18 Attach. A (from Rate Case), Confidential UNITED II-38 Attach. A (from Rate Case), Confidential UNITED XI-12 Attach. A (from Rate Case), Confidential UNITED I-18 Attach. A, and Confidential UNITED IV-11 Attach. A. All data are from June 1, 2018 onward. I am advised by counsel that PWSA has agreed to waive the confidentiality designations of these documents for the limited purpose of the data aggregations included in this testimony, but reserves the right to assert confidentiality as needed.

[73] Id.

For this reason, the Allegheny County Health Department prohibits plumbers from replacing the private side of a lead service line when the public side is left in place, and the Department's Lead Task Force concluded that water systems within the County should not conduct partial replacements.[74] The American Water Works Association likewise recommends avoiding partial replacements, and the EPA is considering banning them.[75] PWSA should not conduct partial replacements.

PWSA's potential exclusion of private-side lead service lines from future replacement programs would also leave a significant source of lead in the ground and continue to expose Pittsburgh residents to high water lead levels.[76] As I discuss above, supra pp. 11-14, many Pittsburgh residents are already exposed to lead from other sources and face serious health risks as a result. Exposure to an additional source of lead from tap water increases and compounds these risks. Primary prevention—eliminating a major source of lead before exposure by finding and removing all lead service lines from the water system—is the only effective way to protect children and other residents from lead in their drinking water. PWSA likewise recognizes that lead service line replacements are one of three mechanisms needed to minimize the presence of lead in drinking water and has set a goal of replacing all public-side lead service lines by 2026.[77] To protect the health of its customers, PWSA should commit to replacing all private-side lead service lines under the same timeframe.

---

[74] Allegheny County, Plumbing Program, https://www.alleghenycounty.us/HealthDepartment/Programs/Plumbing/Plumbing-Program.aspx.

[75] American Water Works Association, AWWA Standard: Replacement and Flushing of Lead Service Lines 9 (2017), https://city.milwaukee.gov/ImageLibrary/Groups/WaterWorks/LeadServiceLines/AWWAStandardReplacementandFlushingofLeadServiceLinesC81017.pdf; EPA Office of Water, supra note 26, at 10.

[76] Pittsburgh UNITED St. C-2, at 16-18.

[77] Appendix B, 11, UNITED I-28; Compliance Plan, at 120.

That some customers could pay for their own private-side lead service line replacements does not address my concern. According to PWSA's recent estimates, a private-side lead service line replacement costs about $7,500.[78] Many customers—and especially low- and moderate-income customers—simply cannot afford this cost, as Mr. Miller explains.[79]

In sum, it should not be a question of whether to replace every lead service line, but when and how.

Q: What do you recommend with respect to the service lines to be included in PWSA's lead service line replacement programs for 2020 through 2026?

A: Given the substantial health risks posed by conducting partial replacements and leaving lead service lines in the ground, PWSA's goal should be to replace all lead service lines, both public and private, by 2026. To accomplish this goal and ensure access to safer drinking water for Pittsburgh residents, PWSA should offer private-side lead service line replacements at no direct cost to customers as part of its proposed replacement programs.

If PWSA does not adopt this approach and maintains its present goal of only replacing all public-side lead service lines in its system, it must make that explicit. The current framing of PWSA's goal as replacing "all lead service lines" by 2026—when PWSA in fact means all public-side lead service lines—is misleading and may prevent residents from taking necessary steps to prevent themselves from lead exposure.[80]

[78] Appendix B, 6, UNITED I-14.
[79] Pittsburgh UNITED St. C-1, at 47-50. Although PWSA's Community Environmental Project offers private-side lead service line replacements for certain low-income residents, that program is very limited and may be underperforming. See infra pp. 39-40.
[80] Pittsburgh UNITED St. C-2, at 15-16.

Q: If PWSA decides to include private-side lead service lines in its replacement programs for 2020 through 2026, do you have any additional recommendations?

A: Yes. PWSA should engage in aggressive and extensive community outreach—including town hall meetings, community events, and other creative outreach efforts—to ensure that PWSA obtains the necessary consent from property owners to conduct private-side replacements. If a property owner refuses a private-side replacement, they—or their tenants—could be subject to a dangerous partial replacement. The burden is on PWSA to avoid partial replacements, particularly at tenant-occupied residences, by encouraging as many property owners as possible to consent to private-side replacements.

Q: Do you have any other concerns about the scope of PWSA's lead service line replacement programs for 2020 through 2026?

A: Yes. I am concerned that PWSA's replacement programs are unlikely to remove even all public-side lead service lines. As Mr. Welter explains, the small diameter water main replacement program will remove only those lead service lines connected to the 130 miles of main scheduled to be replaced by 2026.[81] An untold number of lead service lines not attached to those 130 miles will therefore be missed by the small diameter water main replacement program. As I describe above, leaving a significant source of lead in the ground poses substantial health risks to residents.

Q: What do you recommend with respect to public-side lead service lines that won't be replaced through the small diameter water main replacement program?

A: PWSA should fund a neighborhood-based lead service line replacement program that is separate from the small diameter water main replacement program to target all the lead service

[81] Id. at 26-27.

lines that otherwise will not be replaced through the small diameter water main replacement program.[82] Maintaining a neighborhood-based replacement program presents additional advantages for lead service line selection and prioritization, as I discuss in the next section.

B. Selection and prioritization of homes for lead service line replacement

Q: Please describe PWSA's process for selecting homes for service line replacement between 2020 and 2026.

A: As noted above, PWSA plans to conduct most lead service line replacements through its small diameter water main replacement program beginning in 2020.

It is my understanding that, for 2020, PWSA's small diameter water main replacement program will "piggyback[]" on the 2019 neighborhood-based replacement program and replace water mains that are undersized or known to be in poor condition, and all public-side service lines connected to those mains, within the 2019 replacement areas.[83] Lead service line replacement areas for 2019 are located in several neighborhoods, including Morningside, Homewood, Perry, Mt. Washington, Southside, Northside, and Greenfield.[84] For 2021-2026, PWSA will prioritize replacements based on a model it intends to design as part of the Water Distribution System Master Plan.[85] Before PWSA can use this model, it must complete a two-year upgrade to its Geographic Information System (GIS) to add information on main break, main age, and main material.[86]

PWSA has indicated that blood lead levels, population of children, income, race, and other factors related to lead exposure are typically not included in a small diameter water main

[82] Id. at 26-29.
[83] PWSA St. C-1, at 63.
[84] Id. at 51.
[85] Id. at 68; Appendix B, 14, UNITED IV-3.
[86] PWSA St. C-1, at 63; Appendix B, 4, UNITED 1-8.

replacement program ranking.[87] PWSA has not committed to considering these criteria when it selects areas for small diameter water main replacements.[88]

I note that PWSA is considering some of these criteria—population densities of children under the age of 6, blood lead levels, income, and lead service line density—to prioritize lead service line replacements that will occur in 2019 and into 2020 as part of PWSA's neighborhood-based lead service line replacement program.[89] PWSA is also consulting with the Community Lead Response Advisory Committee (CLRAC), established pursuant to the Joint Settlement of the Rate Case, on how to prioritize replacements using these criteria.[90] However, as I state above, supra p. 17, PWSA has not committed to maintaining a neighborhood-based lead service line replacement program beyond 2020, and the CLRAC is set to expire in 2021 unless PWSA decides to extend it.[91]

Q: What concerns, if any, do you have about PWSA's process for selecting homes for service line replacement between 2020 and 2026?

A: PWSA's approach is insufficient to protect the health of PWSA's customers, particularly those most vulnerable to lead exposure. There is no safe level of exposure to lead. Certain communities and populations—in particular, children, pregnant women, black people, and low-income individuals—are at higher risk of lead exposure. Supra pp. 6-8. Areas with higher concentrations of these at-risk populations must be prioritized for service line replacement.

A primary factor in prioritization of homes for service line replacement should be blood lead levels in children, which are generally a reliable indicator of recent and ongoing lead

[87] Appendix B, 5, UNITED I-11.
[88] Id.
[89] Appendix B, 15, UNITED IV-5.
[90] Recommended Decision, supra note 1, at 14 ¶ C.1.a.v.
[91] Id. at 11 ¶ C.1.a.

exposure and are correlated with lead-contaminated water. Supra p. 5.[92] Another factor should be drinking water lead levels. Other factors to consider are the age of water mains and the age of housing stock. All of these factors should be overlaid with a census map depicting race and income data and, where possible, homes with pregnant women and young children. Areas for service line replacement should be selected by identifying where these concentrations of factors are the highest and prioritizing accordingly. PWSA could also consider areas with high rates of other health conditions such as coronary heart disease, diabetes, low birthweight, and preterm birth—conditions that may be compounded by lead exposure.[93] Prioritizing service lines for replacement in this way will help provide safer service to all Pittsburgh residents—especially to those who are disproportionately exposed to lead and especially vulnerable to lead toxicity.[94]

Based on my understanding of PWSA's practices, PWSA has not committed to using the factors I have identified to select and prioritize areas for small diameter water main replacements (and, consequently, lead service line replacements) for 2020 through 2026, meaning that PWSA's most vulnerable customers could go years without having their lead service lines replaced.

Q: What do you recommend with respect to PWSA's process for selecting homes for service line replacement between 2020 and 2026?

A: PWSA should use the health-related factors I have identified to prioritize lead service line replacements for at-risk customers between 2020 and 2026. Much, if not all, of the data is readily

[92] See also Appendix D, 32, Allegheny Cty. Lead Task Force, at 32 ("Blood lead level surveillance data may help with prioritization.").
[93] The map might also be supplemented by information collected by PWSA; for example, with the next water bill, PWSA could include a leaflet asking customers to identify whether any pregnant women or children under the age of six live in the household.
[94] See Appendix D, 32, Allegheny Cty. Lead Task Force, at 32 (recommending that water systems in Allegheny County prioritize homes with sensitive populations for replacement using elevated blood lead levels and water lead levels as guidance).

available. PWSA should incorporate these data into its GIS database as part of its two-year upgrade and weigh them heavily in the small diameter water main prioritization model developed as part of the Water Distribution System Master Plan for 2021 to 2026.

Although the areas for 2020 small diameter water main replacements have already been selected, PWSA should likewise prioritize these replacements using the health-based factors I identified. Among these areas, PWSA can still determine which blocks contain higher concentrations of at-risk customers and replace mains serving those blocks first. This will help ensure that at-risk customers receive lead service line replacements as soon as possible and are not faced with a months-long delay.

PWSA should also maintain a neighborhood-based lead service line replacement program, as I recommend above. The small diameter water main replacement program focuses not just on the removal of lead service lines but on other issues, such as whether the main is vulnerable to breaks and whether it serves sensitive populations.[95] A neighborhood-based lead service line replacement program, in contrast, has the advantage of focusing solely on lead service line replacements. PWSA should continue funding a neighborhood-based program and use all of the health-based factors I have identified to prioritize replacements for at-risk households under it. PWSA has made some progress in doing this for its 2019-2020 program; it should continue and improve on this design beyond 2020.

PWSA should also extend the term of the CLRAC through at least 2026 and continue to consult with the CLRAC on critical components of PWSA's lead remediation program, including the prioritization of lead service line replacements for vulnerable populations. Doing so will help PWSA obtain community input and build trust on its lead remediation efforts, as

[95] Appendix B, 14, UNITED IV-3.

well as increase transparency and accountability.

Finally, PWSA should clearly and publicly explain its prioritization models across all replacement programs. PWSA should describe what factors it is using, how those factors are weighed against each other and any other relevant considerations, and how and why specific neighborhoods and work areas are chosen. This will further increase transparency and accountability.

C. Water filter distribution

Q: Please describe PWSA's water filter distribution policies.

A: PWSA presently offers an NSF-certified pitcher filter and three replacement cartridges to customers free of charge in three circumstances: (1) when a customer requests and returns a tap water sampling kit and the results are above 15 ppb ("test kit filter program");[96] (2) when a customer qualifies for an existing PWSA customer assistance program and has a public- and/or private-side service line made of lead or unknown material according to PWSA's historical records or curb box inspections ("low-income filter program");[97] and (3) after either a partial or full lead service line replacement ("post-replacement filter program").[98] Otherwise, PWSA encourages residents to purchase their own filters, and provides coupons for them to do so.[99] PWSA does not follow up with customers to verify that they are using a filter correctly.[100]

[96] See Appendix B, 19, UNITED IV-12.
[97] Recommended Decision, supra note 1, at 13 ¶ C.1.a.iv(a); Appendix B, 24, UNITED VII-3.
[98] PWSA St. C-1, at 62-63; Pittsburgh UNITED St. 5, Appendix B, 8, UNITED II-54. If a resident conducts a post-replacement tap water sample and that sample is above EPA's lead action level of 15 ppb, PWSA will send the household additional replacement cartridges.
[99] PWSA, Understanding Lead and Water, http://lead.pgh2o.com/understanding-lead-and-water/#1530634882524-9b49c9fa-f052; PWSA, Community Lead Response: Lead Filters and Other Products, http://lead.pgh2o.com/resources/lead-filters-and-other-products/.
[100] Pittsburgh UNITED St. 5, Appendix B, 8, UNITED II-54.

For the test kit filter program, PWSA promotes the availability of test kits through its website, social media, bill inserts, and public meetings.[101] However, it is unclear to what extent PWSA promotes the availability of filters for customers whose test results are above 15 ppb.[102] If a customer's test results are above 15 ppb, PWSA's filter vendor mails the customer a voucher for a filter along with the customer's test results.[103] For the low-income filter program, PWSA recently mailed letters containing filter vouchers to customers who are currently enrolled in existing PWSA customer assistance programs.[104] PWSA has distributed a total of 500 filters under the test kit and low-income filter programs as of March 2019.[105]

PWSA is required to continue the test kit filter program until its tap water samples are below 15 ppb lead concentration at the 90th percentile for two consecutive six-month periods of tap water monitoring conducted pursuant to the Lead and Copper Rule.[106] PWSA is required to maintain the low-income filter program until December 31, 2019, but has not committed to continuing the program beyond that.[107] PWSA has not committed to continuing its post-replacement filter program beyond 2020; it has indicated that review and analysis of its current policies and water sample data, as well as regulatory requirements, will guide its future water filter distribution policies.[108]

Q: What concerns, if any, do you have about PWSA's water filter distribution policies?

A: Though PWSA's existing policies offer health protections to some customers, I am concerned that they are not health protective enough and that many PWSA customers still face

[101] Appendix B, 1, I&E PS-20.
[102] See, e.g., Community Lead Response: Lead Filters and Other Products, supra note 96.
[103] See Appendix B, 19, UNITED IV-12.
[104] Appendix B, 25, UNITED VII-4.
[105] Appendix B, 19, UNITED IV-12. PWSA distributed 270 filters under the low-income filter program. Appendix B, 24, UNITED VII-3.
[106] Recommended Decision, supra note 1, at 13 ¶ C.1.a.iv(a).
[107] Id. at 14 ¶ C.1.a.iv(b); Appendix B, 20, UNITED IV-17.
[108] PWSA St. C-1, at 62-63.

significant barriers to widespread and consistent filter use. I am also concerned that PWSA has not committed to keeping its filter policies in place until water lead concentrations reach consistently low levels.

Filters—along with education and outreach efforts to ensure that residents use them consistently and properly—are an important interim measure that helps residents reduce their lead exposure until water lead levels reach consistently low levels, e.g., less than 5 ppb. PWSA should provide filters and replacement cartridges to customers both prior to and after lead service line replacements.

Prior to replacement, all customers who have or may have a lead service line, either on the public or private side, are at risk of elevated lead exposure. This is especially true given PWSA's high lead levels over the past three years and the fact that, based on PWSA's projections, it could take years for a customer's lead service line to be replaced.[109] The amount of lead exposure to residents during that time poses significant health concerns. Customers should therefore be protected from exposure until their lines are replaced. Indeed, the Allegheny County Health Department's Lead Task Force recommends offering customers with lead or unknown service lines (private or public) access to NSF-certified filters and education regarding their use and maintenance.[110]

After replacement, as both Mr. Welter and Mr. Weimar explain, filters are necessary to protect public health because disturbance of the service lines can cause spikes in water lead levels.[111] PWSA's post-replacement samples confirm that lead concentrations in drinking water remain high in many homes immediately after a service line replacement. As the graph below

[109] LTIIP, at 28.
[110] Appendix D, 32, Allegheny Cty. Lead Task Force, at 32.
[111] Pittsburgh UNITED St. C-2, at 35-36; PWSA St. C-1, at 62-63.

shows, about 40% of the 114 samples collected within one week of a full or public-side lead service line replacement were higher than 5 ppb and about 20% were higher than 15 ppb, meaning that those residents continued to be at risk of elevated lead exposure:

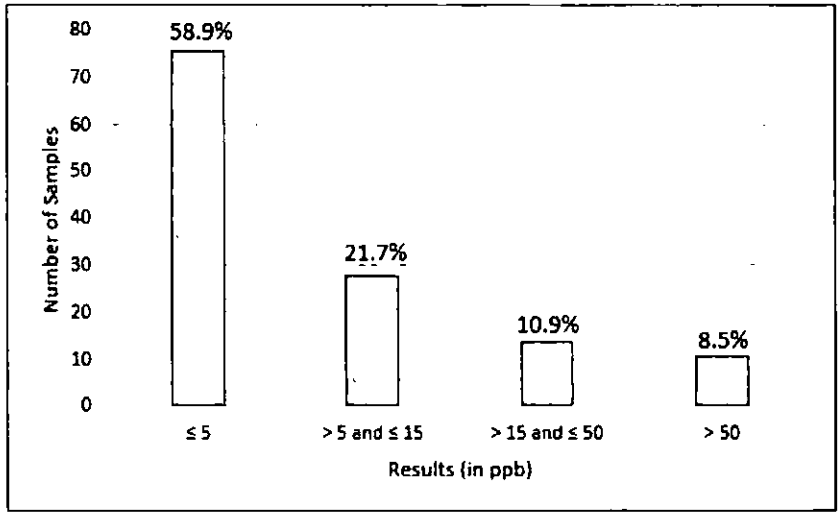


Figure E: Post-Replacement Samples Taken Within One Week of Replacement of Full or Public-Side Lead Service Line[112]

Samples taken within a week of a partial replacement reveal even higher water lead levels. Supra p. 20, Fig. C.

These results are particularly troubling due to PWSA's sampling protocols, which may underestimate customers' normal, day-to-day exposures to lead in their water.[113] Overall, the sampling results show that service line replacements alone are not enough to ensure that

[112] See supra note 72 for the documents used to generate this graph.

[113] There are several ways to test tap water for lead, and each method reveals different information. One method is to collect a water sample using a high flow rate of hot water, without removing or cleaning the aerator. This method maximizes the likelihood of detecting elevated lead levels because lead particles are more readily mobilized by hot, high-flow water. Pittsburgh UNITED St. 5, Appendix D, 17, Memorandum from Peter C. Grevatt, Dir., EPA Office of Ground Water & Drinking Water, to Water Div. Dirs. Regions I-X (Feb. 29, 2016) [hereinafter EPA Memorandum]; Pittsburgh UNITED St. 5, Appendix D, 18, Cartier et al., Investigating Dissolved Lead at the Tap Using Various Sampling Procedures, 103 J. AWWA 55, 57, 62 (2011). Lead particles may also collect inside the aerator. EPA Memorandum, supra. PWSA's chosen method, by contrast—which instructs customers to remove the aerator and then collect a cold-water sample, see infra p. 35—is less likely to reveal lead contamination, if it exists. Even using PWSA's chosen method, PWSA's post-replacement results indicate that a significant number of residents are exposed to high water lead levels following replacement.

customers are receiving safe water in the months following replacement, and highlight the importance of taking additional measures to protect consumers' health, such as providing NSF-certified filters and replacement cartridges, until water lead levels reach consistently low levels.

Additionally, filter programs should be as passive as possible. In general, health-protective interventions are most effective if people can follow their normal routines and still get the benefit of the intervention. The intervention should be seamless. For example, a study on exposure to lead dust found that providing a household with education and cleaning supplies, and conducting regular follow-up visits, did not prevent children's exposure to lead—residents did not consistently follow the cleaning recommendations. In contrast, removing lead from paint and gasoline *did* reduce exposure because people did not have to think about it; they could purchase and use paint and gasoline as usual.

Elements of PWSA's filter policies are not passive enough. Under both the test kit and low-income filter programs, the onus is on customers to go online and input a voucher code to receive a filter.[114] Under the test kit filter program, a customer must first order a test kit, understand and follow the instructions, and collect and return a sample. PWSA's filter distribution policies should instead require as little effort from PWSA's customers as possible—particularly because the health risks facing these customers stem from PWSA's own failure to adequately minimize water lead levels.

Q: What do you recommend with respect to PWSA's water filter distribution policies?

A: PWSA's existing filter policies are insufficiently health protective in light of the concerns I outline above. Regarding the test kit filter program, PWSA should be using a lower threshold than 15 ppb. As discussed above, supra p. 11, EPA's lead action level of 15 ppb is not a health-

[114] See Appendix B, 19, UNITED IV-12; Appendix B, 25, UNITED VII-4.

based standard; water is not safe to drink at this lead concentration. To protect customers with known or suspected lead service lines from exposure while they are waiting for removal of their lead pipes, PWSA should offer free filters to customers whose water lead levels are above 5 ppb.

Regarding both the test kit and low-income filter programs, PWSA's current outreach efforts are inadequate. That PWSA has only distributed 500 filters under these two programs underscores that too few people are taking advantage of them. PWSA should therefore adopt outreach measures that reduce the burden on customers, and especially low-income customers, to obtain a filter. For example, instead of notifying customers that they are eligible for a filter and requiring them to go online and input a voucher code to receive the filter, PWSA should automatically send filters to these customers without any further action on their part. PWSA should also make clear, when it promotes the availability of free test kits, that customers whose results are above 15 ppb will receive a free filter. This could encourage more residents to request and return test kits. PWSA should also extend the CLRAC through at least 2026 so that it can continue to consult with and seek input from the Committee on filter outreach efforts.[115]

PWSA can further reduce barriers to filter use by offering faucet filters to those customers who want them. Filters are only effective if people use them consistently. Based on my knowledge of other public health interventions, and the importance of making interventions passive and easy to use, I am concerned that people may not use pitcher filters consistently. It is easy for people to forget to fill or use the pitcher, meaning that they use the kitchen tap instead. Faucet filters are a more passive solution that does not require residents to change their routines; they can continue using the kitchen faucet as they usually do. However, to be effective, faucet filters must be installed and maintained correctly. While some residents are able to install faucet

[115] See Recommended Decision, supra note 1, at 13-14 ¶ C.1.a.iv(a)-(b).

filters themselves, others will need assistance from PWSA.[116]

In addition to improving customers' awareness of and access to filters, PWSA should educate customers on how to use filters and replacement cartridges correctly and follow up with customers to ensure that they are doing so. If filters are not used properly, they do not provide their intended health benefits. For example, customers may not realize that they should not run hot water through their filters, that they need to regularly change replacement cartridges, or that they should be filtering tap water before cooking with it. PWSA should run a public education campaign to teach customers how to use their filters and replacement cartridges properly. PWSA should also continue to consult with the CLRAC on additional education efforts and possible methods for collecting data on water filter use to determine whether PWSA's education efforts are successful.

Making the changes I have recommended to its existing filter policies will help PWSA reduce barriers to filter use, increase the likelihood that filters will be used properly and consistently, and provide safer service to customers. It is also important that PWSA keep these filter policies in place beyond 2020, even after the introduction of orthophosphate in spring 2019 and until water lead levels reach consistently low levels, e.g., below 5 ppb. As Mr. Welter explains and PWSA recognizes, the orthophosphate may not immediately result in declining lead levels and lead concentrations will vary for homes that still have lead service lines.[117]

[116] It is my understanding that the NSF-certified PUR basic faucet filter is available for $20, and six months of replacement cartridges cost $23. PUR Classic Faucet Filtration System, PUR, https://www.pur.com/faucet-filtration-systems/pur-classic-faucet-filtration-system; PUR Basic Faucet Filter 2-Pack, PUR, https://www.pur.com/filters-and-accessories/pur-basic-faucet-filter. Thus, the cost of providing faucet filters to customers appears to be comparable to the filters PWSA is already providing, especially because PWSA can likely negotiate a lower rate or purchase the filters and replacements wholesale. See Pittsburgh UNITED St. 5, Appendix B, 8, UNITED II-54. The only added cost would likely be the staff or contractor time needed for those customers needing help with installation.

[117] Pittsburgh UNITED St. C-2, at 16-17; Appendix B, 10, UNITED I-27.

Accordingly, PWSA should continue to provide filters, free of charge and both prior to and after replacement, to eligible customers until water lead levels are significantly reduced.

D. Post-replacement measures, Community Environmental Project, meter replacement program, and lead service line inventory

Q: Please describe the measures PWSA takes after a service line replacement, other than filter distribution, to ensure customers are protected from additional lead exposure.

A: Following a lead service line replacement, PWSA leaves an informational door hanger at the residence.[118] The door hanger informs the resident of the work that was done, instructs them how to flush their pipes and taps, and directs them to collect a post-replacement water sample after allowing the water to sit unused for 6 to 8 hours.[119] PWSA also provides the household with a tap water sample kit.[120] The kit, which includes a bottle for collection, instructs the resident to remove any aerators or filters from the kitchen tap, allow cold water to run until a significant change in temperature is noted (about 30 seconds), fill the bottle, put the bottle back in the kit, and place it in the mail.[121] If a partial replacement was conducted, and the resident fails to return the sample, PWSA will provide another door hanger reminder about one month after the date of replacement.[122] Otherwise, PWSA takes no additional steps to encourage residents to collect post-replacement samples.[123] PWSA states that it will continue to provide free sample kits to customers following a partial replacement after 2019, but has not committed to providing free sample kits to customers following a full line replacement after 2019.[124]

---

[118] See Pittsburgh UNITED St. 5, Appendix B, 19, UNITED VIII-33; Pittsburgh UNITED St. 5, Appendix C, 12, UNITED II-51 Attach. B; Pittsburgh UNITED St. 5, Appendix C, 13, UNITED II-51 Attach. D.
[119] Pittsburgh UNITED St. 5, Appendix C, 13, UNITED II-51 Attach. D.
[120] Appendix C, 1, UNITED IV-18 Attach. A, at 1.
[121] Id.
[122] Pittsburgh UNITED St. 5, Appendix B, 19, UNITED VIII-33.
[123] See Appendix B, 21, UNITED IV-18; Pittsburgh UNITED St. 5, Appendix B, 19, UNITED VIII-33.
[124] Appendix B, 20, UNITED IV-17.

PWSA provides an additional free test kit to a customer when their previous post-replacement tap water sample reveals lead levels above 15 ppb.[125] If a post-replacement sample shows water lead levels above 100 ppb, PWSA will visit the household to provide bottled water and to assist with flushing the line.[126] PWSA intends to continue these practices beyond 2019.[127]

Q: What concerns, if any, do you have about PWSA's post-replacement measures?

A: As with PWSA's filter distribution policies, I am concerned that PWSA's existing post-replacement measures are not health protective enough, and that PWSA has not committed to maintaining these important measures in the future.

With respect to PWSA's existing post-replacement sampling program, I am troubled by the extremely low rate of customer participation. Of the 1,794 public-side lead service line replacements conducted since June 1, 2018, only 129 customers, or 7.2%, collected and returned a tap water sample within a week of the replacement.[128] Even fewer (5.6%) collected and returned a tap water sample within three days of the replacement, as PWSA requests.[129]

This low sampling participation rate is concerning because, even after a service line replacement, residual lead stuck to the protective scale inside the pipes in the home's interior plumbing and other lead sources such as lead solder or brass fixtures can cause elevated water lead levels to persist.[130] It can take time, sometimes many months, for lead concentrations to decline following a lead service line replacement.[131] Sampling thus provides customers with critical information about the concentration of lead in their water following replacement. Without it, people may wrongly assume that their water is safe once the lead service line has

[125] See id.
[126] See Pittsburgh UNITED St. 5, Appendix B, 20, UNITED VIII-37.
[127] Appendix B, 20, UNITED IV-17.
[128] See supra note 72 for the documents used to calculate this statistic.
[129] Id. The participation rate for samples collected within one month of replacement is similarly low, at 8.4%. Id.
[130] See Pittsburgh UNITED St. C-2, at 35-37.
[131] See id.

been replaced and may not take adequate steps to reduce their lead exposure, like using filters.

I am also concerned about PWSA's use of the lead action level (15 ppb) as a threshold for asking customers to collect additional tap water samples. As I have described, supra p. 11, the 15-ppb lead action level is not a health-based standard. Thus, it is not an appropriate metric for determining when households are at risk of elevated lead exposures.

I am likewise concerned about PWSA's 100-ppb threshold for assisting customers with flushing and providing bottled water. This threshold seems arbitrary,[132] and is troubling from a health perspective. Waiting to provide flushing assistance and bottled water until a customer's water lead levels are more than 6 times as high as EPA's lead action level—which is itself not a health-based standard—puts customers at far too great a risk of lead exposure.

Finally, I am concerned that PWSA has not committed to continuing any of these health-protective measures beyond 2020.

Q: What do you recommend with respect to PWSA's post-replacement measures?

A: I have three recommendations. First, given the extremely low rate of customer participation, PWSA should reconsider how it conducts post-replacement water sampling. Its current approach—providing instructional door hangers and test kits, but generally not issuing any reminders—is not achieving a sufficient participation rate. PWSA should be making better efforts to get at least one post-replacement water sample from every household that has part or all of its service line replaced. At a minimum, PWSA should follow up with all customers by phone and/or in person in the days immediately after a replacement to encourage participation. PWSA might also fund local, trusted community groups to help customers coordinate and collect samples, or even collect the samples themselves (with customer permission). PWSA should also

[132] See Pittsburgh UNITED St. 5, Appendix B, 20, UNITED VIII-37.

extend the CLRAC through at least 2026 and continue to seek CLRAC advice on how to improve sampling participation rates.[133] Unless PWSA substantially improves the participation rate, PWSA cannot know whether its service line replacements are leading to the provision of safer drinking water.

Second, PWSA should use much lower thresholds for asking customers to collect additional tap water samples and for providing customers with flushing assistance and bottled water. Specifically, PWSA should adopt a much lower threshold than 15 ppb, such as 5 ppb, for requiring customers to collect follow-up testing three months after the previous sample. If a result is higher than 15 ppb, the follow-up test should be conducted much sooner, such as one month later. Follow-up samples should continue to be collected at regular intervals until the samples reveal consistently low lead concentrations, e.g., below 5 ppb. This is because a single sample showing low water lead levels is not necessarily a clean bill of health; lead levels can fluctuate, sometimes dramatically, and a second sample might come back much higher. PWSA should likewise use a much lower threshold than 100 ppb for providing flushing assistance and bottled water. At a minimum, PWSA should adopt a lower threshold for vulnerable populations, such as children, pregnant women, and low-income families.

Regardless of whether PWSA implements the changes I suggest above, it should, at a minimum, keep its existing post-replacement policies in place even after orthophosphate is added to the system. As discussed above, supra p. 34, water lead levels can remain elevated even months after the orthophosphate is introduced, and lead concentrations will vary for homes that still have lead service lines. Thus, it is critical that PWSA continue to take steps to protect

[133] See Recommended Decision, supra note 1, at 13 ¶ C.1.a.iv(a).

customers from additional lead exposure following service line replacements until water lead levels reach consistently low levels, e.g., below 5 ppb.

Q: Please describe the Community Environmental Project.

A: PWSA established the Community Environmental Project pursuant to the Consent Order issued by the Pennsylvania Department of Environmental Protection.[134] Under the Project, PWSA is using $1.8 million to replace private-side lead service lines for customers who are at or below 250% of the Federal Poverty Level.[135] PWSA expects to conduct about 200 private-side replacements through this program.[136] Funds that are not used by November 2020 must be paid to the Department of Environmental Protection as a civil penalty.[137] [138]

PWSA notifies customers about the Community Environmental Project by posting information on its website, on social media, and in monthly newsletters and other flyers and brochures.[139] PWSA and other representatives also discuss the program at community group meetings and with customers who call about lead or other low-income issues.[140] Eighteen private-side lead service lines have been replaced as of March 6, 2019, and another four replacements are scheduled.[141] Over a million dollars in funding remains available.[142]

Q: What concerns, if any, do you have about the Community Environmental Project?

A: My primary concern is that the Community Environmental Project will not achieve 200 private-side lead service line replacements before its funds expire in November 2020. As Mr.

---

[134] PWSA St. C-1, at 55.
[135] Id.
[136] Nearly $2 Million Remains Available for Free On-Demand Lead Line Replacements, supra note 53.
[137] Pittsburgh UNITED St. C-2, Appendix C, 17, Consent Order, at 17 ¶ 4.c; PWSA St. C-1, at 55.
[138]
[139] Appendix B, 12 to B, 13, UNITED II-4.
[140] Id.
[141] Appendix B, 16, UNITED IV-6; Appendix B, 17, UNITED IV-7.
[142] Appendix B, 18, UNITED IV-8.

Miller explains in his testimony, the Project is critical for enabling low-income residents to remove private-side lead service lines.[143] Low-income residents are particularly vulnerable to lead exposure and may lack the resources to conduct the replacements themselves.[144]

Q: What do you recommend with respect to the Community Environmental Project?

A: The low rate of customer participation in the program indicates that PWSA's current outreach efforts are failing. PWSA should consider boosting these efforts by, for example, sending canvassers to eligible homes to educate customers about the health risks of lead in drinking water and the benefits of the Project, and to encourage them to enroll. PWSA could contract with local community groups or colleges to conduct this outreach. PWSA should also distribute tap water testing kits as part of these door-to-door visits. Doing so would help educate customers about the risks of drinking lead-contaminated water and could, depending on the test results, encourage customers to participate.

As I discuss above, PWSA should also consider funding a neighborhood-based lead service line replacement program separate from the small diameter water main replacement program beyond 2020 and should include private-side lead service lines in all of its replacement programs. This will help ensure that low-income residents are protected from the risks of lead exposure and receive an opportunity to have their private-side lead service lines removed even after expiration of the Community Environmental Project.

Q: Please describe PWSA's meter replacement program.

A: PWSA estimates that it will need to replace as many as 50,000 water meters.[145] PWSA

[143] Pittsburgh UNITED St. C-1, at 45.
[144] Id. at 46, 48-49.
[145] LTIIP, at 25.

plans to complete these replacements by June 30, 2024.[146] PWSA has not yet finalized where the meter replacements will occur.[147]

Q: What concerns, if any, do you have about PWSA's meter replacement program?

A: PWSA's meter replacement program could endanger public health if replacements occur at residences that still have a lead service line. Studies have shown that, like partial replacements, meter replacements can physically disturb lead service lines—particularly if the meter is buried in the yard or the home has interior galvanized plumbing—thereby disrupting the protective scale inside pipes that prevents the water from leaching lead and causing spikes in water lead levels.[148]

Q: What do you recommend with respect to PWSA's meter replacement program?

A: To protect against the potential health risks associated with PWSA's meter replacement program, PWSA should coordinate its meter replacement program with its lead service line replacement program to ensure that it conducts meter replacements at homes that have non-lead service lines or have already had their lead service lines removed. If PWSA conducts a meter replacement at a home and suspects that there is a public- and/or private-side lead service line, it should follow PWSA's post-service line replacement protocols and provide the household with a free filter, replacement cartridges, and tap water sampling kit. PWSA should then carefully study the sampling data to determine whether and to what extent water lead levels spike following a meter replacement. Finally, PWSA should ensure that the new meters meet EPA's definition of "lead free," consistent with the Reduction of Lead in Drinking Water Act.[149]

---

[146] PWSA St. C-1, at 31.
[147] Appendix B, 23, UNITED IV-26.
[148] See Appendix D, 63, Miguel A. Del Toral et al., Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study, 47 Envtl. Sci. & Tech. 9300, 9304 (2013); Study Showed Some Chicago Homes With Smart Water Meters Had Higher Lead Levels: Officials, NBC 5 Chi. (Nov. 1, 2018), https://www.nbcchicago.com/news/local/water-lead-chicago-meters-499329631.html; see also Pittsburgh UNITED St. C-2, at 37.
[149] 42 U.S.C. § 300g-6(d).

Q: Please describe PWSA's efforts to inventory the lead service lines in its system.

A: PWSA is developing an inventory of the materials of both the public- and private-side service lines in its system.[150] The inventory, which is not yet complete, is posted in a map on PWSA's website and is based on analysis of historical records, curb box inspections, and excavations.[151]

Due to their unreliability, PWSA has suspended its use of curb box inspections and is evaluating an alternative method for investigating service line material.[152] PWSA has also recently begun adding data on service line material obtained through its meter replacement program.[153]

Q: What concerns, if any, do you have about PWSA's lead service line inventory?

A: My primary concern is that PWSA may not be developing an accurate inventory. As Mr. Welter explains, PWSA's inspection policies to date have limited the completeness and reliability of its inventory.[154] Erroneous information about service line composition could harm customers because it could cause them to believe that their service line is safe, when in fact they should be using filters and taking other proactive measures to limit their lead exposure. For example, although curb box inspections cannot reliably determine that a service line is not made of lead, three property owners recently declined a private-side replacement at least in part because their curb-box inspection results showed no lead pipes.[155] An accurate, public, and up-to-date inventory of every public-side and private-side lead service line in its system will give PWSA and its customers much-needed information about potential lead exposures and facilitate

[150] Appendix B, 8, UNITED I-22.
[151] See PWSA, Lead Map, http://lead.pgh2o.com/your-water-service-line/planned-water-service-line-replacement-map/; Appendix B, 8, UNITED I-22.
[152] Appendix B, 7, UNITED I-19; Appendix B, 9, UNITED I-25; Appendix B, 22, UNITED IV-23.
[153] Appendix B, 8, UNITED I-22.
[154] Pittsburgh UNITED St. C-2, at 30-32.
[155] Appendix C, 5, C,8 UNITED VII-2 Attach. A, at 2, 5.

the prioritization of PWSA's remediation efforts. Put simply, PWSA needs to know how much lead is in its system, and where that lead is, before it can fully address the lead's effects and provide safer service.

V. Conclusion

Q: Please summarize your conclusions and recommendations.

A: Lead in drinking water poses a serious threat to public health. Lead is toxic to the central nervous system and cardiovascular system; even at low levels of exposure, it is harmful to both adults and children. There is no safe level of exposure to lead. Young children, pregnant women, black people, and low-income households are particularly vulnerable to lead exposure.

Pittsburgh residents have an elevated risk of lead exposure from drinking water. In addition to other sources of lead exposure, tap water testing results over the past three years have shown consistently high levels of lead. Because Pittsburgh residents—and particularly children and other vulnerable populations—are being exposed to high levels of lead in their tap water, PWSA must take steps to reduce lead exposure from drinking water.

The primary step PWSA must take to protect its customers' health and ensure access to safer drinking water is to replace all lead service lines connected to its water system. In the interim, PWSA must take additional steps to help Pittsburgh residents control their lead exposure from drinking water.

Based on my evaluation of the health implications of PWSA's lead remediation program for 2020 through 2026, I make the following recommendations:

Scope of PWSA's replacement programs

- Develop and implement a plan to replace all lead service lines in the water system, both public and private, by 2026. This will protect Pittsburgh residents' health by

avoiding harmful partial replacements and eliminating a significant source of lead exposure.

- If PWSA decides to only replace all public-side lead service lines, be explicit about that goal so as not to mislead the public.
- Offer private-side lead service line replacements at no direct cost to customers as part of PWSA's replacement programs through 2026.
- Maintain a neighborhood-based lead service line replacement program through 2026 to help ensure all lead service lines get removed, particularly for at-risk customers.

<u>Selection and prioritization of homes for lead service line replacement</u>

- For both the small diameter water main replacement program and neighborhood-based lead service line replacement program, prioritize lead service line replacements for neighborhoods or blocks with higher concentrations of at-risk populations by analyzing blood lead levels in children, drinking water lead levels, water main ages, and parcel ages, overlaying these factors with a census map depicting race and income data and, where possible, homes with pregnant women and young children, identifying areas where these concentrations of factors are the highest, and selecting areas for replacements accordingly. Make the procedures and criteria for prioritizing replacements open and transparent.
- Extend the term of the CLRAC through at least 2026 and continue to consult with the CLRAC on critical components of PWSA's lead remediation program, including the prioritization of lead service line replacements for vulnerable populations.

Water filter distribution

- Use a threshold of 5 ppb instead of 15 ppb for the test kit filter program.
- Improve outreach efforts and reduce customers' burdens under both the test kit filter program and the low-income filter program, such as by delivering filters and replacement cartridges to eligible customers instead of using a voucher system and making clear that customers who request and return tap water sampling kits and have water lead levels above 15 ppb will receive a free filter and replacement cartridges.
- Offer to install faucet filters for those customers who want them.
- Run a public education campaign to teach customers how to use their filters and replacement cartridges properly. Continue to consult with the CLRAC on additional education efforts and possible methods for collecting data on water filter use to determine whether PWSA's education efforts are successful.
- Continue providing filters and replacement cartridges, consistent with PWSA's filter policies and the recommendations I have made, beyond 2020, until water lead levels are consistently below 5 ppb.

Post-replacement measures, Community Environmental Project, meter replacement program, and lead service line inventory

- Improve post-replacement tap water sampling participation rates, such as by following up with all customers by phone and/or in person in the days immediately after a replacement to encourage participation, funding local, trusted community groups to help customers coordinate and collect samples, or even collect the samples themselves (with customer permission), and continuing to consult with the CLRAC on outreach.

- Ask customers to collect a three-month follow-up tap water sample when a prior tap water sample exceeds 5 ppb; ask customers to collect a one-month follow-up tap water sample when a prior tap water sample exceeds 15 ppb; and use a threshold lower than 100 ppb for providing flushing assistance and bottled water to customers, especially for vulnerable populations.
- Continue taking measures to protect customers from additional lead exposure after a lead service line replacement, consistent with PWSA's post-replacement policies and the recommendations I have made, beyond 2020, until water lead levels are consistently below 5 ppb.
- Improve outreach efforts for the Community Environmental Project, such as by canvassing eligible homes to educate customers about the program, encourage enrollment, and distribute tap water testing kits.
- Coordinate the meter replacement program with the lead service line replacement program to ensure that PWSA conducts meter replacements at homes that have non-lead service lines or have already had their lead service lines removed. If PWSA must conduct a meter replacement at a home with a lead service line, follow PWSA's post-service line replacement protocols and analyze tap water sampling results to determine whether and to what extent meter replacements cause spikes in water lead levels. Ensure that new meters meet EPA's definition of "lead free."
- Develop a complete and accurate inventory of all lead service lines in the water system.

In my opinion, PWSA must take these additional, appropriate steps to reduce exposure to lead in water and deliver safe, reasonable, high-quality water service to its customers.

Q: Does this conclude your direct testimony?

A: Yes. I reserve the right to supplement my testimony based on subsequent information provided by PWSA.

APPENDIX A

Resume of Bruce Lanphear, M.D., M.P.H.

CURRICULUM VITAE

Bruce Perrin Lanphear, MD, MPH

Office Address
Blusson Hall
8888 University Drive
Burnaby, BC V5A 1S6
Canada
e-mail: blanphear@sfu.ca

Home and Mailing Address
3415 Ash Street
Vancouver, BC, V5Z 3E5
TEL: (778) 387-3939

Date of Birth: January 12th, 1963

Marital status: Married to Nancy Ebbesmeyer Lanphear, M.D., a developmental pediatrician

Citizenship: United States of America and Canada (dual citizenship)

Specialty: Board Certified in General Preventive Medicine & Public Health

Employment

1984-1986	Paramedic, Jackson County Jail, Kansas City, Missouri
1988-1989	Physician, International Travel Clinic, University of Cincinnati, Cincinnati, Ohio
1988-1989	Staff Physician, Sexually Transmitted Disease Clinic, Cincinnati Public Health Department, Cincinnati, Ohio
1989-1992	Assistant Professor of Environmental Health, Associate Director, Medical Center Health Services, University of Cincinnati
1992-1997	Senior Instructor, Departments of Pediatrics and of Community & Preventive Medicine, University of Rochester School of Medicine.
1992-1994	National Research Scholar Award in General Pediatric Research, University of Rochester School of Medicine and Dentistry.
1992-1997	Assistant Professor, Department of Pediatrics and of Community & Preventive Medicine, University of Rochester School of Medicine.
1997-2002	Associate Professor, Department of Pediatrics, Children's Hospital Medical Center and the University of Cincinnati, Cincinnati, Ohio.
1997-2008	Director, General Pediatric Research Fellowship Training Program, Children's Hospital Medical Center and the University of Cincinnati.
1997-2008	Director, Children's Environmental Health Center, Children's Hospital Medical Center and the University of Cincinnati.
1997-2006	Associate Professor (Adjunct), Departments of Pediatrics and of Environmental Medicine, University of Rochester School of Medicine & Dentistry, Rochester, NY.
1998-2003	Associate Director for Research, Division of General & Community Pediatrics, Children's Hospital Medical Center.
2001-2002	Associate Professor (tenured), Department of Pediatrics, University of Cincinnati, Cincinnati, Ohio.
2001-2004	Associate Professor (Adjunct), Department of Environmental Health Sciences, University of Michigan School of Public Health, Ann Arbor, Michigan.
2002-2008	Sloan Professor of Children's Environmental Health, Departments of Pediatrics and Environmental Health, University of Cincinnati, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio.

2008-2012	Adjunct Professor of Pediatrics, Department of Pediatrics, Cincinnati Children's Hospital Medical Center and the University of Cincinnati.
2008-	Professor of Children's Environmental Health, Faculty of Health Sciences, Simon Fraser University
2008-	Clinician Scientist, Child & Family Research Institute, BC Children's Hospital, University of British Columbia

Education

1980-1985	Bachelor of Arts in Biology
1980-1986	University of Missouri at Kansas City, Medical Degree (1986)
1986-1987	Internship, University of Arkansas for Medical Sciences, Little Rock, Arkansas
1987-1988	Tulane School of Public Health & Tropical Medicine Masters in Public Health & Tropical Medicine
1987-1989	General Preventive Medicine and Public Health Residency Tulane School of Public Health & Tropical Medicine
1992-1995	Postdoctoral Fellowship in General Academic Pediatric Research University of Rochester School of Medicine, Rochester, NY

Awards and Honors

2011	Sterling Prize in Controversy, Simon Fraser University
2012	Research Integrity Award, International Society for Environmental Epidemiology
2013	Public Policy and Advocacy Award, Academic Pediatric Association
2015	Research Award, Academic Pediatric Association
2015	Confederation of Union Faculty Associations of British Columbia (CUFA-BC) Academic of the Year Award
2018	Lumina Award from the Women for Healthy Environmental Health, Pittsburgh, PA

Teaching Experience

1992-1997	Course Instructor, "Public Health & the Environment", Department of Community & Preventive Medicine, The University of Rochester School of Medicine and Dentistry. A required course for MPH students taught annually.
1997-2008	Founding Director, NIH-funded, General Academic and Community Pediatric Research Fellowship Training Program, Cincinnati Children's Hospital Medical Center. This interdisciplinary, research training program, which included pediatricians, psychologists and epidemiologists, was the first training program in Children's Environmental Health.
1998-2008	Course Co-Instructor, "Children's Health & the Environment", Department of Environmental Health, The University of Cincinnati School of Medicine. A course taught every other year to MPH, PhD and postdoctoral trainees in medical subspecialties.
2008-	Course Instructor, "Children's Health and the Environment". A 2-week intensive course taught annually to 4th year undergraduate students at Simon Fraser University.
2011-	Course Instructor, "Plagues, Pollutants and Poverty: The Origins and Evolution of Public Health". An undergraduate course at Simon Fraser University.

Committee and Community Involvement

1993-1997	Lead Poisoning Prevention Task Force, Monroe County Health Department.
1994-1997	Investigational Review Board, Rochester General Hospital
1995-	Scientific Consultant, National Center for Healthy Housing, Columbia, Maryland.
1996-1997	Member, New York State Task Force on Environmental Neurotoxins, University of Rochester School of Medicine
1996-2001	Member, National Institute for Environmental Health Sciences Grant Review Committee for Community-Based Interventions (FG)
1996-1998	Chairman, U.S. Department of Housing and Urban Development Committee on Lead-Contaminated House Dust
1998	Member, Review Group for National Research Service Awards, Health Resources and Services Administration
1998-2000	Member, Cincinnati Board of Health, Cincinnati, Ohio.
1998-2001	Member, Science and Research Work Group, Office of Children's Health Protection Advisory Committee, U.S. EPA
1998-2000	Member, Cincinnati Lead Poisoning Prevention Advisory Task Force, Cincinnati, Ohio.
1999	Member, K23 Grant Review Committee, National Institute for Environmental Health Sciences, August 1999
1999	Member, Expert Panel on Soil Pica Behavior, Agency for Toxic Substance Disease Registry, June 7th-8th, Atlanta, Georgia
2000	Member, Panel on Health Disparities: Linking Biological and Behavioral Mechanisms with Social and Physical Environments, National Institute for Environmental Health Sciences, July 14-15th
2000-2002	Member, Workshop on Assessing Environmental Exposures to Children, U.S. Environmental Protection Agency, July 26-27th
2000-2004	Member, Children's Environmental Health Project, AAP's Child Health Research Center, Rochester, NY.
2001	Senate Testimony, "Ensuring that Children with Dangerous Levels of Lead in their Blood Receive Care as Early as Possible". Subcommittee on Housing and Transportation of the Committee on Banking, Housing and Urban Affairs, 107th U.S. Congress, November 13th, 2001.
2001	Reviewer, National Research Council, National Academy of Science Update of the 1999 Arsenic in Drinking Water Report
2001-2003	Member, Expert Panel on Children's Health and the Environment, North American Commission for Environmental Cooperation
2002-	Member, Scientific Advisory Board, Scientist Communication Network.
2003	Member, "Herculaneum Health Study Workshop" Agency for Toxic Substance Diseases Registry, May 22nd to 23rd, 2003
2003-2004	Panel Member, "Lead Poisoning in Pregnant Women", Mt. Sinai for Children's Health and the Environment, New York, NY
2003	Member, "Invitational Workshop on a proposed American Family Study" National Human Genome Research Institute, December 1st to 3rd, 2003.

2004-2006	Member, Committee on "Ethical Consideration for Research on Housing-Related Health-Hazards involving Children", National Research Council and the Institute of Medicine, The National Academies
2004	Congressional Testimony, "Tapped Out? Lead in the District of Columbia and the Providing of Safe Drinking Water", Subcommittee on Environment and Hazardous Materials of the Committee on Energy and Commerce, U.S. House of Representatives, 108th Congress, July 22nd, 2004
2005	Reviewer, "Superfund and Mining Megasites – Lessons from the Couer d" Alene River Basin", National Research Council, The National Academies.
2005	Ad Hoc Member, NIEHS Board of Scientific Counselors Review of the Epidemiology Branch, April 3rd to April 5th, 2005
2005	Senate Briefing, "The Connection of Environmental Chemicals and Learning Disabilities", U.S. Senate, May 10th, 2005
2006	Invited Participant, NIEHS Strategic Planning Forum, National Institute for Environmental Health Sciences, Chapel Hill, North Carolina, October 17-18th, 2006.
2006-2008	Member, U.S. EPA's Clean Air Scientific Advisory Committee Lead Review Panel.
2006-2008	Member, National Children's Study Steering Committee, NICHD
2006	Invited Participant, "How Does Housing Affect Health Outcomes of Children?", MacArthur Foundation, Chicago, Illinois, June 21st-22nd, 2006.
2006- 2010	Member, External Scientific Advisory Committee, Richmond Center for Excellence in Tobacco Research, American Academy of Pediatrics.
2007	Testimony, Vermont State Legislature, "The Lingering Legacy of Lead Toxicity", Montpelier, Vermont, February 1st, 2007
2007	Testimony, Connecticut State Legislature, "The Legacy of Lead Toxicity", Hartford, Connecticut, March 14th, 2007. (PG)
2007	Invited Testimony, United States Senate Hearing, "Lead and Children's Health". Committee on Environmental and Public Works, October 18th, 2007
2007-2008	Member, Committee on "Committee on Contaminated Drinking Water at Camp Lejeune", National Research Council, The National Academies.
2008	Member, Expert Panel on Health and the Environment, Statistics Canada, Ottawa,
2008-	Member, Alliance for the Global Elimination of Lead Paint, Intergovernmental Forum on Chemical Safety (IFCS), World Health Organization
2008-2009	Reviewer, Toxicological Review and Recommended Toxicological Reference Values for Environmental Lead Exposure in Canada, Health Canada
2009-2013	Scientific Advisor, Canada Lead Study funded by Health Canada (Patrick Levallois, Principal Investigator).
2009-2014	Board Member, Barro Sin Plomo
2009-2010	Member, Health and Environment Experts Advisory Group of the Canadian Longitudinal Study on Aging, Canadian Institutes of Health Research
2010-2012	Member, US Environmental Protection Agency Science Advisory Board for Evaluating Dust Lead Standards
2010-2013	Advisor, Canada Environmental Health Law and Canadian Partnership for Children's Health and Environment Retrofit Project
2010-2012	Member, Physicians Advisory Panel, Canada Health Measures Survey
2010	Invited Testimony, United States Senate Hearing, "Research on Environmental Health Factors with Autism and Neurodevelopmental Disorders", August 3rd, 2010
2010	Member, Joint FAO/WHO Expert Panel for Toxicological and Health Review of Bisphenol A
2010-2015	Board Member, Global Community Monitoring, Oakland, California
2010-	Chairman, Scientific Advisory Committee for Dartmouth University's Program in Children's Health and the Environment

2011-2016	Member, American Academy of Pediatrics Executive Council on Environmental Health
2011-2012	Member, US Environmental Protection Agency Science Advisory Board for Evaluating Hazards of Partial Water Line Replacement
2011	Invited Testimony, Special Committee on Cosmetic Pesticides, Legislative Assembly, Province of British Columbia, October 7th, 2011
2011-2012	Member, Panel on Health Effects of Low-level Lead, Office of Health Effects, National Toxicology Program of the National Institutes of Environmental Health Sciences,
2012-	Member, Expert Advisory Committee, Canada Health Measures Survey
2012-	Member, Environmental Defence Fund Science Advisory Committee on Toxics
2015	Reviewer, Review of Clinical Guidance for the Care of Health Conditions Identified by the Camp Lejune Legislation, Institute of Medicine, The National Academies
2016-	Member, The Lancet Commission on Pollution, Health & Development
2016-	Member, Targeting Environmental Neuro-Developmental Risks (TENDR)
2016	Member, Steering Committee, The National Lead Summit, United States
2017	Rockefeller Foundation Academic Writing Retreat, Bellagio, Italy
2017-	Member, Advisory Committee for the Flint (MI) Cohort Study
2017-	Pure Earth Leadership Council
2018-	Member Project TENDR Advisory Board
2018-	Member, Mercury Disability Board Committee

Editorial Boards

2000-2015	Assistant Editor, *Environmental Research*
2000-2008	Deputy Editor, *Public Health Reports*
2004	Associate Editor, *Pediatrics* supplement on Children's Environmental Health
2004-2017	Editorial Board Member, *PLoS Medicine*
2005-2014	Editorial Board Member, *Breastfeeding Medicine*
2007-	Editorial Board Member, *Environmental Health*
2008-2012	Editorial Review Board Member, *Environmental Health Perspectives*
2012-2015	Associate Editor, *Environmental Health Perspectives*
2016-	Advisor, *Environmental Health Perspectives* News Section

Societies and Organizations

1989-2008	American Public Health Association
1996-2015	Academic Pediatric Association
1997-2012	American Association for the Advancement of Science
2000-2008	Society for Pediatric Research
2001-2008	American Pediatric Society
2001-2016	Specialty Fellow, American Academy of Pediatrics
2006-	Fellow, Collegium Ramazzini
2006-	Member, International Society for Environmental Epidemiology
2008-	Founding Member, International Society for Children's Health & the Environment
2011-2017	Secretary and Treasurer, International Society for Children's Health & the Environment
2012-	Member, International Society for Exposure Science
2017-2018	Vice-President, International Society for Children's Health & the Environment
2019-2020	President, International Society for Children's Health & the Environment

Video and Website Production – www.littlethingsmatter.ca

1. Canadian Environmental Health Atlas: A Portal to Discover the Promise of Environmental Health.
2. Shifting the Curve: The Impact of Toxins on ADHD in U.S. Children (video)
3. Little Things Matter: The Impact of Toxins on the Developing Brain (video)
4. Little Things Matter: The Impact of Toxins on Preterm Birth (video)
5. Prevention Paradox: Why We are Failing to Prevent Disease (video)
6. Little Things Matter: The Deadly Impact of Airborne Particles (video)
7. Cause or Cure: A Plea for Prevention (video)
8. Crime of the Century: The Failure to Prevent the Lead Pandemic

Original Research

1. Lanphear BP. Deaths in Custody. American Journal Forensic Medicine & Pathology 1987;8:299-301.
2. Lanphear BP, Snider DE. Myths of Tuberculosis. J Occ Med 1991;33:501-504.
3. Linnemann CC Jr, Cannon C, DeRonde M, Lanphear BP. Effect of educational programs, rigid sharps containers, and universal precautions on reported needle-stick injuries in healthcare workers. Infection Control Hospital Epidemiology 1991;12:214-20.
4. Lanphear BP, Buncher CR. Latent period for malignant mesothelioma of occupational origin. Journal Occupational Med 1992;34:718-721.
5. Lanphear BP, Linnemann CC Jr, Cannon CG, DeRonde MM. Decline of clinical hepatitis B in workers at a general hospital. Clinical Infectious Disease 1993:11:10-14.
6. Lanphear BP, Linnemann CC Jr, Cannon C, DeRonde MM, Pendy L, Kerly L. Hepatitis C virus infection in health care workers. Infection Control Hospital Epidemiology 1994;15:745-750.
7. Lanphear BP, Emond M, Jacobs DE, Weitzman M, Winter NL, Tanner M, Yakir B, Eberly S. A side-by-side comparison of dust collection methods for sampling lead-contaminated house-dust. Environmental Research 1995;68:114-123.
8. Lanphear BP, Winter NL, Apetz L, Eberly S, Weitzman M. A randomized trial of the effect of dust control on children's blood lead levels. Pediatrics 1996;98:35-40.
9. Christy C, Pulcino M, Lanphear BP, McConnochie K. Screening for tuberculosis infection in urban children. Arch Pediatrics Adolescent Med 1996;150:722-726.
10. Lanphear BP, Weitzman M, Eberly S. Racial differences in environmental exposures to lead. American Journal of Public Health 1996;86:1460-1463.
11. Lanphear BP, Weitzman M, Winter NL, Tanner M, Yakir B, Eberly S, Emond M, Matte TD. Lead-contaminated house dust and urban children's blood lead levels. American Journal of Public Health 1996;86:1416-1421.

12. Lanphear BP, Byrd RS, Auinger P, Hall CB. Increasing prevalence of recurrent otitis media among children in the United States. Pediatrics 1997. http//www.pediatrics.org/cgi/contents/full99/3/e1.
13. Emond MJ, Lanphear BP, Watts A, Eberly S for the Rochester Lead-in-Dust Study Group. Measurement error and its impact on the estimated relationship between dust lead and children's blood lead. Environmental Research 1997;72:82-92.
14. Lanphear BP, le Cessie S, Atkinson WL, Watelet L. Association of live births and the resurgence of measles. International Journal Epidemiology 1997;26:204-211.
15. Rust SW, Burgoon DA, Lanphear BP, Eberly S. Log-additive versus log-linear analysis of lead-contaminated house dust and children's blood lead levels: Implications for residential dust-lead standard. Environmental Research 1997;72:173-184.
16. Lanphear BP, Roghmann KJ. Pathways of lead exposure in urban children. Environmental Research 1997;74:67-73.
17. Lanphear BP, Byrd RS, Auinger P, Schaffer S. Community characteristics associated with elevated blood lead levels in children. Pediatrics 1998;101:264-271.
18. Lanphear BP, Rust SW, Burgoon DA, Eberly S, Galke W. Environmental exposures to lead and urban children's blood lead levels. Environmental Research 1998;76:120-130.
19. Lanphear BP. The paradox of lead poisoning prevention. Science 1998;281:1617-1618.
20. Lanphear BP, Hall CB, Black J, Auinger P. Risk factors for the early acquisition of HHV-6 and HHV-7 infection in children. Pediatric Infectious Disease Journal 1998;17:792-795.
21. Lanphear BP, Matte TD, Rogers J, Clickner R, Dietz B, Bornschein RL, Succop P, Mahaffey KR, Dixon S, Galke W, Rabinowitz M, Farfel M, Rohde C, Schwartz J, Ashley P and Jacobs DE. The contribution of lead-contaminated house dust and residential soil to children's blood lead levels: A pooled analysis of 12 epidemiologic studies. Environmental Research 1998;79:51-68.
22. Marron R, Lanphear BP, Kouides R, Dudman L, Manchester R, Christy C. Efficacy of informational letters on Hepatitis B immunization rates in university students. J Am College Health 1998;47:123-127.
23. Howard CR, Howard FM, Lanphear BP, deBlieck EA, Eberly S, Lawrence RA. Effect of early pacifier use on breastfeeding duration. Pediatrics 1999;103. http//www.pediatrics.org/cgi/contents/full103/3/e33.
24. Lanphear BP, Howard CR, Eberly S, Auinger P, Kolassa J, Weitzman M, Alexander K, Schaffer S. Primary prevention of childhood lead exposure: A randomized trial of dust control. Pediatrics 1999;103:772-777.

25. Moss ME, Lanphear BP, Auinger P. Association of dental caries and blood lead levels among the U.S. population. JAMA 1999;281:2294-2298.
26. Howard CR, de Blieck EA, ten Hoopen C, Howard F, Lanphear BP, Lawrence RA. Physiologic stability of newborns during cup and bottle-feeding. Pediatrics 1999;104:1204-1207.
27. Steiner JF, Curtis P, Lanphear BP, Vu KO, Reid A. Federally-funded fellowship training in primary care research: perspectives of program directors. Academic Medicine 2000;75:74-80.
28. Stone KE, Lanphear BP, Pomerantz WJ, Khoury J. Injuries and deaths in children due to window-falls. Journal of Urban Health 2000;77:26-33.
29. Mansour M, Lanphear BP, DeWitt TG. Barriers to asthma care among underserved, urban children. Pediatrics 2000;106:512-519.
30. Lanphear BP, Eberly S, Howard CR. Long-term effect of dust control on children's blood lead levels. Pediatrics 2000 http//www.pediatrics.org/cgi/contents/full106/4/e48.
31. Lanphear BP, Dietrich KN, Auinger P, Cox C. Cognitive deficits associated with blood lead levels <10 μg/dl in U.S. children and adolescents. Public Health Reports 2000;115:521-529.
32. Lanphear BP, Aligne C, Auinger P, Byrd R, Weitzman M. Residential exposures associated with asthma in U.S. children. Pediatrics 2001;107:505-511.
33. Lanphear BP, Kahn RS, Berger O, Auinger P, Bortnick S, Naahas R. Contribution of residential exposures to asthma in US children and adolescents. Pediatrics 2001. http://www.pediatrics.org/cgi/content/full/107/6/e98.
34. Phelan KJ, Kalkwarf H, Khoury J, Lanphear BP. Trends and patterns of playground injuries in U.S. children and adolescents. Ambulatory Pediatrics 2001;1:227-233.
35. Mansour M, Lanphear BP, Hornung R, Khoury J, Bernstein DI, Menrath W, Decolongon J. A side-by-side comparison of sampling methods for settled indoor allergens. Environ Res 2001;87:37-46.
36. Haynes E, Lanphear BP, Tohn E, Farr N, Rhoads GG. The effect of dust control on children's blood lead concentrations: A systematic review. Env Health Perspect 2002;110:103-107.
37. Lanphear BP, Hornung R, Ho M, Howard CR, Eberly S, Knauf K. Environmental lead exposure during early childhood. Journal of Pediatrics 2002;140:40-47.
38. Steiner JF, Lanphear BP, Curtis P, Vu KO. The training and career paths of fellows in the National Research Service Award (NRSA) program for research in primary medical care. Acad Med 2002;77:712-718.
39. Steiner JF, Lanphear BP, Curtis P, Vu KO. Indicators of early research productivity among primary care fellows. J Gen Intern Med 2002;17:845-851.

40. Kalkwarf HJ, Khoury JC, Lanphear BP. Milk intake in childhood and adolescence, adult bone density and osteoporotic fractures in U.S. women. Am J Clin Nut 2003;77:257-265.
41. Howard CR, Howard FM, Lanphear BP, Eberly S, deBlieck EA, Oakes D, Lawrence RA. A randomized trial of pacifier use and bottle-feeding and their effect on breastfeeding. Pediatrics 2003;111:511-518.
42. Curtis P, Dickinson P, Steiner J, Lanphear BP, Vu K. Building capacity for research in family medicine: Is the blueprint faulty? Family Medicine 2003;35:124-130.
43. Lanphear BP, Succop P, Roda S, Henningsen G. The effect of soil abatement on blood lead levels in children living near a former smelting and milling operation. Public Health Reports 2003;118:83-90.
44. Canfield RL, Henderson CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP. Intellectual impairment in children with blood lead concentrations below 10 micrograms per deciliter. N Engl J Med 2003;348:1517-1526.
45. Kahn RS, Khoury JC, Nichols WC, Lanphear BP. Role of dopamine transporter genotype and maternal prenatal smoking in childhood hyperactivity-impulsivity, inattentive and oppositional behaviors. Journal of Pediatrics 2003:143: 104-110.
46. Auinger P, Kalkwarf HJ, Mansour M, Lanphear BP. Trends in otitis media in US children. Pediatrics 2003:112:514-520.
47. Haynes E, Kalkwarf H, Hornung R, Wenstrup R, Dietrich K, Lanphear B. Vitamin D Fok1 polymorphism and blood lead levels in children. Environ Health Persp 2003;111:1665-1669.
48. Steiner JF, Curtis P, Lanphear BP, Vu KO, Main DS. Assessing the role of influential mentors in the research development of primary care fellows. Academic Medicine 2004:79:865-872.
49. Yolton K, Auinger P, Dietrich KN, Lanphear BP, Hornung R. Exposure to environmental tobacco smoke and cognitive abilities among US children and adolescents. Environ Health Persp 2005:113:98-103.
50. Phelan KJ, Khoury J, Kalkwarf H, Lanphear BP. Residential injuries in US children and adolescents. Public Health Reports 2005;120:63-70.
51. Wilson SE, Kahn RS, Khoury J, Lanphear BP. Racial differences in exposure to environmental tobacco smoke among children. Environ Health Perspect 2005;113:362-367.
52. Lanphear BP, Hornung R, Ho M. Screening housing to prevent lead toxicity in children. Pub Health Rep 2005;120:305-310.
53. Rosner D, Markowitz G, Lanphear BP. J. Lockhart Gibson and the discovery of the impact of lead pigments on children's health: A review of a century of knowledge. Pub Health Rep 2005;120:296-300.

54. Lanphear BP, Hornung R, Khoury J, Yolton K, Baghurst P, Bellinger DC, Canfield RL, Dietrich KN, Bornschein R, Greene T, Rothenberg SJ, Needleman HL, Schnaas L, Wasserman G, Graziano J. Low-level environmental lead exposure and children's intellectual function: An international pooled analysis. Environ Health Perspect 2005;113:894-899.

55. Nagaraja J, Menkedick J, Phelan KJ, Ashley PJ, Zhang J, Lanphear BP. Deaths from residential injuries in US children and adolescents, 1985 to 1997. Pediatrics 2005;116:454-61.

56. Eskenazi B, Gladstone EA, Berkowitz GS, Drew CH, Faustman EM, Holland NT, Lanphear BP, Meisel SJ, Perera FP, Rauh VA, Sweeney A, Whyatt RM, Yolton K. Methodologic and logistic issues in conducting longitudinal birth cohort studies: Lessons learned from the Centers for Children's Environmental Health and Disease Prevention Research. Environ Health Persp 2005;113:1419-1429.

57. Eggleston PA, Diette G, Lipsett M, Lewis T, Tager I, McConnell R, Chrischilles E, Lanphear BP, Miller R, Krishnan J. Lessons learned for the study of childhood asthma from the Centers for Children's Environmental Health and Disease Prevention Research. Environ Health Persp 2005;113:1430-1436.

58. Spanier AJ, Hornung R, Lierl M, Lanphear BP. Environmental exposures and exhaled nitric oxide in children with asthma. J Pediatrics 2006;149:220-226.

59. Yuan W, Holland S, Cecil K, Dietrich K, Wessel SD, Altaye M, Hornung R, Ris M, Egelhoff J, Lanphear B. The impact of early childhood lead exposure on brain organization: A functional magnetic resonance imaging study of language function. Pediatrics 2006;118:971-977.

60. Howard CR, Lanphear N, Lanphear BP, Eberly S, Lawrence RA. Parental responses to infant crying and colic: the effect on breastfeeding duration. Breastfeeding Med 2006;1:146-155.

61. Brinkman W, Geraghty S, Lanphear B, Khoury J, Gonzalez-Del-Rey J, DeWitt T, Britto M. Evaluation of resident communication skills and professionalism: A matter of perspective? Pediatrics 2006;118:1371-1379.

62. Braun JM, Kahn RS, Froehlich T, Auinger P, Lanphear BP. Exposures to environmental toxicants and attention deficit hyperactivity disorder in U.S. children. Environ Health Perspect 2006;114:1904-1909.

63. Brinkman WB, Geraghty SR, Lanphear BP, Khoury JC, Gonzalez-Del-Rey JA, DeWitt TG, Britto MT. Effect of multisource feedback on resident communication skills and professionalism: a randomized controlled trial. Arch Pediatr Adolesc Med 2007;161:44-49.

64. Wilson SE, Kahn RS, Khoury J, Lanphear BP. The role of air nicotine in explaining racial differences in cotinine among tobacco-exposed children. Chest 2007;131:856-862.

65. Froehlich T, Lanphear BP, Dietrich KN, Cory-Slechta D, Wang N, Kahn RS. Interactive effects of a DRD4 polymorphism, lead, and sex on executive functions in children. Biol Psychiatry 2007:62:243-249.

66. Froehlich TE, Lanphear BP, Epstein JN, Barbaresi WJ, Katusic SK, Kahn RS. Prevalence, recognition and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. Arch Pediatr Adolesc Med 2007;161:857-864.

67. Landrigan PJ, Woolf AD, Gitterman B, Lanphear B, Forman J, Karr C, Moshier EL, Godbold J, Crain E. The Ambulatory Pediatric Association Fellowship in Pediatric Environmental Health: A five-year assessment. EHP 2007;115:1383-1387.

68. Jusko TA, Henderson CR, Lanphear BP, Cory-Slechta DA, Parsons PJ, Canfield RL. Blood lead concentrations < 10 μg/dL and child intelligence at 6 years of age. Environ Health Perspect 2008;116:243-248.

69. Cecil KM, Brubaker CJ, Adler CM, Dietrich KN, Altaye M, Egelhoff JC, Wessel S, Elangovan I, Hornung R, Jarvis K, Lanphear BP. Decreased brain volume in adults with childhood lead exposure. PLoS Med 2008;5:e112.

70. Wright JP, Dietrich KN, Ris MD, Hornung RW, Wessel SD, Lanphear BP, Ho M, Rae MN. Association of prenatal and childhood blood lead concentrations with criminal arrests in early adulthood. PLoS Med 2008;5:e101.

71. Spanier AJ, Hornung RW, Kahn RS, Lierl MB, Lanphear BP. Seasonal variation and environmental predictors of exhaled nitric oxide in children with asthma. Pediatr Pulmonol 2008;43:576-583.

72. Braun JM, Froehlich TE, Daniels JL, Dietrich KN, Hornung R, Auinger P, Lanphear BP. Association of environmental toxicants and conduct disorder in U.S. children: NHANES 2001-2004. Environ Health Perspect 2008;116:956-962.

73. Yolton K, Khoury J, Hornung R, Dietrich KN, Succop P, Lanphear BP. Environmental tobacco smoke exposure and child behaviors. J Dev Behav Pediatr 2008;29:456-463.

74. Yeoh B, Woolfenden S, Wheeler D, Alperstein G, Lanphear B. Household interventions for prevention of domestic lead exposure in children. Cochrane Database Syst Rev. 2008;2:CD006047.

75. Geraghty SR, Khoury JC, Morrow AL, Lanphear BP. Reporting individual test results of environmental chemicals in breastmilk: potential for premature weaning. Breastfeed Med. 2008;3:207-213.

76. Spanier AJ, Kahn RS, Hornung RW, Wang N, Sun G, Lierl MB, Lanphear BP. Environmental exposures, nitric oxide synthase genes, and exhaled nitric oxide in asthmatic children. Pediatr Pulmonol. 2009;44:812-819.
77. Hornung RW, Lanphear BP, Dietrich KN. Age of greatest susceptibility to childhood lead exposure: A new statistical approach. Environ Health Persp 2009;117:1309-1312.
78. Phelan KJ, Khoury J, Xu Y, Lanphear BP. Validation of a HOME Injury Survey. Injury Prevention 2009:15:300-306.
79. Braun J, Yolton K, Dietrich K, Hornung R, Ye X, Calafat AM, Lanphear BP. Prenatal Bisphenol A exposure and early childhood behavior. Environ Health Persp 2009;117:1945-1952.
80. Yolton K, Khoury J, Xu Y, Succop P, Lanphear B, Bernert JT, Lester B. Low-level prenatal exposure to nicotine and infant neurobehavior. Neurotoxicol Teratol. 2009;31:356-363.
81. Froehlich T, Lanphear BP, Auinger P, Hornung R, Epstein JN, Braun J, Kahn RS. The association of tobacco and lead exposure with attention-deficit/hyperactivity disorder in a national sample of US children. Pediatrics 2009;124:e1054-1063.
82. Brubaker CJ, Schmithorst VJ, Haynes EN, Dietrich KN, Egelhoff JC, Lindquist DM, Lanphear BP, Cecil KM. Altered myelination and axonal integrity in adults with childhood lead exposure: A diffusion tensor imaging study. Neurotoxicology 2009;30:867-875.
83. Yolton K, Xu Y, Khoury J, Succop P, Lanphear B, Beebe DW, Owens J. Associations between secondhand smoke exposure and sleep patterns in children. Pediatrics. 2010;125:e261-268.
84. Brubaker CJ, Dietrich KN, Lanphear BP, Cecil KM. The influence of age of lead exposure on adult gray matter volume. Neurotoxicology 2010;31:259-266.
85. Braun JM, Daniels JL, Poole C, Olshan AF, Hornung R, Bernert JT, Xia Y, Bearer C, Barr DB, Lanphear BP. Prenatal environmental tobacco smoke exposure and early childhood body mass index. Paediatr Perinat Epidemiol 2010;24:524-534.
86. Kalkbrenner AE, Hornung RW, Bernert JT, Hammond SK, Braun JM, Lanphear BP. Determinants of serum cotinine and hair cotinine as biomarkers of childhood secondhand smoke exposure. J Expo Sci Environ Epidemiol 2010;20:615-624.
87. Wilson SE, Baker ER, Leonard AC, Eckman M, Lanphear BP. Understanding preferences for disclosure of individual biomarker results among participants in a longitudinal birth cohort. J Med Ethics 2010;doi:10.1136/jme.2010.036517.
88. Braun JM, Daniels JL, Poole C, Olshan AF, Hornung R, Bernert JT, Xia Y, Bearer C, Barr DB, Lanphear BP. A prospective cohort study of biomarkers of prenatal tobacco smoke exposure: The correlation between serum and meconium and their association with infant birth weight. Environmental Health 2010;9:53 (doi: 10.1186/1476-069X-9-53).

89. Braun JM, Kalkbrenner AE, Calafat AM, Bernert JT, Ye X, Barr DB, Sathyanarayana S, Lanphear BP. Variability and predictors of urinary Bisphenol A concentrations during pregnancy. Environ Health Perspect 2011;119:131-137.
90. Wilson SE, Talaska G, Kahn RS, Schumann B, Khoury J, Leonard AC, Lanphear BP. White blood cell DNA adducts in a cohort of asthmatic children exposed to environmental tobacco smoke. Int Arch Occup Environ Health 2011;84:19-27.
91. Lanphear BP, Hornung RW, Khoury J, Yolton K, Lierl M, Kalkbrenner AE. Effects of HEPA air cleaners on unscheduled asthma visits and asthma symptoms in children exposed to second hand tobacco smoke. Pediatrics 2011;127:93-101.
92. Phelan KJ, Khoury J, Xu Y, Liddy S, Hornung R, Lanphear BP. A randomized, controlled trial of home injury hazard reduction: The HOME Study. Arch Pediatrics Adolesc Medicine 2011;165:339-345.
93. Cecil KM, Dietrich KN, Altaye M, Egelhoff JC, Lindquist DM, Brubaker CJ, Lanphear BP. Proton magnetic resonance spectroscopy in adults with childhood lead exposure. Environ Health Perspect 2011;119:403-408.
94. Spanier AJ, Kahn RS, Xu Y, Hornung R, Lanphear BP. A comparison of biomarkers and parent report of tobacco exposure to predict wheeze. J Pediatrics 2011;159:776-782.
95. Braun J, Kalkbrenner A, Calafat A, Yolton K, Xiaoyun Y, Dietrich KN, Lanphear BP. Impact of early life bisphenol A exposure on behavior and executive function in children. Pediatrics 2011;128:873-882.
96. Sathyanarayana S, Braun JM, Yolton K, Liddy S, Lanphear BP. Case Report: High prenatal Bisphenol A exposure and infant behavior. Environ Health Perspect 2011;119:1170-1175.
97. Spanier AJ, Kahn RS, Hornung R, Lierl M, Lanphear BP. Associations of fraction of exhaled nitric oxide with beta agonist use in children with asthma. Pediatr Allergy Immunol Pulmonol. 2011 Mar;24(1):45-50.
98. Byars KC, Yolton K, Rausch J, Lanphear BP, Beebe DW. Prevalence, patterns and persistence of sleep problems in the first 3 years of life. Pediatrics 2012;129:276-284.
99. Yeoh B, Woolfenden S, Wheeler D, Alperstein G, Lanphear B. Household interventions for prevention of domestic lead exposure in children. Cochrane Database Syst Rev. 2012;2:CD006047.
100. Ciesielski T, Weuve J, Bellinger DC, Schwartz J, Lanphear B, Wright RO. Cadmium exposure and neurodevelopmental outcomes in U.S. children. Environ Health Persp 2012;120:758-763.
101. Beebe DW, Rausch J, Byars K, Lanphear B, Yolton K. Persistent snoring in preschool children: predictors and behavioral and developmental correlates. Pediatrics 2012;130:382-389.

102. Spanier AJ, Kahn RS, Kunselman AR, Hornung R, Xu Y, Calafat A, Lanphear BP. Prenatal exposure to Bisphenol A and childhood wheeze from birth to 3 years of age. Environ Health Perspect 2012;120:916-920. http://dxdoi.org/10.1289/ehp.1104175. (Recipient of the Michael Shannon Young Investigator Award, Denver, Colorado, April 30th, 2011.)

103. Rauch S, Braun J, Barr DB, Calafat A, Montesanto A, Yolton K, Khoury J, Lanphear BP. Associations of prenatal exposure to organophosphate pesticides with gestational age and birth weight Env Health Perspect 2012;120:1055-1060. http://dx.doi.org/10.1289/ehp.1104615.

104. Hayward I, Malcoe LH, Cleathero LA, Janssen PA, Lanphear BP, Hayes MV, Mattman A, Pampalon R, Venners SA. Investigating maternal risk factors as potential targets of intervention to reduce socioeconomic inequality in small for gestational age: a population-based study. BMC Public Health. 2012;13;12:333.

105. Braun JM, Hoffman E, Schwartz J, Sanchez B, Schnaas L, Mercado-Garcia A, Solano-Gonzalez M, Bellinger DC, Lanphear BP, Hu H, Tellez-Rojo MM, Wright RO, Hernandez-Avila M. Assessing windows of susceptibility to lead-induced cognitive deficits in Mexican children. Neurotoxicology. 2012;33:1040-1047.

106. Budtz-Jorgenson E, Bellinger D, Lanphear BP, Grandjean P on behalf of the International Pooled Lead Study Investigators. An international pooled analysis for obtaining a benchmark dose for environmental lead exposure in children. Risk Analysis 2013;33:450-461.

107. Oulhote Y, Le Tertre A, Etchevers A, Le Bot B, Lucas J-P, Mandin C, Le Strat Y, Lanphear B, Gleorennec P. Implications of different residential lead standards on children's blood lead levels in France: Predictions based on a national cross-sectional survey. Int J Hygiene Health. 2013;216:743-750.

108. Sathyanarayana S, Alcedo G, Saelens BE, Zhou C, Dills RL, Lanphear B. Unexpected results in a randomized dietary trial to reduce phthalate and bisphenol A exposures. J Exp Science Environ Epidemiol 2013. doi.10.1038/jes.2013.9

109. Spanier A, Wilson S, Ho M, Hornung R, Lanphear BP. The contribution of housing renovation to children's blood lead levels: a cohort study. Environmental Health 2013;12:72.

110. Arbuckle TE, Fraser WD, Fisher M, Davis K, Liang CL, Lupien N, Bastien S, Velez MP, von Dadelszen P, Hemmings DG, Wang J, Helewa M, Taback S, Sermer M, Foster W, Ross G, Fredette P, Smith G, Walker M, Shear R, Dodds L, Ettinger AS, Weber JP, D'Amour M, Legrand M, Kumarathasan P, Vincent R, Luo ZC, Platt RW, Mitchell G, Hidiroglou N, Cockell K, Villeneuve M, Rawn DF, Dabeka R, Cao XL, Becalski A, Ratnayake N, Bondy G, Jin X, Wang Z, Tittlemier S, Julien P, Avard D, Weiler H, Leblanc A, Muckle G, Boivin M, Dionne G, Ayotte P, Lanphear B, Séguin JR, Saint-Amour D, Dewailly E, Monnier P, Koren G, Ouellet E.

Cohort profile: the maternal-infant research on environmental chemicals research platform. Paediatr Perinat Epidemiol. 2013 Jul;27(4):415-25. doi: 10.1111/ppe.12061.

111. Braun JM, Kalkbrenner A, Just AC, Yolton K, Sjodin A, Hauser R, Webster GM, Chen A, Lanphear BP. Gestational exposure to endocrine disrupting chemicals and reciprocal social, repetitive and stereotypic behaviors in 4 and 5 year old children. Environ Health Perspect 2014;122:513-520. (CEHN Article of the Month August, 2014.)
112. Phelan KJ, Morrongiello B, Khoury J, Xu Y, Liddy S, Lanphear BP. Maternal supervision of children during their first 3 years of life: the influence of maternal depression and child gender. J Pediatr Psychol 2014;39:349-357.
113. Chen A, Yolton K, Rauch S, Webster GM, Hornung R, Sjodin A, Dietrich KN, Lanphear BP. Cognitive deficits and behavior problems in children with prenatal PBDE Exposure. Environ Health Perspect 2014;122:856-862. (CEHN Article of the Month, September, 2014.)
114. Kato K, Wong L-Y, Chen A, Dunbar C, Webster G, Lanphear B, Calafat, A. Changes in serum concentrations of maternal poly- and perfluoroalkyl substances over the course of pregnancy and predictors of exposure in a multiethnic cohort of Cincinnati, Ohio pregnant women during 2003–2006. Environmental Science & Technology 2014;48:9600-9608.
115. Watkins DJ, Eliot M, Sathyanarayana S, Calafat AM, Yolton K, Lanphear BP, Braun JM. Variability and Predictors of Urinary Concentrations of Phthalate Metabolites during Early Childhood. Environ Sci Technol. 2014;48:9600-9608.
116. Braun JM, Lanphear BP, Calafat AM, Deria S, Khoury J, Howe CJ, Venners SA. Early-life Bisphenol A exposure and child body mass index: A prospective cohort study. Environ Health Perpect 2014;122:1239-1245.
117. Prasodjo A, Pfeiffer CM, Fazili Z, Xu Y, Liddy S, Yolton K, Savitz DA, Lanphear BP, Braun JM. Serum cotinine and whole blood folate concentrations in pregnancy. Ann Epidemiol. 2014;24:498-503.e1. doi: 10.1016/j.annepidem.2014.04.004.
118. Spanier AJ, Kahn RS, Kunselman AR, Schaefer EW, Hornung RW, Xu Y, Calafat AM, Lanphear BP. Bisphenol A exposure and the development of wheeze and lung function in children through age 5 years. JAMA Pediatrics 2014;168:1131-1137.
119. Evens A, Hryhorczuk D, Lanphear BP, Rankin KM, Lewis DA, Forst L, Rosenberg D. The impact of low-level lead toxicity on school performance among children in the Chicago Public Schools: a population-based retrospective cohort study. Environ Health 2015;14:21 DOI 10.1186/s12940-015-0008-9.
120. Romano ME, Webster GM, Vuong AM, Zoeller RT, Chen A, Hoofnagle AN, Calafat AM, Karagas MR, Kimberly Yolton K, Lanphear BP, Braun JM. Gestational urinary bisphenol A and

maternal and newborn thyroid hormone concentrations: the HOME Study. Environmental Research 2015;138:453-460.

121. Barnard H, Rao R, Xu Y, Froehlich T, Epstein J, Lanphear BP, Yolton K. Association of the Conners' Kiddie J Continuous Performance Test (K-CPT) and Parent-Report Measures of Behaviors and Executive Functioning. Atten Disord. 2015 pii:1087054715578271. PMID: 25846228
122. Vuong AM, Webster GM, Romano ME, Braun JM, Zoeller RT, Hoofnagle AN, Sjödin A, Yolton K, Lanphear BP, Chen. Maternal polybrominated diphenyl ether (PBDE) exposure and thyroid hormones in maternal and cord sera: the HOME Study, Cincinnati, USA. Environ Health 2015;123:1079-1085. PMID: 25893858.
123. Werner EF, Braun JM, Yolton K, Khoury JC, Lanphear BP. The association between maternal urinary phthalate concentrations and blood pressure in pregnancy: the HOME Study. Environ Health 2015;14:75 doi:10.1186/s12940-015-0062-3.
124. Melissa Wagner-Schuman, Jason Richardson, Peggy Auinger, Joseph Braun, Bruce Lanphear, Jeffrey N. Epstein, Kimberly Yolton and Tanya E Froehlich. Association of Pyrethroid Pesticide Exposure with Attention-Deficit/Hyperactivity Disorder in a Nationally Representative Sample of U.S. Children. Environmental Health 2015;28:14:44 DOI 10.1186/s12940-015-0030-y.
125. Buckley JP, Engel SM, Braun JM, Whyatt RM, Daniels JL, Mendez MA, Richardson DB, Xu Calafat AM, Lanphear BP, Wolff MS, Herring AH, Rundle AG. Prenatal phthalate exposures and body mass index among 4 to 7 year old children: A pooled analysis. Epidemiology 2016;27:449-58. doi: 10.1097/EDE.0000000000000436.
126. Engel SM, Bradman A, Wolff MS, Rauh VA, Harley KG, Yang JH, Hoepner L, Barr DB, Yolton K, Vedar MG, Xu Y, Hornung RW, Wetmur JG, Chen J, Holland N, Perera FP, Whyatt RM, Lanphear BP, Eskenazi B. Prenatal organophosphorous pesticide exposure and child neurodevelopment at 24 months: an analysis of four birth cohorts. EHP 2016;124:822-830.
127. Braun JM, Chen A, Romano ME, Calafat AM, Webster GM, Yolton K, Lanphear BP. Prenatal perfluoroalkyl substance exposure and child adiposity at 8 years of age: The HOME Study. Obesity 2016;24:231-237.
128. Webster GM, Rauch SA, Ste Marie N, Mattman A, Lanphear BP, Venners SA. Cross-sectional associations of serum perfluoroalkyl acids and thyroid hormones in U.S. adults: variation according to TPOAb and Iodine status. Environ Health Persp 2016124935-942. doi: 10.1289/ehp.1409589.

129. Braun JM, Kalloo G, Chen A, Dietrich KN, Liddy-Hicks S, Morgan S, Xu Y, Yolton K, Lanphear BP. Cohort Profile: The Health Outcomes and Measures of the Environment (HOME) Study. Int J Epidemiol 2017;46:24 doi: 10.1093/ije/dyw006.
130. Taylor MP, Forbes MK, Opeskin B, Parr N, Lanphear BP. The relationship between atmospheric lead pollution and aggressive crime: An ecologic study. Environ Health 2016;15:23. doi: 10.1186/s12940-016-0122-3.
131. Harley KG, Engel SM, Vedar MG, Eskenazi B, Whyatt RM, Lanphear BP, Bradman A, Rauh VA, Yolton K, Hornung RW, Wetmur JG, Chen J, Holland NT, Barr DB, Perera FP, Wolff MS. Prenatal exposure to organophosphorous pesticides and fetal growth: pooled results from four longitudinal birth cohort studies. Env Health Perspect 2016;124:1084-1092.
132. Vuong AM, Yolton K, Webster GM, Sjodin A, Calafat AM, Braun JM, Dietrich KN, Lanphear BP, Chen A. Prenatal polybrominated diphenyl ether and perfluoroalkyl substance exposures and executive function in school-age children. Env Res 2016;147:556-564.
133. Stacy SL, Eliot M, Calafat AM, Chen A, Lanphear BP, Hauser R, Papandonatos GD, Sathyanarayana S, Ye X, Yolton K, Braun JM. Patterns, variability and predictors of urinary Bisphenol A concentrations during childhood. Environ Sci Tech 2016;50:5981-5990.
134. Romano ME, Xu Y, Calafat AM, Yolton K, Chen A, Webster GM, Eliot MN, Howard CR, Lanphear BP, Braun JM. Maternal serum perfluoralkyl substances during pregnancy and duration of breastfeeding. Env Res 2016;149:239-246.
135. Shoaff JR, Romano ME, Yolton K, Lanphear BP, Calafat AM, Braun JM. Prenatal phthalate exposure and infant size at birth and gestational duration. Env Res 20161;50:52-58.
136. Tewar S, Auinger P, Braun JM, Lanphear B, Yolton K, Epstein JN, Froehlich TE. Association of bisphenol A exposure and attention-deficit/hyperactivity disorder in a national sample of U.S. children. Environ Res 2016;150:112-118.
137. Vuong AM, Braun JM, Sjodin A, Webster GM, Yolton K, Lanphear BP, Chen A. Prenatal polybrominated diphenyl ether exposure and body mass index in children up to 8 years of age. Environ Health Perspect 2016;124:1891-1897.
138. Donauer S, Altaye M, Xu Y, Sucharew H, Succop P, Calafat AM, Khoury JC, Lanphear B, Yolton K. An observational study to evaluate associations between low-level gestational exposure to organophosphate pesticides and cognition during early childhood. Am J Epidemiol 2016;184:410-418.
139. Percy Z, Xu Y, Sucharew H, Khoury JC, Calafat AM, Braun JM, Lanphear BP, Chen A, Yolton K. Gestational exposure to phthalates and gender-related play behaviors in 8-year old children: an observational study. Environ Health 2016;15:doi: 10.1186?s12940-016-0171-7.

140. Blackowicz MJ, Hryhorczuk DO, Rankin KM, Lewis DA, Haider D, Lanphear BP, Evens A. The impact of low-level lead toxicity on school performance among Hispanic subgroups in the Chicago Public Schools. Int J Environ Res Public Health 2016 doi: 10.3390/ijerph13080774.
141. Ernhardt J, Xu Y, Khoury J, Yolton, Lanphear B, Phelan K. Cognitive and motor abilities of young children and risk of injuries in the home. Inj Prev 2016 doi: 10.1136/injuryprev-2016-042031.
142. Zhang H, Yolton K, Webster GM, Sjodin A, Calafat AM, Dietrich KN, Xu Y, Xie C, Braun JM, Lanphear BP, Chen A. Prenatal PBDE and PCB exposures and reading, cognition and externalizing behaviours in children. Environ Health Perspect 2017;125:746-752.
143. Braun JM, Bellinger DC, Hauser R, Wright RO, Chen A, Calafaat AM, Yolton K, Lanphear BP. Prenatal phthalate, triclosan and bisphenol A exposures and child visual-spatial abilities. Neurotoxicology 2017;58:75-83.
144. Vuong AM, Braun JM, Yolton K, Xie C, Webster GM, Sjodin A, Dietrich KN, Lanphear BP, Chen A. Prenatal and postnatal polybrominated diphenyl ether exposure and visual spatial abilities in children. Env Res 2017;153:83-92.
145. Etzel TM, Calafat AM, Ye X, Chen A, Lanphear BP, Savitz DA, Yolton K, Braun JM. Urinary triclosan concentrations during pregnancy and birth outcomes. Environ Res 2017;156:505-511.
146. Pell T, Eliot M, Chen A, Lanphear BP, Yolton K, Sathyanarayana S, Braun JM. Parental concern about environmental chemical exposures and children's urinary concentrations of phthalates and phenols. J Pediatr 2017;186:138-144.e3.
147. Millenson ME, Braun JM, Calafat AM, Barr DB, Huang YT, Chen A, Lanphear BP, Yolton K. Urinary organophosphate insecticide metabolite concentrations during pregnancy and children's interpersonal, communication, repetitive, and stereotypic behaviors at 8 years of age: The HOME Study. Environ Res 2017;157:9-16.
148. Stacy SL, Eliot M, Etzel T, Papandonatos GD, Calafat AM, Chen A, Hauser R, Lanphear BP, Sathyanarayana S, Ye X, Yolton K, Braun JM. Patterns, variability and predictors of urinary triclosan concentrations during pregnancy and childhood. Environ Sci Technol 2017 (in press).
149. Stacy SL, Papandonatos GD, Calafat AM, Chen A, Yolton K, Lanphear BP, Braun JM. Early life bisphenol A exposure and neurobehavior at 8 years: identifying windows of heightened vulnerability. Environ Int 2017107:258-265.
150. Lam J, Lanphear BP, Bellinger D, Axelrad DA, McPartland J, Sutton P, Davidson L, Daniels N, Sen S, Woodruff TJ. Developmental PBDE exposure and IQ/ADHD in childhood: A systematic review and meta-analysis. Environ Health Persp 2017;125:086001. doi: 1289/EHP1632.

151. Braun JM, Yolton K, Stacy SL, Erar B, Papandonatas GD, Bellinger DC, Lanphear BP, Chen A. Prenatal environmental chemical exposures and longitudinal patterns of child neurobehavior. Neurotoxicology 2017;62:192-199.
152. Rosen-Carole CB, Auinger P, Howard CR, Brownell EA, Lanphear BP. Low-level prenatal toxin exposure and breastfeeding duration. A prospective cohort study. Matern Child Health J. 2017;doi: 10.1016/j.neuro.2017.07.027.
153. Vuong AM, Yolton K, Xie C, Webster GM, Sjodin A, Braun JM, Dietrich KN, Lanphear BP, Chen A. Childhood polybrominated diphenyl ether (PBDE) exposure and neurobehavior in children at 8 years. Env Res 2017;158:8677-684.
154. Braun JM, Muckle G, Arbuckle T, Bouchard MF, Fraser WD, Ouellet E, Seguin JR, Oulhote Y, Webster GM, Lanphear BP. Associations of prenatal urinary bisphenol A concentrations with child behaviors and cognitive abilities. Environ Health Perspect 2017;125(6):067008. doi: 10.1289EHP984.
155. Kingsley SL, Kelsey KY, Butler R, Chen A, Eliot MN, Romano ME, Houseman A, Koestler DC, Lanphear BP, Yolton K, Braun JM. Maternal serum PFOA concentration and DNA methylation in cord blood: A pilot study. Environ Res 2017;158:174-178.
156. Poropat AE, Laidlaw MAS, Lanphear B, Ball A, Mielke HW. Blood lead and preeclampsia: A meta-analysis and review of implications. Environ Res 2017;160:12-19.
157. Shoaff J, Papandonatos GD, Calafat AM, Xe X, Chen A, Lanphear BP, Yolton K, Braun JM. Early-life phthalate exposure and adiposity at 8 Years of Age. Environ Health Persp 2017;125:097008. doi: 10.1289/EHP1022.
158. Vuong AM, Yolton K, Poston KL, Xie C, Webster GM, Sjodin A, Braun JM, Dietrich KN, Lanphear BP, Chen A. Prenatal and postnatal polybrominated diphenyl ether (PBDE) exposure and measures of inattention and impulsivity in children. Neurotoxicol Teratol 2017;64:20-28.
159. Zhang H, Yolton K, Webster GM, Ye X, Xie C, Calafat AM, Dietrich KN, Braun JM, Lanphear BP, Chen A. Prenatal and childhood perfluoroalkyl substance exposures and children's reading skills at ages 5 and 8 years. Environ Int 2017;111:224-231. doi: 1016/j.envint.2017.11.031. PMID: 29241079
160. Woods MM, Lanphear BP, Braun JM, McCandless LC. Gestational exposure to endocrine disrupting chemicals in relation to infant birth weight: A Bayesian analysis of the HOME Study. Environ Health 2017;16:115. doi: 10.1186/s12940-017-0332-3.

161. Vuong AM, Yolton K, Dietrich KN, Braun JM, Lanphear BP, Chen A. Exposure to polybrominated diphenyl ethers (PBDEs) and child behavior: Current findings and future directions. Horm Behav 2017 doi: 10.1016/j.yhbeh.2017.11.008.

162. Landrigan PJ, Fuller R, Acosta NJR, Adeyi O, Arnold R, Basu NN, Baldé AB, Bertollini R, Bose-O'Reilly S, Boufford JI, Breysse PN, Chiles T, Mahidol C, Coll-Seck AM, Cropper ML, Fobil J, Fuster V, Greenstone M, Haines A, Hanrahan D, Hunter D, Khare M, Krupnick A, Lanphear B, Lohani B, Martin K, Mathiasen KV, McTeer MA, Murray CJL, Ndahimananjara JD, Perera F, Potočnik J, Preker AS, Ramesh J, Rockström J, Salinas C, Samson LD, Sandilya K, Sly PD, Smith KR, Steiner A, Stewart RB, Suk WA, van Schayck OCP, Yadama GN, Yumkella K, Zhong M. The Lancet Commission on Pollution and Health. Lancet 2017 pii: SO140-6736(17)32345-0. doi: 10.1016/S0140-6736(17)32345-0. PMID: 29056410.

163. Lanphear BP, Rauch S, Auinger P, Allen R, Hornung RW. Low-level lead exposure and mortality in US adults: a population-based cohort study. Lancet Public Health 2018; https://doi.org/10.1016/S2468-2667(18)30025-2

164. Kalloo G, Calafat AM, Chen A, Yolton K, Lanphear BP, Braun JM. Early life triclosan exposure and child adiposity at 8 years of age: a prospective cohort study. Environ Health 2018;17:24. doi: 10.1186/s12940-018-0366-1.

165. Braun JM, Chen A, Hoofnagle A, Papandonatos GD, Jackson-Browne M, Hauser R, Romano ME, Karagas MR, Yolton, Zoeller TR, Lanphear BP. Associations of early-life urinary triclosan concentrations with maternal, neonatal, and child thyroid hormone levels. Horm Behav 2018;101:77-84.

166. Taylor MP, Forbes MK, Opeskin B, Parr, N, Lanphear BP. Further analysis of the relationship between atmospheric lead emissions and aggressive crime: An ecological study. Environ Health 2018;17:10. Doi: 10.1186/s12940-018-0354-5.

167. Etzel T, Muckle G, Arbuckle TE, Fraser WD, Ouellet E, Seguin JR, Lanphear B, Braun JM. Prenatal urinary triclosan concentrations and child neurobehavior. Env Int 2018;114:152-159. doi: 10.1016/j.envint.2018.02.032.

168. Romano ME, Eliot MN, Zoeller RT, Hoofnagle AN, Calafat AM, Karagas MR, Yolton K, Chen A, Lanphear BP, Braun JM. Maternal urinary phthalate metabolites during pregnancy and thyroid hormone concentrations in maternal and cord sera: The HOME Study. Int J Hyg Environ Health 2018;221:623-631. doi: 10.1016/j.ijheh.2018.03.010.

169. Jackson-Brown MS, Papandonatos GD, Chen A, Calafat AM, Yolton K, Lanphear BP, Braun JM. Identifying vulnerable periods of neurotoxicity to triclosan exposure in children. Environ Health Perspect 2018;126:057001. doi: 10.1289/EHP2777.

170. Kingsley SL, Eliot MN, Kelsey KT, Calafat AM, Ehrlich S, Lanphear BP, Chen A, Braun JM. Variability and predictors of serum perfluoralkyl substance concentrations during pregnancy and early childhood. Environ Res 2018;165:247-257. PMID: 29734025

171. Barn P, Gombojav E, Ochir C, Laagan B, Beejin B, Naidan G, Boldbaatar B, Galsuren J, Byambaa T, Janes C, Janssen PA, Lanphear BP, Takaro TK, Venners SA, Webster GM, Yuchi W, Palmer CD, Parsons PJ, Roh YM, Allen RW. The effect of portable HEPA filter air cleaners on indoor PM2.5 concentrations and second-hand tobacco smoke exposure among pregnant women in Ulaanbaatar, Mongolia: The UGGAR randomized controlled trial. Sci Total Environ 2018;615:1379-1389.

172. Braun JM, Kalkwarf HJ, Papandonatos GD, Chen A, Lanphear BP. Patterns of early life body mass index and childhood overweight and obesity status at 8 years of age. BMC Pediatrics 2018;11:161. doi: 10.1186/s12887-018-1124-9.

173. Vuong AM, Braun JM, Webster GM, Zoeller TR, Hoofnagel AN, Sjodin A, Yolton K, Lanphear BP, Chen A. Polybrominated diphenyl ether (PBDE) exposures and thyroid hormones in children at 3 years. Environ Int 2018;117:339-347.

174. Li N, Yolton K, Lanphear BP, Chen A, Kalkwarf HJ, Braun JM. Impact of early-life weight status on cognitive abilities in children. Obesity 2018;26:1088-1095.

175. Oulhote Y, Tremblay E, Arbuckle TE, Fraser WD, Lemelin JP, Seguin JR, Ouellet E, Forget-Dubois N, Ayotte P, Boivin M, Dionne G, Lanphear BP, Muckle G. Prenatal exposure to polybrominated diphenyl ethers and predisposition to frustration at 7 months. Env Int 2018;119:79-88.

176. Vuong AM, Yolton K, Wang Z, Xie C, Webster GM, Ye X, Calafat AM, Braun JM, Dietrich KN, Lanphear BP, Chen A. Childhood perfluororalkyl substance exposure and executive function in children at 8 years. Env Int 2018;119:212-219.

177. Vuong AM, Braun JM, Yolton K, Wang Z, Xie C, Webster GM, Ye X, Calafat AM, Dietrich KN, Lanphear BP, Chen A. Prenatal and childhood exposure to perfluoroalkyl substances and measures of attention, impulse control and visual spatial abilities. Env Int 2018;119:413-420.

178. Braun JM, Hornung R, Chen A, Dietrich KN, Jacobs DE, Jones R, Khoury JC, Liddy-Hicks S, Morgan S, Baez Vanderbeek S, Xu Yingying, Yolton K, Lanphear BP. Effect of residential lead-hazard interventions on childhood blood lead concentrations and neurobehavioral outcomes. JAMA Pediatrics 2018:doi:10.1001/jamapediatrics.2018.3282.

179. Kalloo G, Wellenius GA, McCandless L, Clafat AM, Sjodin A, Karagas M, Chen A, Yolton K, Lanphear BP, Braun JM. Profiles and predictors of environmental chemical mixture exposure

among pregnant women: The Health Outcomes and Measures of the Environment Study. Environ Sci Technol 2018;52:10104-10113.

180. Barn P, Gombojav E, Ochir C, Boldbaatar B, Laagan B, Beejin B, Naidan G, Galsuren J, Legtseg B, Byambaa T, Hutcheon JA, Janes C, Janssen PA, Lanphear BP, McCandless L, Takaro TK, Venners SA, Webster GM, Allen RW. The effect of portable HEPA filter air cleaner use during pregnancy on fetal growth: The UGAAR randomized controlled trial pregnant Environ Int 2018;121:981-989.
181. Buck CO, Eliot MN, Kelsey KT, Calafat AM, Chen A, Ehrlich S, Lanphear BP, Braun JM. Prenatal exposure to perfluoralkyl substances and adipocytokines: the HOME Study. Pediatr Res 2018;doi: 10.1038/s41390-018-0170-1.
182. Shoaff J, Papandonatos GD, Calafat AM, Chen A, Lanphear BP, Ehrlich S, Kelsey KT, Braun JM. Prenatal exposure to perfluoralkyl substances: infant birth weight and early life growth. Environ Epidemiol 2018;doi:10.1097/EE9.0000000000000010.
183. Sears CG, Braun JM, Ryan PH, Xu Y, Werner EF, Lanphear BP, Wellenius GA. The association of traffic-related air and noise pollution with maternal blood pressure and hypertensive disorders of pregnancy in the HOME Study cohort. Env Int 2018;121:574-581.
184. Li N, Arbuckle TE, Muckle G, Lanphear BP, Boivin M, Chen A, Dodds L, Fraser WD, Ouellet E, Seguin JR, Velez MP, Yolton K, Braun JM. Associations of cord blood leptin and adiponectin with children's cognitive abilities. Psychoneuroendocrinology 2019;99:257-264.
185. Till C, Green R, Grundy JG, Hornung R, Neufeld R, Martinez-Mier A, Ayotte P, Muckle G, Lanphear B. Community water fluoridation and urinary fluoride concentrations in a national sample of pregnant women in Canada. Environmental Health Perspectives 2018;126:107001.
186. Desrochers-Couture M, Oulhote Y, Arbuckle TE, Fraser WD, Seguin JR, Ouellet E, Forget-Dubois N, Ayotte P, Boivin M, Lanphear BP, Muckle G. Environ Int 2018;121:1235-1242.
187. Goetz AR, Beebe DW, Peugh JL, Mara CA, Lanphear BP, Braun JM, Yolton K, Stark LJ. Sleep 2018;doi:1093/sleep/zsy214.
188. Pagalan L, Bickford C, Weikum W, Lanphear BP, Brauer M, Lanphear N, Hanley GE, Oberlander TF, Winters M. Association of prenatal exposure to air pollution with autism spectrum disorder. JAMA Pediatrics 2018;doi:10.1001/jamapediatrics.2018.3101.
189. Yuchi W, Gombojav E, Boldbaatar B, Galsuren J, Enkhmaa S, Beejin B, Naidan G, Ochir C, Legtseg B, Byambaa T, Henderson SB, Janes CR, Lanphear BP, McCandless L, Takaro TK, Venners SA, Webster GM, Allen RW. Evaluation of random forest regression and multiple linear regression for predicting indoor fine particulate matter concentrations in a highly polluted city. Environ Pollut 2018;16;746-753.

190. Liang H, Vuong AM, Xie C, Webster GM, Sjodin A, Yuan W, Miao M, Braun JM, Dietrich KN, Yolton K, Lanphear BP, Chen A. Childhood polybrominated diphenyl ether (PBDE) serum concentrations and reading ability at ages 5 and 8 years: The HOME Study. Environ Int 2018;doi:10.1016/j.envint.2018.11.026.
191. Vuong AM, Braun JM, Wang Z, Yolton K, Xie C, Sjodin A, Webster GM, Lanphear BP, Chen A. Exposure to polybrominated diphenyl ethers (PBDEs) during childhood and adiposity measures at age 8 years. Environ Int 2019;123:148-155.
192. Patel NB, McCandless LC, Chen A, Yolton K, Braun J, Jones RL, Dietrich KN, Lanphear BP. Very-low-level prenatal mercury exposure and behaviors in children: The HOME Study. Environ Health 2019;18:4 doi: 10.1186/s12940-018-0443-5.
193. Landrigan PJ, Braun JM, Crain EF, Forman J, Galvez M, Gitterman BA, Halevi G, Karr C, Mall JK, Paulson JA, Woolf AD, Lanphear BP, Wright RO. Acad Pediatr 2019;doi: 10.1016/j.acap.2019.01.001
194. Jackson-Browne MS, Papandonatos GD, Chen A, Yolton K, Lanphear BP, Braun JM. Early-life triclosan exposure and parent-reported behavior problems in 8-year-old children. Environ Int 2019. doi: 10.1016/j.envint.201901.021
195. Vuong AM, Yolton K, Xie C, Dietrich KN, Braun JM, Webster GM, Calafat AM, Lanphear BP, Chen A. Prenatal and childhood exposure to poly- and perfluoroalkyl substances (PFAS) and cognitive development in children at 8 years. Environ Res 2019;172:242-248.
196. Bernardo BA, Lanphear BP, Venners SA, Arbuckle TE, Braun JM, Muckle G, Fraser WD, McCandless LC. Assessing the relation between plasma PCB concentrations and elevated autistic behaviours using Bayesian predictive odds ratios. Int J Environ Res Public Health 2019;16:pii: E457. Doi: 10.3390/ijerph16030457.
197. Braun JM, Li N, Arbuckle TE, Dodds L, Massarelli I, Fraser WD, Lanphear BP, Muckle G. Association between gestational urinary bisphenol A concentrations and adiposity in young children: The MIREC Study. Environ Res 2019;172:454-461.
198. Li N, Papandonatos GD, Calafat AM, Yolton K, Lanphear BP, Chen A, Braun JM. Identifying periods of susceptibility to the impact of phthalates on children's cognitive abilities. Environ Res 2019;172:604-614.

Editorials and Commentaries

1. Lanphear BP, Gergen PJ. Measuring asthma trends in US children (invited commentary). Am J Epidemiol 2003;158:105-107.

2. Lanphear BP. Origins and evolution of children's environmental health. Essays on the future of environmental health research: A tribute to Dr. Kenneth Olden. Environ Health Perspect 2005;24-32.
3. Lanphear BP, Vorhees CV, Bellinger DC. Protecting children from environmental toxins. PLoS Med. 2005;2(3):e61.
4. Lanphear BP. Lead Poisoning Prevention – Too Little, Too Late. JAMA 2005;293:2274-2276.
5. Wigle DT, Lanphear BP. Human health risks from low-level environmental exposures: No apparent safety thresholds. PLoS Med 2005;2(12)e350.
6. Lanphear BP, Paulson J, Beirne S. Trials and tribulations of protecting children from environmental hazards. Environ Health Perspect 2006;114:1609-1612.
7. Swanson, JM, Kinsbourne M, Nigg J, Lanphear B, Stefanatos GA, Volkow G, Taylor E, Casey BJ, Castellanos FX, Wadhwa PD. Etiologic subtypes of attention-deficit/hyperactivity disorder: brain imaging, molecular genetic and environmental factors and the dopamine hypothesis. Neuropsychol Rev 2007;17:39–59.
8. Lanphear, BP. The conquest of lead poisoning: A Pyrrhic victory. Environ Health Perspect 2007;115:A484-A485.
9. Lanphear BP, Hornung RW, Khoury J, Dietrich KN, Cory-Slechta DA, Canfield RL. The conundrum of unmeasured confounding: Comment on "Can some of the detrimental neurodevelopmental effects attributed to lead be due to pesticides? by Brian Gulson." Sci Total Environ 2008;396:196-200.
10. Taylor MP, Schniering CA, Lanphear BP, Jones AL. Lessons learned on lead poisoning prevention: One-hundred years on from Turner's declaration. J Paediatr Child Health 2011;47:849-856.
11. Bellinger DC, Goldman LR, Lanphear BP, Eskenazi B, Jacobs DE, Miller M. The launch of the International Society for Children's Health and the Environment (ISCHE). Environ Health Perspectives 2011;119:a420-a421.
12. Rauch S, Lanphear BP. Prevention of Disabilities: Elevating the Role of Environment. Future of Children. 2012;22:193-217.
13. Taylor MP, Winder C, Lanphear BP. Eliminating childhood lead toxicity in Australia: A call to lower the intervention level. Med J Aust 2012;197:493.
14. Lanphear BP. ADHD: A preventable epidemic? Archives of Pediatrics and Adolescent Medicine 2012;166:1182-1184. doi: 10.001/archpediatrics.2012.1900
15. Bellinger DC, Burger J, Cade TJ, Cory-Slechta DA, Finkelstein M, Hu H, Kosnett M, Landrigan PJ, Lanphear B, Pokras MA, Redig PT, Rideout BA, Silbergeld E, Wright R, Smith DR. Health

risks from lead-based ammunition in the environment. Environ Health Perspect. 2013 Jun;121(6):A178-9. doi: 10.1289/ehp.1306945. No abstract available.

16. Hornung R, Lanphear BP. The supralinear dose-response for environmental toxicants: a statistical artifact? Clinical Toxicology 2014;52:88-90.
17. Taylor MP, Winder C, Lanphear BP. Australia's leading public health body delays action on the revision of the public health goal for blood lead exposures. Environ Int. 2014 Sep;70:113-7. doi: 10.1016/j.envint.2014.04.023.
18. Allen RW, Barn P, Lanphear B. Randomized controlled trials in environmental health research: unethical or underutilized? PLoS Med 2015;12:e1001775. doi:10.1371/journal.pmed.1001775.
19. Lanphear BP. The impact of toxins on the developing brain. Annual Review in Public Health 2015;36:211-230.
20. Bakan J, Lanphear BP, Sargent JD. Medical journals and free speech. Pediatrics 2015;135:403-405.
21. Calafat AM, Longnecker MP, Koch HM, Swan SH, Hauser R, Goldman LR, Lanphear BP, Rudel RA, Engel SM, Teitelbaum SL, Whyatt RM, Wolff MS. Optimal exposure biomarkers for nonpersistent chemicals in environmental epidemiology. Environ Health Perspect 2015;123:A-166-A168.
22. Myers JP, Antoniou MN, Blumberg B, Carroll L, Colborn T, Everett LG, Hansen M, Landrigan PJ, Lanphear BP, Mesnage R, Vandenberg LN, Vom Saal FS, Welshons WV, Benbrook CM. Concerns over use of glyphosate-based herbicides and risks associated with exposures: a consensus statement. Environ Health 2016;15(1):19. doi: 10.1186/s12940-016-0117-0.
23. Crighton E, Abelsohn A, Blake J, Enders J, Kilroy K, Lanphear B, Marshall L, Phipps E, Smith G. Beyond alcohol and tobacco smoke: Are we doing enough to reduce fetal toxicant exposure? J Obstet Gynaecol Can 2016;38:56-59.
24. Bennett D, Bellinger DC, Birnbaum LS, Bradman A, Chen A, Cory-Slechta DA, Engel SM, Fallin MD, Halladay A, Hauser R, Hertz-Picciotto I, Kwiatkowski CF, Lanphear BP, Marquez E, Marty M, McPartland J, Newschaffer CJ, Payne-Sturges D, Patisaul HB, Perera FP, Ritz B, Sass J, Schantz SL, Webster TF, Whyatt RM, Woodruff TJ, Zoeller RT, Anderko L, Campbell C, Conry JA, DeNicola N, Gould RM, Hirtz D, Huffling K, Landrigan PJ, Lavin A, Miller M, Mitchell MA, Rubin L, Schettler T, Tran HL, Acosta A, Brody C, Miller E, Miller P, Swanson M, Witherspoon NO. 2016. Project TENDR: Targeting Environmental Neuro-Developmental Risks. The TENDR Consensus Statement. Environ Health Perspect 2016;124:A118–A122; http://dx.doi.org/10.1289/EHP358.

25. Hirtz D, Campbell C, Lanphear B. Targeting environmental neurodevelopmental risks to protect children. Pediatrics 2017 139;pii:e20162245.
26. Vandenberg LN, Blumberg B, Antoniou MN, Benbrook CM, Carroll L, Colborn T, Everett LG, Hansen M, Landrigan PJ, Lanphear BP, Mesnage R, Vom Saal FS, Welshons WV, Myers JP. Is it time to reassess current safety standards for glyphosate-based herbicides? J Epidemiol Community Health 2017;71:613-618.
27. Bellinger DC, Chen A, Lanphear BP. Establishing and achieving national goals for preventing lead toxicity and exposure in children. JAMA Pediatrics 2017;171:616-618.
28. Lanphear BP. Still treating lead poisoning after all these years. Pediatrics 2017;140(2):e20171400.
29. Lanphear BP. Low-level toxicity of chemicals: No acceptable levels? PLoS Biology 2017;15:e2003066. https://doi.org/10.1371/journal.pbio.2003066
30. Hanna-Attisha M, Lanphear BP, Landrigan P. Lead poisoning in the 21st Century: The silent epidemic continues. Am J Public Health 2018;108:1430.
31. Hertz-Picciotto I, Sass JB, Engel S, Bennett DH, Bradman A, Eskenazi B, Lanphear BP, Whyatt R. Organophosphate pesticide exposure during pregnancy and child neurodevelopment: Recommendations for essential policy reforms. PLoS Med 2018;15:e1002671.
32. Basu N, Lanphear BP. The challenge of pollution and health in Canada. Can J Public Health 2019;110:159-164.

Chapters and Reviews

1. Lanphear BP. Hepatitis B immunoprophylaxis: Development of a cost-effective program in the hospital setting. Infect Control Hospital Epidemiol 1990;11:47-50.
2. Lanphear BP. Trends and patterns in the transmission of bloodborne pathogens to health care workers. Epidemiologic Reviews 1994;16:437-450.
3. Kapil V, Lanphear BP. Tuberculosis - surveillance, prevention, and control. Occupational Environmental Medicine Report 1994;8:35-38.
4. Myers G, Davidson P, Weitzman M, Lanphear B. Contribution of heavy metals to developmental disabilities in children. Mental Retard Dev Dis 1997;3:239-245.
5. Lanphear BP. Transmission and control of blood-borne viral hepatitis in health care workers, in Occupational Medicine: State of the Art Reviews. McDiarmid MA, Kessler E, (eds), Hanley & Belfus, Inc. Philadelphia, PA, 1997;12:717-730.

6. Lanphear BP. Indoor Pollutants and Toxins, in *Ambulatory Pediatrics*, Green, Haggerty and Weitzman (eds.) 5th edition, 1999, W.B. Saunders Company, Philadelphia, PA.
7. Lanphear BP, Dietrich KN, Berger O. Prevention of lead toxicity in US children. Ambulatory Pediatrics 2003;3:27-36.
8. Sandel M, Phelan KJ, Wright R, Hynes HP, Lanphear BP. The effects of housing interventions on child health. Pediatr Ann 2004;33:474-481.
9. Breysse P, Farr N, Galke W, Morley R, Lanphear BP, Bergofsky L. The relationship between housing and health: children at risk. Environ Health Persp 2004;112:1583-1588.
10. Lanphear BP, Wright RO, Dietrich KN. Environmental toxins. Pediatrics in Review 2005;26:191-197.
11. Lanphear BP, Bearer CF. Biomarkers in paediatric research and clinical practice. Arch Dis Child. 2005;90:594-600.
12. Lanphear BP. Lead. In Children's Health and the Environment. Philip Landrigan and Ruth Etzel (eds). Oxford University Press. 2013.
13. Foreman J, Silverstein J, Committee on Nutrition; Council on Environmental Health; American Academy of Pediatrics. Organic foods: health and environmental advantages and disadvantages. Pediatrics 2012;130:e1406-1415.doi:10.152/peds.2012-2579.
14. Iodine deficiency, pollutant chemicals, and the thyroid: new information on an old problem. Council on Environmental Health, Rogan WJ, Paulson JA, Baum C, Brock-Utne AC, Brumberg HL, Campbell CC, Lanphear BP, Lowry JA, Osterhoudt KC, Sandel MT, Spanier A, Trasande L. Pediatrics. 2014;133:1163-6. doi: 10.1542/peds.2014-0900.
15. Rosenthal FS, Lanphear BP, Gottesfeld P, Krzyzanowski M and others. ISEE Call for action for global control of lead exposure to eliminate lead poisoning. Epidemiology 2015;26:774-777.
16. Ahdoot S, Paulson JA, Baum C, Bole A, Brumberg HL, Campbell CC, Lanphear BP, Lowry JA, Pacheco SE, Spanier AJ, Trasande L. Global climate change and children's health. Pediatrics 2015;136:5:992-997.
17. Ahdoot S, Pacheco SE for The Council on Environmental Health. Global climate change and children's health – Technical Report. Pediatrics 2015;136:5:992-997.
18. Paulson JA, Zaoutis TE, for the Council on Environmental Health and the Committee on Infectious Disease. Nontherapeutic use of antimicrobial agents in animal agriculture: implications for pediatrics. Pediatrics 2015;136:6:e1670-e1677.
19. Lanphear BP for the American Academy of Pediatrics Council on Environmental Health. Prevention of Lead Toxicity. Pediatrics 2016;138(1):e20161493.

20. England LJ, Aagaard K, Bloch M, Conway K, Cosgrove K, Grana R, Gould TJ, Hatsukami D, Jensen F, Kandel D, Lanphear B, Leslie F, Pauly JR, Neiderhiser J, Rubinstein M, Slotkin TA, Spindel E, Stroud L, Wakschlag L. Developmental toxicity of nicotine: A transdisciplinary synthesis and implications for emerging tobacco products. Neurosci Biobehav Res 2017;72:176-189.
21. Matsui EC, Abramson SL, Sandel MT and AAP Council on Environmental Health. Pediatrics 2016;138:pii: e20162589.

Blogs

1. Trasande L, Lanphear BP. Preventing A Thousand Flints: Getting Reform of Chemical Regulation Right. Health Affairs Blog. May 23, 2016. http://healthaffairs.org/blog/2016/05/23/preventing-a-thousand-flints-getting-reform-of-chemical-regulation-right/

Letters

1. Menkhaus NA, Lanphear BP, Linnemann CC. Airborne transmission of varicella-zoster virus in hospitals. Lancet 1990;2:1315. May 23, 2016.
2. Lanphear BP. The resurgence of measles and herd immunity. JAMA 1992;268:789.
3. Lanphear BP, Linnemann CC, Cannon C. A high false positive rate of tuberculosis associated with Aplisol. J Infect Dis 1994;169:703-704.
4. Lanphear BP. Potential consequences of using Aplisol tuberculin tests in prior epidemic investigations. Infection Control Hospital Epidemiology 1995;16:255.
5. Canfield R, Henderson C, Lanphear BP. Intellectual impairment and blood lead levels. N Engl J Med. 2003;349:500-502.
6. Juskow T, Canfield RC, Henderson C, Lanphear BP. Comments on "Recent development in low level lead exposure and children's intellectual abilities". Environ Health Perspect 2005;113:A16.
7. Lanphear BP, Hornung R, Khoury J, Yolton K, Dietrich KN. Lead and IQ in Children. Environ Health Persp 2006;114:A86-A87.
8. Hornung R, Lanphear B, Dietrich K. Response to: "What is the meaning of non-linear dose-response relationships between blood lead concentration and IQ?" Neurotoxicology. 2006;27:635.

9. Braun J, Lanphear BP. Comments on "Lead neurotoxicity in children: is prenatal exposure more important than postnatal exposure?" Acta Paediatr. 2007;96:473; author reply 474-475.
10. Braun J, Kahn RS, Froehlich T, Auinger P, Lanphear BP. Comments on "Exposures to environmental toxicants and attention deficit hyperactivity disorder in U.S. children." Environ Health Perspect. 2007;115:A399.
11. Geraghty SR, Morrow AL, Lanphear B. The heart of the matter on breastmilk and environmental chemicals: essential points for healthcare providers and new parents. Breastfeed Med. 2009;4:125-126.
12. Joshi TK, Bailar JC 3rd, Craner J, Davis D, Ehrlich R, Franco G, Frank AL, Huff J, LaDou J, Lanphear B, London L, Melnick RL, O'Neill R, Osaro E, Rosenman KD, Sass J, Smith AH, Soskolne CL, Stephens C, Stuckey R, Takaro TK, Teiteibaum D, Watterson A, Yassi A. Physician expelled from Indian Association of Occupational Health after critique. Int J Occup Environ Health. 2009 Oct-Dec;15(4):419-420.
13. Calafat AM, Koch HM, Swan SH, Hauser R, Goldman LR, Lanphear BP, Longnecker MP, Rudel RA, Teitelbaum SL, Whyatt RM, Wolff MS. Misuse of blood serum to assess exposure to bisphenol A and phthalates. Breast Cancer Res. 2013;15:403.
14. Soskone CL, Al-Delaimy WK, Burns K, Finch MR, Gaudino JA, Jr, Lanphear B, Oremus M, Phillips L, Ruff K, Weiss SH, Wing S. Competing interests in epidemiology. BMJ 2015;350.PMID: 25569167.
15. Taylor MP, Forbes MK, Opeskin B, Parr N, Lanphear BP. Further analysis of the relationship between atmospheric lead emissions and aggressive crime: an ecological study. Environ Health 2018;17:doi: 10.1186/s12940-018-0354-5.
16. Lanphear BP, Hornung RW, Auinger P, Allen R. Environmental exposure to lead: old myths never die. Lancet Public Health 2018;e363 doi: 10.1016/S2468-2667(18)30128-2.

Presentations

1. "Biologic Hazards to Health Care Personnel in the Workplace". University of Cincinnati, Cincinnati, Ohio, September 26, 1990.
2. "Common Misconceptions about Tuberculosis". American Lung Association, St. Elizabeth's Hospital, Belleville, IL, March 19, 1991.
3. "Prevention and Control of Infectious Disease in Health Care Workers". Miami Valley Hospital, Dayton, OH, September 5, 1991.

4. "Transmission of Hepatitis B Virus Infection in Health Care Workers". Ohio University, Athens, Ohio, March 21, 1992.
5. "Universal Immunization Against Hepatitis B Virus". Grand Rounds, Dayton Children's Hospital, May 1992, Dayton, Ohio.
6. "Correlation of Blood Lead Levels and Dust Lead Levels Using Three Dust Collection Methods. Environmental Protection Agency, Research Triangle, N.C., January 20,1994.
7. "Relation of Lead-Contaminated House Dust and Blood Lead Levels in Urban Children" Environmental Protection Agency, Washington, D.C., February, 1994.
8. "Lead-Contaminated House Dust and Blood Lead Concentrations in Children", Society for Pediatric Research, Seattle, Washington May 5, 1994.
9. "EPA Health-Based Standards for Soil and Dust". Alliance to End Childhood Lead Poisoning, Washington, D.C., May 17, 1994.
10. "Epidemiology of Tuberculosis in Health Care Settings". University of Cincinnati, Cincinnati, OH, August 19, 1994.
11. "A Side-by-Side Comparison of Sampling Methods for Lead-Contaminated House Dust". American Public Health Association, Washington, D.C., November 1, 1994.
12. "Trends in Childhood Exposure to Lead: Implications for Prevention". University of Rochester, Pediatric Grand Rounds, February 15, 1995.
13. "Childhood Exposure to Lead". Visiting Professor, Nazareth College, Rochester, New York, March 24, 1995.
14. "Transmission and Control of Infections in Health Care Workers". (Moderator & Speaker) American College of Occupational Environmental Medicine, Las Vegas, Nevada, May 4, 1995.
15. "Lead Exposure Prevention Research at the University of Rochester". New England Lead Conference, Kennebunkport, Maine, August 3, 1995.
16. "Prevention of Childhood Lead Exposure". 1st Annual Midwest Conference on Childhood Lead Poisoning Prevention, Kansas City, MO, September 10-11, 1995.
17. "Childhood Lead Exposure: Implications for Occupational Health". National Institute for Occupational Safety and Health, Cincinnati, OH, May 10, 1996.
18. "Community Characteristics and Children's Blood Lead Concentrations". American Public Health Association, New York City, NY, November 19, 1996.
19. "Evolution of a Disease: The Science of Childhood Lead Exposure Prevention." American Public Health Association, New York City, NY, November 18, 1996.
20. "Childhood Lead Exposure: A Local and National Perspective." Occupational Medicine Grand Rounds, University of Rochester, January 2, 1997.

21. "Prevention of Childhood Lead Exposure: The U.S. Experience". (Keynote) University of the West Indies and Pan American Health Organization, Kingston, Jamaica, January 23, 1997
22. "Lead-Contaminated House Dust and Children's Blood Lead Levels". (Keynote Presentation) Look Out for Lead Conference, Madison, WI, May 22, 1997.
23. "Primary Prevention of Childhood Lead Exposure: A Randomized Trial of Dust Control". American Public Health Association, Indianapolis, November 13, 1997.
24. "Evolution of a Disease: Prevention of Childhood Lead Exposure." Pediatric Grand Rounds, Medical University of South Carolina, Charleston, SC, March 20, 1998.
25. "The Science of Childhood Lead Exposure Prevention." Tulane/Xavier Center for Bioenvironmental Research, New Orleans, May 4-5th, 1998.
26. "Lead Hazard Control Research" Conference on Linking Health, Housing & Environment, Centers for Disease Control, Department of Housing and Urban Development, National Institutes of Health, Phoenix, Arizona, June 21-24, 1998.
27. "A Randomized Trial of Dust Control to Prevent Childhood Lead Exposure." Presenter and Co-chairman, Section on Heavy Metals, 1st International Conference on Children's Environmental Health, Amsterdam, The Netherlands, August 11-13th, 1998.
28. "Prevention of Childhood Lead Exposure: A Critique of the EPA's Proposed Residential Lead Standard". Office of Children's Health Protection, U.S. Environmental Protection Agency, Washington, D.C., November 5, 1998.
29. "Science and Policy of Lead Poisoning Prevention in the United States". Nicholas School of the Environment, Duke University, Durham, North Carolina, February 22, 1999.
30. "Behaviors in Early Childhood and Exposure to Environmental Toxins". (invited) Pediatric Environmental Health Conference, San Francisco, CA May 4, 1999.
31. "Patterns of Lead Exposure in Early Childhood". International Conference on Lead Exposure, Reproductive Toxicity and Carcinogenicity, Gargnano, Italy, May 7, 1999.
32. "Adverse Effects of Blood Lead Concentrations <10 μg/dL" (Invited), 17th International Conference Neurotoxicology Conference, Little Rock, Arkansas, October 17-20, 1999.
33. "Emerging Research and Implications for Prevention of Childhood Lead Exposure" (Invited), 2nd Annual Syracuse Lead Conference, Syracuse, New York October 27th, 1999.
34. "Prevention of Lead Poisoning in Children" Sierra Club, Omaha, NE, November 16th, 1999.
35. "Children's Environmental Health: A Focus on Residential Hazards" Department of Pediatrics, University of Nebraska Hospital, November 17th, 1999.
36. "Effectiveness of Lead Hazard Controls", New England Lead Conference, New Hampshire, Tufts University School of Medicine, April 25, 2000.

37. "Subclinical Lead Toxicity in U.S. Children and Adolescents", Pediatric Academic Societies, Boston, MA, May 15, 2000.
38. "Contribution of Residential Exposures to Asthma in U.S. Children and Adolescents", Pediatric Academic Societies, Boston, MA, May 16, 2000.
39. "The Effect of Soil Abatement on Blood Lead Concentration in Children living near a former Smelter and Milling Operation" (invited). Coeur d'Alene, Idaho, May 24, 2000.
40. "The Paradox of Lead Poisoning Prevention" (invited). National Institute of Justice, Washington, D.C., July 18th, 2000.
41. "Evolution of a Disease: Prevention of Childhood Lead Exposure." Pediatric Grand Rounds, Children's Hospital Medical Center, Cincinnati, Ohio, August 22, 2000.
42. "Children's Environmental Health: A Focus on Residential Hazards" Pediatric Grand Rounds, Department of Pediatrics, University of Rochester School of Medicine, Rochester, NY, September 20th, 2000.
43. "Prevention of Lead Poisoning in Childhood" 7th Annual Childhood New York State Lead Poisoning Prevention Conference, Purchase College, NY, September 29, 2000.
44. "Excavating the Enigmas of Childhood Lead Exposure". Department of Environmental and Occupational Medicine, Harvard University School of Public Health, Boston, MA, October 16th, 2000.
45. "Contribution of Residential Exposures to Asthma". Eliminating Childhood Lead Poisoning: Our Challenge for the Decade, Centers for Disease Control and the U.S. Department of Housing & Urban Development, December 11th, 2000.
46. "Setting Research Priorities for the Decade". (Moderator & Speaker) Eliminating Childhood Lead Poisoning: Our Challenge for the Decade, Centers for Disease Control and the U.S. Department of Housing & Urban Development, December 13th, 2000.
47. "Evolution of a Disease: Prevention of Childhood Lead Exposure." (Keynote Presentation) Look Out for Lead Conference, Madison, WI, April 12, 2001.
48. "Environmental Lead Exposure and Children's Intelligence at Blood Lead Concentrations below 10 μg/dl." APA Presidential Plenary Session, Pediatric Academic Society Meeting, Baltimore, MD, April 30, 2001.
49. "Elimination of Childhood Lead Exposure: Obstacles & Opportunities" (Plenary). National Housing Conference and Exposition, New Orleans, LA, May 16th, 2001.
50. "Prevention of Childhood Lead Exposure: A Public Health Perspective" (Keynote Presentation). Philadelphia Health Department, Philadelphia, PA, May 23rd, 2001.

51. "Evolution of a Disease: Prevention of Childhood Lead Exposure." (Keynote Presentation), Charles Drew University, Los Angeles, California, October 22nd, 2001.
52. "Primary Prevention of Childhood Lead Exposure" (Keynote Presentation), Midwest Regional Lead Conference, Pittsburgh PA, October 29th, 2001.
53. "Prevention of Childhood Lead Exposure: Shifting to Primary Prevention" (Keynote Presentation), Indiana Department of Health, Lead-Safe Conference, November 7th, 2001.
54. "A Strategy for Primary Prevention of Childhood Lead Exposure" A testimony to Housing and Transportation Subcommittee, U.S. Senate, Washington, D.C., November 13, 2001.
55. "Ethical issues of Environmental Research involving Children" (moderator and speaker). Panelists were Jeffrey Kahn, Ph.D., and Leonard Glantz, J.D., Raleigh-Durham, North Carolina, NIEHS Conference of Children's Environmental Health Centers, January 23, 2001.
56. "Evolution of a Disease: Science and Prevention of Childhood Lead Exposure." Grand Rounds, Omaha Children's Hospital, Omaha, Nebraska, March 1, 2002.
57. "Racial Disparities in Children due to Environmental Hazards" Ohio Commission on Minority Health, Columbus, Ohio March 27, 2002.
58. "Prevention of Childhood Lead Exposure in a Former Mining Community" Tar Creek, Oklahoma, April 4, 2002.
59. "Evolution of a Disease: Science and Prevention of Childhood Lead Exposure." Grand Rounds, Hasbro Children's Hospital, Brown University, Providence Rhode Island, May 17, 2002.
60. "Evolution of a Disease: Science and Prevention of Childhood Lead Exposure." Grand Rounds, Dayton Children's Hospital, Wright University, Dayton, Ohio May 22, 2002.
61. "Evolution of a Disease: Science and Prevention of Childhood Lead Exposure." International Lead Congress, Washington, DC, June 3rd, 2002.
62. "Residential Hazards: A Neglected Health Problem" Agency for Toxic Substances Disease Registry, Centers for Disease Control and Prevention, Atlanta, Georgia, August 19th, 2002.
63. "Control of Residential Exposures to Environmental Neurotoxins" National Center for Healthy Homes (Moderator and Speaker), Annapolis, VA, November 7th, 2003.
64. "The Promises and Potential Pitfalls of Primary Lead Poisoning Prevention" Purchase College, 9th Annual Childhood New York State Lead Poisoning Prevention Conference, Purchase College, New York,, October 4th, 2002.
65. "Evolution of a Disease: the Science and Prevention of Childhood Lead Exposure." Pediatric Grand Rounds, Syracuse, NY, October 9th, 2002.
66. "Evolution of a Disease: the Science and Prevention of Childhood Lead Exposure." University of Texas at El Paso, El Paso, Texas January 29th, 2003.

67. "Childhood Lead Poisoning" Introduction to Children's Environmental Health, Seattle, Washington, Pediatric Academic Society, May 3rd, 2003.
68. "The Legacy of Lead: Childhood Lead Poisoning in the 21st Century". Chicago Lead Summit, Chicago, Illinois, May 28th, 2003.
69. "The Legacy of Lead: Childhood Lead Poisoning in the 21st Century". Case Western Reserve University, Cleveland, Ohio, June 3rd, 2003.
70. "Housing and Children's Health", Sprawl: The impact on vulnerable populations, University of Cincinnati College of Medicine, Cincinnati, Ohio, July 8th, 2003.
71. "Trials and Tribulations of Protecting Children from Environmental Toxins". Duke University, Nicholas School of the Environment, Durham, NC, November 6th, 2003.
72. "Adverse Effects of Fetal and Childhood Exposures to Prevalent Toxins" Midwest Critical Regional Neonatology Conference, Covington, KY, November 14th, 2003.
73. "Control of Residential Hazards in Children" American Public Health Association, San Francisco, CA, November 18th, 2003.
74. "Low-Level Exposure to Environmental Lead Exposure and Children's Intellectual Function: An International Pooled Analysis". 21st International Neurotoxicology Conference, Honolulu, Hawaii, February 11th, 2004.
75. "Trials and Tribulations of Protecting Children from Environmental Hazards" Workshop on Ethical Issues on Children's Environmental Health, Children's Environmental Health Network, Washington, D.C. March 5, 2004.
76. "Low-Level Exposure to Environmental Lead Exposure and Children's Intellectual Function: An International Pooled Analysis", Pediatric Academic Societies Annual Meeting. Pediatric Research 2004;55:163A.
77. "The Impact of the Environment on Children's Health" Bob Smith Endowed Lecture, Department of Pediatrics, First Gulf Coast Children's Environmental Health Symposium, Baylor University, Houston, Texas.
78. "The Search for Environmental Causes of Learning Disabilities, Learning Disabilities Initiative, Baltimore, MD, May 18th, 2004.
79. "Residential Hazards in Children: A Neglected Public Health Problem", Pediatric Grand Rounds, Boston Medical Center, Department of Pediatrics, Boston University Medical Center, Boston, MA, May 20th, 2004.
80. "Residential Hazards in Children" "Healthier Homes, Stronger Families: Public Policy Approaches to Healthy Housing", National Center for Healthy Housing, Washington, D.C., June 2nd, 2004.

81. "Fetal and Early Childhood Exposures to Prevalent Toxins" Pediatric Grand Rounds, Ste. Justine Children's Hospital, University of Montréal, Montreal, Canada, June 16th, 2004.
82. "Childhood Exposure to Lead-Contaminated Soil: A Problem of the Past or a Problem from the Past?" National Academy of Science Committee on Superfund Site Assessment and Remediation in Coeur d'Alene River Basin", June 17th, 2004, Coeur d'Alene, Idaho.
83. "The Legacy of Lead" (Keynote Speaker). Chicago Lead Summit, Region V EPA Headquarters, September 15th, 2004.
84. "A Tale of Two Toxins: Children's Exposure to Tobacco and Lead" (with Michael Weitzman), The American Academy of Pediatrics, San Francisco, CA, October 10th, 2004.
85. "A Legacy of Childhood Lead Poisoning" University of Washington, Seattle, Washington, October 30, 2004.
86. "Protecting Children from Environmental Toxins", Pediatric Grand Rounds, Seattle Children's Hospital, Seattle Washington, March 10th, 2005.
87. "The Science and Politics of Childhood Lead Poisoning", Northwest Pediatric Environmental Health Conference, University of Washington, Seattle, Washington, March 11th, 2005.
88. "The Effects of Low-level Exposure to Environmental Toxins during Fetal Development and Early Childhood", Children's' Hospital of Fudan University, Shanghai International Pediatric Forum, Shanghai, China, June 16th to 18th, 2005.
89. "The Role of Biomarkers in Revealing Genetic and Environmental Influences of Disease and Disability" Psychiatry Grand Rounds, University of Cincinnati, February 8th, 2006.
90. "Trials and Tribulations of Protecting Children from Environmental Hazards: Ethical Issues", Johns Hopkins University of Medicine, March 17th, 2006.
91. "Key Elements of a Primary Prevention Strategy for Lead Poisoning", Albany Law School, Union University, Albany, New York, March 16th, 2006.
92. "Low-Level Lead Toxicity: The Ongoing Search for a Threshold"", Case Western Reserve University, City Club of Cleveland, Cleveland, OH March 4th, 2006.
93. Integrating Genetic and Environmental Influences in Pediatric Research" (Moderator and Speaker), Pediatric Academic Societies, San Francisco, CA, April 30th 2006.

94. "Ethical Issues in Housing Health Hazard Research Involving Children" (Topic Symposia) Pediatric Academic Societies, San Francisco, CA, May 2nd 2006.
95. "Low-Level Lead Toxicity: The Ongoing Search for a Threshold"", International Workshop on Neurotoxic metals: from Research to Prevention, University of Brescia, Italy, June 17th, 2006.
96. "Efficacy of HEPA-CPZ Air Cleaners on Unscheduled Asthma Visits and Asthma Symptoms", International Society for Environmental Epidemiology, Paris France, September 6th, 2006.
97. "Protecting Children from Environmental Toxins", Region VIII Children's Environmental Health Summit, Vail, Colorado September 20th, 2006.
98. "Integrating Genetic and Environmental Biomarkers in Pediatric Epidemiology", Visiting Professor, Simon Fraser University and University of British Columbia, Vancouver, British Columbia, October 19th-20th, 2006.
99. "The Legacy of Lead", Indiana Lead Conference, Indianapolis, Indiana, October 24, 2006.
100. "Ethical dilemmas in Children's Environmental Health", Seminar Series in Ethics of Toxicology, University of Champagne-Urbana, Champagne, Illinois, November 19th, 2006.
101. "Low-Level Lead Toxicity: Implications for Prevention"", WHO Informal Workshop on Lead, University of Munich, Germany, November 30th, 2006.
102. "Low-Level Lead Toxicity: The Ongoing Search for a Threshold"", National Environmental Public Health Conference, National Centers for Disease Control, Atlanta, Georgia, December 4th, 2006.
103. "The Epidemiologic Conquest of Childhood Lead Toxicity: A Pyrrhic Victory". NIEHS Workshop on Children's Environmental Health Research: Past, Present and Future. January 22nd, 2007.
104. "Linking Low-level Exposures to Environmental Toxicants with ADHD". Duke Integrated Toxicology and Environmental Health Program Symposium on Developmental Neurobehavioral Disabilities and Toxic Exposures, March 23, 2007, Durham, North Carolina.
105. "Using Biomarkers to Link Environmental Influences with Disease and Disability", The Channing Laboratory, Harvard University, Boston, Massachusetts, April 4th, 2007.
106. "The Lingering Legacy of Lead Toxicity". Grand Rounds, Department of Pediatrics, St. Louis Children's Hospital, St. Louis University, St. Louis, Missouri, April 11th, 2007.
107. "Protecting Children from Environmental Toxicants", United States Council of Catholic Bishops, Washington, D.C., April 30th, 2007.
108. "Efficacy of HEPA-CPZ Air Cleaners on Unscheduled Asthma Visits and Asthma Symptoms", Pediatric Academic Societies, APA Presidential Platform Plenary Session, Toronto, Canada, May 7th, 2007.

109. "The Lingering Legacy of Lead Toxicity" Grand Rounds, Department of Pediatrics, Omaha Children's Hospital, University of Nebraska, Omaha, Nebraska, April 11th, 2007.
110. "Linking Low-level Neurotoxicant Exposures of the Developing Brain to Learning and Behavioral Problems." International Conference on Developmental Programming and Effects of Environmental Toxicants in Human Health and Disease, Faroe Islands, May 20th, 2007.
111. "Protecting Children from Environmental Toxicants: The Neglected Legacy of Rachel Carson", National Policy Consultation Series on Children's Health and Environment, Moncton, New Brunswick, Canada, May 31, 2007.
112. "Low-Level Toxicity of Environmental Toxicants: Much Ado about Nothing?" Occupational and Environmental Health Seminar Series, Health Canada, Ottawa, Canada, June 6th, 2007.
113. "Linking Low-Level Lead Exposure with Child and Adolescent Psychopathology", 13th Annual International Society for Research in Child and Adolescent Psychopathology, London, England, June 19th, 2007.
114. "The Legacy of Lead Toxicity". Pediatric Grand Rounds, New York Presbyterian Hospital-Weill Cornell Medical Center, September 18th, 2007.
115. "Protecting Children from Environmental Toxicants: The Neglected Legacy of Rachel Carson". Pediatric Grand Rounds, Children's Hospital at Dartmouth, Dartmouth Medical School, September 19th, 2007.
116. "The Legacy of Lead Toxicity: Effects of Childhood Lead Exposure in Children, Adolescents and Adults". Mid-America Conference, Philadelphia, Pennsylvania, October 4th, 2007.
117. "Low-Level Toxicity of Environmental Toxicants: Much Ado about Nothing?" International Society for Exposure Analysis (invited plenary session), Raleigh-Durham, North Carolina, October 17th, 2007.
118. The Global Elimination of Lead Toxicity: A Focus on Housing." National Institute of Public Health, Rennes, France, October 22nd, 2007.
119. Linkage of Environmental Lead Exposure with Psychopathology in Children and Adolescents" Ramazzini Collegium, Carpi, Italy, October 25th, 2007.
120. "Linking Exposures to Environmental Toxicants with Child and Adolescent Psychopathology", Symposium on Environmental Toxicity and the Brain, University of Toronto, Toronto, Canada, December 7th, 2007.
121. "Linking Exposures to Environmental Toxicants with Child and Adolescent Psychopathology." Pediatric Grand Rounds, Rochester General Hospital and Strong Memorial Hospital, Rochester, New York, April 1&2, 2008.

122. "Rochester's Role in the Ongoing Elimination of Childhood Lead Toxicity." Beaven Lecture, Rochester Academy of Medicine, Rochester, New York, April 1, 2008.
123. "The Lingering Legacy of Lead Toxicity: Lansing Legacy." Michigan's Conference for Lead Safe & Healthy Homes, East Lansing, MI, April 22, 2008.
124. First Annual Controversies in Pediatric Environmental Health, "Should the Centers for Disease Control Lower the Blood Lead Level of Concern". A debate by Bruce Lanphear and George G. Rhoads (James Sargent, Moderator). Pediatric Academic Societies Meeting, Honolulu, Hawaii, May 2nd, 2008.
125. "Linking Exposure to Environmental Toxicants with Psychopathology in Children and Youth". Visiting Professor, Alberta Child and Youth Network, Calgary Children's Hospital, Calgary, Alberta. May 13th-15th, 2008.
126. Lead Toxicity and the Teenage Brain", Youth Exploring Science Program, St. Louis Science Center, St. Louis, Missouri, June 30th, 2008.
127. "The Legacy of Childhood Lead Toxicity". Health Canada, Ottawa, Canada, October 6th, 2008.
128. "Protecting Children from Environmental Toxicants: The Neglected Legacy of Rachel Carson". The 2008 Rachel Carson Legacy Conference: Green Chemistry – Solutions for a Healthy Economy, Duquesne University, Pittsburgh, Pennsylvania, September 20th, 2008.
129. "Trials and Tribulations of Protecting Children from Environmental Hazards", Ethics in Toxicology Seminar Series, University of Champagne-Urbana, Champagne, Illinois, September 22nd, 2008.
130. "Industry's Influence on the Prevention of Childhood Lead Poisoning." In: Symposia on Insulating Environmental Health Research from Conflicting Interests. International Society for Environmental Epidemiology Annual Meeting, Pasadena, California, October 14th, 2008.
131. "The Lingering Legacy of Lead Toxicity: Implications for Research and Policy on Other Environmental Toxicants". (Keynote Presentation) BC Environmental and Occupational Health Research Network, Vancouver, BC, November 7th, 2008.
132. "Effects of Environmental Toxicants on Children's Development". DB-PREP Course, American Academy of Pediatrics, Atlanta, Georgia, December 5th, 2008.
133. "Linking Low-level Environmental Toxicants with New Morbidities of Childhood". BC Children's Grand Rounds, British Columbia, Vancouver, February 6th, 2009.
134. "Using Biomarkers to Link Exposures with Disease and Disability in Children". Workshop on Physical and Chemical Exposures in Canadian Cohort Studies, Canadian Institute of Health Research and Health Canada, February 8th-9th, 2009.

135. "How Dangerous Is Lead In Drinking Water?" An interview on "Around The Water Cooler" with Werner Troesken and Bruce Lanphear. February 18th, 2009.
136. "Linking Environmental Toxicants with ADHD in Children" (invited), Learning Disabilities Association Annual Meeting, February 25th, Salt Lake City, Utah.
137. "The Lingering Legacy of Lead Toxicity", Norfolk Children's Hospital, April 30th, 2009, Norfolk Virginia.
138. Second Annual Controversies in Pediatric Environmental Health Debate, "Should Pediatricians Advise Parents to Feed their Children Organic Foods?" A debate by Joel Forman and Janet Silverstein (Bruce Lanphear, Moderator and Organizer). Pediatric Academic Societies Meeting, Baltimore, MD, May 4th, 2009.
139. "A Pattern of Pathology: The Population Impact of Environmental Toxicants on Health". Workshop on Endocrine Disruptors, Endocrine Society, Washington, DC, June 9th, 2009.
140. "The Quandary of Environmental Contaminants in Human Milk", 25th Anniversary of US Surgeon General's Report on Breastfeeding, Washington, DC, June 13th, 2009.
141. "Linking Exposures to Environmental Toxicants with Learning Problems and Psychopathology in Children." Northwest Conference on Children's Health and Environment, Tukwila, Washington, October 1st, 2009.
142. "The Second Coming of the Sanitarians", Pediatric Grand Rounds, University of California at Davis Children's Hospital, Sacramento, California, October 9th, 2009.
143. "The Second Coming of the Sanitarians", National Institute of Public Health, Rennes, France, November 4th, 2009.
144. "Linking Exposure to Environmental Toxicants with ADHD in Children." Symposium on ADHD. Riyadh, Saudi Arabia, November 7th, 2009.
145. "The Interplay of Genetic and Environmental Influences in Common Conditions of Children." Macquarie University, Department of Geology, Sydney, Australia, November 18th, 2009.
146. "The Lingering Legacy of Lead Toxicity: A Call for the Global Elimination of Lead Exposure." Pacific Basin Consortium Symposium on Environment and Health, Perth, Australia, November 13th, 2009.
147. "The Second Coming of the Sanitarians", SFU President's Lecture, Simon Fraser University, Burnaby, BC, March 4th, 2010.
148. Third Annual Controversies in Pediatric Environmental Health Debate, "Should the American Academy of Pediatrics Sponsor a Ratings Board to Provide Evidence-based Ratings for Media?" A debate by James Sargent and Donald Shifrin (Bruce Lanphear, Moderator and Organizer). Pediatric Academic Societies Meeting, Vancouver, BC, May 2nd, 2010.

149. "Efficacy of Reducing Lead Hazards in Housing on Lead-Contaminated House Dust, Blood Lead Concentration and Intellectual Abilities in Children." Pediatric Academic Societies Meeting, Vancouver, BC May 1st, 2010.
150. "Protecting Children from Environmental Toxicants: The Neglected Legacy of Rachel Carson." Pediatric Grand Rounds, Cornell Weill Medical College, New York, New York. May 25th, 2010.
151. "Excavating the Enigmas of Childhood Lead Toxicity", Guest Lecturer, "Introduction to Toxicology, Harvard School of Public Health, Boston, Massachusetts, October 27th, 2010.
152. "The Conquest of Lead Poisoning: A Pyrrhic Victory", Lead Action Collaborative, New England Carpenters Center, Boston, Massachusetts, October 28th, 2010.
153. "Protecting Children from Environmental Toxicants: The Neglected Legacy of Rachel Carson." Academy of Breastfeeding Medicine, San Francisco, California, October 29th, 2010.
154. "Bisphenol A and Behavior Problems in Children". Eastern Perinatal Conference, Kingston, Ontario, November 10th, 2010.
155. "Low-Level Toxicity of Environmental Toxicants: Much Ado about Nothing?" UBC Statistics Department Seminar, November 18th, 2010.
156. "Protecting Children from Environmental Toxicants." Children's Hospital of Quebec, University of Laval, Quebec City, Quebec, December 17th, 2010.
157. "Low-level Toxicity: Implications for Research and Policy", Joint Talks by C. Arden Pope and Bruce Lanphear, SFU, UBC and UW Annual Occupational and Environmental Health Conference, Semiahmoo, WA January 7th, 2011.
158. "Crime of the Century: Lead Toxicity in the 20th Century", Panel Presentation and Discussion, UC Davis, Sacramento, California April 7th, 2011.
159. Fourth Annual Controversies in Pediatric Environmental Health Debate, "Should Parent Slather their Children with Sunscreen?" A debate with Russell Chesney, MD and Sophie Balk, MD, (Bruce Lanphear, Moderator and Organizer). Pediatric Academic Societies Meeting, Denver, Colorado, May 1st, 2011.
160. The Conquest of Lead Toxicity: A Pyrrhic Victory", Canadian Water Network, Ecole Polytechnique de Montreal, Montreal, Canada, June 9th, 2011.
161. The Contribution of Environmental Influences on Chronic Disease, Canadian Partnership for Health and Environment, Toronto, Canada, June 16th, 2011.
162. "The Second Coming of the Sanitarians", Environmental and Occupational Health Seminar, University of Washington School of Public Health, Seattle, WA, May 12th, 2011.
163. "Crime of the Century: The Failure to Prevent the Lead Pandemic". Sterling Prize in Controversy, Wosk Centre, Simon Fraser University, Vancouver, BC, October 19th, 2011.

164. "Measuring Exposure: The Benefits and Limits of Biomarkers". Canadian Institute for Human Development, Child and Youth Research, Montreal, Canada, December 6th, 2011.
165. "Rachel Carson: Clarity of Vision". SFU, UBC and UW Annual Occupational and Environmental Health Conference, Semiahmoo, WA, January 6th, 2012.
166. "The Truth About Toxins: What Parents and Health Professionals Should Know". Environmental Influences on Neurodevelopment: Translating the Emerging Science into Public Health Policy". UCLA School of Public Health, Los Angeles, California, January 12th, 2012.
167. "Protecting Children from Environmental Toxicants: The Neglected Legacy of Rachel Carson". Mattel Children's Hospital, Los Angeles, California, January 13th, 2012.
168. "Why Should We Share Data?", Data Sharing Strategies for Environmental Health Workshop, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, February 6th and 7th, 2012.
169. "The Science and Prevention of Lead Toxicity" (Keynote Presentation), Forum on Lead Toxicity: A Little is Still Too Much", Macquarie University, Sydney, Australia, June 5th, 2012
170. "Canada Environmental Health Atlas Knowledge Translation Workshop", Canadian Public Health Association, Edmonton, Alberta, June 13th, 2012.
171. "First Annual Controversies in Pediatric Environmental Health Debate: Should organophosphate pesticides be reduced or banned?" A debate with Brenda Eskenazi and Bruce Lanphear (Rob McConnell, Moderator). International Society for Environmental Epidemiology, Columbia, SC, August 28th, 2012.
172. "Supralinear Dose-Response Relationship of Environmental Toxicants: Research and Policy Implications." Moderator and Speaker, with Arden Pope, Roel Vermeulen and Bruce Lanphear. International Society for Environmental Epidemiology, Columbia, SC, August 29th, 2012.
173. Tanya Froehlich and Bruce Lanphear, "ADHD and Environmental Toxicants: Time for Prevention?", Society for Development and Behavioral Pediatrics, Phoenix, AZ, September 9th, 2012.
174. "The Epidemic of Childhood Disabilities: A Failure to Regulate". Workshop on Children's Rights and Corporate Responsibility, Green College, University of British Columbia, Vancouver, BC, October 19th, 2012.
175. "Low-level Toxicity: Much Ado About Nothing?", Department of Preventive Medicine Seminar, University of Southern , California, Los Angeles, California, October 23rd, 2012.
176. "Reflections on Silent Spring". (Invited Keynote). International Society for Exposure Sciences, Seattle, Washington, October 28th, 2012.

177. "Randomized Controlled Trials in Children's Environmental Health: Underutilized or Unethical?" The University of Washington Northwest Pediatric Environmental Health Specialty Unit and Center for Child Environmental Health, Seattle, Washington, February 26th, 2013.
178. "Crime of the Century: Our Failure to Prevent the Lead Pandemic". Dali Lana School of Public Health and of School Environment, University of Toronto, Toronto, Ontario, March 26th, 2013.
179. "The Ongoing Search for a Threshold". International Conference of Toxicology, Seoul, Korea, July 1, 2013.
180. "Blood Lead Concentrations and Cardiovascular Mortality in the United States: The NHANES Mortality Follow-up Cohort Study". International Society for Environmental Epidemiology, Basel, Switzerland, August 2, 2013.
181. "The Conquest of Lead Poisoning: A Pyrrhic Victory". Corporations and Global Health Governance. Simon Fraser University, Burnaby, British Columbia. September 17th, 2013.
182. "Striking at the Root: Changing the Narrative on the Causes of Disease". Corporations and Global Health Governance. Simon Fraser University, Burnaby, British Columbia. September 17th, 2013.
183. "Crime of the Century: The Failure to Prevent the Lead Pandemic". Pacific Basin Consortium, East-West Center, Honolulu, Hawaii. September 26, 2013.
184. "Low-level Toxicity: Policy Implications for the 21st Century". Symposium on Policy Implications of Environmental Exposures in the 21st Century. Pacific Basin Consortium, East-West Center, Honolulu, Hawaii. September 27, 2013.
185. "Excavating the Enigmas of Childhood Lead Toxicity". Network for Soil Contamination Research (INSCR), Delhi University, New Delhi, India. October 22nd, 2013.
186. "The Lingering Legacy of Lead Toxicity: A Call for the Global Elimination of Lead Exposure", World Health Organization, New Delhi, India. October 24th, 2013. "The Environmental Health Atlas: A Portal to Discover the Promises of Environmental Health." National Institute of Environmental Health Sciences, Raleigh-Durham, NC, November 10th, 2013.
187. "Protecting Children from Environmental Toxins". Japan Dioxin and Endocrine Disruptors Preventive Action, Tokyo, Japan, November 24th, 2013.
188. "ADHD: A Preventable Epidemic?" Alberta Children's Hospital, Calgary, Alberta, December 16th, 2013.
189. "Little Things Matter: The Impact of Toxins on the Developing Brain". Early Years Conference, Vancouver, British Columbia, January 30th, 2014.
190. "Little Things Matter: The Impact of Toxins on the Developing Brain". Dalhousie University, Halifax, Nova Scotia, March 6th, 2014.

191. "Low-level Toxicity of Environmental Toxins: Much Ado About Nothing?". Dalhousie University, Halifax, Nova Scotia, March 6th, 2014.
192. "The Canadian Environmental Health Atlas: A Portal to Discover the Promises of Environmental Health." School of Occupational and Environmental Health, University of British Columbia, March 28th, 2014.
193. "Little Things Matter: The Impact of Toxins on the Developing Brain". British Columbia Healthy Child Alliance, Vancouver, British Columbia, April 2nd, 2014.
194. "Sixth Annual Controversies in Pediatric Environmental Health Debate, E-Cigarettes: A weapon in the war against tobacco or a threat to tobacco control. (Moderator). Featuring Greg Connelly and James Sargent. Pediatric Academic Societies, Vancouver, May 4th, 2014.
195. "Striking at the Root Causes of Chronic Disease in Children" (Moderator). James Sargent, Joel Bakan and David Kessler, May 5th, 2014.
196. "Little Things Matter: The Impact of Toxins on the Developing Brain" (Keynote). OHKA Healthy Homes Alliance, Omaha, Nebraska, May 15th, 2014.
197. "Excavating environmental risk factors for autism: Suspects and strategies". A workshop on examining a multi-systems approach to autism and the environment: challenges and opportunities for research". Toronto, Ontario, June 23rd-24th, 2014.
198. "Lead Poisoning: Tackling a Global Problem" (Co-Moderator and Speaker). International Society for Environmental Epidemiology, Seattle, Washington, August 25th, 2014.
199. "Interventions to Reduce Exposures to Environmental Hazards in Pregnant Women and Children", (Moderator and Speaker). International Society for Environmental Epidemiology, Seattle, Washington, August 25th, 2014.
200. 3rd Annual ISCHE-Sponsored Debate: Should there be any restrictions on universities or academicians receiving payment from industry or other sources? (Moderator). International Society for Environmental Epidemiology, Seattle, Washington, August 25th, 2014.
201. "Crime of the Century: Our Failure to Prevent the Lead Pandemic", Tulane University School of Public Health and Tropical Medicine, New Orleans, Louisiana, September 5th, 2014.
202. "Environment Matters", Children's Environmental Health Panel. Society for Environmental Journalists, New Orleans, Louisiana, September 6th, 2014.
203. "Insidious Influence of Industry on Science: How Corporations Undermine Science", 5th Annual C. Everett Koop Distinguished Lecture, "Corporate Threats to Children's Health", with Joel Bakan and James Sargent, Dartmouth University, New Hampshire, October 6th, 2014.
204. "Crime of the Century: Our Failure to Prevent the Lead Pandemic", John Rosen Memorial Lecture, Montefiore Medical Center, New York, New York, October 8th, 2014.

205. "Little Things Matter: The Impact of Toxins on the Developing Brain" (Keynote). Prenatal Environmental Health Education (PEHE) Conference, University of Ottawa. Ottawa, Ontario, November 21st, 2014.
206. "Little Things Matter: The Impact of Toxins on the Developing Brain" (Keynote). ISEE Asian Regional Meeting, Shanghai, China, November 30th, 2014.
207. "Crime of the Century: Our Failure to Prevent the Lead Pandemic", John Rosen Memorial Lecture, ISEE Asian Regional Meeting, Shanghai, China, November 31st, 2014.
208. "Data Visualization", with Joe Braun and Allan Just, Pediatric Environmental Health Scholars Retreat, Reston, VA, December 6th, 2014.
209. "Victories in Public Health: Progress or Adaptation?" SFU, UBC and UW Annual Occupational and Environmental Health Conference, Semiahmoo, WA January 8th, 2015.
210. "Food in the Industrial Era: Is Backward the Way Forward?" Children's Environmental Health Network, Austin, Texas, February 4th, 2015.
211. "Excavating the enigmas of childhood lead toxicity". Broken Hill City Council and Lead Reference Group, Broken Hill, New South Wales, Australia, March 3rd, 2015.
212. "Prevention Paradox: Why a Little Lead is Too Much". Unequal Exposure Symposium, Climate Change Research Center, University of New South Wales, March 5th, 2015, Sydney, Australia.
213. "Crime of the Century: Our Failure to Prevent the Lead Pandemic". 10th Annual Break the Cycle Conference, Emory University, Atlanta, Georgia. April 23rd, 2015.
214. "The Staggering Cost of Lead Toxicity and the Unbelievable Benefit of Preventing It". 10th Annual Break the Cycle Conference, Emory University, Atlanta, Georgia. April 24th, 2015.
215. Seventh Annual Controversies in Pediatric Environmental Health Debate, "GMOs: A Hazard or Harvest of Health?" A debate with Joel Forman, MD and Daniel Goldstein, MD, (Bruce Lanphear, Moderator and Organizer). Pediatric Academic Societies Meeting, San Diego, California, April 27th, 2015.
216. "Impact of Dwellings on Child Health", Canadian Green Building Council Conference, Vancouver Convention Center, Vancouver, BC, April 28. 2015.
217. "Impact of Tobacco on the Developing Brain", Developmental Effects of Nicotine and Implications for Emerging Tobacco Products, Rockville, Maryland, May 5th, 2015.
218. "Impact of Toxins on the Developing Brain" India Tour (Bengaluru, Trivandrum, Kolkata, and Chandigarh) Sponsored by PAN-India, September 4th-11th, 2015.
219. "Impact of Dwellings on Child Health", Green School Summit, Calgary, Alberta, September 25th. 2015.

220. "Prevention Paradox: Why a Little Lead is Too Much", A debate with George Rhoads, Montefiore Medical Center, Tarrytown, October 2nd, 2015.
221. "Crime of the Century: Our Failure to Prevent the Lead Pandemic" (Keynote Presentation), University of Cincinnati Department of Environmental Health 50th Anniversary Gala, Cincinnati, Ohio, October 9th, 2015.
222. "Impact of Toxins on the Developing Brain" (Keynote Presentation) Children's Environmental Health Centers Annual Meeting, Washington, DC, October 31, 2015.
223. "The Impact of Toxins on the Developing Brain: Our Failure to Prevent Brain-based Disorders in Children", National Core for Neuroethics, UBC November 12th, 2015.
224. "Impact of Dwellings on Child Health", Canada Green Building Council, Toronto, ON Green, December 1st, 2015.
225. "The Tortuous Road to Prevention: Are We There Yet", Air Quality and Impacts on Health: Beyond the Heart and the Lungs, The Lung Association of BC, February 28th, 2016.
226. "Lead's Long Shadow: What the Story of Flint, Michigan Means for All of Us", with Bruce Lanphear, Mona Hanna-Attisha and Marc Edwards. Collaborative on Health and the Environment Webinar, March 8th, 2016.
227. "Little Things Matter: The Impact of Toxins on the Developing Brain", Collaborative on Health and Environmental Alaska Working Group Webinar, March 9th, 2016.
228. "Victories in Public Health: Progress or Adaptation?", Symposium Against Indifference, Ashland University, Ashland, Ohio, April 5th, 2016.
229. "Little Things Matter: The Impact of Toxins on the Developing Brain" (Keynote), Children's Environmental Health: New Findings from California Research, Sacramento, California, April 7th, 2016.
230. "Crime of the Century: Our Failure to Prevent the Lead Pandemic", Distinguished Visiting Professor in Health Law, Loyola University, Chicago, Illinois April 21st, 2016.
231. "The Population Impact of Toxins on Intellectual Abilities: Implications for Policy and Prevention", in Symposia on Environmental Toxins and the Brain: Growing Evidence of Risk, Pediatric Academic Societies, Baltimore, MD, May 2nd, 2016.
232. "Data Visualization and Video Production for Public Consumption", in Symposia on Innovative Tools to Enhance Knowledge Translation of Environmental Health: Data Visualization, Videos and Message Mapping, (co-Moderated by Mark Miller and Bruce Lanphear), Pediatric Academic Societies, Baltimore, MD, April 30th, 2016.
233. "Crime of the Century: Our Failure to Prevent the Lead Epidemic", Michigan State University, Flint, MI, May 7th, 2016.

234. "Crime of the Century: Our Failure to Prevent the Lead Epidemic", Johns Hopkins University School of Public Health, Baltimore, MD, May 7th, 2016.
235. "Little Things Matter: The Impact of Toxins on the Developing Brain", Baltimore, MD, International Medical Federation Autism Research (IMFAR), May 8th, 2016.
236. "Public Health Matters: Videos on Toxic Chemicals, Air Pollutants and the Prevention Paradox", Mongolian National University of Medical Sciences, June 23, 2016.
237. "Little Things Matter: The Impact of Toxins on the Developing Brain", USC Annenberg Center for Health Journalism, July 18th, 2016.
238. "Preventing Lead Toxicity", California Environmental Protection Agency, Occupational Environmental Health Hazard Assessment, September 23rd, 2016.
239. "Unleashing the Power of Prevention: Creating Video to Re-Imagine our Approach to Disease," World Issues Forum, Fairhaven College, University of Western Washington, (with Bob Lanphear), November 2, 2016.
240. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Pediatric Grand Rounds, Maimonides Hospital, November 15th, 2016.
241. "Little Things Matter: The Impact of Toxic Chemicals on the Child Health" (Keynote), Hudson Valley Perinatal Conference, November 16th, 2016.
242. "Little Things Matter: The Impact of Toxins on the Developing Brain", IPEN, San Francisco, CA, November 18th, 2016.
243. "Unleashing the Power of Prevention: Creating Video to Re-Imagine our Approach to Disease", SFU, UBC and UW Annual Occupational and Environmental Health Conference Semiahmoo, WA, January 5th, 2017.
244. "Unleashing the Power of Prevention: Creating Video to Re-Imagine our Approach to Disease", University of New Brunswick, January 25th, 2017.
245. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", New Brunswick Children's Environmental Health Collaborative, January 26th, 2017.
246. "Unleashing the Power of Prevention: Creating Video to Re-Imagine our Approach to Disease", Rockefeller Center, Bellagio, Italy, February 22nd, 2017.
247. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", The Science in Society Speaker Series, Okanagan College, Vernon, BC, April 6th, 2017.
248. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain" (invited plenary), Vancouver, British Columbia, Canadian Pediatric Society, June 3rd, 2017.
249. "Unleashing the Power of Prevention: Creating Video to Re-Imagine our Approach to Disease", Macquarie University, Sydney, Australia, September 29th, 2017.

250. "Unleashing the Power of Prevention: Creating Video to Re-Imagine our Approach to Disease", Brown University, Providence, Rhode Island, October 13th, 2017.
251. Cause or Cure: Does the Relentless Pursuit of a Cure Endanger our Health? University of Alaska, Alaska Tribal Health Consortium, Anchorage, Alaska, November 2nd, 2017.
252. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain" (Keynote), All Alaska Pediatric Conference, Anchorage, Alaska, November 3rd, 2017.
253. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", CINBIOSE 30th Anniversary, University of Quebec at Montreal, Montreal, November 9th, -10th, 2017.
254. "The Legacy of Lead Poisoning: Moving towards Prevention". East Chicago Community Meeting, Illinois, November 26th, 2017.
255. "Cause or Cure", NIEHS Environmental Health Seminar, University of Southern California, Los Angeles, California, December 1st, 2017.
256. "Little Things Matter: The Impact of Lead on Brain Development" (Keynote Presentation), Workshop on Lead-Free Schools, Pew Trust, Washington, DC, December 6th-7th, 2017.
257. "Low-level Toxicity of Chemicals: No Acceptable Threshold?" Risk Modeling, Mitigation and Modeling in Health Sciences, Centre de Recherches Mathematiques, Montreal, QC, December 11th, 2017.
258. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Department of Psychology and Neuroscience, York University, Toronto, ON, December 13th, 2017.
259. "The impact of Pollutants on Human Health: No Safe Levels?", Center for Energy and Environmental Contaminants, Macquarie University, Sydney, Australia, February 13th, 2018.
260. "Cause or Cure: Does the Relentless Pursuit of a Cure Endanger our Children's Health?", Department of Pediatrics, University of Wisconsin at Madison School of Medicine, Madison, Wisconsin, March 1st, 2018.
261. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Wisconsin Environmental Health Network, Madison, Wisconsin, March 2nd, 2018.
262. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Biennial Atlantic Symposium on Learning Disabilities Association, Fredericton, NB.
263. "Crime of the Century: The Failure to Prevent the Lead Pandemic" (Keynote). 11th UK and Ireland Environmental and Occupational Epidemiology, John Snow Lecture Hall, London School of Hygiene and Tropical Medicine, April 27th, 2018.
264. "The Impact of Pollutants on Human Health: No Safe Levels?" From Toxicology to Planetary Health, London School of Hygiene and Tropical Medicine, April 27th, 2018.

265. Topic Symposium: "Toxic Chemicals and the Rise of Chronic Disease in Childhood: A Preventable Epidemic?" (chair and speaker), Pediatric Academic Societies, May 7th, 2018.
266. "Prevention Paradox; Why a Little Lead is Too Much", Ontario Water Advisory, Toronto, CA, May 7th, 2018.
267. "How the Secrets of Body Care and Cleaning Products Impact your Health", Panel with Bruce Lanphear, Muhannad Malas and Janie McConnell, Centre for Free Expression, Ryerson University, Toronto, ON, May 7th, 2018.
268. "Prevention Paradox; Why a Little Lead is Too Much" (Keynote), Pittsburgh, PA, Get the Lead Out Conference, May 9th, 2018.
269. "Low-level Lead Exposure and Mortality", Global Health Forum, Miami, Fl, May 23rd, 2018.
270. "Unleashing the Power of Prevention: Targeting Toxic Chemicals and Pollutants", Canadian Public Health Association, Montreal, QC, May 28th, 2018.
271. "The Impact of Pollutants on Human Health: No Safe Levels?" Chemicals Management Plan Stakeholder Advisory Council, Health Canada, May 30th, 2018.
272. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Pediatric Grand Rounds, University of California – Davis, Sacramento, CA, June 8th, 2018.
273. "Why a Little Lead is Too Much", Health Canada, Ottawa, ON, August 29th, 2018.
274. "Unleashing the Power of Prevention: Mobilizing Science to Prevent Disease", ISEE-ISES Workshop, Ottawa, ON, August 30th, 2018.
275. "The Lingering Legacy of Lead: Why a Little Lead is Too Much", LA Lead Summit: A Strategy for Prevention, University of Southern California, September 14th, Los Angeles, CA.
276. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Children's Hospital of Orange County, Orange County, CA, September 19th, 2018.
277. "The Lingering Legacy of Lead: Why a Little Lead is Too Much", Hurley Medical Center, Flint, Michigan, October 3rd, 2018.
278. "Lead and The Mysterious Decline in Coronary Heart Disease", National Institute of Occupational Safety and Health, Cincinnati, OH, October 11, 2018.
279. "Little Things Matter: The Impact of Toxic Chemicals on the Developing Brain", Grand Rounds, Oregon State Health University, Portland, OR, October 23, 2018.
280. "The Impact of Pollutants on Human Health: No Safe Levels?" Oregon Environmental Council, Portland, OR, October 23, 2018.
281. "Little Things Matter: The Impact of Toxic Chemicals and Organic Food on Children's Health", HIPP Scientific Symposium on Organic Food, Kranzberg, Germany, October 30, 2018.

282. "The Mysterious Decline in Coronary Heart Disease", Harvard University Lead Summit, Cambridge, MA, November 15th, 2018.
283. "The Impact of Pollutants on Human Health: No Safe Levels?" Department of Epidemiology, UMass, Amherst, MA, November 16th, 2018.

Grants

Active Grant Awards

1. Co-investigator (Ryan Allen, PI). Randomized Interventions to Evaluate the Effects of Air Pollution Exposure on Children's Health and Development. 03/01/2015 – 03/31/2019, Canadian Institutes of Health Research (CIHR), $720,535. (10% effort)
2. Co-investigator (Joseph Braun, PI). Endocrine Disrupting Chemicals, Thyroid Hormones and Child Neurobehavior. 06/01/2015-03/31/2019. National Institutes of Health, $471,241 (5% effort). The purpose of this study is test if and when early life exposures to phthalates, triclosan, or bisphenol A adversely impacts children's cognition and behavior.
3. Consultant (Joseph Braun, PI). Early Life Perfluoroalkyl Substance Exposure and Obesity: Mechanisms and Phenotyping. 02/01/2016-01/31/2021. National Institutes of Health, $523,725 (5% effort). The purpose of this award is to study the impact of exposure to perfluoroalkyl chemicals on the development of child obesity, adverse cardiometabolic markers and gene regulation. (2.5% effort)
4. Co-Applicant (Linda Booij, Maryse Bouchard PI). In utero exposure to Bisphenol-A and the developing brain in humans: A longitudinal study of epigenetic mechanisms. 03/01-2016 – 03/31/2019. Canadian Institutes of Health Research (CIHR), $344,025. (2.5% effort).
5. Principal Investigator (Multiple PI Award with Christine Till). "Impact of early life fluoride exposure on cognitive and behavioural outcomes in children". NIEHS, 09/30/16 – 05/01/19, $296,683 (10% effort).
6. Consultant (Aimin Chen, Principal Investigator). Developmental neurotoxicity of organophosphate and novel brominated flame retardants in children. National Institute for Environmental Health Sciences. 1RO1ES028277. 09/30/2017-06/30/22 (10% effort).

Past Grant Awards

1. Principal Investigator, "Dust-Lead and Blood Lead Levels among Urban Children". The National Center for Lead-Safe Housing, $561,619, 06/15/93 to 08/31/94. Department of Housing and Urban Development Contract MDLPT0001-93. (25% effort).
2. Principal Investigator, "Determinants of Lead Exposure among Children in Monroe County, NY", NIEHS Pilot Grant, University of Rochester School of Medicine and Dentistry, Department of Environmental Medicine. $7,600, 06/15/93 to 12/31/95. (0% effort)
3. Principal Investigator, "The Effectiveness of Dust Control in Reducing Children's Blood Lead Levels" U.S. Department of Housing and Urban Development, $128,394, 04/01/94 to 05/30/95. (25% effort).
4. Principal Investigator, "Primary Prevention of Exposure to Lead". Centers for Disease Control and Prevention, $832,228, 09/30/94 to 10/01/98. (25% effort)
5. Principal Investigator, "Lead-Contaminated House Dust and Children's Blood Lead Levels". National Center for Lead-Safe Housing, $43,260, 10/01/96 to 03/30/96. (25% effort).
6. Co-investigator (Christy, PI), "Tuberculosis Screening in Children". New York Department of Health, $15,000, 01/01/95 to 12/31/96. (0% effort)
7. Co-investigator (Weitzman, PI), "Fellowship Training in General Pediatrics" (Grant # D28PE50008). Bureau of Health Professions, HRSA, U.S. Public Health Service, $1,752,816, 06/01/96 to 05/30/97. (10% effort).
8. Principal Investigator, "Neurobehavioral Effects of Low-Level Childhood Lead Exposure". University of Rochester School of Medicine & Dentistry, $8,560, 06/01/96 to 05/30/97. (0% effort)
9. Principal Investigator, "Neurobehavioral Effects of low-level Lead Exposure in Children". NIEHS Pilot Grant, University of Rochester Department of Environmental Medicine, $20,035, 09/01/97 to 08/30/97. (0% effort).
10. Co-investigator (Howard, PI), "Effect on Breastfeeding of Pacifiers and Bottle Feeding". Bureau of Maternal and Child Health, $420,333, 10/01/96 to 09/30/00. (2.5% effort)
11. Co-investigator (Canfield, PI) "Lead and Children's Cognitive Functioning", Research Grants Program, Cornell University. $17,000, 10/01/96 to 09/31/97 (0% effort).
12. Principal Investigator, "Neurobehavioral Effects of Low-Level Lead Exposure in Children" (RO1-ES 08338). National Institute of Environmental Health Sciences, 12/01/96 to 11/31/01, $1,946,848. (25% effort).
13. Co-investigator, (Aligne, PI). "Reduction in Passive Smoking among Children with Asthma: A Randomized Trial of HEPA Air Filtration." 10/01/96 to 09/31/97, $6,000. KIDD Grant, Rochester General Hospital (0% effort).

14. Co-investigator, (DeWitt, PI). "Faculty Development in General Pediatrics". Bureau of Health Professions, Health, Department of Health and Human Services 07/01/97 to 06/30/00, $338,000. (15% effort).
15. Principal Investigator, "A Side-by-Side Comparison of Allergen Sampling Methods", U.S. Department of Housing and Urban Development, 01/02/98 to 12/31/98, $163,065. (15% effort).
16. Principal Investigator, "National Research Service Award - Fellowship Training in General Pediatrics and Adolescent Medicine" (1T32PE10027), Health Resources and Services Administration, DHHS. 07/01/98 to 06/30/03. $634,408. (0% effort).
17. Co-investigator, (Steiner, PI) "Survey of Directors and Graduates of NRSA Fellowship Training Programs", Health Resources and Services Administration, Department of Health and Human Services. 06/01/98 to 06/30/99.
18. Principal Investigator, "Effect of Soil Remediation on Children's Blood Lead Levels in Midvale, Utah". U.S. Environmental Protection Agency, 08/01/98 to 07/30/99. $62,550. (15% effort).
19. Co-investigator, (Phelan, PI) Trends and Patterns in Playground Injuries among U.S. Children." Ambulatory Pediatric Association, 05/05/99 to 05/04/00. $9,000 (0% effort).
20. Principal Investigator, "Risk Assessment for Residential Lead Hazards". U.S. Department of Housing and Urban Development, 09/01/99 to 08/30/00. $102,435. (25% effort).
21. Principal Investigator, "Residential Exposures associated with Asthma in U.S. Children and Adolescents" U.S. Department of Housing and Urban Development, 07/16/99 to 03/15/00. $30,400. (20% effort).
22. Principal Investigator, "Effectiveness of Lead Hazard Control Interventions – A Systematic Review" National Center for Lead-Safe Housing, 10/01/99 to 06/01/00. $22,500 (10% effort).
23. Principal Investigator, "Racial Disparity in Blood Lead Levels due to Genetic Variation in Calcium Absorption". NIEHS Pilot Grant, Center for Environmental Genetics, University of Cincinnati, 04/01/00 to 03/31/01. $28,130 (0% effort).
24. Principal Investigator, "International Pooled Analysis of Prospective, Lead-Exposed Cohorts". National Institute of Environmental Health Sciences, National Institutes of Health, 08/15/00 to 09/14/01, $16,000. (2.5% effort).
25. Principal Investigator, "A Randomized Trial to Reduce ETS in Children with Asthma" (RO1-HL/ES65731). National Heart, Lung and Blood Institute, National Institutes of Health, 09/29/00 to 09/28/04, $1,546,848. (25% effort).
26. Co-investigator, (Geraghty, PI) "Breastfeeding Practices of Mothers of Multiples". Ambulatory Pediatric Association, 05/01/01 to 04/30/02. $5,000 (0% effort).

27. Principal Investigator (Subcontract), "A Longitudinal Study of Lead Exposure and Dental Caries". National Institute of Dental and Craniofacial Research, National Institutes of Health, 08/01/01 to 07/30/04. $300,000 (10% effort).
28. Co-investigator (Phelan, PI), "Fatal and Non-Fatal Residential Injuries in U.S. Children and Adolescents" U.S. Department of Housing and Urban Development, 03/01/01 to 11/31/01. $40,700. (5% effort).
29. Principal Investigator, "Prevalent Neurotoxicants in Children" (PO1-ES11261). National Institute for Environmental Health Sciences and U.S. Environmental Protection Agency, 09/01/01 to 09/31/06, $5,000,000. (30% effort).
30. Principal Investigator, "International Pooled Analysis of Lead-Exposed Cohorts". Centers for Disease Control (RO1/CCR 521049). Centers for Disease Control, 09/15/01 to 09/14/02, $28,473. (3% effort).
31. Principal Investigator, supplement to "Prevalent Neurotoxicants in Children" (PO1-ES11261). NIEHS, 09/01/02 to 09/31/07, $1,800,000. (10% effort).
32. Co-Investigator, "ADHD Phenotype Network: Animal Model to Clinical Trial". National Institute of Neurologic Diseases, 09/15/02 to 06/30/05 (15% effort).
33. Principal Investigator, "Linkage of ADHD and Lead Exposure", Springfield, Ohio Department of Health, 02/01/03 to 06/01/04, $25,000. (0% effort).
34. Co-investigator (Yolton, PI) "Explorations of ETS Exposure on Child Behavior and Sleep" NIEHS, 04/01/04 to 03/30/06, $300,000. (5% effort).
35. Co-investigator (Haynes, PI) "MRI as a Biomarker of Manganese Exposure". NIEHS, 09/01/04 to 08/30/06, $300,000. (5% effort).
36. Co-investigator (National Center for Healthy Housing, PI) "Development of a Standardized Housing Assessment for Asthma", U.S. Department of Housing and Urban Development, 11/01/05 to10/31/07, $50,000. (5% effort).
37. Co-Investigator (Hershey, PI) "Epithelial Genes in Allergic Inflammation" National Institutes of Allergy and Infectious Diseases", 07/01/06 to 06/30/07, $4,787.541. (3% effort).
38. Co-Investigator and Mentor (Wilson, PI), "Racial Difference in DNA Adducts in Tobacco-Exposed Children". Dean's Scholar Award, University of Cincinnati, 02/22/06 to 01/21/09, $150,000 (5% effort).
39. Principal Investigator, "National Research Service Award - Fellowship Training in Primary Care Research," (1T32PE10027), Health Resources and Services Administration, DHHS. 07/01/98 to 06/30/08. $1,600,000. (0% effort).

40. Co-Investigator and Mentor (Kahn, PI). "Childhood Asthma in an Era of Genomics: Will the Generalist's Role be Recast?" Robert Wood Johnson Generalist Physician Faculty Scholars Program" 06/01/04 to 05/30/08, $300,000.
41. Co-Investigator and Mentor (Spanier, PI), "Exhaled Nitric Oxide to Manage Childhood Asthma". National Heart, Lung and Blood Institute, 07/01/06 to 06/31/08, $200,000 (10% effort).
42. Co-investigator (Sub-Contract PI), BYPL Vanguard Center (Specker, Principal Investigator), "National Children's Study", National Institute for Child Health and Development, 11/01/05 to 10/31/10, $500,000. (20% effort). [Relinquished with relocation to SFU].
43. Associate Director and Co-Investigator, (Ho, PI). "Center for Environmental Genetics," NIEHS, 04/01/08 to 3/31/13, $1,000,000 (10% effort). [Relinquished with relocation to SFU.]
44. Co-Investigator (Yolton, PI). "Tobacco Smoke and Early Human Behavior". Clinical Innovator Award, Flight Attendant Medical Research Institute", 07/01/07 to 06/30/10, $300,000. (3% effort).
45. Co-Investigator (Spanier, PI). "Low Level Prenatal Tobacco Exposure and Infant Wheeze." Young Clinical Scientist Award, Flight Attendant Medical Research Institute, 07/01/07 to 06/30/12, $300,000. (5% effort).
46. Co-Investigator and Mentor (Spanier, PI). K23, "Prenatal Low Level Tobacco & Phthalate Exposure and Childhood Respiratory Health". National Institute for Environmental Health Sciences, 12/1/07 to 11/30/12, $623,679 (0% funded effort).
47. Co-investigator (Yolton, PI). "Neurobehavioral effects of insecticide exposure in pregnancy and early childhood." NIEHS, 09/01/09 to 08/31/12.
48. Principal Investigator (Bruce Lanphear, PI), "A Community-Based Trial to Prevent Lead Poisoning and Injuries," National Institute for Environmental Health Sciences, 04/01/07 to 03/30/13, $2,000,000. (25% effort).
49. Co-Investigator (Kim N. Dietrich, PI). "Early Lead Exposure, ADHD & Persistent Criminality: Role of Genes & Environment," National Institute for Environmental Health Sciences, 04/01/07 to 3/31/2013, $1,250,000. (2.5% funded effort).
50. Co-Investigator and Sub-Contract PI (Brenda Eskenazi, PI). This supplemental award was to conduct a pooled analysis of prenatal organophophate pesticide exposures with birth outcomes and neurodevelopment in children using 4 US birth cohorts. NIEHS, 09/01/2009 to 08/31/2013, $96,000 (0% effort).
51. Mentor and Supervisor (Glenys Webster, PI). Michael Smith Foundation for Health Research Postdoctoral Training Award, 03/01/12 to 02/28/15, $134,500 (5% effort).

52. Co-Principal Investigator (Tye Arbuckle, PI). Maternal-Infant Research on Environmental Chemicals: Effects on Child Development (MIREC-CD). 06/26/11 to /5/25/14, Health Canada Chemical Management Program, $283,000 (10% effort).
53. Co-Investigator (Patti Dods and Amanda Wheeler, co-PIs). Phthalate Exposure and the development of asthma in the CHILD Study. 06/01/11 to 05/30/14, Health Canada Chemical Management Program, $204,000 (5% effort). Consultant (Stephanie Engel, PI). A pooled investigation of prenatal phthalate exposure and childhood obesity. 11/01/2012 – 10/31/15, NIEHS. $275,000. (5% effort).
54. Co-Investigator (Ryan Allen, PI). A randomized air filter intervention study of air pollution and fetal growth in a highly polluted community. 06/08/2012 – 05/30/15, CIHR $348,000 (10% effort).
55. Co-Investigator (William Fraser and Tye Arbuckle, co-PIs). MIREC-CD Biomonitoring Study in Vancouver. 09/01/2013 – 08/30/2014. Health Canada, $120,138 (10% effort).
56. Principal Investigator. Knowledge translation tools for capacity building for an online Canadian Environmental Health Atlas. 03/01/12 – 02/28/13, Canadian Institutes of Health Research, $98,974 (10% effort).
57. Principal Investigator (with Lawrence McCandless). Prenatal exposure to environmental contaminants and fetal growth: How to account for multiplicity when testing multiple statistical hypotheses?. 07/01/2015-06/30/2016. Canadian Institutes of Health Research (CIHR), $12,000 (5% effort).
58. Principal Investigator, Canadian Environmental Health Atlas Knowledge Translation to produce videos and interactive tools. 06/01/2015-07/30/2016. Canadian Internet Registration Authority, $50,000 (10% effort).
59. Co-Investigator (Kieran Phelan, PI). "Injury Prevention in a Home Visitation Population". NICHD, 09/28/10 to 07/31/16, $2,000,000 (total direct costs over 5 years) (10% effort).
60. Co-applicant (Timothy F. Oberlander, PI). Developmental origins of autism: A population level linked data study of prenatal antidepressant medication exposure. 09/01/2013 – 09/31/2016, Canadian Institutes of Health Research (CIHR), $285,768.
61. Principal Investigator (Multiple PI Award with Aimin Chen and Kimberly Yolton). "Longitudinal study of exposures to PBDEs and PFCs and child behavior". NIEHS, 04/30/11 – 05/01/17, $2,150,000 (total direct costs over 5 years) (20% effort).
62. Principal Applicants (McCandless and Lanphear). Biostatistical methods for estimating the cumulative impact of environmental contaminant exposures on preterm birth. Canadian

Institute for Human Development, Child and Youth Health. 12/06/16-12/05/18, $200,000 (10% effort).

Ethics Training for Research

CITI (Collaborative Institutional Training Initiative) (Reference# 7159023). Academic and Regional Health Centers Curriculum Course, completed on December 16th, 2011.

CITI (Collaborative Institutional Training Initiative) (Reference# 7160515), Canada GCP Curriculum Course, completed on December 16th, 2011.

CITI (Collaborative Institutional Training Initiative) (Reference# 8316270), Human Subjects Core Curriculum, completed on August 17th, 2012.

CITI (Collaborative Institutional Training Initiative) (Reference# 13561457), Academic and Regional Health Centers Core Curriculum, completed on September 1st, 2014.

CITI (Collaborative Institutional Training Initiative) (Reference# 16954900), Human Subjects Research Core Curriculum, completed on October 31st, 2015.

APPENDIX B

Interrogatory Responses

I&E PS-20 ..... Appendix B, 1

I&E PS-23 ..... Appendix B, 2

I&E PS-30 ..... Appendix B, 3

UNITED I-8 ..... Appendix B, 4

UNITED I-11 ..... Appendix B, 5

UNITED I-14 ..... Appendix B, 6

UNITED I-19 ..... Appendix B, 7

UNITED I-22 ..... Appendix B, 8

UNITED I-25 ..... Appendix B, 9

UNITED I-27 ..... Appendix B, 10

UNITED I-28 ..... Appendix B, 11

UNITED Set II-4 ..... Appendix B, 12

UNITED Set IV-3 ..... Appendix B, 14

UNITED Set IV-5 ..... Appendix B, 15

UNITED Set IV-6 ..... Appendix B, 16

UNITED Set IV-7 ..... Appendix B, 17

UNITED Set IV-8 ..... Appendix B, 18

UNITED Set IV-12 ..... Appendix B, 19

UNITED Set IV-17 ..... Appendix B, 20

UNITED Set IV-18 ..... Appendix B, 21

UNITED Set IV-23 ..... Appendix B, 22

UNITED Set IV-26 ..... Appendix B, 23

UNITED Set VII-3 ..... Appendix B, 24

UNITED Set VII-4 ..... Appendix B, 25

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Bureau of Investigation and Enforcement PS-1 to PS-20 in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: I&E-PS-20: Does PWSA have free lead test kits available to all PWSA water customers? If so, provide the following information:

a. Explain the process that customers must undertake to obtain a lead testing kit.
b. Indicate how customers are informed of their opportunity to obtain a free lead test kit.

Response:

a. Yes, Free lead test kits are available to all PWSA drinking water customers. Customers can request one by calling PWSA's Lead Help Desk or visiting the Lead Facts portion of the pgh2o.com website (lead.pgh2o.com). If they call, our staff will take the necessary information and submit the request to PWSA's laboratory to mail a test kit. The website has an easy-to-use online form (pgh2o.com/leadform) where the customer can input the required information and the test kit will be mailed to them.

   In locations included in our Lead Service Line Replacement (LSLR) areas, PWSA leaves a test kit (all which come with sampling and postage-paid mailing instructions) at locations where we find lead lines on the public or private side when we excavate. With water main repairs, PWSA leaves a test kit at all locations where lead is found, including both residential and non-residential locations.

b. Information concerning the availability of these free test kits is on PWSA's pgh2o.com website, and PWSA provides information about the test kit availability at public meetings where lead is discussed. In addition, the correspondence mailed by PWSA to all people within the LSLR Program areas contains information on how to request a test kit. PWSA also promotes its lead remediation programs, including the lead test kit program, in its public education materials and bill inserts that are mailed to customers. PWSA promotes the lead test kit program using its various social media channels including Facebook and Twitter as well as its press releases and media outreach efforts.

Response Provided by: Dan Duffy, P.E.*, PMP
Lead Service Line Replacement Project Manager
Consultant for The Pittsburgh Water and Sewer Authority

Dated: February 7, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Bureau of Investigation and Enforcement,
Set I&E-PS-22 through I&E-PS-42
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: I&E-PS-23	Does PWSA have an estimate of the number of lead service lines still remaining in its system? If yes, please provide the estimate. If not, please indicate what action(s) PWSA must undertake in order to produce an estimate.
Response:	Based on the March 31, 2018 Updated Materials Evaluation Report, there were approximately 12,218 public side lead service lines in the system. Since the beginning of 2018 (and through February 1, 2019), 2,134 public side service lines have been replaced leaving around 10,100 remaining.
Response Provided by:	Robert A Weimar, Executive Director Dan Duffy, P.E.*, PMP Lead Service Line Replacement Project Manager Consultant for The Pittsburgh Water and Sewer Authority
Dated:	Robert A Weimar, Executive Director

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Bureau of Investigation and Enforcement,
Set I&E-PS-22 through I&E-PS-42
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: I&E-PS-30	Reference the response to I&E-RR-1 Attachment A. Lead Service Line Replacement appears to end as a separate capital spending line Item in 2019. Please confirm that spending for LSLRs occurs thereafter under the Small Diameter Water Main Replacement line item.
Response:	Confirmed.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	February 28, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-8	When does PWSA expect to complete the upgrade to its Geographic Information System (GIS) to include main break, main age, and main material? (PWSA St. No. C-1 at 63) Can PWSA calculate small diameter water main selection criteria scores before this GIS update is complete? (PWSA St. No. C-1 at 63; LTIIP at 20-23)
Response:	As noted on Page 62 of PWSA St. No. C-1, PWSA plans to undertake a 2-year upgrade to its Geographic Information System (GIS) to include main break, main age and main material to provide a more robust prioritization model. PWSA cannot calculate small diameter water main selection criteria on all water mains in the system until the GIS is upgraded. Until that time, PWSA can only prioritize within its current pool of water mains currently identified for replacement.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-11	Will PWSA consider modifying the selection criteria for its small diameter water main program (see LTIIP at 21-23) to include consideration of blood lead levels, population of children, income, race, and other factors related to lead exposure? If not, why?
Response:	The criteria that will be included will be developed as part of the water distribution system master plan. Generally the criteria listed in this question are not typically included in a SDWMRP ranking. No decision has been made at this time about whether or not to include them.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-14	What does PWSA expect the average cost of a public-side lead service line replacement to be under the small diameter water main program? What does PWSA expect the average cost of a private-side lead service line replacement to be if PWSA were to include those service lines in its small diameter water main program?
Response:	The cost of the public service line replacement is covered under the per foot cost for water main replacement for planning level estimates. PWSA assumed $7500/private side replacement for planning level estimates.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-19	Please describe the "various methods" PWSA is evaluating to complete the inventory of its residential service line connections. (PWSA St. No. 1 at 53)
Response:	PWSA is looking at several items with regards to the Curb Box Inspection (CBI) program, which is the present method used to complete the inventory. The evaluation is considering the effect of improvements to the CBI program, evaluating other data which may be available, including City of Pittsburgh, PWSA and County records, the use of a predictive, machine-learning model and data being collected by PWSA's meter replacement program.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-22	Has PWSA begun to create an inventory of private-side service lines in its system? If no, does PWSA plan to do so?
Response:	PWSA maintains an inventory of both public and private side service line material. The current inventory is based on historic records, material verification and replacement, Curb Box Inspection Results and data collected during PWSA's meter replacement program. The meter replacement program, started at the end of 2018, will involve the replacement of 50,000 residential meters over the next 5 years, during which PWSA will record the service line material entering and exiting the meter. The material is being logged using a tablet application allowing seamless incorporation into PWSA's GIS. This information will be used to update the web map on PWSA's website on a monthly basis, starting in April 2019.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-25 Please explain why PWSA is reconsidering curb box inspections as a method to identify the material composition of service lines.

Response: With the CBI program, service line material is determined by locating and cleaning the curb box/stop and inserting a small camera down the box to determine material type. A lead line is identified as having an indicative bulb-type "wipe joint" - this wipe-joint is the method in which the lead line was attached to the valve. Non-lead lines are typically identified by the fittings observed in the curb box.

In instances where non-lead is identified at the curb box, PWSA cannot state with certainty that the entire service line is not lead. This is because the curb stop (with new tail pieces) may have been replaced, but other portions of the service line may still be lead material.

The CBI may not be successful for the following reasons:

- Inability to locate curb box (labeled as "cannot locate" in records)
- Curb box damaged such that equipment cannot access the curb stop (labeled as "not accessible" in records)
- Line degraded and cannot determine material type (labeled as "unknown" in records)

As such, the only CBI data that can be relied on is where lead is identified, which during the 2018 CBI program (Work Orders B01 – B08) occured in about 9.6 percent of the public side locations and about 8.7 percent of the private side locations

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-27	How far does PWSA expect lead levels to fall after orthophosphate is added to PWSA's drinking water? (See PWSA St. No. 1 at 49)
Response:	It is difficult to accurately predict how far lead levels will fall after orthophosphate addition. Based on historical use of orthophosphate addition for corrosion control across the country, and the preliminary pipe loop testing performed within PWSA, a reduction of lead levels is expected. However, for homes with a lead service line, the lead concentration will vary. The variations could include changes with: the volume of the sample obtained, sampling procedure, sampling location within the home, time of year sampling is performed, stagnation period, etc. The LCR does not capture these changes. Therefore, it is not possible to predict how far the lead will fall after orthophosphate addition. The proposed monitoring plan is designed to assess the overall performance of orthophosphate addition.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set I in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED I-28 If lead levels do not "plunge" as PWSA expects following the introduction of orthophosphate (Compliance Plan at 120), what steps will PWSA take to bring lead levels down?

Response: The approach to lead control at the residential and commercial end users within thc PWSA water service area is multi-faceted due to multiple mechanisms by which lead may be released in water. The three main activities used to accomplish this objective (lead control) are:

- Lead service line replacement program
- Orthophosphate addition
- Flushing of chemical scales and biofilms

PWSA will continue to implement all three activities along with the comprehensive monitoring of the water quality parameters. Based on collected field data, the scale of the program may be changed and each of these three activities adjusted (i.e. flushing locations, orthophosphate dosage) in effort to minimize presence of lead in drinking water.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED II-4 How does PWSA promote, target, or otherwise recruit participants for its Private Lead Line Replacement Community Environmental Project? Please provide a copy of all written correspondence and/or marketing materials used to inform consumers about the availability of PWSA's Private Lead Line Replacement Community Environmental Project.

Response: PWSA's outreach for the CEP program has continued to evolve since outreach first started in September 2018. Components to the outreach include:

- Dollar Energy Fund, who administers PWSA's CAP and CEP programs, asks customers who are calling for CAP or winter moratorium if they are interested in getting their lead line replaced, and follows up with those that are;
- PWSA Lead Help Desk personnel discuss the option with customers who call about lead issues and are not otherwise in a lead service line replacement program work order area;
- PWSA includes information about the program in every PWSA monthly newsletter that is mailed to a distribution list, posted on our website and promoted via social media;
- PWSA includes information about the program in every monthly bill insert that is mailed to all customers
- PWSA discusses the CEP program at every community group meeting that is attended (14 to date in 2019 and 60 attended in 2018) and it is described in the CAP flyer distributed during these meetings.
- Described in the lead exceedance brochure that was mailed to every water customer (service and mailing address) on January 31, 2019. Brochures and posters were also mailed to all the following organizations in Pittsburgh:
  - Public and private schools or school boards
  - Women, Infants and Children (WIC) and Head Start Programs
  - Public and private hospitals and medical clinics
  - Pediatricians
  - Family planning clinics
  - Local welfare agencies
  - Licensed child care centers
  - Public and private preschools
  - Obstetricians-Gynecologists and Midwives

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set II in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

- Listed on special posters and flyers for the Lead Service line Replacement Program which are being provided to the same organizations listed above that are in or near the project areas.

See UNITED-II-4 Attach A through F for samples of PWSA's customer facing materials.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 6, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-3	Fully explain the basis for PWSA's decision to allocate a weight of 5% to lead service line density in its prioritization model for the small diameter water main replacement program (LTIIP at 21-23, Table 2-3.), and provide all analysis and documents underlying that decision.
Response:	When PWSA replaces SDWM, it evaluates various factors, not only lead service lines. Other factors include, but are not limited to, how many people are affected, if there is a sensitive customer base (such as a nursing home), etc. Knowing the 2020 SDWMP, 10 miles total, would be focused on areas of high densities of LSL, the 2019 SDWMP, 2.5 miles total, focused on other factors such as population served, vulnerability to breaks, and fire flow deficiencies. Note that the prioritization model referenced in the LTIIP was for the 2019 SDWMP only and a new prioritization model will be developed as part of the Water Distribution System Master Plan and will be implemented once the GIS system is upgraded.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-5	Please clarify what factors were used and/or are being used to prioritize 2019 lead service line replacements in light of (i) Mr. Weimar's testimony that 2019 lead service line replacements were prioritized in low-income areas where pregnant women and young children under six years of age live. (See PWSA St. 1, at 51, 56); and (ii) PWSA's PENNVEST application indicating that 2019 lead service line replacements were prioritized in areas with higher population densities of children under 6 years of age, higher blood-lead levels, and greater densities of lead service lines (PWSA St. 1, Exh. RAW/C-23, at 1, 9).
Response:	PWSA is working with the Community Lead Response Advisory Committee, as described in the 2019 Tariff Settlement, to determine the prioritization for the 2019 LSLR Program. The prioritization includes population densities of children under 6 years of age, higher blood-lead levels, income and greater densities of lead service lines.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-6	How many lead service line replacements has PWSA completed under the Community Environmental Project? (See PWSA St. 1, at 55.)
Response:	As of March 6, 2019, a total of 20 public side and 18 private side lead service lines have been replaced as part of the CEP.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-7 Excluding the customers who have already had their service lines replaced, as identified in response to UNITED IV-6, how many customers have applied and been deemed eligible for a lead service line replacement through the Community Environmental Project? (See PWSA St. 1, at 55.) Of those, how many lead service lines are currently scheduled for replacement under the Community Environmental Project?

Response: A total of 58 customers have qualified for the CEP and returned the customer consent agreement necessary for PWSA to perform the work. As of March 6, 2019, for 54 of those customers, PWSA has either: (1) completed lead service line replacements; or (2) not completed a lead service line replacement as non-lead lines were found on both sides of the curbstop. Work is scheduled for the four other customers. Another 80 customers have met the income requirements and PWSA is awaiting the return of their customer consent agreements.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-8	Of the $1.8 million in Community Environmental Project funds, how much has been spent on service line replacements? How much has been committed to future service line replacements but not yet spent? (See PWSA St. 1, at 55.)
Response:	As of January 31, 2019, a total of $67,939.75 has been spent on the CEP.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-12 Under PWSA's existing policy of providing pre-replacement filters to customers who request tap water sampling kits and whose kits reveal lead levels exceeding 15 parts per billion, please identify:

A. How much time it takes, on average, from when a customer requests a tap water sampling kit to when the customer receives the kit;
B. How much time it takes, on average, from when a customer is notified that their tap water sample exceeds 15 parts per billion to when the customer receives a filter;
C. Whether PWSA hand delivers filters to eligible customers or provides eligible customers with vouchers redeemable from the filter vendor (see Rate Case UNITED XI-10(b)); and
D. How many filters PWSA or the filter vendor has distributed since February 2018 (by month).

Response:

A. PWSA provides a list of customers who request a test kit to our vendor (120 Water Audit) once a week. Based on our contract with 120 Water Audit, lead test kits are to be mailed to the customer within seven days of 120 Water Audit receiving our list.
B. Based on the contract with 120 Water Audit, customers are mailed the laboratory results along with a voucher for a filter within three days of the certified laboratory result being known.
C. PWSA provides vouchers.
D. PWSA does not track the number of filters by month for the LSLR programs. Since August 2018 PWSA has ordered over 2,000 pitchers (along with over 6,000 filters) for the LSLR program, and since the voucher program started in November 2018 we have distributed over 500 pitchers and filters to customer request lead kit exceedance locations and CAP customers.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-17 Has PWSA decided whether it will continue the following post-replacement protocols beyond 2019? If so, please describe PWSA's decision. If not, please explain why not.

A. Providing a free tap water sampling kit to all customers following a service line replacement, regardless of whether a partial or full replacement was conducted (Rate Case UNITED II-1 Attach. V, at 5-6);
B. Providing a free additional test kit to customers whose previous post-replacement tap water sample contains lead levels above 15 parts per billion (Rate Case UNITED II-1 Attach. V, at 5-6);
C. Providing bottled water and flushing assistance to customers whose post-replacement tap water sample contains lead levels above 100 parts per billion (Rate Case UNITED II-1 Attach. V, at 5-6);
D. Providing a free filter and replacement cartridges to any customer whose pre-replacement tap water sample contains lead levels above 15 parts per billion (Rate Case UNITED XI-10);
E. Providing a free filter and replacement cartridges to households that qualify for a customer assistance program and that may have a lead service line based on historical records or curb box inspection results (Rate Case Settlement § III.C.1.a.iv.b).

Response:

A. PWSA intends to evaluate the data from the 2019 program to determine if testing after a full line replacement is necessary going forward. However, PWSA will continue to provide free tap water sampling kits to customers following a partial line replacement as required by PA DEP.
B. PWSA intends to continue this practice.
C. PWSA intends to continue this practice.
D. PWSA intends to continue this practice.
E. Pursuant to the Rate Case Settlement, PWSA plans to continue this practice until December 31, 2019. No decision has been made regarding continuation of this element of our Community Lead Response Program.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-18 Other than the measures described in Rate Case Interrogatory UNITED II-1 Attach. V, at 5-6 and UNITED VIII-33, please describe in detail what additional steps PWSA takes, if any, to encourage customers to complete post-replacement tap water sampling. Please provide any related notices, information, and/or materials given to customers.

Response: In addition to the measures currently being taken, PWSA is giving further training and instruction to all Construction Inspectors on the LSLR project in direct communication with the customers after completion of the replacement and when delivering the sample kit. Sampling instruction on the sample kit box, along with a copy of the Chain of Custody form included in the kit are provided in UNITED-IV-18 Attach A. The Flushing Instruction card that is left with the sample kit is provided in UNITED-IV-18 Attach B.

Response Provided by: Robert A. Weimar, Executive Director
The Pittsburgh Water and Sewer Authority

Dated: March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-23	Is PWSA currently conducting curb box inspections? (See PWSA St. 1, at 53.) If so, how many additional curb box inspections does PWSA plan to conduct and when will those inspections be completed?
Response:	PWSA has temporarily suspended the curb box inspection program while the evaluation discussed above is ongoing.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of Pittsburgh United, Set IV in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED-IV-26	Please describe PWSA's plans to determine service line material composition during the 50,000 meter replacements PWSA expects to conduct over the next five years, including any information PWSA has about where these meter replacements will occur. (See PWSA St. 1, at 31-32.)
Response:	During the meter replacement, PWSA plumbers are recording the service line material entering the meter from the street side and exiting the meter on the house side. PWSA is currently developing plans as to where these meter replacements will occur.
Response Provided by:	Robert A. Weimar, Executive Director The Pittsburgh Water and Sewer Authority
Dated:	March 14, 2019

Response of Pittsburgh Water and Sewer Authority ("PWSA") to the Interrogatories of the Pittsburgh United, Set VII in Docket No. M-2018-2640802 and Docket No. M-2018-2640803

Request: UNITED VII-3 How many free filters has PWSA distributed to households that qualify for an existing PWSA customer assistance program and that have a public- and/or private-side service line made of lead or an unknown material, consistent with paragraph III.C.1.iv.b. of the Rate Case Joint Petition for Settlement?

Response: To date, a free pitcher and filter kit (consisting of one pitcher and three filters) have been distributed to approximately 270 locations.

Response Provided by: Robert A. Weimar, Executive Director, The Pittsburgh Water and Sewer Authority
Daniel T. Duffy, P.E.*, PMP, Lead Service Line Replacement Project Manager
Consultant (East Woods Associates, LLC) for
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

**Response of Pittsburgh Water and Sewer Authority ("PWSA")
to the Interrogatories of the Pittsburgh United, Set VII in
Docket No. M-2018-2640802 and Docket No. M-2018-2640803**

Request: UNITED VII-4 How does an eligible customer obtain a filter under the program described at UNITED VII-3?

Response: Customers enrolled in an existing PWSA customer assistance program, who, based on PWSA's records, have a public- and/or private-side service line made of lead or an unknown material, receive a letter. The letter provides a website address to enter in a unique voucher code (associated with their address). The letter also provides the phone number and email address of the PWSA Lead Help Desk if additional assistance is needed.

Response Provided by: Robert A. Weimar, Executive Director, The Pittsburgh Water and Sewer Authority
Daniel T. Duffy, P.E.*, PMP, Lead Service Line Replacement Project Manager
Consultant (East Woods Associates, LLC) for
The Pittsburgh Water and Sewer Authority

Dated: March 26, 2019

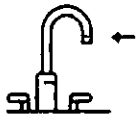
APPENDIX C

Attachments to PWSA Interrogatory Responses

UNITED IV-18 Attach. A ..... Appendix C, 1
UNITED VII-2 Attach. A ..... Appendix C, 4

UNITED-IV-18 Attach A

IMPORTANT: BE SURE TO TEST YOUR WATER FIRST THING IN THE MORNING OR AFTER YOUR WATER HAS NOT BEEN USED FOR 6-8 HOURS.



STEP ONE
Kitchen tap is recommended. Remove any aerators or filters on the tap. A frequently used bathroom tap can be used if kitchen tap has an under counter filtering system in place.



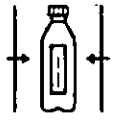
STEP TWO
Allow the water to run until a significant change in temperature is noted. (Approximately 30 seconds.)



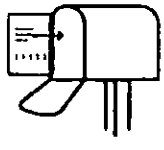
STEP THREE
Fill the bottle to the top and secure cap.



STEP FOUR
Complete Chain of Custody. Verify the information is correct. Sign, date, and include a phone number where you can be reached. Put Chain of Custody back in box.



STEP FIVE
Put bottle back in box.



STEP SIX
Place box in mailbox for delivery by US Postal Service.

If you have any questions about this sample kit please contact the 120WaterAudit help desk at 412-625-3282 or PWSA@120WaterAudit.com
All questions about lead service lines should be directed to the PWSA Lead Help Line at 412-255-8987 or LeadHelp@pgh2o.com



120 WaterAudit
Know your water.

If you have any questions, please call us at **800-674-7961** or email us at Support@120WATERAUDIT.COM

CHAIN OF CUSTODY

NOTE: Please mail your sample within **5 days** of when it is collected. Your sample **WILL NOT BE ANALYZED** unless this Chain of Custody form is filled out **COMPLETELY**.

Pittsburgh Water and Sewer Authority (PWSA): LSLR 2019 Post Construction Kit 1	SDWIS#5020038 Lead Help Desk 412-255-8987
****PLACE LABEL OR WRITE KIT ID, CUSTOMER NAME, ADDRESS & PHONE NUMBER IN THIS AREA****	
MATRIX: DW	LEAD

TO BE FILLED OUT BY RESIDENT:

SINK SAMPLED (CIRCLE ONE): Kitchen or Bathroom SAMPLED BY (NAME):	PHONE:	COLLECTED DATE	COLLECTED TIME
RETURNED BY (CUSTOMER SIGNATURE):		RETURNED DATE	RETURNED TIME

LAB USE ONLY			
RECEIVED IN LAB BY:	DATE	TIME	CWM PROFILE#
WORK ORDER:		REPORTABLE AS: S	

Appendix C, 2

Pittsburgh UNITED Statement C-3, Bruce Lanphear
Appendix C

NOTICE:

Please mail your sample within **5 days** of when it is collected. Your sample **WILL NOT BE ANALYZED** unless the Chain of Custody form is filled out **COMPLETELY**.

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team follow -up	Comments	Additional Notes
1812	Verify	Declined	Private Side Non-Lead	Opt Out via email 1/10/19. Private Side Replaced per owner		Nothing in Cogsdale to show replaced on public	
1938	Verify	Declined	Blank		Yes	Owner said she didnt understand and had questions Said her neighbor told her she made a mistake Explained process and would like to opt in advised will send a new agreement 12/27	Received Accepted Agreement
1956	Verify	Declined	Private Side Non-Lead	Replaced 2017			
6907	Verify	Declined	Can't Afford	Can't afford at this time	Yes	Spoke to owner on 3/8/19 explained program and benefits Wants to opt in asked to email agreement and addendum	Nothing in Cogsdale to show replaced on public
6911	Verify	Declined	Other	1. Lack of trust of PWSA per multiple historical issues and dealings 2 Paperwork only provides responsibility 30 days past replacement does not mention if contractor is insured/bonded (husband attorney read)			
6933	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
6938	Verify	Declined	Private Side Non-Lead	The service line was replaced in 2018		PWSA SIDE IS LEAD LEAK IS ON WIPE JOINT FLIPPED TO BRILLIANT ON TEMP FROM 6940 NEW 3/4" COPPER LINE FROM METER TO CS IS INSTALLED 10-19-18 MCDONAGH	
6939	Verify	Declined	Private Side Non-Lead	Line from street to my house were changed in 1977	No		Received Accepted Agreement While checking Cogsdale for this property shows that 6938 Bishop replaced on Public 10/18/18
1145	Verify	Declined	Private Side Non-Lead	See attached letter and documentation In Feb 2011 a leak was detected on my water line I had insurance through PWSA Vortex Plumbing was the PWSA contractor who replaced my water line	No		Nothing in Cogsdale to show replaced on public
1417	Verify	Declined	Blank		Yes	Owner under the impression there would be cost to her Explained how the program works and if she is not happy with how they will do replacement at coordination she can still opt out Will opt in will send agreement 12/27	Nothing in Cogsdale to show replaced on public
1419	Verify	Declined	Private Side Non-Lead	My service line to home is copper			Nothing in Cogsdale to show replaced on public
1619	Verify	Declined	Private Side Non-Lead	I spent 15k to replace my private line 10 years ago			
1816	Verify	Declined	Private Side Non-Lead	PWSA replaced the line from main to curb/my husband replaced the line from the curb to the house with copper.			Nothing in Cogsdale to show replaced on public
1931	Verify	Declined	Private Side Non-Lead	By my great grandfather Salvatore C a 1929 inspection done Nov 16th 1929 confirmed copper lineWe do not have lead lines. Inconvenient NOT NEEDED.	Yes	Customer called in for a 3rd time to lead help desk about not wanting us to do a replacement on her property	Nothing in Cogsdale to show replaced on public
1802-08	Verify	Declined	Private Side Non-Lead	Property was redeveloped in 2018. All water lines were replaced	No		Nothing in Cogsdale to show replaced on public
1016	Verify	Declined	Private Side Non-Lead	Verbal Opt Out - Lines have been replaced		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
1019	Verify	Declined	Can't Afford	We can not afford to pay any damage to property,walls, lawn or replace lawn if necessary			Nothing in Cogsdale to show replaced on public
1173	Verify	Declined	Private Side Non-Lead	Private line was replaced 2015. But please contact if any issues are unresolved.	No		Nothing in Cogsdale to show replaced on public
1208	Verify	Declined	Private Side Non-Lead	My section of the line was replaced with plastic in 2012	No		Nothing in Cogsdale to show replaced on public
1217	Verify	Declined	Private Side Non-Lead	Already replaced along with sewer line	No		Nothing in Cogsdale to show replaced on public
1418	Verify	Declined	Private Side Non-Lead	We replaced the line last September 2018 because line was leaking	No		Aug 2018 water was shut off for waste of water. Nothing in cogsdae to show we replaced the public
1441		Declined	Private Side Non-Lead	I replaced my line with a copper line years ago	No		Nothing in Cogsdale to show replaced on public
1620	Verify	Declined	Can't Afford	Cannot afford to take time off to let people into the house & have two dogs Do not want disruption			Nothing in Cogsdale to show replaced on public
1625	Verify	Declined	Private Side Non-Lead	The water line from curb box to my house was replaced in 2013 along with a newmeter, shut off valve & backflow tank (Additional info in GIS)	No	Per Cogsdale 12/2013 Private side had a leak Nothing in Cogsdale to show replaced on public Called in to LHD 3/14 and said is going to opt back in	Nothing in Cogsdale to show replaced on public
1670	Verify	Declined	Private Side Non-Lead	My water line was replaced years ago when I lived here	No		Nothing in Cogsdale to show replaced on public
1719	Verify	Declined	Can't Afford	I am a senior on low income would not be able to make any possible repairs or pay any possible repairs			
1720	Verify	Declined	Private Side Non-Lead	I had my private water line replaced in 2017	No	March 2017 homeowner had a leak on their side according to Cogsdale	
6905	Verify	Declined	Concerned about Impacts	That there may be damage to my property	Yes	Left Mssg concerning decline LSLR 12/31/18	
6916	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
1623	Verify	Declined	Private Side Non-Lead	We replaced the private side line to the house 25 years ago with flexible copper pipe!!! I also have used the lead test kit this summer. We have a undetectable amount according to the test results.	No		Nothing in Cogsdale to show replaced on public
3709	Verify	Declined	Private Side Non-Lead	I have a copper water line coming into my house			Nothing in Cogsdale to show replaced on public
3822	Verify	Declined	Other	Does not want line replaced Refused to sign agreement		Msgg left to return agreement 2/13 Verbal Opt out taken by Lead Help Desk 2/18/19	Nothing in Cogsdale to show replaced on public
3830	Verify	Declined	Can't Afford	Afraid of possible financial responsibilities		2nd door hanger 2/18 Verbal opt out taken by LHD Declined CEP & URA info	Nothing in Cogsdale to show replaced on public
105	Verify	Declined	Private Side Non-Lead	Stated Private line replaced	No	Per Cogsdale Leak marked over 6" main Leak repaired, new service curb to main (Mason, Evans, Leckie 05/27/14).	
40	Verify	Declined	Other	My private water line is not lead, its galvonized iron	Yes	No answer No answer Machine 12/21 On 1/7/19 customer called in and spoke to Lead Help Desk and tried to convince him into opting in and he still declined	Nothing in Cogsdale to show replaced on public
3444	Verify	Declined	Private Side Non-Lead	Privately owned portion of service line has already been replaced (appox 2004) (existing valve & PWSA service line is lead)	No		Nothing in Cogsdale to show replaced on public
2714	Verify	Declined	Private Side Non-Lead	Copper on private side		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
100	Verify	Declined	Concerned about Impacts	Just replaced steps and walls with landscaping for a total of $20,000-water filter is cheap to replace and repair			
300	Verify	Declined	Private Side Non-Lead	Replaced private side 2 years ago	No	Verbal Opt out taken by Lead Help Desk	on Customer side 2014 but nothing showing public repl
304	Verify	Declined	Private Side Non-Lead	We have had the lead supply line from the curb box to our meter replaced	No		Nothing in Cogsdale to show replaced on public
123	Verify	Declined	Other	Property Vacant and should be condemned. Lots of damage		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
3720	Verify	Declined	Other	Personal reasons		Collected agreement in the field Wife unable to sign husband signed while she was sitting there	Nothing in Cogsdale to show replaced on public
3732	Verify	Declined	Can't Afford	Am not financially able to pay additional cost	Yes	Called and spoke to owner explained LSLR program Decided will opt in Sent another agreement 1/28/19	Nothing in Cogsdale to show replaced on public
3736	Verify	Declined	Private Side Non-Lead	We have copper pipes in house	No		Nothing in Cogsdale to show replaced on public
3818	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist 12/20/18 Owner returned call said she declined because she doesn't want anyone in her home She said she had someone work in her basement before and she had to sue them she doesn't want to go thru it again Advised of coordination and how they can explain what all would or could be impacted she said once again she doesnt want us in her home 1/3/19	Nothing in Cogsdale to show replaced on public

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow-up	Comments	Additional Notes
2637	Verify	Declined	Private Side Non-Lead	Replaced private side of service line		Offered to collect agreement while canvassing by LHD Declined Gave Verbal Opt out to LHD	PWSA made repair to small leak on public 10/201. Customer replaced there lead line
3825	Verify	Declined	Other	Liaison canvassed/Received verbal opt out refused to sign		Noted to account by Lead Help Desk	Nothing in Cogsdale to show replaced on public
3845	Verify	Declined	Other	I Drink Bottled Water			Nothing in Cogsdale to show replaced on public
416	Verify	Declined	Private Side Non-Lead	In the early 80's I had my lead line replaced with copper from the curb box to the meter			Nothing in Cogsdale to show replaced on public
417	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist. 12/20/18	Nothing in Cogsdale to show replaced on public
419	Verify	Declined	Private Side Non-Lead	Has copper		Verbal Opt out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
135	Verify	Declined	Can't Afford	I have a retaining wall. I don't want to replace it because it would cost to much to replaces I don't want my property damage it might cost too much to repair	Yes	Called owner explained to have coordination first and Let contractor explain how they would do replacement and of not satisfied can decline at coordination customer happy with this option will opt in sent new agreement. 12/27	Received Accepted Agreement
425	Verify	Declined	Can't Afford	Too old. On social security. Can't afford incidentials like landscaping etc.	Yes	Explained process and how he can still opt out after coordination if not happy with info given. He has a wa9 concerned about and Said he is 78 and received CBI letter that he is non-lead so he really doesn't want it now 12/20/18	Nothing in Cogsdale to show replaced on public
2629	Verify	Declined	Other	Because I can No further comments			Nothing in Cogsdale to show replaced on public
362	Verify	Declined	Other	Customer's note stated:"Private lead line replacement would involve some work inside my house. The homeowner would be somewhat responsible for making certain areas accessible I live alone and am 92 years old and not able to get around as before and wou d not be much help. I have lived here since 1985 and drink alot of water (not bottled) tap water"			Nothing in Cogsdale to show replaced on public
2810	Verify	Declined	Other	Lack of Confidence in PWSA			Nothing in Cogsdale to show replaced on public
2837	Verify	Declined	Private Side Non-Lead	A New 3/4" service line was installed at this property		Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
3036	Verify	Declined	Other	Personal			Nothing in Cogsdale to show replaced on public
3232	Verify	Declined	Concerned about impacts	Just re-landscaped my yard			Nothing in Cogsdale to show replaced on public
3330	Verify	Declined	Private Side Non-Lead	Replaced w/ copper 2008			Nothing in Cogsdale to show replaced on public
3606	Verify	Declined	Concerned about impacts	Do not want to tear up property. We are too old to start project	No	Historical records show Copper since 1959 on private side	Nothing in Cogsdale to show replaced on public
3624	Verify	Declined	Private Side Non-Lead	This house water line was already replaced by owner few years ago.			Nothing in Cogsdale to show replaced on public
3830	Verify	Declined	Other	Lack of Confidence in PWSA			Nothing in Cogsdale to show replaced on public
3955	Verify	Declined	Can't Afford	I live on an fixed income & may not have funds to finish work of concrete sidewalks and steps etc.	Yes	Left detailed VM 12/20/18	Received Accepted Agreement
3959	Verify	Declined	Private Side Non-Lead	Water line replaced 3 yrs ago from curb box to home	No		Nothing in Cogsdale to show replaced on public
321	Verify	Declined	Private Side Non-Lead	Had lines replaced about 20 years ago with copper	No		Nothing in Cogsdale to show replaced on public
11	Verify	Declined	Private Side Non-Lead	I replaced my water line a few years ago	No	In Cogsdale 10/2016 verified leak on private side. Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
2703	Verify	Declined	Other	Moving			Nothing in Cogsdale to show replaced on public
2800	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
127	Verify	Declined	Private Side Non-Lead	I already have copper lines			Nothing in Cogsdale to show replaced on public
430	Verify	Declined	Private Side Non-Lead	The private service line at 430 Venture has already been replaced (also gas line are new)	No		Nothing in Cogsdale to show replaced on public
2815	Verify	Declined	Other	Said wants to opt out while canvassing. Refused to sign		Canvassed 2/25 Verbal Opt out canvassing	Nothing in Cogsdale to show replaced on public
6723	Verify	Declined	Private Side Non-Lead	Was already replaced	No		Nothing in Cogsdale to show replaced on public
6819	Verify	Declined	Other	Water Shut Off Rehab Property	Yes	Called after receiving decline agreement. Wanted to explain the LSLR program. said he just lost his baby sister and it is too much for him to think about. he will call back if he decides to do it . 1/28/19	Nothing in Cogsdale to show replaced on public
7010	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
7111	Verify	Declined	Other	Admin Opt Out 1/10/19 Owner Deceased no POA on File	Yes	Called Dorothy opted in but she is not the owner. Owner is deceased. She said she is common law wife Not executor of estate. No paperwork. Her status was changed By Lead Help desk to Opt out	9/22/2016 Contractor hit unmarked service line.
7210	Verify	Declined	Private Side Non-Lead	Line Already Replace			Nothing in Cogsdale to show replaced on public
7058	Verify	Declined	Private Side Non-Lead	My Private line has been replaced with copper pipes	No		Nothing in Cogsdale to show replaced on public
6854	Verify	Declined	Other	Canvassed area. Verbal Opt out Refused to sign		Canvassed 1/22. Verbal Opt out canvassing	Nothing in Cogsdale to show replaced on public
7125	Verify	Declined	Private Side Non-Lead	My Private & PWSA Service lines are copper	No	Per Cogsdale 12/2013 Private side had a leak. Nothing in Cogsdale to show replaced on public.	Nothing in Cogsdale to show replaced on public
7154	Verify	Declined	Private Side Non-Lead	Private side may have been replaced			Nothing in Cogsdale to show replaced on public
705	Verify	Declined	Blank		No	Per notes in Cogsdale Owner had a leak on private side Roto Rooter called Lead Help Desk 12/17 and information was sent to Ops for replacement on public side	
539	Verify	Declined	Private Side Non-Lead	Canvassed area private side copper		Area canvassed owner gave verbal opt out	Nothing in Cogsdale to show replaced on public
1461	Verify	Declined	Other	Property Vacant water Turned off	No	Vacant	Nothing in Cogsdale to show replaced on public
7208	Verify	Declined	Private Side Non-Lead	Said doesn't have lead lines		LHD called and owner gave a verbal opt out	Nothing in Cogsdale to show replaced on public
6641	Verify	Declined	Private Side Non-Lead	Line replaced already 7-8 years ago		LHD called and owner gave a verbal opt out	Nothing in Cogsdale to show replaced on public
7029	Verify	Declined	Other	Verbally opted out said city is supposed to tear down		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
7319	Verify	Declined	Private Side Non-Lead	I decline; we do not have lead in our house	No		Nothing in Cogsdale to show replaced on public
275	Verify	Declined	Private Side Non-Lead	I have a 3/4" copper line from curb box to house.	No		Nothing in Cogsdale to show replaced on public
349	Verify	Declined	Other	N/A			Nothing in Cogsdale to show replaced on public
426	Verify	Declined	Private Side Non-Lead	I have copper lines coming into my house			Nothing in Cogsdale to show replaced on public
473	Verify	Declined	Private Side Non-Lead	Copper line Verbal opt out		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
502	Verify	Declined	Private Side Non-Lead	I have copper lines coming into my house			Nothing in Cogsdale to show replaced on public
516	Verify	Declined	Private Side Non-Lead	When my husband was alive he had all the pipes underground replaced-the city replaced a pipe at that time in the front street	No		Nothing in Cogsdale to show replaced on public
230	Verify	Declined	Private Side Non-Lead	New Line Installed November 2005 Please See Attached Drawing	No		Nothing in Cogsdale to show replaced on public
212	Verify	Declined	Private Side Non-Lead	Replaced my portion of service line in Oct/ 2015	No		Nothing in Cogsdale to show replaced on public
980	Verify	Declined	Other	I received a notice from you saying an inspection of my line shows no lead pipes	Yes	Called phone on account. The number was for the old owner. Advised me as a courtesy, if he can find new owner info he will shoot him an email. To contact us 1/7	Nothing in Cogsdale to show replaced on public
354	Verify	Declined	Private Side Non-Lead	The house was just built and therefor there is no lead piping	No	According to Allegheny County Real Estate Built 2015 (this may be new development)	
438	Verify	Declined	Private Side Non-Lead	house new construction No lead piping	No	According to Allegheny County Real Estate Built 2016 (this may be new development)	
476	Verify	Declined	Private Side Non-Lead	My home was built in 2017. Water Lines are built to modern standards - no lead pipes	No	According to Allegheny County Real Estate Built 2017 (this may be new development)	
123	Verify	Declined	Private Side Non-Lead	Replaced my side with copper 2 years ago.			In Cogsdale shows customer had a service leak on their side nothing showing public replaced
215	Verify	Declined	Private Side Non-Lead	Lead Line was replaces with 3/4 copper line from curbstop to meter about 27 years ago			Nothing in Cogsdale to show replaced on public

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
255	Verify	Declined	Sample Results	Testing shows no lead level in water at home	Yes	Spoke to Owner advised her that shows lead on private and asked if she recently changed line Said no Explained the process & coordination She said she is convinced and will opt in. Sent out new agreement 12/27	Received Accepted Agreement
357	Verify	Declined	Private Side Non-Lead	Customer has copper service line			Nothing in Cogsdale to show replaced on public
358	Verify	Declined	Private Side Non-Lead	Had my water line replaced in 77-79, with Copper. Box to main to house.	No		Nothing in Cogsdale to show replaced on public
389	Verify	Declined	Can't Afford	House very old , built in1890 , on fixed income and money is very tight.	Yes	Left Msg concerning decline LSLR 12/20/18	Nothing in Cogsdale to show replaced on public
313	Verify	Declined	Can't Afford	Cannot incur any additional costs	Yes	Left detailed VM about opting in 12/20/18	Nothing in Cogsdale to show replaced on public
1731	Verify	Declined	Private Side Non-Lead	I replaced a copper line in 2015/2016 PWSA should reimburse.			Nothing in Cogsdale to show replaced on public
18	Verify	Declined	Private Side Non-Lead	New Construction. New Water service to be installed later	No	This was vacant land/new construction	Nothing in Cogsdale to show replaced on public
43	Verify	Declined	Private Side Non-Lead	My side already replaced			Nothing in Cogsdale to show replaced on public
51	Verify	Declined	Private Side Non-Lead	We replaced our house and water line in 1991			Nothing in Cogsdale to show replaced on public
243	Verify	Declined	Other	LHD called owner gave verbal opt out did not want to hear about program when they tried to explain		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
247	Verify	Declined	Other	1. It is unnecessary. I am70 years old and do not have lead poisoning, nor do I know anyone living in the city who does. 2. I dont want to pay to do the repairs that will result from the replacement.	No	Historical records show Copper since 1952 on private side	Nothing in Cogsdale to show replaced on public
253	Verify	Declined	Can't Afford	First of all I am on a fixed income our home is on the high side of our St. We have a 20 foot city block wall Utilities go underneath that wall It would cause us a fortune The gas,sewer line and water line are extremely close to each other	No		Nothing in Cogsdale to show replaced on public
280	Verify	Declined	Private Side Non-Lead	Private portion of line leading to house is copper	No		Nothing in Cogsdale to show replaced on public
285	Verify	Declined	Can't Afford	Too Costly	Yes	Explained process and how she can still opt out after coordination Customer said great, will opt-in will send another agreement 12/20/18	Nothing in Cogsdale to show replaced on public
335	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist.12/20/18	Nothing in Cogsdale to show replaced on public
429	Verify	Declined	Private Side Non-Lead	Attached Letter explaining Private and Public side replaced 8-10years ago	no		Nothing in Cogsdale to show replaced on public
122	Verify	Declined	Can't Afford	Live on fixed income - if damages occur I can't afford the expense	Yes	Left detailed Msg about opting in 12/20/18	Nothing in Cogsdale to show replaced on public
202	No Action	Declined	Private Side Non-Lead	Have copper lines inside house	No	The site action for this property is No Action. Changed to Not Required	Not Required
305	Verify	Declined	Private Side Non-Lead	My Line is Copper			Nothing in Cogsdale to show replaced on public
436	Verify	Declined	Private Side Non-Lead	Private side done 10yrs ago		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
464	Verify	Declined	Can't Afford	cost to repair wall makes this prohibitive	Yes	Explained process and how he can still opt out after coordination Customer would like to opt-in will send another agreement 12/20/18	Nothing in Cogsdale to show replaced on public
246	Verify	Declined	Private Side Non-Lead	Private side was already replaced			Nothing in Cogsdale to show replaced on public
234	Verify	Declined	Private Side Non-Lead	Service line replaced in 2002		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
315	Verify	Declined	Other	LHD called Customer not interested in replacement		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
267	Verify	Declined	Private Side Non-Lead	Line replaced in 2015 new from street into budding	No	In cogsdale 265 Republic "15" main collapsed Need to replace +/- 10' main" Nothing to refer service lince for 267 was replaced from main to curb box.	Nothing in Cogsdale to show replaced on public
200	Verify	Declined	Private Side Non-Lead	Replaced lead with copper from curb box to house.	No		Nothing in Cogsdale to show replaced on public
290	Verify	Declined	Other	LHD called customer not happy, opted out of program		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
250	Verify	Declined	Private Side Non-Lead	The customer side has been replaced		Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
258	Verify	Declined	Private Side Non-Lead	copper from street into house	No	Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
312	Verify	Declined	Private Side Non-Lead	It has been determined our line is copper.			Nothing in Cogsdale to show replaced on public
23	Verify	Declined	Other	Damage that I'll have to repair. Don't believe line to meter is lead due to age of building	Yes	Owner he was worned about having to go thru his steps and them being torn down explained coordination and possible tranch-less method. Advise to have coordination and see how the replacement would take place if does not agree with how they would replace can opt out. He will resign agreement 12/27	Received Accepted Agreement
52	Verify	Declined	Private Side Non-Lead	Has been changed with sidewalk (copper).	No		Nothing in Cogsdale to show replaced on public
95	Verify	Declined	Private Side Non-Lead	Had pipes in yard replaced about 7 years ago we have no lead in our water. Terry's Plumbing	No		Nothing in Cogsdale to show replaced on public
519	Verify	Declined	Private Side Non-Lead	Line Replaced with 25 yrs ago	No		Nothing in Cogsdale to show replaced on public
203	Verify	Declined	Private Side Non-Lead	It has already been replaced	No		Nothing in Cogsdale to show replaced on public
256	Verify	Declined	Private Side Non-Lead	New coper lines installed			Nothing in Cogsdale to show replaced on public
305	Verify	Declined	Blank				
316	Verify	Declined	Can't Afford	I have lived here for 45 yrs, my kids are all grown, it would be too expensive	Yes	Left Msg concerning decline LSLR 12/20/18	Nothing in Cogsdale to show replaced on public
329	Verify	Declined	Private Side Non-Lead	Several Years ago I replaced water lined from street meter to my house			Nothing in Cogsdale to show replaced on public
338	Verify	Declined	Concerned about impacts	My cost to replace my sidewalk and driveway $11,000 I recently had my sidewalk & and driveway replaced with mesh to enhance the strength of the driveway. There is no way that your replacement would be comparable Also my family lived at this address for 62 years and my mother drank the water for 62 yrs and died at 95 That doesnt sound like she ingested a lot lead	No	Historical records show Copper since 1956 on private side	Nothing in Cogsdale to show replaced on public
353	Verify	Declined	Private Side Non-Lead	Home Built in 2016 without a lead private water line			Nothing in Cogsdale to show replaced on public
443	Verify	Declined	Private Side Non-Lead	New property/construction	No	According to Allegheny County Real Estate Built 2013 (this may be new development) In Cogsdale 443, 445 and 447 a order was put in to drill 1in ferrule for each address 11/2012)	
2	Verify	Declined	Private Side Non-Lead	The line was replaced with copper 15 years ago. From meter to curb.			Nothing in Cogsdale to show replaced on public
303	Verify	Declined	Can't Afford	Don't have funds for damages or repairs	Yes	Left VM to find out why declined and how we could assist.12/31/18. Spoke to owner explained how LSLR work and coordination appt. She said she would like to opt in aware of she is not in agreement at the coordination she can still opt out 1/2/19	Received Accepted Agreement
403	Verify	Declined	Other	2/4/19 Canvassed area with Bill L. Collected agreement. Signed initials Said he doesnt want anything else to do with it and told me to fill out the rest. And slam the door.			Nothing in Cogsdale to show replaced on public
61	Verify	Declined	Private Side Non-Lead	Copper pipes already			Nothing in Cogsdale to show replaced on public
1227	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
1845	Verify	Declined	Private Side Non-Lead	Water Line replaced in Oct 2015 See attached sheet	No	In Cogsdale does show repairs on private side Nothing saying replacement on public.	Nothing in Cogsdale to show replaced on public
1904	Verify	Declined	Private Side Non-Lead	I have a copper line)			Nothing in Cogsdale to show replaced on public
919	Verify	Declined	Private Side Non-Lead	We had new water lines put in a few years back	No		Nothing in Cogsdale to show replaced on public
1600	Verify	Declined	Private Side Non-Lead	New 3/4" copper line installed years ago			Nothing in Cogsdale to show replaced on public
964	Verify	Declined	Private Side Non-Lead	Private Side Copper			Nothing in Cogsdale to show replaced on public
972	Verify	Declined	Private Side Non-Lead	Already replaced			Nothing in Cogsdale to show replaced on public

Community Lead Response
Opt-Out Database

Appendix C

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow-up	Comments	Additional Notes
1110	Verify	Declined	Concerned about Impacts	Don't Want Property Messed Up.			Nothing in Cogsdale to show replaced on public
615	Verify	Declined	Other	any damage done to my property PGH2o will be held responsible	Yes	Called because received agreement to decline. Wanted to explained LSLR more. Line was busy called twice. 1/24/19	Nothing in Cogsdale to show replaced on public
816	Verify	Declined	Private Side Non-Lead	Already Replaced. Replaced	No		Nothing in Cogsdale to show replaced on public
708	Verify	Declined	Private Side Non-Lead	Private Lead line replacement was completed when home was purchased			Nothing in Cogsdale to show replaced on public
724	Verify	Declined	Blank		Yes	Owner said its cost too much and he has a tenant, told tenant to use water filter. Explained program said to resend agreement by email 12/20.	Received Accepted Agreement
904	Verify	Declined	Private Side Non-Lead	Already Replaced line.	Yes	Collected Agreement in the field. Owner said he replaced it. Said the sewer line collapsed has both replaced	Nothing in Cogsdale to show replaced on public
949	Verify	Declined	Private Side Non-Lead	My private water line is copper pipes.	No		Nothing in Cogsdale to show replaced on public
30	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist. 12/21/18	Nothing in Cogsdale to show replaced on public
23	Verify	Declined	Concerned about Impacts	I don't want my yard nd house torn up. I cant afford any unforseen problems. I'll stay as I am. Thank you			
1929	Verify	Declined	Other	Customar called in irrate 3x 's saying he doesn't want to be bothered or nothing from PWSA. Stop calling.		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
850	Verify	Declined	Private Side Non-Lead	Opt-out via email Private Side Replaced	No		Nothing in Cogsdale to show replaced on public
729	Verify	Declined	Private Side Non-Lead	Copper put into whole house 10 years ago. Latest test shows no lead	No		Nothing in Cogsdale to show replaced on public
836	Verify	Declined	Blank		Yes	Called and asked reason of decline said 82yrs old and there is nothing wrong with his water. The lady from Michigan cost the city a lot of money and if we come to he his house he is going to tell us to get out of here 12/21	Nothing in Cogsdale to show replaced on public
921	Verify	Declined	Private Side Non-Lead	I found out that the line on the house side on in is not lead it was changed a while ago			Nothing in Cogsdale to show replaced on public
20	Verify	Declined	Private Side Non-Lead	My line has been replaced w/ copper			Nothing in Cogsdale to show replaced on public
826	Verify	Declined	Private Side Non-Lead	After a fire in 1995 my house was completely rebuilt. My privately owned service line is not lead. I have copper pipes from the curb.	No		Nothing in Cogsdale to show replaced on public
1022	Verify	Declined	Private Side Non-Lead	I have a copper line)			Nothing in Cogsdale to show replaced on public
980	Verify	Declined	Private Side Non-Lead	I have copper to my house			Nothing in Cogsdale to show replaced on public
55	Verify	Declined	Other	I would rather have my water line tied to Roscoe Steet instead of Baldauf Street	Yes	Tried to explained how the LSLR works when she said she cannot afford it. Not sure she is really understanding. She said she uses water filter and said thanks for understanding, she had more focus of where the water line is coming in at . ON GIS looks like she is tied in to Roscoe 1/3/19	Received Accepted Agreement
2359	Verify	Declined	Private Side Non-Lead	Service line already replaced	No		Nothing in Cogsdale to show replaced on public
2361	Verify	Declined	Private Side Non-Lead	Already replace service line			Nothing in Cogsdale to show replaced on public
2603	Verify	Declined	Blank		Yes	Said there property is old. Said they already get water in basement and cannot take on the cost if has problems in the future. Said they tested no detect and use water pictures. Also commented on neighbor they take care of at 2605. 12/21	Nothing in Cogsdale to show replaced on public
2605	Verify	Declined	Concerned about Impacts	Can't handle clean-up foundation not good	No	Neighbor at 2603 said they take of Mrs Kowalewski and she is 85 yrs old. Said her front yard is sinking in and the contractor said it would 40,000 to fix. Said she doesn't heve much longer. 12/21	Nothing in Cogsdale to show replaced on public
2666	Verify	Declined	Can't Afford	Can not afford to fix damages that you may cause on my property			Nothing in Cogsdale to show replaced on public
1917	Verify	Declined	Blank		Yes	Left VM to find out why declined and how we could assist. 12/21/18	Nothing in Cogsdale to show replaced on public
34	Verify	Declined	Private Side Non-Lead	Water Line was replaced 5 years ago	No		Nothing in Cogsdale to show replaced on public
939	Verify	Declined	Concerned about Impacts	Liaison canvassed area owner refused to sign agreement. Verbal Opt-Out. Said PWSA main broke ~10 years ago and flooded Basement. Said PWSA repaired main but public/private service materials unknown		Area canvassed owner gave verbal opt out	Nothing in Cogsdale to show replaced on public
1123	Verify	Declined	Other	Homeowner calledstated that his grandfather purchased the house in 1898 and he has been living in it for 83 years		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
209	Verify	Declined	Private Side Non-Lead	Its been replaced	No	In Cogsdale 1 11/2018 shows 6" CRACK. (On Main)INSTALLED A SIX INCH STAINLESS. But nothing to show line replacement	Nothing in Cogsdale to show replaced on public
126	Verify	Declined	Private Side Non-Lead	We have replaced private line with copper			
111	Verify	Declined	Private Side Non-Lead	Since 1980 everything has been replaced	No	Historical show private is Copper. Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
618	Verify	Declined	Private Side Non-Lead	We had our water lines replaced a few years ago due to a leak			Nothing in cogsdale to show replaced on public
840	Verify	Declined	Private Side Non-Lead	Lead Line Replaced With Brass Over 10 Yrs Ago			Nothing in cogsdale to show replaced on public
903	Verify	Declined	Private Side Non-Lead	We had the line replaced in January 2017(see attached invoice) We would like to be reimbursed for the cost of replacement.	No	Leak on Homeowners sied was reported 1/2017 in Cogsdale but nothing to show public side was replaced	Nothing in cogsdale to show replaced on public
2701	Verify	Declined	Can't Afford	My wife & I's age and potential cost.			Nothing in Cogsdale to show replaced on public
2725	Verify	Declined	Private Side Non-Lead	Our sude of the line was replaced by copper pipe in 1998	No		Nothing in Cogsdale to show replaced on public
2786	Verify	Declined	Private Side Non-Lead	OPT-OUT city side copper due to leak 3/20/17 owner did private side later in year	No	Per John Mcarthy: DUG CURB, COPPER ON CITY SIDE. LEAD ON HOMEOWNERS SIDE 244- FORESTER - HUBER 3/17/17	Unsure is this was verbal or by email
2838	Verify	Declined	Other	There is no lead in the house			Nothing in Cogsdale to show replaced on public
2877	Verify	Declined	Sample Results	1. Water tested below risk recently 2. No help from PWSA restoring any mess caused by contractors	Yes	Left Msg concerning decline LSLR 12/27/18	Nothing in Cogsdale to show replaced on public
2965	Verify	Declined	Private Side Non-Lead	unnecessary (new construction)	No		Nothing in Cogsdale to show replaced on public
3061	Verify	Declined	Blank		Yes	Unable to leave message 12/21	
6373	Verify	Declined	Private Side Non-Lead	use my own contractor	No		Nothing in Cogsdale to show replaced on public
6307	Verify	Declined	Other	How will you do this when it is on my private property. PWSA does nothave consent to replace any lines on my property (addition statement on agreement)			Nothing in Cogsdale to show replaced on public
6361	Verify	Declined	Private Side Non-Lead	We own a new house build in 2004. The Builder said we have copper line and we don't have any lead lines. Please call me with any questions	No	According to Allegheny County Real Estate house built in 2005. Nothing in Cogsdale to show replaced on public	Nothing in Cogsdale to show replaced on public
6334	Verify	Declined	Other	I agree only to meet with PWSA to hear what the plan is & to learn why lead levels can increase!	Yes	LVM to explained we need an accepted agreement to coordinate 12/27. Owner called into LHD advised of agreement acceptance. Sent agreement to customer	Received Accepted Agreement
847	Verify	Declined	Private Side Non-Lead	Private Portion of line replaced with Copper			Nothing in Cogsdale to show replaced on public
909	Verify	Declined	Other	We're old (83 & 71) and house not marketable. We drink bottled water too. Also Representative (cousin) Linda Berry			Nothing in Cogsdale to show replaced on public
10	Verify	Declined	Private Side Non-Lead	Already replaced w/ copper. Happy to have you guys inspect!	No		Nothing in Cogsdale to show replaced on public
809	Verify	Declined	Private Side Non-Lead	My line from inside the house to the middle of the street was replaced Spring of 2008			Nothing in Cogsdale to show replaced on public
839	Verify	Declined	Private Side Non-Lead	had pipes replaced with copper a few years ago			Nothing in Cogsdale to show replaced on public

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow-up	Comments	Additional Notes
6441	Verify	Declined	Private Side Non-Lead	After a sewer backup several yrs ago. We had our lead water lines replaced between the street and the house	No		Nothing in Cogsdale to show replaced on public
725	Verify	Declined	Other	Could only sign agreement after inspection and clear work plan specified	Yes	Explained process and how he can still opt out after coordination if not happy with info given asked if can put the in the email of opt out option. Said will redo and opt in 12/20/18	Received Accepted Agreement
6510	Verify	Declined	Other	Declined via email owner not satisfied with terms of agreement.		Opt out taken Via email by Lead Help Desk	DUG AND RESE BOX KEY FINE. COPPER BOTH SIDES 242- FORESTER-COLAPITRO 3/8/17
858	Verify	Declined	Concerned about Impacts		Yes	Left vm to see why declined. 12/27. Owner called in spoke to someone at LHD and advised she read fine print and doesn't want to have to pay for wall or any damages after we leave that may incur still declining 12/27	Nothing in Cogsdale to show replaced on public
923	Verify	Declined	Private Side Non-Lead	I do not have lead lines The system part is not lead either.	No		Nothing in Cogsdale to show replaced on public
984	Verify	Declined	Blank		Yes	Called Spoke to owner thought there was a cost for replacement but said the cost wasnt listed on agreement and didn't want to have to unhook the washer and dryer. Will opt in sent another agreement 12/21	Nothing in Cogsdale to show replaced on public
4344	Verify	Declined	Other	I planned on using a water filter for drinking water.			Nothing in Cogsdale to show replaced on public
4326	Verify	Declined	Concerned about Impacts	Homeowner is declining because of the potential damage to the property. Coordinator will call the homeowner to explain the trenchless options .	Yes	Left Mssg concerning decline sending a new agreement to opt in so can have coordination LSLR 12/20/18. Called back would like to opt in sent agreement by email 12/20/18	Nothing in Cogsdale to show replaced on public
728	Verify	Declined	Other	Not Sure			Nothing in Cogsdale to show replaced on public
6486	Verify	Declined	Blank		Yes	Left mssg to find out why declined and how we could assist 12/21/18	Nothing in Cogsdale to show replaced on public
610	Verify	Declined	Private Side Non-Lead	5/8 Copper Already			Nothing in Cogsdale to show replaced on public
640	Verify	Declined	Other	Verbal Opt out		Verbal Opt Out taken by Lead Help Desk	Nothing in Cogsdale to show replaced on public
648	Verify	Declined	Private Side Non-Lead	I am declining replacement of the private portion of my water line as it was previous replaced by Matt Martz Plumbing in July 2018 (please see attached statement)	No		Nothing in Cogsdale to show replaced on public
773	Verify	Declined	Private Side Non-Lead	Water Line into House is Copper	No		Nothing in Cogsdale to show replaced on public
6413	Verify	Declined	Can't Afford	1. House is on Terrace and it would be a major disruption and expense to replaceand restore property Limited income 2. (m not going to be living here too much longer. (Full explaination in GIS)	No		Also Historical records show copper. Nothing in Cogsdale to show replaced on public
6417	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
924	Verify	Declined	Other	Taking care of husband he's been sick.			Nothing in Cogsdale to show replaced on public
6501	Verify	Declined	Other	I never find lead(pb) problem(above 15ppb) in my house water. As a matter of fact even if my private line is made by pb, it should be covered by thick deposit after so many years. I worked at PWSA as a chemist (more attached in GIS)			Nothing in Cogsdale to show replaced on public
6545	Verify	Declined	Other	Liability			Nothing in Cogsdale to show replaced on public
6589	Verify	Declined	Other	Reversed osmosis system two letters from lab "non found"	No	Came into front counter. Said he doesn't trust the city. Ever since he had a tree put in by the city and said it was messed up Doesn't trust anything the city has to do with.	Nothing in Cogsdale to show replaced on public
6611	Verify	Declined	Other	Have water filtering system installed for the entire house			Nothing in Cogsdale to show replaced on public
4261	Verify	Declined	Private Side Non-Lead	I replaced line from curb stop to water meter with copper pipe in 2017			Nothing in Cogsdale to show replaced on public
4349	Verify	Declined	Sample Results	We tested lead level and it was below 15. (It was 5)	Yes	Left Mssg concerning decline LSLR 12/27/18	Nothing in Cogsdale to show replaced on public
3157	Verify	Declined	Other	Not Necessary			Nothing in Cogsdale to show replaced on public
3163	Verify	Declined	Blank		Yes	Said she just doesnt want to. Cannot cover cost. she said the agreement says they are responsible for private. And that we have to come into her house explained we are paying for replacement,restoring sidewalk and back filling yard. said maybe at a later date explained we will no return at a later date said then she still doesn't want to. 12/21	Nothing in Cogsdale to show replaced on public
4303	Verify	Declined	Blank				Nothing in Cogsdale to show replaced on public
2702	Verify	Declined	Private Side Non-Lead	We are opting out because we just had the privately owned service line replaced(with copper) at the end of October 2018	No		Nothing in Cogsdale to show replaced on public
6347	Verify	Declined	Other	Not Necessary			
6357	Verify	Declined	Private Side Non-Lead	Was replaced line several years ago with copper pipe	No	Nothing in Cogsdale to show replaced on public	Received Accepted Agreement
2095	Verify	Declined	Private Side Non-Lead	We have copper lines	No		Nothing in Cogsdale to show replaced on public
1927	Verify	Declined	Can't Afford	I do not have the means to move washer, dryer or any obstacles in the way			Nothing in Cogsdale to show replaced on public
755	Verify	Declined	Other	Do I house I Public Part (Waste of Money)			Nothing in Cogsdale to show replaced on public
500	Verify	Declined	Other	Verbal Opt Out /Declined to Sign This is 2nd time in field.			Nothing in Cogsdale to show replaced on public
226	Verify	Declined	Private Side Non-Lead	In 2017 PWSA replaced LWSL. In 2018 I replaced LWSL from my property juncture to PWSA. Replacement of all lines completed	No	Per John Koller 9/2017 DUG AND RESET OX, STOP GOOD, COPPER ON BOTH SIDES. 9/7/17 wd 11 costa	
627	Verify	Declined	Private Side Non-Lead	Declined Via email Private side replaced w/ copper		Opt out taken Via email by Lead Help Desk	Nothing in Cogsdale to show replaced on public
651	Verify	Declined	Other	Canvassed area owner Verbally Declined. He refused to sign He said he willnot sign anything that has to do with the city. Bill asked several times he said No 3 times.	No	Canvassed area. owner Verbally Declined He refused to sign. He said he willnot sign anything that has to do with the city. Bill asked several times he said No 3 times.	Nothing in Cogsdale to show replaced on public
1221	Verify	Declined	Can't Afford	Can't afford at this time	Yes	Said had it replaced in 80's to copper. Reason for decline originally was can't afford. He doesn't care if we replace ours but there side is good 12/20/18	Nothing in Cogsdale to show replaced on public
413	Verify	Declined	Other	Personal reasons			Nothing in Cogsdale to show replaced public
429	Verify	Declined	Private Side Non-Lead	They dug up there side already and have copper.		Collected agreement in the field.	Nothing in Cogsdale to show replaced public
1900	Verify	Declined	Blank		Yes	Unable to leave message This is a store front unsure of how many units 12/21	Nothing in Cogsdale to show replaced public
1425	Verify	Declined	Private Side Non-Lead	New housing copper pipes at the time of construction	No	According to Allegheny County Real Estate house built in 2010.	Nothing in Cogsdale to show replaced public
1515	Verify	Declined	Private Side Non-Lead	Verbal Opt out Owner Reports property is New and CBI results stated non-lead. Request to be removed from Robo Call list		This verbal out was made via Lead Help Desk. When Canvassed aread was a brand new side walk where curb box was	Nothing in Cogsdale to show replaced on public
2225	Verify	Declined	Concerned about Impacts	We do not want our garden disturbed or the foundaton of our 200 year old home.			Nothing in Cogsdale to show replaced on public
12	Verify	Declined	Private Side Non-Lead	Lines are new to curb box from home - lead line to street replaced by water company			Nothing in Cogsdale to show replaced on public
2136	Verify	Declined	Other	After the criminal plumbing bill I refuse to grant access to my house to the health dept - EVER!	Yes	Left Mssg concerning decline for LSLR and to find out did he replace private because of Health dept inspecting work. 1/4/19	Nothing in Cogsdale to show replaced public
28	Verify	Declined	Other	Daughter states Mother died in August believes the home is going into forclosure and the daughter does not have anything to do with the property	No	Assuming this was a verbal opt out Unsure of date	Nothing in Cogsdale to show replaced on public
334	Verify	Declined	Private Side Non-Lead	In 1991 the lead service line @ this residence was removed and replaced with a non-lead line	No		Nothing in Cogsdale to show replaced on public

House Number	Site Action Required	Agreement Status	Reason for Decline	Agreement Notes	Lead Team Follow -up	Comments	Additional Notes
1430	Verify	Declined	Other	We don't know the whole cost of the replacement of the line We have a concrete porch in it's way"	Yes	Spoke to owner after receiving declined agreement Explained LSLR Program, advised if doesn't agree after coordination can still opt out said didnt understand and would like to opt in Sent in agreement. 1/28/19	Nothing in Cogsdale to show replaced public
745	Verify	Declined	Private Side Non-Lead	I have copper line	No	Collected agreement in the field Owner said he replaced it he doesn't need us doing his line he replaced in 2000 Cant we see that it has been done already when he remodeled?	Nothing in Cogsdale to show replaced public
20	Verify	Declined	Can't Afford	This is a old house and I can't afford to replace anything that goes wrong on my part. Won't be living here to many more years anyway will buy water for drinking and get filter.	Yes	Explained LSLR program and to have coordination first and let contractor explain how they would do replacement and of not satisfied can decline at coordination. Will opt in sent agreement 1/4/19	Nothing in Cogsdale to show replaced public
2586	Verify	Declined	Concerned about Impacts	Worried about Damage done to landscape	Yes	Left Mssg concerning decline LSLR 1/4/19	Nothing in Cogsdale to show replaced public
625	Verify	Declined	Other	Canvassed area Wife said she was not signing and they don't want anything done husband was present as well		Area canvassed owner gave verbal opt out	Nothing in Cogsdale to show replaced public
1118	Verify	Declined	Private Side Non-Lead	Mr Timothy called in and advised that he sent in his agreement to opt out and he stated this was sent in twice He stated that if we do not stop calling him, he will file harassment by communications charges against us I will put decline as a verbal opt out He stated his lines were replaced on the public side in 1970 with copper.	No	Called into Lead Help desk with Verbal Opt out	Nothing in Cogsdale to show replaced public
508	Verify	Declined	Private Side Non-Lead	My lines are copper own home since 1972 & they have been copper since.	No	Historical Records show private is copper since 1949 No records for public	Nothing in Cogsdale to show replaced public
1918	Verify	Declined	Private Side Non-Lead	Opted out w/ LHD over phone said he does not have lead	No	When canvassing in Jan & Feb noticed this is a new contruction property	Nothing in Cogsdale to show replaced public
1921	Verify	Declined	Private Side Non-Lead	Had the water line replaced 5 or 6 years ago	No		Nothing in Cogsdale to show replaced public
6	Verify	Declined	Blank		Yes	Unable to leave message 12/21	Nothing in Cogsdale to show replaced
2328	Verify	Declined	Private Side Non-Lead	Have copper pipes	No		Nothing in Cogsdale to show replaced on public
2014	Verify	Declined	Sample Results	We have had out water tested it showed no lead We do not want to be responsible for the large retaining wall in front of our home This wall belongs to the city not us			Nothing in Cogsdale to show replaced on public
2025	Verify	Declined	Private Side Non-Lead	Replaced previously	Yes	Collected out in Field Said both public and private are non-lead We explained LSLR program Said we dont need to do his side we can do whatever we need to on public.	Nothing in Cogsdale to show replaced
1958	Verify	Declined	Private Side Non-Lead	I installed a new 3/4" service line at this property			Nothing in Cogsdale to show replaced on public
1960	Verify	Declined	Private Side Non-Lead	1' installed a new 3/4" or 1" service line at this property			Nothing in Cogsdale to show replaced on public
1961	Verify	Declined	Private Side Non-Lead	Property has copper water line	No		Nothing in Cogsdale to show replaced on public
1962	Verify	Declined	Private Side Non-Lead	A new service line was installed			Nothing in Cogsdale to show replaced on public
1964	Verify	Declined	Private Side Non-Lead	1' installed a new 3/4" or 1" service line at this property			Nothing in Cogsdale to show replaced on public
1966	Verify	Declined	Private Side Non-Lead	A new 3/4 inch service line was installed			Nothing in Cogsdale to show replaced on public
2032	Verify	Declined	Private Side Non-Lead	A new 3/4 inch service line was installed			Nothing in Cogsdale to show replaced on public
522	Verify	Declined	Private Side Non-Lead	Line is copper			Nothing in Cogsdale to show replaced on public
111	Verify	Declined	Private Side Non-Lead	My line from curb to property was replaced in 2015	No	Per John Mcarthy in Cogsdale"NEW PLASTIC CURB TO MAIN 240- KIRK-FORESTER 10/5/15"	
2232	Verify	Declined	Private Side Non-Lead	The line was replaced in 2018			Nothing in Cogsdale to show replaced on public
6115	Verify	Declined	Private Side Non-Lead	lead lines were replaced a few years ago when dug up to fix a leak on property			

APPENDIX D

Other Documents

Allegheny Cty. Lead Task Force, Final Report & Recommendations (2017).....Appendix D, 1

Miguel A. Del Toral et al., Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study, 47 Envi. Sci. Technol. 9300 (2013)....Appendix D, 59

ALLEGHENY COUNTY LEAD TASK FORCE



December 2017

Final Report & Recommendations

A report commissioned by Allegheny County Executive Rich Fitzgerald

MESSAGE FROM THE LEAD TASK FORCE

County Executive Rich Fitzgerald,

In May of 2017, you commissioned the Lead Task Force and charged us with reviewing county data, examining potential policies, and reviewing strategies and literature related to childhood lead exposure in the county. The Task Force was asked to provide a report and recommendations related to lead sources in our environment.

Specifically, the Task Force was charged with the following:

- Review the current literature and speak with experts on sources of lead and the relative risks to the Allegheny County population
- Review available data to determine what we know and don't know relevant to childhood lead exposure in our county
- Review strategies for assessing the impact of universal lead screening
- Examine possible policies that protect the public from lead exposure
- Make recommendations for interventions and prevention of lead exposure

Since its inception, the Lead Task Force has met eight times and spoken with twenty experts, both national and local, to understand "best practices" for protecting the public's health, with a focus on primary prevention. We have also reviewed the literature and numerous research studies, and received recommendations from the public and parents.

Our recommendations are based on the best currently available science. Lead is a neurotoxin that can impact childhood development and cause numerous health problems. Lead levels in children have been significantly reduced nationally as well as within Allegheny County due to a variety of public policies aimed at removing lead from gasoline, paint and water pipes. However, given our county's legacy of industry, old housing stock, and lead pipes, the risk of lead exposure still remains and is preventable. The Flint water crisis has refocused nationwide efforts regarding lead exposure. Here in Allegheny County, several public drinking water systems have exceeded the action level set by the Environmental Protection Agency (EPA) Lead and Copper Rule (LCR), causing public concern and highlighting the risk of lead in drinking water. Lead in paint and dust remains a known hazard, particularly in our most disadvantaged neighborhoods. The legacy of pollution, gasoline use, and housing demolition has also impacted our soil.

Today, we must acknowledge that lead is ubiquitous in our environment. We must address the risk of exposure to this lead in all its forms using both primary prevention and post-exposure intervention strategies. We must also acknowledge lead exposure as a health equity issue that must be resolved. As the Centers for Disease Control and Prevention notes, there is no safe blood lead level in children. Preventing exposure and mitigating risk is critical to protecting our children's health. We agree with President Obama that it is important to avoid stigmatizing lead-exposed children to ensure that their future is not harmed by preconceived assumptions.

"We know now what we didn't know then, which is it can cause problems if children get exposed to lead at elevated levels. But the point is that as long as kids are getting good health care, and folks are paying attention, and they're getting a good education, and they have community support, and they're getting some good home training, and they are in a community that is loving and nurturing and thriving, these kids will be fine. And I don't want anybody to start thinking that somehow all the kids in Flint are going to have problems for the rest of their lives, because that's not true. That is not true. And I don't want that stigma to be established in the minds of kids" President Obama Flint Michigan, 2016.[1]

The Lead Task force is pleased to present this report to you with our recommendations on how best to protect the public's health. Primary prevention is imperative. Implementation of these recommendations will require cross-jurisdictional efforts, collaboration, and the engagement of multiple partners to achieve. Protecting our children's health and their future is paramount.

Thank you for this opportunity to serve the public's interest.

Signed:

The Allegheny County Lead Task Force

PATRICK DOWD, Ph.D.

Executive Director of Allies for Children

RICHARD FORD

City of Clairton Council Member

BERNARD D. GOLDSTEIN, M.D.

Emeritus Professor and former Dean of the Graduate School of Public Health at the University of Pittsburgh

KAREN HACKER, M.D., M.P.H

Director of Allegheny County Health Department

DEBORAH MOSS, M.D., M.P.H

Associate Professor of Pediatrics at University of Pittsburgh, Children's Hospital of Pittsburgh of UPMC Division of General Academic Pediatrics, and Pediatric Medical Director UPMC for You and Medical Director, UPMC for Kids

AMY G. NEVIN, M.D.

Pediatrician

VALERIE MCDONALD ROBERTS

Chief Urban Affairs Officer, Office of Mayor William Peduto

JEANNE M. VANBRIESEN, Ph.D., P.E.

Duquesne Light Company Professor of Civil and Environmental Engineering and the Director of the Center for Water Quality in Urban Environmental Systems (Water QUEST) at Carnegie Mellon University

SHARON WATKINS, Ph.D.

State Epidemiologist, Pennsylvania Department of Health

Table of Contents

Message from the Lead Task Force 2
Executive Summary 4
Introduction 8
Background 10
Brief History of Lead in the US and Allegheny County 10
Health Effects of Lead 11
Current Known Data on Childhood Lead Exposure in Allegheny County 14
Allegheny County Health Department (ACHD) Approach to Lead 15
Surveillance: How ACHD is Tracking Lead Exposure 15
Primary Prevention and Education 17
Interventions 17
Findings from Literature Review and Consultation with Experts 19
Residential Lead 19
Disclosure Laws 19
Water 20
Soil 22
Best Primary Prevention Strategies to Address Reduction of Residential Lead Exposure 24
Monitoring and Reporting Information on Exposure 26
Investigating Hazards 26
Education and Outreach 27
Recommendations 28
Paint, Dust, and Other Household Sources 29
Water 32
Soil 34
Alternative Sources 36
Monitoring and Reporting Information on Risk and Exposure 38
Investigation of Hazards 41
Public Awareness and Advocacy 43
References 45
Glossary 50

Executive Summary

Lead is a known neurotoxin and a serious threat to public health, particularly to our children. There is no safe lead level in children, and lead exposure from any source contributes to the lead burden for children. Blood lead levels, a measure of children's exposure, have declined steadily, both nationally and locally, as society has passed major legislation to reduce sources of exposure, including removing lead from gasoline, paint, and plumbing fixtures. However, historical use of lead means that existing sources remain a threat. Continued action is needed to eliminate harmful exposure to lead in our environment. In May 2017, The Honorable Rich Fitzgerald, Allegheny County Executive, commissioned a task force to review data on all sources of lead and provide a set of recommendations for further action.

The Task Force of nine members met regularly throughout the summer and fall of 2017. The Task Force reviewed the scientific literature, interviewed over 20 nationally-recognized and local experts, and obtained input from the public. They then compiled a set of recommendations related to major sources of lead including paint and dust, water, soil, and alternative sources.

The Task Force recognizes that while progress has been made to address lead exposure, the ubiquitous presence of lead in our environment from all known sources continues to represent a threat to human health. The Task Force concluded that both primary prevention (identifying and remediating hazards before children are affected) and intervention strategies (to address children who have experienced exposure) are required. However, only primary prevention will lead to a continuing overall reduction in childhood lead exposure and should, as such, be prioritized.

To address the environmental threat, the Lead Task Force developed a set of recommendations related to the leading sources of lead exposure in Allegheny County. Recommendations were also developed related to monitoring and reporting and related to education and outreach. Implementation of these recommendations will require cross-jurisdictional efforts, collaboration, and the engagement of multiple partners.

Eliminating harmful lead exposure is a long-term process. Protecting children will require the work of multiple agencies as well as individuals. Simple actions such as minimizing dust carried into the home from outside (e.g., leaving shoes at the door) and cleaning dust generated from painted surfaces inside (e.g., window sills and doors) can help reduce a child's potential exposure to lead. Water filters that remove lead can protect against lead in water if a home is serviced by lead pipes or contains lead fixtures. Universal blood level testing will help identify children who have been exposed to lead in their environment so that swift action can be taken to protect the child from further harm. Information on blood lead levels will assist all parties in better understanding where lead hazards are most prevalent and allow for improved targeted interventions.

The Lead Task Force developed a series of recommendations for eliminating harmful lead exposures in Allegheny County. The recommendations are split into four main categories: control sources of lead, monitor and report information on exposure, investigate hazards, and educate the public on community lead hazards.

The ultimate goal of each recommendation is to eliminate harmful exposures to lead. The Task Force recognizes that while there is no safe level of exposure to lead, complete elimination of all lead from the environment is impossible. The Task Force recommends working toward elimination of harmful human-made lead hazards and reducing human exposure to all forms of lead.

(Continued on page 6)

(Continued from page 5)

Recommendations are accompanied by additional information pertaining to the partners needed for full implementation, the resources required, the expected timeframe, and the challenges and opportunities inherent in each. This report is not intended to provide explicit policy directives, but to suggest areas that need consideration by many distinct stakeholders.

Recommendations

1. Paint, Dust and Other Household Sources

1.1 Increase the supply of a lead-safe/lead-free housing through a lead-safe, lead-free certification program.

1.2 Inform homeowners, housing providers and residents of lead hazards and lead exposure routes and provide information on opportunities and requirements for remediation.

1.3 Establish programs that financially support lead remediation.

1.4 Prioritize settings where children spend substantial portions of time.

1.5 Advocate for state and federal resources to support remediation of lead hazards in housing, child care facilities and schools.

1.6 Increase the number of lead-safe contractors by expanding training and certification programs.

2. Water

2.1 Reduce exposure to lead from water lines by decreasing the presence of lead containing plumbing materials (pipes, solder, fixtures).

2.2 Undertake short and medium-term strategies to minimize exposure.

2.3 Prioritize settings where children spend substantial portions of time.

2.4 Advocate for improved national standards.

3. Soil

3.1 Improve demolition standards and conformity to those standards.

3.2 Identify and remediate contaminated soil.

3.3 Support home owners and housing providers to test and remediate lead in soil.

(Continued on page 7)

Recommendations, continued

4. Alternative Sources

4.1 Identify and eliminate alternative sources of exposure to lead.

4.2 Identify high-risk occupations and hobbies and encourage appropriate lead-safe practices to protect workers and their families.

4.3 Advocate for additional federal regulations to identify and eliminate importation of lead containing items that pose risk to children.

5. Monitoring and Reporting Information on Risk and Exposure

5.1 Identify communities in the County with high-risk for lead exposure.

5.2 Enhance surveillance efforts to address actionable interventions.

5.3 Enhance Public Reporting.

6. Investigation of Hazards

6.1 Monitor changes to the Center for Disease Control and Prevention's (CDC) guidelines for management of elevated blood lead levels and adjust programming accordingly.

6.2 Conduct primary prevention investigations in homes based on risk factors (see recommendation for paint, dust and home hazards).

6.3 Provide linkage to resources for all children with elevated blood lead levels based on CDC guidelines.

7. Public Awareness and Advocacy

7.1 Reconstitute a community lead advisory committee such as the prior "Lead Safe Pittsburgh" organization as a countywide working group.

7.2 Expand education strategies particularly on the hazards of lead and strategies for remediation.

The report begins with a background section that describes a brief history of lead in the United States and in Allegheny County. A short overview of the health effects of lead follows. A summary of current known data on childhood lead exposure in Allegheny County along with a description of current activities of the Allegheny County Health Department related to lead is also included. The report then provides a full discussion of what was learned by the Task Force in each of the recommendation areas. This includes all the main sources as well as information on primary prevention policies, monitoring and reporting, investigation of hazards, and education and outreach. The report concludes with detailed information on the recommendations: goals and activities as well as information on partners required, timeline and challenges and opportunities.

Introduction

Lead is a known neurotoxin and a serious threat to public health, particularly to our children. There is no safe lead level in children, and lead exposure from any source contributes to the lead burden for children. Thus, it is critical that we eliminate harmful exposure to lead from all sources, including paint, soil and water. Blood lead levels in all children tested in Allegheny County have been trending downwards over the last several decades, but we still have work to do. Strategies must include primary prevention of lead exposures as well as interventions when exposures are detected. **Primary prevention** is focused on identifying and remediating lead hazards before a child is exposed. **Intervention** (also called secondary prevention) is focused on implementing measures after a child is identified as having an elevated blood lead level, indicating exposure.[2]

Lead comes from many sources including paint, dust, soil and water, as well as, less commonly, alternative sources such as toys and other consumer products. All sources pose a risk of exposure. Additional actions to further reduce and ultimately eliminate harmful exposure are required and should reflect evidence-based best practices. Only primary prevention will lead to a continuing overall reduction in childhood lead exposure.

On May 9, 2017, County Executive Rich Fitzgerald announced the formation of a Lead Task Force and charged its members with reviewing county data, examining potential policies, and reviewing literature, and assessing strategies related to childhood lead exposure in the county. He further directed that a report and recommendations be submitted within six months.

Specifically, the task force was charged with the following:

- Review the current literature and speak with experts on sources of lead and the relative risks to the Allegheny County population
- Review available data to determine what we know and don't know relevant to childhood lead exposure in our county
- Review strategies for assessing the impact of universal lead screening, should the recently-adopted Board of Health regulation become law
- Examine possible policies that protect the public from lead exposure
- Make recommendations for interventions and prevention of lead exposure

(Continued on page 9)

(Continued from page 8)

Nine members with expertise in various pertinent areas were appointed to the Task Force:

- **Patrick Dowd, Ph.D.,** Executive Director of Allies for Children
- **Richard Ford,** City of Clairton Council Member
- **Bernard D. Goldstein, M.D.,** Emeritus Professor and former Dean of the Graduate School of Public Health at the University of Pittsburgh
- **Karen Hacker, M.D., M.P.H.,** Director of Allegheny County Health Department
- **Deborah Moss, M.D., M.P.H.,** Associate Professor of Pediatrics at University of Pittsburgh, Children's Hospital of Pittsburgh of UPMC Division of General Academic Pediatrics, and Pediatric Medical Director UPMC for You and Medical Director, UPMC for Kids
- **Amy G. Nevin, M.D.,** Pediatrician
- **Valerie McDonald Roberts,** Chief Urban Affairs Officer, Office of Mayor William Peduto
- **Jeanne M. VanBriesen, Ph.D., P.E.,** Duquesne Light Company Professor of Civil and Environmental Engineering and the Director of the Center for Water Quality in Urban Environmental Systems (Water QUEST) at Carnegie Mellon University
- **Sharon Watkin, Ph.D.,** State Epidemiologist, Pennsylvania Department of Health

Over the course of their six-month engagement, the Task Force met eight times from May-November 2017. In addition to regular in person meetings, the Task Force engaged in multiple calls with leading experts and reviewed major national reports and peer-reviewed literature on lead exposure and lead risk. The steps the Task Force conducted included:

1. Reviewed the scientific literature and multiple national reports related to lead exposure and risk
2. Reviewed pertinent federal, state and local regulations in Allegheny County and in other municipalities throughout the U.S.
3. Interviewed over 20 nationally-recognized and local specialists in the field (Refer to Appendix 1 for a listing of all experts who were interviewed)
4. Reviewed and evaluated current and proposed policy and protocols implemented by the Allegheny County Department of Health.
5. Released a request for information from the public on August 30, 2017 and received two responses
6. Interviewed parents of children who had experienced lead exposure

The Task Force then developed a set of specific recommendations through a consensus approach, with review by members with specific content expertise. These recommendations were prepared for presentation to the County Executive.

Background

Brief History of Lead in the US and Allegheny County

Lead has been present in the United States in many different forms for hundreds of years including in gasoline, paint, pipes and for various industrial applications. Since the early 1970s, there have been significant policy decisions and legislation that have dramatically reduced exposure, as measured by the mean blood lead level observed in children.[3]

Lead has been used in paint for thousands of years. Adding lead creates a highly durable and washable paint, which was desirable for use as both an interior and exterior paint. In 1978, federal legislation removed lead from all residential paint, which protected new construction and renovation projects, but did not require removal of existing lead paint found in many homes and businesses. Pennsylvania ranks 4th in the U.S. for total housing units built before 1978.[4] In Allegheny County, more than 80% of homes were built prior to lead being removed from paint, and 41% of homes were built before 1950, when lead-based paint was used more frequently.[5] These homes can, and most likely do, still contain lead paint.

Lead can also be present in water when it is transported from water treatment facilities to homes through pipes that contain lead, or when it travels within the home through plumbing fixtures that contain lead. Lead is highly ductile and long-lasting. It was preferred for pipe materials for many years.[6,7] The Safe Drinking Water Act (SDWA) prohibits the "use of any pipe, any pipe or plumbing fitting or fixture, any solder, or any flux, after June 1986, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free."[8] Section 1417 of the SDWA originally established the definition for "lead free" as solder and flux with no more than 0.2% lead and pipes with no more than 8% lead. The rule was strengthened in 1996 to require plumbing fittings and fixtures (e.g. faucets used within households) to be "lead free" as well. In 2011, the Reduction of Lead in Drinking Water Act (RLDWA) revised the definition of lead free, reducing the allowable lead content from 8% to 0.25% in pipes and fixtures. Fixtures in non-potable uses were exempt (e.g. toilets, tub fillers); fire hydrants were later exempted as well. Due to these many changes, pipes and plumbing fixtures in current use throughout Allegheny County may contain variable amounts of lead.

To protect consumers from lead that might enter the water from existing plumbing, The Environmental Protection Agency (EPA) passed the Lead and Copper Rule (LCR) in 1991. This regulation requires corrosion control treatment to be applied by water utilities to reduce the release of lead (and copper) from pipes and fixtures. The LCR requires corrective action if the lead concentration exceeds an action level of 15 ppb in more than 10% of samples taken at customers taps (the copper action level is 1.3 ppm). Corrective action may include removal of lead pipes in the system and changes to corrosion control chemical dosing. The action level, however, is not health-based.[9,10]

There are 35 community public water systems in Allegheny County that are responsible for treating drinking water and delivering it to homes. Many of these utilities do not know exactly how many lead service lines are

(Continued on page 11)

still in place, connecting homes to the water distribution system. Water service lines are split in their ownership – with water authorities generally owning to the "curbside" of homes, after which pipes are considered private property and are owned by homeowners. Even if water authorities are aware of the locations of all lead pipes within their distribution systems, they may be unable to replace the full length of a service line without customer permission and participation.

Another source of lead in Allegheny County comes from airborne emissions, which also contribute to lead in soil. Allegheny County has had a significant industrial presence since the early 1800s. Smelters and other facilities produced airborne lead emissions as a byproduct of manufacturing processes. The Allegheny County Health Department (ACHD) Air Quality Program continues to monitor lead in emissions as an air toxin and as a criteria air pollutant (regulated under the Clean Air Act). Because of the unique and hilly topography of Allegheny County, these historic emissions settled in greater concentrations in low-lying valleys, rather than dispersing as they would in flatter terrain. As such, Allegheny County is home to areas with higher levels of lead in soil. Beginning in the 1920s, lead was added to gasoline, and tailpipe emissions contributed lead to the environment, particularly in close proximity to roads, until lead was banned from gasoline in 1996.[11] This resulted in an additional source of airborne lead, which also contributes to the legacy issues of lead in Allegheny County soil. Further, workers exposed to lead in their workplace can carry lead dust home on their persons and clothes, which poses additional hazards in homes.

Lead can also enter the soil from a variety of sources including ammunition at shooting ranges and the demolition of pre-1978 buildings that contain lead paint. Demolition can lead to higher concentrations of lead-containing soil, particularly at the center of properties where houses stood. EPA has set standards for lead concentrations in soil: 400 parts per million (ppm) for soil that children might have contact with, and 1200 ppm for soil that affects adults.[12] As in the case of most federal standards, states and other local authorities are permitted to set more stringent standards.

Other sources of lead also exist and may include cosmetics, toys, jewelry, ceramics, and candy when these products are made in countries where lead regulations do not exist. Some standards exist in the United States for some of these "alternative" sources of lead, but they are not comprehensive and only apply to products made and sold in the U.S. The United States Food and Drug Administration's recommended maximum lead level in candy is 0.1 parts per million (ppm).[13] In 2011, the United States Consumer Product Safety Commission lowered the limit for total lead content in children's products sold in the U.S. to 100 ppm.[14] Thus, we must stay alert to products entering the USA from foreign countries that do not restrict the use of lead.

Over the last 40 years, with a commitment to eliminating harmful lead exposure in all areas – paint, water, soil – through policies and regulations, our nation and county have successfully made progress as illustrated in the downward trend in childhood blood lead levels (Figure 1). This threat is not eliminated yet, and there is still work to be done.

Health Effects of Lead

As noted by the American Academy of Pediatrics (AAP), there is no safe lead level in children.[15]

The health effects of lead are well known.[16,17] Lead impairs brain development and children under the age of six are particularly vulnerable to its effects. At extremely high levels of lead exposure, which are rare in the United States and Allegheny County, lead can cause seizures, coma, and even death. Increasingly, studies are

(Continued on page 12)

showing adverse effects of lead at lower and lower levels. Lead can cause significant detriments to cognition, neurologic function and behavior, for children in particular, as their neurological systems are still developing. High lead levels are also a health concern to people of all ages.

The recent AAP report, "Prevention of Childhood Lead Toxicity," states that even low blood lead levels, such as 5 µg/dL and lower, can lead to impaired cognition.[17] Numerous studies have confirmed the broad spectrum of childhood health disorders that are manifested as a reaction to lead toxicity. Low level lead exposure can lead to diminished intellectual abilities, increased rates of hyperactivity and attention deficit disorder, and lower birth weights. Impacts to cognitive functions seen by exposure to lead can be measured by IQ scores and academic performance.[18,19] The impacts of lead toxicity on the neurological system appear to be irreversible, although there is evidence that other factors including nutrition and neurodevelopmental supports, can influence outcomes.[20,21]

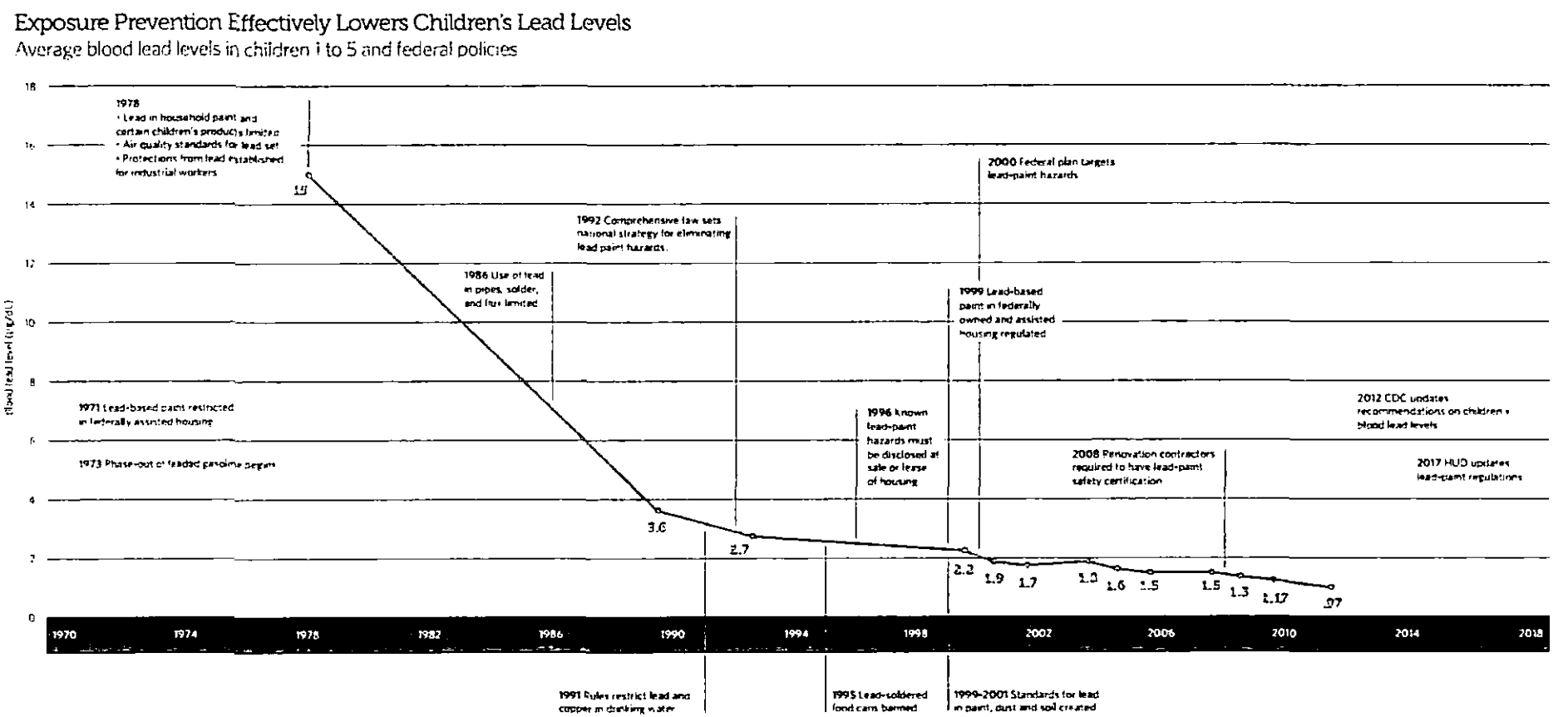
The exact biological mechanism of the neurological impact of lead is not fully understood, but lead may compete with other metals that are critical for a child's growth and development, such as calcium, iron, and zinc. These metals are key in developing brains, helping to build healthy brain cells and healthy nervous systems.[3] Lead exposure also compromises the other systems of the body including the cardiovascular, immune, endocrine, renal and hematological systems, and reproductive systems. Lead causes harm in adults such as renal issues, fertility issues, digestive problems, and memory and concentration issues. Lead can also harm the developing fetus.[3]

Compounding the problem is the disproportionate effect of legacy lead issues on disadvantaged communities. Children in inner city disadvantaged areas, which in Allegheny County are predominantly African-American communities, are more likely to be living in dwellings with residual lead paint, older water pipes and plumbing fixtures, and outdoor soil contamination from previous demolitions. Further, inner city residents may also suffer from nutritional deficiencies (e.g., insufficient iron) that alter the absorption of lead, increasing the risk from lead exposure.

The growing body of evidence was reviewed by the Advisory Committee on Childhood Lead Poisoning Prevention for the Centers for Disease Control and Prevention (CDC). Acknowledging research that shows negative outcomes at lower levels of lead exposure than previously considered,[22] the Committee recommended in its 2012 report that "CDC should use a childhood BLL reference value based on the 97.5th percentile of the population BLL in children ages 1-5 (currently 5 µg/dL) to identify children and environments associated with lead-exposure hazards. The reference value should be updated by CDC every four years based on the most recent population based blood lead surveys among children."[16] Further, it noted "public health and environmental policies should encourage actions to reduce all lead exposure, to the extent feasible and, should specifically focus on minimizing disparities in childhood BLLs." The CDC has provided guidance for follow-up and case management of children based on confirmed blood lead levels.[23] It is important to note that the 97.5th percentile of the population BLL has decreased since the report written but the CDC has not changed the reference value.

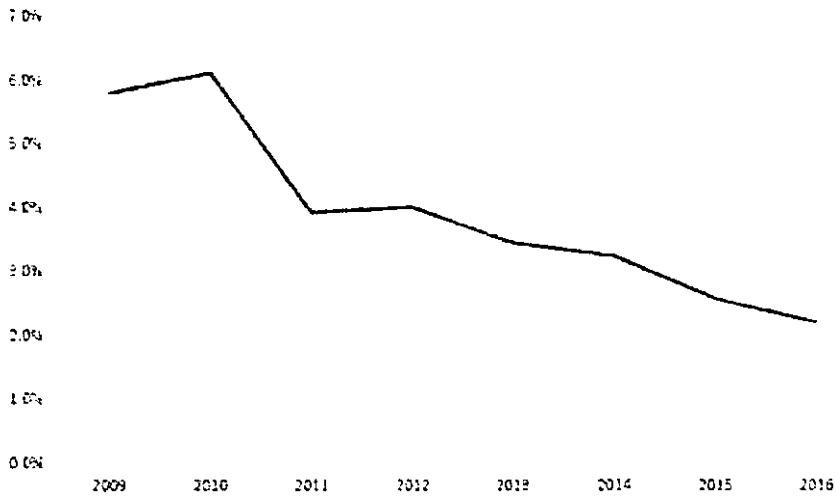
(Continued on page 14)

Figure 1. Policies that have impacted blood lead levels in children. PEW Charitable Trust Report[3]



Sources: Reproduced and modified from Mary Jean Brown & H. Falk, "Toolkit for Establishing Laws to Control the Use of Lead Paint. Module C.iii. Conducting Blood Lead Prevalence Studies," Global Alliance to Eliminate Lead Paint (2016); President's Task Force on Environmental Health Risks and Safety Risks to Children, "Key Federal Programs to Reduce Childhood Lead Exposures and Eliminate Associated Health Impacts" (November 2016), https://ptfceh.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_ childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf ©

Figure 2. Percent of Children < 6 years of age tested for lead with confirmed* tests in Allegheny County ≥5 µg/dL



Year	Total Individuals Tested	County 5+ ug/dL Confirmed
2009	10839	630
2010	11406	697
2011	13393	529
2012	13901	559
2013	13864	480
2014	13718	448
2015	13692	355
2016	14245	318

Data from PA NEDSS System

**CDC case definition defines a confirmed elevated blood lead level as one venous blood lead test ≥5 µg/dL, or two capillary blood lead tests ≥5 µg/dL drawn within 12 weeks of each other (but not on the same day) https://wwwn.cdc.gov/nndss/conditions/lead-elevated-blood-levels/case-definition/2016/*

Current Known Data on Childhood Lead Exposure in Allegheny County

In general, lead levels in children under age six in Allegheny County have been trending downwards as they have in the rest of the nation. In 2016, the percent of children under six years of age with confirmed blood lead levels ≥5 µg/dL (the current reference level defined by the CDC) decreased to 2.3% among children tested, marking a drop of over 50% since 2009 (Figure 2). In addition, the number of children with blood levels ≥10 µg/dL has been decreasing annually. In 2016, there were 74 children countywide (0.5% of children tested) with confirmed blood lead levels at or above 10 µg/dL compared to 166 in 2010 (1.4% of children tested).

These data suggest progress in primary prevention of lead exposure and the associated risk to children's health in the county. However, it is important to note that lead testing has been voluntary (except for children with Medicaid insurance, where it is required). Therefore, not all age-eligible children are tested in a given year, and the children that are tested may not be representative of all children in the county. While some children are never tested, other children receive capillary tests (a finger stick screening test generally conducted in a doctor's office, that is prone to false positive error[24,25]). When a capillary test is high, this is considered an unconfirmed test unless the test is followed up by a more accurate venous blood draw test conducted in a laboratory.[26]

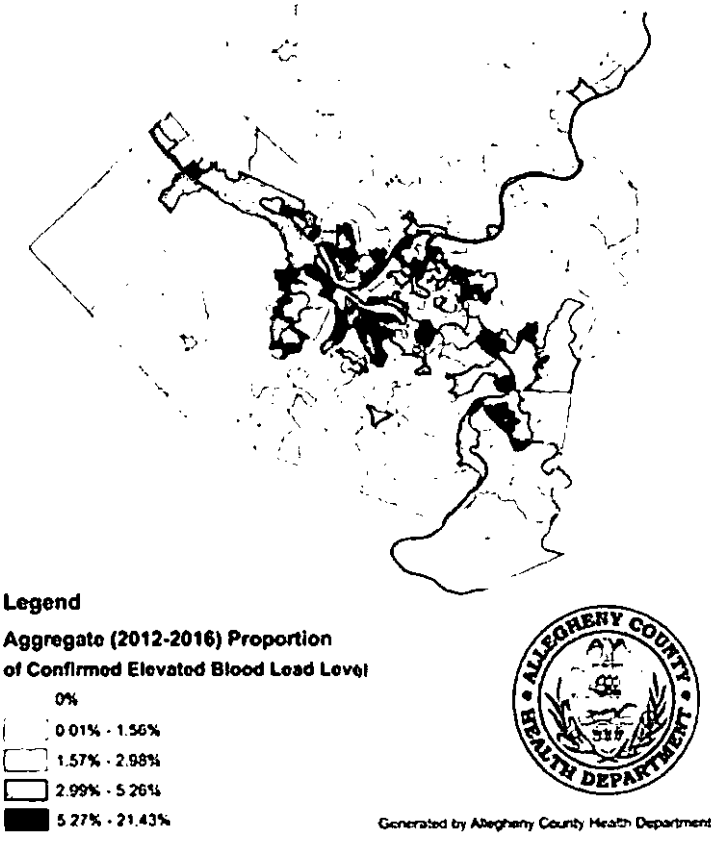
While the overall percent and number of children with confirmed elevated blood lead levels is decreasing, some areas of the county are disproportionately affected. Figure 3 shows census tracts in the county between 2012 and 2016, revealing which areas of the county had the highest proportion of children with blood lead levels of 5 µg/dL or above.

Allegheny County Health Department (ACHD) Approach to Lead

The ACHD has spent decades addressing the problem of lead exposure in our county through investigation of elevated blood lead levels in children, enforcement actions when hazards are identified, and education to help families reduce childhood exposures. However, ACHD efforts have been hampered by reductions in resources.

In 2012, reductions to CDC funding eliminated some components of the Federal Childhood Lead Poisoning Prevention Program and dollars were transferred to the Maternal and Child Health Bureau in Health Resources Services Administration (HRSA) for the Healthy Homes Program. Then in 2016, the Healthy Homes Program shifted away from lead entirely. Even though funding for lead programming was eliminated in 2016, ACHD maintained its lead investigation program and proactively strengthened the standard for investigation from ≥15 µg/dL to ≥10 µg/dL in December of 2016.

Figure 3. Allegheny County census tracts with high proportions of confirmed* elevated blood lead levels



Data from PA NEDSS System.
**CDC case definition defines a confirmed elevated vlood lead level as one venous blood lead test ≥5 µg/dL, or two capillary blood lead tests ≥5 µg/dL drawn within 12 weeks of each other (but not on the same day)*

Today, ACHD is expanding its efforts to address lead in a more comprehensive manner. The ACHD's comprehensive lead strategy has three main parts: tracking information on lead exposure (surveillance), education and primary prevention, and intervention. These strategies have been made possible by local foundation support; their continuation will depend on funding.

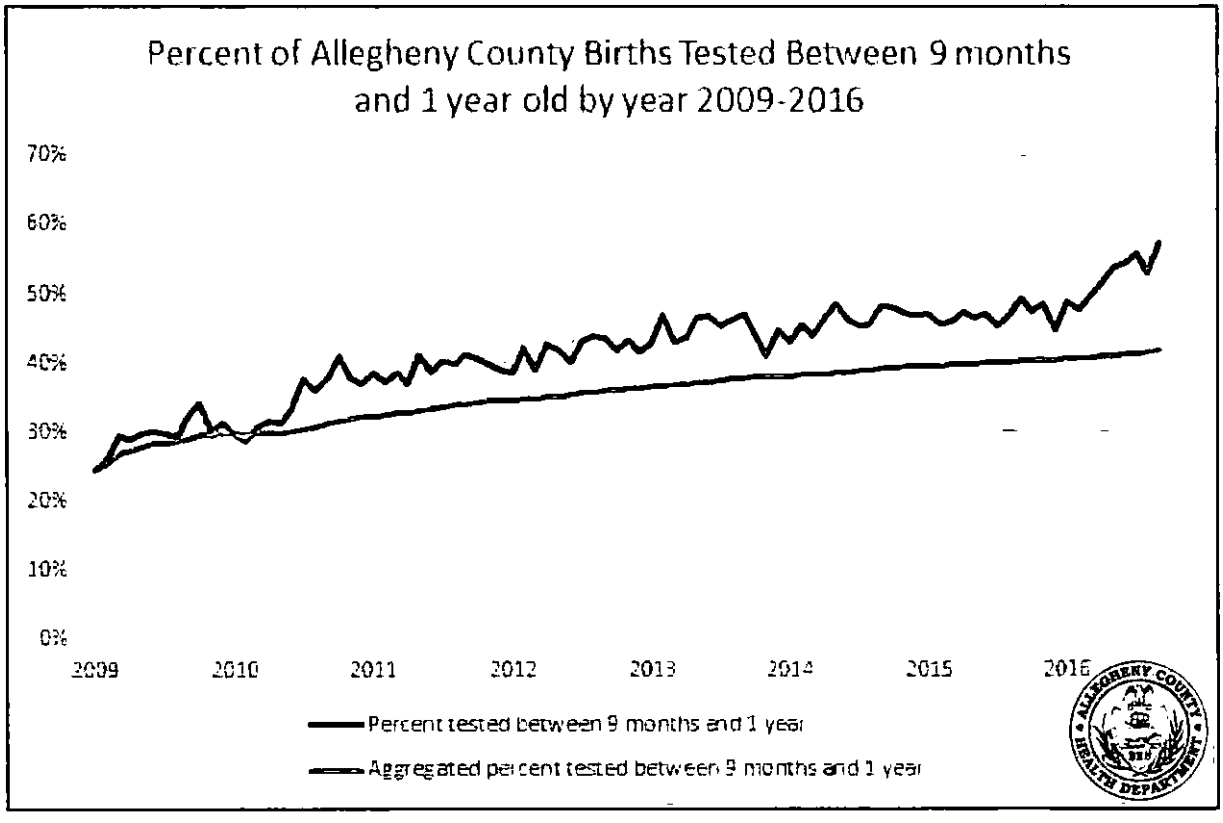
Surveillance: How ACHD is Tracking Lead Exposure

In Pennsylvania, all blood lead test results are reportable to the state through the Pennsylvania National Electronic Disease Surveillance System (PA NEDSS), and most come in through electronic laboratory results. In the past, ACHD generally used Pennsylvania Department of Health statewide reports to monitor lead exposure in our region. Access to these reports was regularly delayed by multiple years, making timely assessment impossible. Further, since lead testing was only mandated for Medicaid-insured children, many children in the State (and county) were not tested. In Allegheny County, while the number of children tested has increased since 2009, it remains under-representative of the total population of children.

Recent data (Figure 4) shows that about 47% of children between nine months and one year were tested in 2016.

(Continued on page 16)

Figure 4. Percent of children born who were tested for blood lead in Allegheny County between 9 and 12 months*



Data from PA NEDSS System.

**9 months-1 year time frame is defined as 270 and 412 days for analysis purposes*

On July 5, 2017, the County Council approved a first of its kind in Pennsylvania regulation requiring universal lead testing for young children. As a result, beginning in January 2018;[27] all children are required to be tested for lead exposure at approximately 9-12 months old and again at approximately 24 months old.* This increased surveillance will assist ACHD with monitoring lead levels in all Allegheny County children and will inform the optimal, targeted screening and intervention strategies to reduce and eliminate on-going and future lead exposure. It is interesting to note that the percent of age-eligible children who received lead testing increased in 2016. This is likely due to the increased attention to lead in the news, the discussions that ACHD has had with pediatric providers about lead testing, and the impending regulation.

ACHD is now monitoring elevated blood lead levels (EBLLs) in real time by extracting data from the PA NEDSS system directly. This surveillance has allowed ACHD to examine exposure over time and identify patterns of exposure using ArcGIS mapping. It will allow ACHD to determine the percent of children who received lead testing and what type they received. In addition, ACHD is now able to identify children with elevated capillary tests that do not have venous confirmation. Data is also used for identifying high-risk communities that bear an undue burden of children with EBLLs. It also allows ACHD to look at other factors including the presence of lead water lines (when available), the age of housing and economic determinants of lead exposure.[28]

Finally, surveillance improvements will progressively allow more up to date data to be shared in a more transparent manner with the public through the ACHD website. An annual lead report is already planned and will be available.

(Continued on page 17)

*Moral or religious exemptions are possible

Primary Prevention and Education

Given the loss of resources previously described, efforts in primary prevention slowed in the last decade. The prior "Lead Safe Pittsburgh" stakeholder advisory coalition disbanded in the early 2000's and represented a loss of citizen focus on the issue. ACHD is renewing efforts to address lead exposure and recognizes that primary prevention must be a critical focus. ACHD is developing a new comprehensive communications strategy to educate Allegheny County residents on the risks of lead exposure, including how to prevent and mitigate it. ACHD has an active set of web pages with information on lead's health impact, existing sources and programs that are currently offered. Links to national resources are also available, as is information on data, investigation procedures, water issues, and partial lead line replacements.[29]

Allegheny County Economic Development (ACED) recently received a three-year U.S. Department of Housing & Urban Development (HUD) grant the Lead Safe Homes Program-that provides financial resources for lead mitigation to families who meet income guidelines and have children < 6 years living in or spending significant time in the home or have a pregnant woman in the home. These resources are targeted for prevention and are not dependent on having a child with an EBLL. Working with ACED and CountyStats, ACHD is using data to identify priority communities for outreach and education for the Lead Safe Homes Program. Letters were recently sent to new parents living in these high-risk communities with information on the Lead Safe Homes program. In addition, ACHD released a Request for Proposals to engage community partners in expanding educational efforts to high-risk communities. The grantees will be chosen in December to start work in January 2018.

The ACHD Safe and Healthy Homes[29] program is also available to those who meet income requirements and have children. It can provide home visits and education for a variety of in-home hazards, including lead, prior to any identified exposure. ACHD has integrated lead assessment into other existing programs by cross-training ten housing inspectors as lead inspectors and educating maternal and child home visitors and Women Infants and Children (WIC) staff to recognize and educate about lead hazards during their regular home visits. For example, when a housing inspector visits a home to investigate a health hazard, they also can visibly assess lead hazards and refer the family to educational materials, suggest their children be tested for lead exposure, and provide referrals to the Lead Safe Homes program and Safe and Healthy Homes program.

Interventions

ACHD has done home investigations to identify lead hazards for children with EBLLs for decades using federal funding. As noted, when federal resources were discontinued, ACHD continued investigations and lowered the threshold for investigation from 15 µg/dL to 10 µg/dL by converting an empty position to a lead inspector position. The quality of lead paint risk assessments has improved over time and conforms to federal standards. Investigations involve education; visual inspection; testing for lead-based paint, contaminated lead dust, water, and soil, if appropriate. According to the CDC, ACHD is one of the few programs that includes water sampling in investigations.[30]

If initial water samples are elevated above the LCR action level, additional samples are taken. Starting in 2017, inspectors also check for lead lines at the water meter and advise families to contact their water authority to determine if they have lead service lines. They counsel families to use NSF International-certified (NSF) filters or bottled water and appropriate flushing techniques. Between 2014 and 2017, home investigations for EBLLs

(Continued on page 18)

have not found water to be the primary source of exposure but water may have been an additional contributor to childhood lead exposure. Of the 137 investigations conducted in this time-frame, there have only been three cases (2%) where water lead levels were above the LCR Action level. In all three cases, the child was ingesting lead from other sources and in one case, the family was using an NSF-certified filter.

The information garnered in a lead investigation is shared with both parents and health care provider. In the case of landlords, citations are issued, and enforcement takes place if landlords do not comply with mandated remediation. This year so far, there have been 25 citations issued and enforcement efforts are ongoing. From January to November 2017, ACHD was notified of 85 cases of confirmed blood lead levels ≥10 µg/dL. Of these, 6% (5) are in process, 54% (46) received home investigation, 16% (14) were not able to be contacted after multiple tries, and 24% (20) of families refused services (reasons included; moving, knowing where the lead was located and not needing help, and none).

As recommended by the CDC,[23] ACHD has adopted the CDC reference level of 5µg/dL. In July, in addition to lead home investigations for children with confirmed blood lead levels of 10 µg/dL and above, ACHD began contacting parents of children with confirmed blood lead levels of 5-9 µg/dL to conduct an assessment via a lead source questionnaire (see Appendix 3). Based on the information obtained, ACHD provides education on sources, remediation, access to resources including the Lead Safe Homes and Safe and Healthy Homes program, and referral to early intervention programming.

In support of the recently passed universal lead screening regulation, ACHD will be offering blood lead level testing to children who are uninsured or underinsured starting in 2018. Notification will be available through the education program as well as doctor's offices, community groups, child care centers, etc.

Last year, in response to the CDC's adoption of the reference level of 5 µg/dL representing an EBLL in children, and in conjunction with the Allegheny Department of Human Services, ACHD successfully lobbied at the state Department of Human Services to change eligibility criteria for children's access to Early Education Intervention. Children with EBLLs of 5 µg/dL are now eligible in addition to those with higher blood lead levels.

Findings from Literature Review and Consultation with Experts

In the recent AAP report "Prevention of Childhood Lead Toxicity",[17] the leading childhood lead exposures include lead-paint dust (from wear and tear and renovation in homes built prior to 1978 with existing lead based paint), water, and soil (see Figure 5).[31,32] Here is what the Lead Task Force learned about these sources over the course of our engagement.

Residential Lead

"Lead-based paint and lead contaminated dust are the most hazardous sources of lead for U.S. children."[33] While all sources of lead are hazardous and must be considered, lead paint and dust in older dilapidated homes built prior to 1978, are the primary source of childhood lead exposure.[31,34] Points of friction, where frequent and repeated movement across lead paint occurs, are critical exposure areas. These areas include windows, doorways, and porches. Moving windows up and down or closing and opening doors deposits lead containing dust on the floor where it can be tracked around home environments.[35] Window sills are common sites for lead paint dust deposits. In addition, gnawing activities on window sills is not uncommon in teething children, leading to direct exposure through unintended consumption. Lead paint can have a sweet taste, which can increase this behavior in children. Porches are areas where children play in the summer and deteriorated paint can also be a source of exposure either through dust or paint chips.

Disclosure laws

Many homeowners and renters may be unaware of the presence of lead paint in their homes. U.S. EPA's Lead Residential Lead-Based Paint Disclosure Program[36] requires all home sellers and housing providers to disclose all known lead hazards (presence of lead paint, lead-contaminated soil and lead pipes and fixtures) to prospective buyers and renters and to provide educational information on identifying and controlling those hazards. However, disclosure of lead paint relies on the home seller or provider having knowledge of the presence of lead hazards.

Abatement or remediation of lead-based paint requires expertise. Pursuant to federal law and the Pennsylvania Lead Certification Act 44 of 1995,[37] only lead certified contractors, supervisors and workers may engage in removing lead paint hazards. Additionally, the EPA Lead Renovation, Repair and Painting Rule (RPR Rule) requires that firms performing renovation, repair, and painting projects that disturb lead-based paint in homes, child care facilities and pre-schools built before 1978 have their firm certified by EPA (or an EPA authorized state), use certified renovators who are trained by EPA-approved training providers and follow lead-safe work practices."[38] Untrained and uncertified individuals who attempt to remove lead paint hazards or disturb lead painted surfaces during renovation work may inadvertently create a greater lead paint hazard, by creating excess lead dust. Renovation can contribute to approximately 10% of EBLLs in children.[31,39]

In addition to lead paint dust from windows, doors, and porches due to deteriorated lead-based paint, or from renovation, lead dust may also be tracked into the home on shoes from leaded soil. Proper cleaning of

(Continued on page 20)

horizontal surfaces, particularly uncarpeted floors and windowsills, with damp rags can help to safely remove lead dust from these surfaces. It is also recommended that a vacuum cleaner with a high efficiency particulate arresting (HEPA) filter be used regularly to remove lead-contaminated dust from the home.[40]

Efforts to provide cleaning services to residents and/or to train residents in cleaning techniques to reduce lead exposure have not always been successful in preventing elevated blood lead levels.[41]

Water

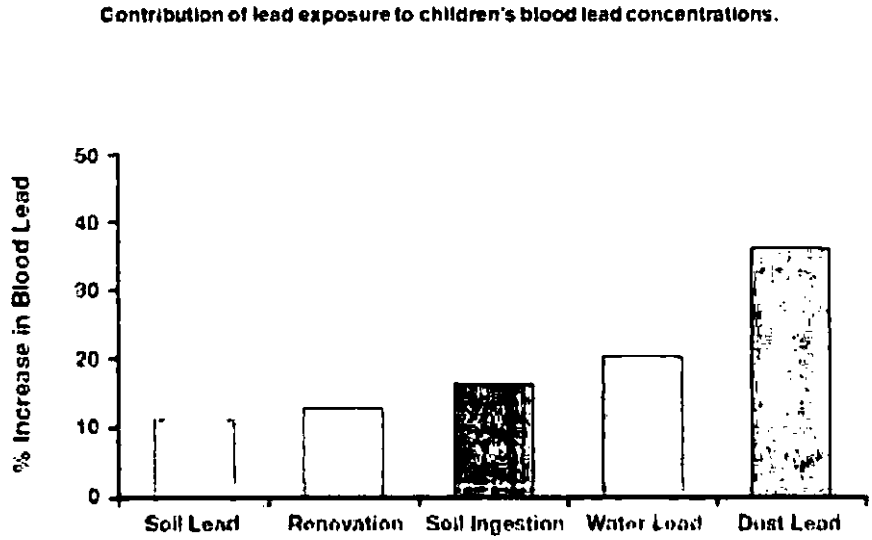
Compared to other drinking water contaminants, lead is unique because it is not usually present in the water as it leaves the water treatment plant. Instead, potable water can be contaminated with lead due to the corrosion of lead-bearing plumbing materials such as pipes, faucets, fittings, and solder. Most lead in drinking water systems in the United States is found in lead pipe that connects each home to the water main in the street; these connecting pipes are called service lines. Estimates suggest drinking water contributes approximately 20% of the overall lead exposure to children.[31,42] As noted by EPA, "Infants who consume mostly mixed formula can receive 40 percent to 60 percent of their exposure to lead from drinking water"[43] and recent studies have documented that lead in water can be a major contributor to EBLLs.[42,44,45]

Lead is released from water pipes and fixtures due to dissolution of the primary material or through routine or episodic detachment of lead-containing scale particles that form on the pipe. Lead-containing pipe scale can become dislodged by disruption (excavation, repairs, partial line replacements), resulting in larger, but less frequent, doses of lead.[46] Lead in water is not only a risk when the water is consumed directly; contaminated water used to cook food (e.g. rice or pasta), or to reconstitute juice or infant formula, will also result in direct exposure to lead. Within the home, lead can be removed from water using NSF-certified[47] water filters approved for removing lead, such as faucet filters or pitcher filters. Filters must be changed regularly to maintain efficacy and prevent potential growth of bacteria. Filtered water must be used for all consumption (drinking and food preparation) to reduce exposure.

The EPA has set a maximum contaminant level goal (MCLG) for lead of zero, recognizing that there is no safe level of lead in water.[12] The MCLG is a health-based, non-enforceable value. EPA did not set an enforceable maximum contaminant level (MCL) for lead in water, but rather required drinking water utilities to optimize corrosion control to reduce lead in water; this is called a treatment

(Continued on page 21)

Figure 5. Contribution of lead exposure to children's blood lead concentration



COUNCIL ON ENVIRONMENTAL HEALTH Pediatrics
2016;138:e20161493

PEDIATRICS

technology (TT) requirement. The LCR requires water utilities to monitor drinking water at customer's taps. If this monitoring shows the lead concentration exceeds the action level (15ppb) at more than 10% of sampled customer's taps, the utility must take action to reduce lead, including, but not limited to, replacement of lead service lines (LSLs).

Thus, in general, water utilities attempt to control the release of lead from lead-bearing materials and scales by maintaining water chemistry conditions (i.e., pH and alkalinity) that reduce lead release or by adding corrosion inhibitors (e.g., phosphate).[48,49] However, even in well-maintained systems with optimized corrosion control plans, there is still the potential for elevated water lead levels.[50]

The majority of the lead exposure from tap water comes from LSLs, which connect each home to the main water line in the street.[51-53] A recent study estimated that as many as 22 million Americans living in 6.2 million homes have a partial or full LSL.[54] However, it can be very challenging for a water utility to identify the locations within its distribution system that contain lead pipe. In many cases, records of the type of pipe installed do not exist. Residents can check the incoming pipe using a simple "scratch test" (scratching the incoming line to the water meter to see if it is lead, copper or other substance) to determine its contents but in some homes interior access to assess the pipe entering the home may not be feasible. Non-invasive methods to determine pipe materials from the street-side are under development, but at present, there is no easy way to identify service line material.

The service line is often (but not always) a single piece of pipe. But in most locations, it has two owners. The utility owns the portion from the water main to the connection point on the homeowner's property (near the street). The homeowner owns the pipe from that connection to the home. Either or both sections of pipe can be made of lead. The utility has responsibility for maintaining (and replacing if necessary) its portion of the service line, but because the customer-owned part of the service line is private property, the utility has neither the responsibility nor often the authority to replace the customer-owned part of the service line.

For water authorities to remove and replace customer-owned lead lines would require customer permission and a source of funding. It might also require changes to local or state regulations that restrict access to private property. Since many utilities are not permitted to spend general funds from water fees on replacement of privately owned pipes, if a homeowner is not able to pay for replacement of the pipe, work on the private side of the pipe cannot be completed. However, recent research suggests that partial lead line replacement instead of full lead line replacement can pose increased risk of lead in water.[30,55] Given the risk, several cities have stopped partial lead line replacements and passed regulations allowing replacement of private pipes by water authorities, using various funding models.[3]

The RAND Corporation recently provided a summary of policy options for water supply lead remediation in Pittsburgh and reviewed the costs, regulatory barriers, and feasibility of options.[56] As they note in a subsequent commentary,[57] "flushing and filtering, coupled with effective corrosion control, could cost-effectively help to reduce lead exposure in the near-term while a more permanent solution is developed." However, "in the long term, full service line replacement is the only option that would permanently resolve the risk of lead in water." Table 1 summarizes the options for drinking water lead hazard mitigation.

In Flint, Michigan, federal and state funding is supporting removal of all lead pipes in what is being called the FAST START Initiative. Full line replacement is being conducted with resident's permission.[58] They are using a technique that was implemented in Lansing, Michigan for trenchless replacement of service lines which allows for copper pipes to be threaded through existing lead pipes rather than removing the original lead pipes.

Table 1. Summary of the Options for Lead Mitigation and Decision Criteria

Policy Option	Impact on Lead Remediation	Cost Per Residence	Technical Feasibility	Legal or Regulatory Barriers	Time Frame
Status quo	Continued risk of lead exposure to residents	[illegible] per year; $20[illegible] $33[illegible] over ten years	No technical requirements, but requires residents to consistently comply with flushing instructions	None	Immediate
Filters	Provides short-term protection from lead in water, but only for those who sign up for the Safe Water Program or procure their own filters	$80–$1,290 in the first year; $580–$2,400 over ten years	Procuring and distributing water filters is feasible, but filters must be maintained and replaced regularly	None	Safe Water Program rolled out quickly, but will only last three to six months
Optimal corrosion control	If administered correctly, should protect water from lead pipes, but it is an ongoing operations strategy rather than a permanent fix	-	Study currently under way to determine most effective anticorrosive; Blue Ribbon Panel assessing management changes	Legal challenges ongoing over unlawful change	Dependent on the amount of time the study will take; will need ongoing oversight and regulation
Partial replacement of service lines by PWSA	Has been shown to increase amount of lead leaching into the water supply. Only effective in coordination with property owners to replace private portions of lines.	$1,125–$12,720 one-time cost	Labor- and resource-intensive, but new technologies exist	PWSA must replace 7 percent of lines per year, but only until 90th percentile drops below 15 ppb; from curb to house, service lines are private—must generate resident buy-in	With rate PWSA about ten years to replace all LSLs
Full replacement of LSLs by PWSA	Permanently reduces risk source of [illegible] exposure in [illegible]	$2,[illegible]–$20,650 one-time cost	Labor- and resource-intensive, but new technologies exist	Municipal Authority Act being contested to allow for PWSA to replace private portion of LSLs	Very [illegible] estimates of 13 years for widespread replacement
	Performance Key	[illegible]	Medium-high	Medium-low	Low

From May LW, Fischbach JR, Abbott M. Informing Pittsburgh's Options to Address Lead in Water. Perspective [56]

Soil

Lead in soil comes from many sources. Lead is naturally present in soil as well as due to known sources of contamination. Although the phase out of leaded gasoline began in 1975, it was not banned in the United States until 1996. Emissions from vehicles powered by leaded gasoline would often settle in soil around garages, alleys, and busy intersections. Runoff from these areas has transported lead to the edges of properties.[59]

In the past, federal standards to control air emissions of lead from industrial facilities were also less stringent,[60] resulting in areas with higher concentrations of lead in soil surrounding specific facilities. Due to the unique topography of Allegheny County, both industrial emissions and gasoline emissions tended to settle near the points of emission, rather than blowing further away. Industrial sources in valleys, for example, could be expected to have higher concentrations of lead in the soil than sources in higher elevations and more open areas.

Lead paint can enter the soil through demolition debris which could be buried or left in abandoned properties. This usually results in higher concentrations of lead-contaminated soil in the center of properties. Lead can also enter soil around the edges of the house due to paint chips falling to the ground and years of unsafe scraping and sanding exterior house paint when preparing to apply new coats of paint. The so-called "drip line" usually extends 2-3 feet out from the foundation wall of the house.

Demolition standards are set by the state in the Pennsylvania Construction Code Act of 1999.[61] Municipal governments are required to adhere to state standards but can create stronger regulations.[62] The only portion of demolition that ACHD has authority over where lead is concerned is air quality. Experts we spoke to had questions about whether municipalities are adequately enforcing current demolition regulations and/or using the latest best practices for lead remediation (including the amount of organic cover needed to cover foundations).[59]

Lead-contaminated soil can be consumed, whether through direct ingestion or the inadvertent hand-to-mouth behavior of children. Airborne/ soil dust may also pose a risk in areas with little grass cover like urban yards and spaces. However, this is not considered to be the primary risk of lead-contaminated soil exposure. The greater risk is tracking contaminated soil into homes where children often spend a greater majority of their time. Soil tracking can be reduced by taking shoes off when entering a home as well as home cleaning strategies.[40]

EPA has set standards for lead concentrations in soil: 400 parts per million (ppm) for children, and 1200 ppm for adults. These are considered to be too lenient by local experts.[59]

Levels of lead in soil can be measured through soil sample tests and though x-ray fluorescent (XRF) analyzers, but often this does not provide a complete analysis of an entire property.[59] Concentrations of lead can vary in soil only a few feet apart, so while soil testing can be helpful, due to the high variability it can be challenging to make general assumptions about levels across large areas. Isotopic analysis of soil samples can also be conducted, which can identify the original source of the lead (e.g., gas, paint, industrial smelting). Testing conducted in Allegheny County by the Allegheny County Conservation District using XRF has shown paint to be the primary source of lead found in soil samples.[63]

There is concern that consumption of plants grown in lead-contaminated soil poses a risk, particularly from certain plants that extract heavy metals from soil (i.e. mustard greens and certain root crops, such as carrots, radish, and turnips). However, these levels are often low, and of more concern is the dust on the plant itself, which can be eliminated by washing before consumption.

Crops that are grown entirely above ground have minimal transport of lead into the edible part of the crop. Soil pH levels in Allegheny County tend to be alkaline (pH>7), and this feature inhibits transport of lead into plants.[59]

The primary methods to control lead in soil are to maintain neutral or alkaline pH, build soil organic levels by using organic composting materials, boost soil phosphorous levels, and maintain contaminate-free top soil such as turf sod and mulch.[64.]

Best Primary Prevention Strategies to Address Reduction of Residential Lead Exposure

There are numerous housing-based primary prevention policies that have been implemented at the local level (generally at the municipal level) to address lead hazards. Unfortunately, not all have been evaluated for

(Continued on page 24)

impact, and implementation resources are critical to success.[65] Based on several reports and articles that used case studies,[3,65] the Task Force contacted informed experts from five major cities (New York, Philadelphia, Chicago, Milwaukee, and Rochester) to understand their approach to lead and its success and review their ordinances. These cities have employed a variety of strategies to conduct primary prevention often using existing municipal inspectors to conduct lead-free, lead-safe certification inspections. As noted by *Kormacher and Hanley,*[65] there are critical elements that are important to assess prior to determining housing-based primary prevention policies:

1. Physical environment (geographic targeting)

2. Health status and systems: What percentage of high-risk children receive blood lead tests? What percentage of these have elevated blood lead levels?

3. Public awareness (by residents, landlords, and community leaders) of the connection between lead poisoning and health, educational, and social outcomes.

4. Economy/housing market

5. State legal environment: Does the locality have the authority to implement a local lead law?

6. Case law: What are the relevant court rulings and settlements related to lead hazards, duty to maintain properties, inspections, and landlord liability?

7. Implementation resources: What is the public (city inspectors) and private (number of certified risk assessors and sampling technicians) capacity for conducting proactive inspections? [65]

While several communities have developed lead-safe/lead-free certification programs, not all effectively enforce their ordinances. The Task Force was particularly impressed with efforts in Rochester, NY. In 2005, Rochester, NY passed an ordinance that required regular inspections of most rental units built before 1978 for lead hazards as part of their existing certificate of occupancy process.[66] Property owners must correct any lead hazard violations before they can obtain a certificate of occupancy. The Rochester process for code enforcement generally runs on a 2–3-year cycle but homes in high-risk areas, or those in which lead hazards have been identified, are inspected more frequently. Investigations also occur on a complaint-driven basis, and when EBLLs are identified in a child residing at a particular address. To date, Rochester has inspected over 141,000 homes.[3] Rochester operates a searchable database of lead-safe units, certificates of occupancy issued since 2006, property maps with violations, and code enforcement data. Rochester has also been extremely successful at obtaining HUD dollars to remediate property identified as containing lead hazards. Data from Rochester (figure 6) suggests that this strategy has directly impacted blood lead levels.

New York City also has strong enforcement and inspection policies that are conducted by the City's housing department.[67] New York City began conducting investigations of homes with children under six years of age with elevated blood lead levels, and when hazards were found, investigative services were offered to any family with a young child in the same building. Inspectors found that in New York City's high multi-occupancy building environment, one child with an EBLL in a building indicated poor building maintenance, and identified lead hazards in one unit were often found in other units. New York City also has a searchable database listing every housing unit in which a prospective renter or buyer can find a list of violations, including lead violations, and their current status.[68] Education is a strong component of New York City's lead hazard abatement strategies, and residents appear to be aware of how and when to reach out to the housing agency with concerns. Any identified hazards must be remediated by the owner of the building. If owners do not fix issues

(Continued on page 25)

Figure 6: Children's blood lead level results, City of Rochester, July 2004-2008[66]

	Preimplementation of lead law		Postimplementation of lead law	
Level of blood lead	Year −2 1 July 2004–30 June 2005	Year −1 1 July 2005–30 June 2006	Year 1 1 July 2006–30 June 2007	Year 2 1 July 2007–30 June 2008
No. of children screened	7,256	7,420	7,146	6,528
Mean BLL (µg/dL)	4.73	4.21	4.00	3.73
Median BLL (µg/dL)	4.00	3.00	3.00	3.00
No. of children with BLL ≥ 10 µg/dL	604	490	403	284
Percentage of children with BLL ≥ 10 µg/dL	8.3	6.6	5.6	4.4

BLL, blood lead level.
[a]These results are based on health department BLL data from the 2 years before and 2 years after implementation of the lead law (see Boyce et al. 2008).

Source: Reproduced and modified from Katrina Smith Korfmacher, Maria Ayoob and Rebecca Morley. "Rochester's Lead Law: Evaluation of a Local Environmental Health Policy Innovation." Environmental Health Perspectives, Vol. 120. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3279433/

within the required timeline,[67] they are referred to an emergency repair program in the housing agency.[69] The agency then makes the repairs, and the owner is billed. A lien may be put on the property until the bill is paid. New York City also has money from New York State, which is focused on primary prevention. Some of this funding provides training for certification of lead-certified construction workers.

In Milwaukee, using HUD grant dollars, the health department has successfully remediated almost 18,000 homes over a 20-year period, averaging 1000 per year, with a strong focus on window remediation in particular.[70] In Illinois, the CLEAR-WIN Program provided pilot funding for installation of 8,000 windows in 466 housing units between 2010 and 2014. The program proved effective in reducing lead hazards based on levels of indoor lead dust. It is now before the state legislature for full implementation.[71,72]

In Chicago, health department staff used predictive modeling to identify risk factors for lead hazards in the home.[73] Based on this information, they reached out to WIC clients living in homes with characteristics suggesting potentially elevated exposure. Attempts were made to investigate homes that were considered high -risk. Unfortunately, the response rate was relatively low.[74]

Philadelphia's Lead Paint Disclosure and Certification Law passed in 2012 requires landlords to obtain certification prior to renting to tenants with children under age 6.[75] However, the law is largely unenforced. Staff estimate that of the over 18,000 rental units, only 2000 have been certified. When a child has an elevated lead level and the home is inspected, a citation is issued if there is no lead-safe certification.[76]

Broadly, cities reported low uptake of lead home investigations if the child did not have an EBLL. Even with a child with a confirmed EBLL, cities reported rates of parental refusal of home investigations that range from 25-50%. Thus, cities are trying multiple strategies to address primary prevention, usually based on grant funding and generally focused on high-risk neighborhoods. Rochester's approach is the most promising and has the evaluation data to demonstrate its success.

Monitoring and Reporting Information on Exposure

Monitoring and reporting information on lead exposure poses unique challenges, which have been tackled in a variety of ways across the United States. Under Pennsylvania Code, Title 28, Chapter 27, all blood lead test results on both venous and capillary specimens for persons under 16 years of age are reportable regardless of result, to the state Department of Health.[77] Patient blood lead levels are protected health information, and are subject to HIPAA rules, as well as the Pennsylvania Disease Prevention and Control Law of 1955. Thus, data are shared with the ACHD but remain private. Summary data are provided to the community (e.g., Figure 3) without identifying individuals.

Currently ten states, and the District of Columbia (DC) require universal testing.[78] Pennsylvania requires testing for children on Medicaid insurance, but not for other children.[79] Even so, Medicaid notes that only about 70% of Medicaid-insured children in Pennsylvania are being tested. Recently, the governor called for regulation to require universal lead testing of children in Pennsylvania. Universal testing of blood lead levels will enable health care providers to act when elevated levels are seen and allow for better targeting of primary prevention efforts. Some physicians and pediatricians are unaware of testing requirements and necessary follow-ups or think that children are not at-risk due to their housing.[80] Thus, universal testing will provide an extra layer of safety for children who might not be identified for testing by their health care provider. Moving to universal testing will also require additional education for providers and the use of standardized terms for reporting.

There are two methods of testing for blood lead levels: capillary tests, which utilize a finger prick method; and venous tests, which extract blood directly from a vein. While capillary tests can be used to effectively identify children without lead exposure, they have a high risk of returning an incorrect elevated result, or false-positive, as lead may be present on the skin surrounding the finger prick. Therefore, confirmatory venous tests are recommended for any elevated capillary tests since venous tests are much more accurate than capillary. Further, a false positive capillary test due to site contamination can indicate lead in the child's environment and underscores the need to educate the public on community risks.[26] The majority of cities we reviewed require validation of capillary tests with venous tests prior to initiating an investigation of the child's home. In addition, consultants agreed that venous tests should be used to confirm capillary tests.[81,82]

Widespread blood lead level testing can provide useful information to identify regional "hot spots" where lead exposure is prevalent and where interventions can be directed with consideration to limited resources. Methods such as predictive modeling can assist investigators in identifying risk factors that may lead to lead exposure (age of home, condition of home, presence of lead pipes, presence or absence of children who have been exposed, etc.).[74]

Investigating Hazards

Lead hazard investigations take different forms and follow different standards in various states, counties and municipalities. The CDC recommends a series of action steps depending on blood lead levels but leaves interpretation of some actions up to local authorities depending on available resources.[23] The majority of health departments tackling lead as an issue use threshold confirmed blood lead level values to trigger environmental (home) investigations. However, there is tremendous variability in the trigger values, ranging from levels of 5 µg/dL to 20 µg/dL. Generally, departments triggers are based on available resources (see appendix for trigger levels used by a sample of communities for assessment and home investigations). For example, in some communities home investigations are taking place for selected age groups of children with lower blood lead levels. In New York City home investigations are being conducted for children < 15 months of age with lead levels over 8 µg/dL, for children 16 months to 6 years of age at levels of 10-14 µg/dL and for all other children up to age 18 at a level of 15 µg/dL. [69] In Chicago, investigations are being conducted for children < 1 year of age with levels ≥ 6 µg/dL and for all other children at levels of 10 µg/dL.[74] Recently, New Jersey added $10 million dollars to the state budget to assist with local investigation and Newark NJ set its trigger for home investigations at 5 µg/dL .[83] While a few other communities have recently lowered their levels for home investigation to 5 µg/dL, other communities (Philadelphia, Cincinnati, and the State of Rhode Island) continue to use a threshold of 10 µg/dL. Connecticut and Virginia use 20 µg/dL as a trigger for a single confirmed test and 15 µg/dL if there are two consecutive confirmed tests.

(Continued on page 27)

Typically, families of children with reported blood lead levels of 5-9 µg/dL receive educational outreach, alerting them to the levels reported by their child's most recent blood lead test, and providing information on how to reduce lead exposure. There was disagreement among experts consulted as to whether home investigation should be done for levels of 5-9 µg/dL since there has been no published scientific evidence detailing the effectiveness of these home investigations.[84] In addition, lab error can be as much as 2 µg/dL, making it difficult to measure with confidence changes at low blood lead levels.[85] However, early evidence (unpublished study)[86] from one city suggests that home visits for children with blood lead levels of 5-9 µg/dL can have significant impact.

Home investigations themselves, even when conducted by EPA-certified lead risk assessors, also vary across communities. There are different standards for what tests are conducted, what sources are analyzed, what tools are used, and so on. The cities we spoke to did not test water but were considering strategies to do so. ACHD has been testing water for lead for many years.

The number of lead investigators employed by Health departments and other agencies that investigate lead hazards are limited by available resources. We found great variability in funding for individual departments. Some (such as New York) received state-specific dollars for prevention programming while others maintained small lead investigation staff such as Milwaukee. In addition, most communities used HUD grants to pay for remediation and were dependent on these funds to support primary prevention efforts.

Other than public health access to investigation staff, another big challenge facing lead investigations is the growing number of families that refuse investigations as mentioned previously. A household with a child with an EBLL may not allow investigators to enter the home or conduct an investigation. There are no requirements that give investigators the authority to enter private property to conduct an investigation. This issue must be addressed. Building trust with community members and developing better strategies to allow for home entry and uptake of remediation programs is critical.

Education and Outreach

Population based lead education campaigns have been conducted in many jurisdictions at varying times. In New York City, for example, residents have been privy to educational campaigns for many years that encourage renters to call a local number to report any peeling paint or other lead hazards.

Health departments and communities often maintain lead prevention education materials on their websites. In addition, education is often conducted in alignment with home lead investigations, and is generally provided to families with children who have reported blood lead levels that do not meet the level of household investigation.

A few studies have looked at the efficacy of educational campaigns that teach families how to clean their homes to reduce lead dust. Unfortunately, education alone does not appear to lower blood lead levels.[87]

RECOMMENDATIONS

The Lead Task Force has developed a series of recommendations for eliminating and mitigating lead hazards in Allegheny County. These recommendations are split into four main categories:

- *control sources of lead,*
- *monitor and report information on exposure,*
- *investigate hazards,*
- *educate the public and others on community lead hazards.*

Recommendations are given with additional information pertaining to the partners needed to fully implement recommendations, the resources required, the expected timeframe, and the challenges and opportunities inherent in each. This report is not intended to provide explicit policy directives, but to suggest areas that need consideration by many distinct stakeholders. Additional work is needed to achieve the recommendations included in this report. ***Implementation of these recommendations will require cross-jurisdictional efforts, collaboration and the engagement of multiple partners to achieve.***

The ultimate goal of each recommendation is to eliminate harmful exposures to lead. The Task Force recognizes that while there is no safe level of exposure to lead, complete elimination of all naturally-occurring lead is impossible. The Task Force recommends working toward elimination of harmful human-made lead hazards and reducing human exposure to all forms of lead.

1. Paint, Dust, and Other Household Sources

Goal: Eliminate harmful exposure to lead from paint, dust, and other household sources.

Recommendations: Paint and dust continue to be major sources of exposure in housing across Allegheny County. To make Allegheny County a safer place to live and raise children, we must prioritize primary prevention by reducing these areas of exposure and preventing the harmful effects of lead before they occur. Therefore, the Lead Task Force recommends the following actions.

1.1 Increase the supply of a lead-safe/lead-free housing

a. Establish a mandatory and enforceable lead-safe/lead-free certification program for all rental housing (including federally funded Section 8 housing or those supported by the county Department of Human Services) based on the Rochester model. We believe that unlike other programs, the Rochester program appears to adhere to a high standard supported by monitoring and enforcement that has been shown to be successful.

b. Establish a voluntary lead-safe/lead-free certification program for owner-occupied housing.

c. Provide financial incentives to support lead-safe/lead-free housing programs, prioritizing up-front incentives over tax credits, and supporting alternative housing when tenants are displaced.

d. Provide a registry of lead-safe/lead-free housing to the public.

e. Continually review and revise standards for lead-safe/lead-free housing to be consistent with current research, best practices, as well as state and federal standards.

f. Actively engage housing providers and housing provider associations in the process of the above recommendations, emphasizing positive messaging, as per Rochester model.

1.2 Inform homeowners, housing providers and residents of the potential of exposure from lead hazards and lead exposure routes and provide information on opportunities and requirements for remediation

a. Establish a process for housing providers to attest to providing federally mandated materials, such as Lead Hazard Information, to residents.

b. Share current HUD and EPA information and materials, such as Protect Your Family from Lead in Your Home, with home owners and residents.

c. Focus these efforts on communities known to have higher exposure to lead.

(Continued on page 30)

1.3 Establish programs that financially support lead remediation

a. Establish resources for remediation such as low interest loans, community funds, and grants.

b. Prioritize programs that offer low-cost replacement for windows and doors installed in a manner consistent with federal guidelines.

c. Focus these efforts on communities known to have higher exposure to lead.

1.4 Prioritize settings where children spend substantial portions of time

a. Identify resources to address lead identification and remediation in sites where young children are frequently present.

b. Assuming financial support is available, work with the State to require child care sites to be lead-safe or lead-free as part of licensing.

1.5 Advocate for state and federal resources to support remediation of lead hazards in housing, child care facilities and schools

a. Home owners, renters, and municipal and county leaders should advocate collectively for resources to support and encourage remediation of lead hazards in Allegheny County communities.

b. Increase the number of housing inspectors in ACHD for primary prevention purposes.

c. Identify strategies to train and fund municipal housing inspectors in lead investigation.

1.6 Increase the number of lead-safe contractors by expanding training and certification programs

a. Home owners, renters, and municipal and county leaders should advocate collectively for resources to underwrite tuition and training costs for these programs.

Additional Considerations

Partners

To meet these primary prevention goals will require a collaborative effort involving homeowners, housing providers, residents, child care providers, multiple county agencies (health department, economic development, human services) and municipal and county leadership. Homeowners should have their homes certified as lead-safe or lead-free. Housing providers must inform their residents of lead hazards and certify their housing units as lead-safe or lead-free. County agencies and municipalities should collaborate with municipal leaders and other appropriate agencies to establish policies that create certification programs, maintain records, and provide enforcement of certification. Institutions like the Institute for Politics (IOP) can be helpful in determining the best strategy to implement a lead-safe, lead-free primary prevention program in Allegheny County by bringing all parties together. Local educational institutions can expand their efforts to

(Continued on page 31)

train and certify additional lead-safe contractors. Across the country, in communities where this has been most successful, significant cross-jurisdictional collaboration exists across all sectors and information is widely available for the public. Advocacy agencies can assist with educational efforts and advocate for needed resources for remediation and necessary staffing.

Resources

County officials, municipal leaders and appropriate agencies must work together to secure resources to support and incentivize remediation efforts as well as to provide enforcement measures.

Timeframe

This will be a multi-year effort. The first step will involve building the support necessary to develop and implement certification programs. Designing and implementing these programs will take time but will have dramatic impacts on the quality and value of housing. The goal should be to complete this process in under five (5) years, as it has been accomplished in this timeframe in other communities.

Challenges & Opportunities

Efforts to adopt and implement a primary prevention program with effective enforcement will require collaboration on many levels. There are numerous challenges inherent in cross-jurisdictional efforts. Regulation will be required at either the county and/or municipal level. Implementation and enforcement will require coordination with existing rental registries where they exist and with existing inspectional services. In the words of John Zilka, President of Applied Systems, "without effective enforcement any ordinance is a "toothless tiger." Currently, a variety of municipalities in the county have regulations related to inspection, registration and/or certification programs for rental housing and this represents a significant opportunity. The IOP, with support from the ACHD and other county agencies, can bring together municipalities for the purposes of evaluating the existing ordinances and practices as well as determining the best approach for replicating a mandatory and enforceable lead-safe/lead-free certification program for all rental housing based on the Rochester model. The cost of remediation is also a challenge. In the past, grants from HUD have been available to support remediation but Allegheny County has not always applied for these opportunities. Collective advocacy at the state and federal levels will be required and should encourage support for remediation efforts. This is the time to convene municipal leaders, raise awareness, and work collaboratively on the promulgation of appropriate ordinances.

2. Water

Goal: Eliminate harmful exposure to lead from water.

Recommendations: Lead pipes, solder and household fixtures continue to be a source of lead exposure in Allegheny County. Several of our water systems have recently exceeded the national LCR action levels. Utilities that meet the LCR may still provide water that contains lead, especially at homes with a lead service line. Therefore, the Lead Task Force makes the following recommendations.

2.1 Reduce exposure to lead from water lines by decreasing the presence of lead containing plumbing materials (pipes, solder, fixtures)

a. Water systems should conduct a comprehensive inventory of their lead service lines and commit to replacing them over the long-term. Replacement schedules should prioritize homes with elevated water lead levels and those with sensitive populations (children and pregnant women). Blood lead level surveillance data may help with prioritization.

b. Water systems should be encouraged to share lead line inventory with the public via maps.

c. Water Systems should not conduct partial lead line replacements given the risk that they pose to the public.

d. Communities and water systems should develop strategies and identify funding to ensure that only full lead line replacement practices are employed.

e. Individuals should assess the use of lead plumbing and fixtures within their own homes, (by means of scratch-tests or professional evaluations of pipe content), and replace or mitigate to reduce exposures.

f. The proposed lead-safe lead-free certification program (see recommendation under housing) should include all sources, including water, in the screening process.

2.2 Undertake short and medium-term strategies to minimize exposure

a. Encourage utilities to enhance corrosion control to further reduce lead levels in drinking water.

b. Water systems should offer customers with lead or unknown service lines (private or public) access to free water testing and to NSF-certified filters and education regarding their use and maintenance (with a particular focus on vulnerable populations such as infants and pregnant women).

c. Water systems should inform customers of potential risk and simple actions to decrease exposure, including how to identify lead lines in the home, the use of routine flushing, and the use of filters for water consumed for drinking and food preparation.

(Continued on page 33)

2.3 Prioritize settings where children spend substantial portions of time

a. Encourage school water testing and replacement of lead containing fixtures and plumbing.

b. Encourage child care settings to identify lead service lines, test water, and provide appropriate mitigation strategies if necessary (NSF-certified filters and/or bottled water for formula and food preparation).

c. Encourage any other settings that predominantly provide services to children and pregnant women to identify lead service lines, test water, and provide appropriate mitigation strategies if necessary (NSF-certified filters and/or bottled water for formula and food preparation).

2.4 Advocate for improved national standards

a. Encourage the EPA to revise the LCR to include: the development and adoption of a "health-based" standard; improved sampling protocols including higher frequency; eliminating partial line replacements as a mitigation strategy; and revising the action level to incorporate new information on health risk associated with lower levels of lead exposure. [88]

Additional Considerations

Partners

Water systems and municipalities will need to work together to realize these action steps. Homeowners will also need to be involved, particularly where line replacement is taking place, to accept line replacement and coordinate actions. The public needs to be informed about the use of funds and the progress made by water systems in a transparent manner (online information on lead lines as they are identified and removed, for example). State government will need to be involved given the large investment required for replacement and the need to change regulations regarding access to customer-owned service lines. State agencies will also need to work with water systems to ensure corrosion control meets standards. For prioritization of sites where children and pregnant women may be at risk, school systems, child care providers, after-school providers, hospitals, state department of health and human services, as well as other organizations that care for children will need to be involved. Advocacy organizations and other non-profits also have an important role to play in monitoring progress and advocating for additional resources and change in regulation.

Resources

Resources needed for elimination of lead containing plumbing apparatus will be required. Use of utility-specific funds will likely lead to increased water bills for customers. State and federal funds (through the state-revolving fund) should be available for projects. For short-term temporary solutions (such as NSF-certified filters) funding strategies should be considered that recognize the burden on disadvantaged populations. Removal of customer-owned lead service lines should be incentivized through targeted financing options (e.g., low interest loans or public funding). Identification of lead lines will help with targeting resources.

(Continued on page 34)

Timeframe

Removal of lead service lines is a long-term effort (multiple decades). Short and medium-term strategies such as enhanced corrosion control, newly emerging techniques for lead line replacement, and use of NSF-certified filters, should be considered as part of lead exposure reduction plans.

Challenges & Opportunities

The EPA LCR currently requires specific actions of any water system that exceeds the action level (currently 15 ppb) in ten percent of samples. The rule does not provide a health-based level for action. Thus, reducing lead exposure via water through compliance with the LCR alone will remain a challenge for the immediate future. Aging infrastructure is a major challenge for water systems and will require financial strategies as will identification of lead service lines. Small water systems will require technical assistance to communicate information about water lead levels and ways consumers can reduce their risk from this source. The alternatives available for mitigation of this risk (such as threading existing lead pipes with copper pipes) should be explored for safety, feasibility and cost effectiveness.

3. Soil

Goal: Eliminate harmful exposure to lead from soil.

Recommendations: Exposure to lead from soil poses a serious threat to the residents of Allegheny County, particularly young children. Soil often contains lead from gasoline and from legacy industrial processes involving lead. Demolition of old structures containing lead paint and dust as well as years of scraping and sanding external lead-based paint can further increase the exposure to lead from soil. Improved demolition practices combined with increased soil testing and remediation strategies will significantly reduce the threat of lead exposure from soil. Therefore, the Lead Task Force recommends the following actions, focusing on primary prevention.

3.1 Improve demolition standard and conformity to those standards

a. Conduct a review of demolition standards across all municipalities and recommend lead safe standards for all municipalities and Allegheny County.

b. Improve enforcement of lead safe demolition standards.

c. Regularly review and update these standards as research becomes available, as well as communicating and partnering with the demolition industry, expecting that EPA recommendations for lead concentrations in soil will become more stringent.

(Continued on page 35)

3.2 Identify and remediate contaminated soil

a. Provide funding to conduct tests of vacant and blighted lots, particularly those with condemned or demolished structures near schools, childcare centers, parks and playgrounds, and provide funding for remediation.

b. Encourage the use of more diverse cover seed mixes on demolished lots to build soil health as well as storm water holding capacity while diluting soil lead content.

c. Improve and enforce standards related to the application of clean fill in support of soil remediation.

d. Advocate at the state and federal levels for cleanup standards for soil that reflect current research.

e. Educate the public of the risk of lead in empty lots with prior structures, and the risk of tracking lead-contaminated soil into the home.

3.3 Support home owners and housing providers to test and remediate lead in soil

a. Create programs to assist with soil testing for lead.

b. Provide affordable recommendations for residents with elevated levels of lead in soil, include community-composting programs that provide free or discounted organic material that can be used to dilute, immobilize and otherwise improve health of contaminated soils.

Additional Considerations

Partners

In the near term, community organizations like the Allegheny County Conservation District, universities, municipalities and county agencies can work together to enhance and extend existing soil testing programs, prioritizing those communities with higher concentrations of elevated blood lead levels in children and higher concentrations of blighted lots. Most immediately, home owners, housing providers and residents can be engaged to understand the risk of lead in soil and conduct soil testing. The Institute for Politics (IOP) can assist with examining demolition policies and best practices while municipal government can adopt and enforce these policies and practices. The Conservation District can provide guidance to municipalities, neighborhoods, and residents on best practices to mitigate exposure to contaminated soil.

Resources

Resources are needed to support soil testing. The Allegheny County Conservation District along with municipalities should collaborate to improve demolition standards and enforcement as well as soil remediation and increasing public awareness. Resources for mitigation will also need to be identified.

Timeframe

Working with municipalities to identify effective and practical approaches will require analysis and time. Initial efforts will involve analysis of existing ordinances and practices as well as education efforts for residents. Within a few years, municipalities must, where necessary, adopt improved standards for demolition and increase enforcement of these standards.

(Continued on page 36)

Challenges & Opportunities

The IOP, and the Allegheny County Conservation District along with support from county agencies can bring together municipalities to evaluate local demolition ordinances. With the assistance of the Conservation District and other soil-interested organizations, parties can educate on best practices and establish new standards for demolition and compliance as needed. Together they can work with municipalities, especially those with areas of concentrations of high blood lead levels, universities, and community organizations, to improve access to testing and remediation. ACHD can help raise awareness of the hazard of lead in soil. However, enforcement of standards is key in the primary prevention of lead exposure from soil and there will be challenges in resources to conduct enforcement activities. Some of the challenges will be financial and others may be staffing. Individual municipalities must at a minimum adhere to state policies; however, they can be more stringent than the state. Passing more stringent regulations will also have challenges.

4. Alternative Sources

Goal: Eliminate harmful exposure to lead from alternative and unexpected sources.

Recommendations: While the majority of lead exposure comes from the three major sources already mentioned, there are a variety of alternative sources that must also be recognized, monitored and eliminated on a continual basis as they are identified. Therefore, the Lead Task Force recommends the following activities.

4.1 Identify and eliminate alternative sources of exposure to lead

a. Monitor air sources of lead, identify and intervene in airborne sources of lead exposure.

b. Identify alternative sources such as jewelry, tile, candy, toys, cosmetics, etc. during EBLL investigations of children's homes.

c. Educate families and providers about alternative sources.

d. Maintain awareness of alerts and advisories from FDA and Consumer Protection and investigate any reports of new consumer risk (presence of candy, toys) and remove them from shelves.

4.2 Identify high-risk occupations and hobbies and encourage appropriate lead-safe practices to protect workers and their families

4.3 Advocate for additional federal regulations to identify and eliminate importation of lead containing items that pose risk to children

(Continued on page 37)

Additional Considerations

Partners

The Allegheny Health Department along with community organizations, pediatric providers, and the public, must be aware of these alternative sources and if discovered, report their presence to ACHD and/or the Pennsylvania Department of Health for investigation.

Resources

Educational materials for providers, home visitors, and families need to include information on alternative sources. This can be done with existing resources.

Timeframe

This can be done in the short term, much of which is already happening.

Challenges & Opportunities

There are ongoing opportunities to identify all potential sources of lead in the environment and remove them whenever possible. However, communities need to develop more awareness about both alternative and other sources to best protect themselves and their children.

5. Monitoring and Reporting Information on Risk and Exposure

Goal: Assure surveillance and public reporting of lead exposure in Allegheny County.

Recommendations: Historically, lead surveillance has been based on reported blood level tests in children on an annual basis. Often, release of the data has been delayed for up to two years, making any real-time surveillance impossible. The Lead Task force believes that it is important to monitor childhood lead exposure on a population basis (in addition to an individual basis) to determine temporal and spatial trends that will improve exposure prevention and enable improved decision making, particularly as it pertains to issues of health equity. In addition, it will be important to establish performance measures and follow them regularly to evaluate progress towards goals. These data and measures of progress should be available to the public in a transparent and timely manner, while protecting individual privacy in health records. We should follow new emerging evidence on reference levels for these analyses. The Lead Task Force recommends the following activities related to monitoring and reporting on lead risk and exposure:

5.1 Identify communities in the county with high-risk for lead exposure

a. Utilize BLL data, housing data, other known risk factors as well as explore the use of investigation data on where lead hazards exist (paint, soil and water) to identify and map communities with high - risk in the county and to spatially resolve risk factors.

b. Encourage compliance with child testing particularly in high-risk communities.

c. Provide information via maps to the public when available on lead-safe, lead free housing.

d. Utilize analytic tools such as predictive models and indices to target efforts for education and intervention.

e. Utilize ACHD-owned datasets and/or other datasets to improve information about sensitive sub-populations. (For example, link EBLL case level data for children to adult EBLL case level data by name and address to determine adults who may have potential take home exposures; potentially link EBLL data with refugee data sources at the state).

f. Monitor consumer reports and FDA sites for recalls involving products that are alternative sources.

(Continued on page 39)

5.2 Enhance surveillance efforts to address actionable interventions

a. Conduct ongoing surveillance using timely data.

b. Use blood lead level testing results as surveillance to address issues as they emerge (i.e. clusters of EBLLs).

c. Follow children eligible for blood lead level testing from birth to test date to determine whether the universal testing regulation improves testing rates.

d. Reduce unconfirmed capillary tests by identifying them (no additional venous after 12 weeks) and reaching out to primary care providers and families to encourage follow-up venous tests.

e. Increase testing and messaging by working with pediatric primary care providers, including messaging that requires test results to be entered into PA NEDDS database. Assure that certified laboratory methods are being used.

5.3 Enhance Public Reporting

a. Provide information to the reconstituted "lead-safe" task force to oversee county-wide progress.

b. Provide an annual lead report to the public and provide community-based data as requested. Utilize standardize terms to increase understanding and provide data to the public in a transparent manner such as on a public website.

c. Work with water systems to encourage them to report water testing results in an interactive manner to the public.

d. Make reports of high-risk areas and provider testing rates readily available to pediatric providers.

Additional Considerations

Partners

The work of reporting and surveillance falls mostly in the purview of the Allegheny Health Department and the Pennsylvania Department of Health. However, for some data, other partners will hold the responsibility for reporting (i.e., insurance companies, health care organizations, housing organizations, water systems, etc.) Partners include the State Department of Health, pediatric primary care providers, medical societies, laboratories, universities and other academic institutions, managed care organizations, and community organizations. ACHD has already utilized university partnerships to evaluate pilot projects and has an opportunity to continue this work.

Resources

Much of the work identified in this section is being implemented. However, resources for continued surveillance must be secured and over time, stabilized to ensure that these efforts are sustained over time.

Timeframe

The universal testing regulation is being implemented in January 2018. The activities leading up to this implementation must be accomplished by that time. It is critical that most of these activities are completed over the next 1 year period and integrated into existing work plans.

(Continued on page 40)

Challenges & Opportunities

The refocus on lead has offered an opportunity to reconsider and address communities at highest risk. The Task Force see the lead issue as an issue of environmental justice and community-wide importance. We urge stakeholders to consider lead as but one component in the challenge to address health inequities and to remember there are numerous other environmental issues that should be considered. Therefore, while the challenge is mostly in accumulating and consolidating data, there is opportunity to embed lead work with other health equity issues, encompassing primary prevention of lead exposure as part of addressing adverse childhood experiences overall. Challenges also exist in the informatics infrastructure needed to effectively combine data from remediation assessment with clinical data and other environmental data. In addition, data from insurance organizations and clinical providers is HIPAA-protected and these organizations will need to consider how best to inform the public of their work. Currently, investigation data is not housed in PA NEDDS and therefore is difficult to obtain. Improved data management would require additional resources at the state and local level and offers potentially high returns as comprehensive data structures often enable improved decision-making. Finally, there are challenges inherent in educating providers and increasing their engagement in testing and reporting.

6. Investigation of Hazards

Goal: Investigate and mitigate known home lead hazards.

Recommendations: ACHD has been conducting lead investigations for multiple decades. Along with increased primary prevention efforts, secondary intervention for children with Elevated Blood Lead Levels is required. Current investigation efforts are strong and follow HUD and EPA guideline but could expand. The Lead Task Force recommends further action as follows:

6.1 Monitor changes to the CDC guidelines for management of elevated blood lead levels and adjust programming accordingly

a. Adjust the level for home investigation and assessments based on CDC guidelines and available resources.

b. Seek funding to increase the number of inspectors at the ACHD to meet the changing demand.

c. Continue education and outreach for children with confirmed EBLL of 5-9 µg/dL.

d. Conduct a pilot of home investigation for confirmed EBLLs of 5-9 µg/dL in high-risk communities. Assess the impact and determine feasibility of lowering investigation level to 5 µg/dL (including financial reimbursement from insurers).

e. Check for lead water lines as part of home investigation and if present (either public or private)

provide filters approved for removing lead along with education regarding safe and effective filter use.

6.2 Conduct primary prevention investigations in homes based on risk factors (see recommendation for paint, dust and home hazards)

a. Set goals and identify resources for annual primary prevention home investigations in high -risk neighborhoods and in high-risk homes. Hire new inspectors to carry out this work.

b. Assess need to train non-ACHD staff to conduct lead investigations (municipal inspectors).

c. Investigate strategies, with community engagement, to improve access to homes for lead investigation. Improve acceptance rates of services offered to lead-affected families by offering incentives to allow visits for education and inspection, such as pairing home evaluation with free window replacement.

d. In multi-unit buildings where a child with EBLL is identified and a home-based exposure is identified through investigation, consider investigations of other children (<6 years) inhabited units in the building, as is done in the NYC program.

6.3 Provide linkage to resources for all children with elevated Blood Lead Levels based on CDC guidelines

a. All young children with a confirmed blood lead levels of 5 µg/dL or above should be offered quality early childhood services (Early Intervention for children aged birth to age 3).

b. Refer eligible families to existing lead hazard remediation programs when lead hazards are identified.

Additional Considerations

Partners

Currently, home investigations for confirmed EBLLs are the purview of the ACHD. However, there may be opportunities to train other municipal staff to conduct lead investigations. Housing providers and home owners are critical partners in this effort. Advocacy organizations and other community organizations play an important role in education of residents on testing, mitigation and primary prevention. Agencies including insurance companies, health care providers, schools and child care providers can educate and refer families to existing programs.

Resources

Expansive primary prevention programs that conduct risk assessments in buildings without identified children with EBLLs will require new resources in the form of inspectors and support for remediation. In order to adjust to changing levels of EBLL investigations, additional inspectors may be needed, as well as resources for remediation. Resources from managed care organizations, county government, state and federal government,

(Continued on page 42)

educational institutions, and municipal government are required to obtain the additional training required for lead-safe construction tradesmen, inspectors and other lead abatement occupations. In addition, the development of the necessary information technology to link enforcement to monitoring activities will be required.

Timeframe

Home investigations are currently being provided for children with confirmed EBLLs of 10 µg/dL and above. To expand to a confirmed levels of 5 µg/dL will require resources not yet available, but a pilot could be launched in 2018.

Challenges & Opportunities

The ACHD will require resources for additional lead inspectors. Because lead inspections are voluntary and homeowner acceptability is not universal, the challenge is to gain access and provide inspection services to as many homes as possible. To be effective will require strengthened relationships with existing municipal inspectors and community groups and leaders. It will also require new information technology to ensure that information on inspections and remediation is appropriately handled for monitoring purposes.

7. Public Awareness and Advocacy

Goal: Raising public awareness and sustaining advocacy.

Recommendations: Raising and sustaining public awareness is essential to the goal of eliminating harmful exposure to lead in Allegheny County. Providing wide access to information and regular review of progress will generate public advocacy to propel leaders to rally Allegheny County to achieve its goal. Therefore, the Lead Task Force recommends the following actions:

7.1 Reconstitute a community lead advisory committee such as the prior "Lead Safe Pittsburgh" organization as a countywide working group

a. Monitor progress towards implementation of task force recommendations.

b. Provide regular reports to the public containing standard terms and measures to ensure everyone is working toward common objectives.

(Continued on page 43)

7.2 Expand education strategies particularly on the hazards of lead and strategies for remediation

a. Educate residents on the risks of lead exposure from all sources and the impact of lead on health. Prioritize high-risk neighborhoods, areas where children spend substantial amounts of time and populations likely to be at risk.

b. Provide information to the public on all sources of exposure, screening, follow up confirmatory testing, strategies for mitigating risk, and benefits of good nutrition.

c. Educate health care providers on risks of lead exposure from all sources, resources for referral, case management, screening, and use of PA NEDSS for reporting.

d. Educate homeowners and tenants on the potential sources of lead in drinking water, and what actionable steps they can take to minimize this exposure.

e. Educate water systems about methods to identify lead service line and actions to take to lower lead levels in water.

f. Develop materials for health care providers about universal screening and resources (screening at 9-12 months and again at 2 years).

g. Educate homeowners and housing providers about current Environmental Protection Agency and Housing and Urban Development disclosure laws.

h. Inform residents about exposure to lead in soil and the value of cleaning of shoes and outer wear, washing vegetables and controlling dust, all of which can contribute to the reduction of exposure to lead.

Additional Considerations

Partners

The broader public has an important role to play in advocating for policy and practice changes and monitoring progress toward the goals and objectives. To reconstitute a community advisory committee will take county leadership and citizen engagement. Education of the public will require participation from state and county agencies (health, human services, economic development) schools, organizations that interface with children, health care providers, water systems, municipal leadership, landlord and tenant organizations, housing providers, community organizations addressing conservation and soil quality, real estate agents, foundations, non-profits, and advocacy organizations.

Resources

Gathering information, producing the materials to elevate public awareness and engaging in advocacy will require resources. This should be funded by a combination of public and private funds and sustained over time.

Timeframe

The recommendations involve short-, intermediate- and long-term goals. The community lead advisory committee- Lead Safe Allegheny- should function until the Allegheny County has eliminated the threat of harmful exposure to lead.

(Continued on page 44)

Challenges & Opportunities:

The primary challenge is lethargy. For years and until the crisis in Flint, Michigan, local governments and largely, the public, assumed our nation had done what was possible to reduce harmful exposure to lead. A community lead advisory committee-Lead Safe Allegheny- for Allegheny County can establish goals, share information, produce reports and advocate effectively to ensure we maintain public vigilance until we have achieved our overall goal of protecting children by eliminating harmful exposure to lead in all sources.

References

1. President Barack Obama. Speech in Flint Michigan. 2016.
2. Centers for Disease Control and Prevention. Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Preventing Lead Exposure in Young Children: A Housing-Based Approach to Primary Prevention of Lead Poisoning. Washington, DC: Centers for Disease Control and Prevention; 2004.
3. The Pew Charitable Trusts. *10 Policies to Prevent and Respond to Childhood Lead Exposure.* 2017. http://www.pewtrusts.org/~/media/assets/2017/08/hip_childhood_lead_poisoning_report.pdf
4. Pennsylvania Department of Health. *Childhood Lead Surveillance Annual Report – 2014.* 2014.
5. United States Census Bureau. Census.gov American Fact Finder 2017.
6. Rabin R. The lead industry and lead water pipes "A Modest Campaign". *Am J Public Health.* 2008;98 (9):1584-1592.
7. Troesken W. *The Great Lead Water Pipe Disaster.* Cambridge, MA: MIT Press; 2004.
8. EPA. Title XIV of The Public Health Service Act: Safety of Public Water Systems (Safe Drinking Water Act). 1986.
9. EPA. EPA, Lead and Copper Rule 1991.
10. Russell C, Brandhuber P, Lytle D,. Lead in Drinking Water: Past, Present, And Future. *Opflow, American Water Works Association.* 2017:10-15.
11. Newell RG, Rogers K. *The U.S. Experience with the Phasedown of Lead in Gasoline.*Washington, D.C.2003.
12. EPA. Lead Based Paint Hazards. *40 C.F.R. § 745.65(c)*2010.
13. United States Food and Drug Administration. Guidance for Industry: Lead in Candy Likely To Be Consumed Frequently by Small Children. https://www.fda.gov/Food/GuidanceRegulation/ ucm077904.htm
14. United States Consumer Product Safety Commission. Total Lead Content. https://www.cpsc.gov/ Business--Manufacturing/Business-Education/Lead/Total-Lead-Content
15. American Academy of Pediatrics. Lead Exposure in Children. 2017; https://www.aap.org/en-us/ advo cacy-and-policy/aap-health-initiatives/lead-exposure/Pages/Lead-Exposure-in-Children.aspx.
16. Advisory Committee on Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention. *Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention Report of the Advisory Committee on Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention.* 2012. https://www.cdc.gov/nceh/lead/acclpp/final_document_030712.pdf

References

17. American Academy of Pediatrics Council on Environmental Health. Prevention of Childhood Lead Toxicity. *Pediatrics.* 2016;138(1).

18. Bellinger DC. Very low lead exposures and children's neurodevelopment. *Curr Opin Pediatr.* 2008;20 (2):172-177.

19. Evens A, Hryhorczuk D, Lanphear BP, et al. The impact of low-level lead toxicity on school performance among children in the Chicago Public Schools: a population-based retrospective cohort study. *Environ Health.* 2015;14:21.

20. Chiodo LM, Jacobson SW, Jacobson JL. Neurodevelopmental effects of postnatal lead exposure at very low levels. *Neurotoxicol Teratol.* 2004;26(3):359-371.

21. Schmidt CW. After the Screening: What Happens Next for Children with Elevated Blood Lead? *Environ Health Perspect.* 2017;125(10):102001.

22. Lanphear BP, Hornung R, Khoury J, et al. Low-level environmental lead exposure and children's intellectual function: an international pooled analysis. *Environ Health Perspect.* 2005;113(7):894-899.

23. Centers for Disease Control and Prevention. CDC Recommended Actions Based on Blood Lead Level. 2017. https://www.cdc.gov/nceh/lead/acclpp/actions_blls.html

24. Schonfeld DJ, Rainey PM, Cullen MR, Showalter DR, Cicchetti DV. Screening for lead poisoning by fingerstick in suburban pediatric practices. *Arch Pediatr Adolesc Med.* 1995;149(4):447-450.

25. Warniment C, Tsang K, Galazka SS. Lead poisoning in children. *Am Fam Physician.* 2010;81(6):751-757.

26. American Academy of Pediatrics. Detection of Lead Poisoning 2017; https://www.aap.org/en-us/ advocacy-and-policy/aap-health-initiatives/lead-exposure/Pages/Detection-of-Lead-Poisoning.aspx.

27. Allegheny County Health Department. ARTICLE XXIII. UNIVERSAL BLOOD LEAD LEVEL TESTING In: Department ACH, ed2017.

28. Akkus C, Ozdenerol E. Exploring childhood lead exposure through GIS: a review of the recent literature. *Int J Environ Res Public Health.* 2014;11(6):6314-6334.

Allegheny County Health Department. Safe and Healthy Homes Program. 2017; http://www.achd.net/ safehomes/tips.html http://www.achd.net/safehomes/drinking-water.html. Accessed November 28, 2017.

30. Brown MJ, Margolis S. Lead in drinking water and human blood lead levels in the United States. *MMWR Suppl.* 2012;61(4):1-9.

Lanphear BP, Hornung R, Ho M, Howard CR, Eberly S, Knauf K. Environmental lead exposure during early childhood. *J Pediatr.* 2002;140(1):40-47.

32. Spanier AJ, Wilson S, Ho M, Hornung R, Lanphear BP. The contribution of housing renovation to children's blood lead levels: a cohort study. *Environ Health.* 2013;12:72.

References

33. Centers for Disease Control and Prevention. Lead Prevention Tips. 2017. https://www.cdc.gov/nceh/lead/tips.htm

34. Levin R, Brown MJ, Kashtock ME, et al. Lead exposures in U.S. Children, 2008: implications for prevention. *Environ Health Perspect.* 2008;116(10):1285-1293.

35. Zilka J. Conversation with John Zilka, President, Applied Systems. July 6, 2017.

36. EPA. Lead Residential Lead-Based Paint Disclosure Program (Section 1018 of Title X). 1996.

37. Commonwealth of Pennsylvania. 1995 P.L.291, No. 44 Lead Certification Act 1995.

38. EPA. EPA Renovation, Repair and Painting Program. 2017. https://www.epa.gov/lead/renovation-repair-and-painting-program

39. Lanphear BP, Dietrich KN, Berger O. Prevention of lead toxicity in US children. *Ambul Pediatr.* 2003;3(1):27-36.

40. EPA. Protect Your Family From Exposures to Lead *EPA*. Washington, DC. https://www.epa.gov/lead/protect-your-family-exposures-lead

41. Lanphear BP, Howard C, Eberly S, et al. Primary prevention of childhood lead exposure: A randomized trial of dust control. *Pediatrics.* 1999;103(4 Pt 1):772-777.

42. Etchevers A, Le Tertre A, Lucas JP, et al. Environmental determinants of different blood lead levels in children: a quantile analysis from a nationwide survey. *Environ Int.* 2015;74:152-159.

43. EPA. Basic Information about lead in drinking water. 2017. https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water

44. Ngueta G, Abdous B, Tardif R, St-Laurent J, Levallois P. Use of a Cumulative Exposure Index to Estimate the Impact of Tap Water Lead Concentration on Blood Lead Levels in 1- to 5-Year-Old Children (Montreal, Canada). *Environ Health Perspect.* 2016;124(3):388-395.

45. Triantafyllidou S, Edwards, M., . Lead (Pb) in tap water and in blood: Implications for lead exposure in the United States. *Critical Reviews in Environmental Science and Technology.* 2012;42:1297-1352.

46. Deshommes E, Laroche L, Nour S, Cartier C, Prevost M. Source and occurrence of particulate lead in tap water. *Water Res.* 2010;44(12):3734-3744.

47. International. N. Water Filters and Other Types of Water Treatment. 2017; http://www.nsf.org/consumer-resources/what-is-nsf-certification/water-filters-treatment-certification

48. Hayes C, Croft, T., Campbell, A., Douglas, I., Gadoury, P. & Schock, M. . Computational modelling techniques in the optimization of corrosion control for reducing lead in Canadian drinking water. *Water Qual Res.* 2014;49:82-93.

49. Muylwyk Q, Sandvig, A. & Snoeyink, V. . Developing Corrosion Control for Drinking Water Systems. *AWWA Opflow.* 2014;40(11):24-27.

References

50. Masters SE, M. Increased Lead in Water Associated with Iron Corrosion. *Environ Eng Sci* 2015;32:361-369.

51. Sandvig A, Kwan, P., Kirmeyer, G., Maynard, B., Mast, D., Trussell, R. R., Trussell, S., Cantor, A. & Prescott, A. Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues. *AWWA Res Found Am Water Works Assoc* 2008;8.

52. Schock MR. Causes of temporal variability of lead in domestic plumbing systems. *Environ Monit Assess.* 1990;15:59-82.

53. Van den Hoven TS, N. Lead Monitoring. In: Quevauviller PT, K. C., ed. *Anal. Methods Drink. Water: Advances in Sampling and Analysis* John Wiley & Sons, Ltd; 2005.

54. Cornwell DA, Brown, R. A. & Via, S. H. National Survey of Lead Service Line Occurrence. *J Am Water Works Assoc.* 2016(108):E182–E191

55. Trueman BF, Camara E, Gagnon GA. Evaluating the Effects of Full and Partial Lead Service Line Replacement on Lead Levels in Drinking Water. *Environ Sci Technol.* 2016;50(14):7389-7396.

56. Fischbach JR ML. Getting the lead out of Pittsburgh's water. *Pittsburgh Post-Gazette.* July 3, 2017.

57. May LW FJ, Abbott M.,. *Informing Pittsburgh's Options to Address Lead in Water.* 2017.

58. City of Flint Michigan. Fast Start Initiative 2017; https://www.cityofflint.com/fast-start/. Accessed November 28, 2017, 2017.

59. Burgess J. Conversation with Jonathan Burgess, Allegheny County Conservation District. August 31, 2017.

60. EPA. Lead in Air Pollution 2017. https://www.epa.gov/lead-air-pollution

61. Commonwealth of Pennsylvania. PA Construction Code Act

62. City of Pittsburgh P. Code of Ordinances, Title X, Building.

63. Burgess J. Results of soil testing 2017. unpublished work

64. PennState Extension. Lead in Residential Soils: Sources, Testing, and Reducing Exposure. In: PennState Extension, ed. 2017. https://extension.psu.edu/lead-in-residential-soils-sources-testing-and-reducing-exposure

65. Korfmacher KS, Hanley ML. Are local laws the key to ending childhood lead poisoning? *J Health Polit Policy Law.* 2013;38(4):757-813.

66. Korfmacher KS, Ayoob, M., Morley, R. Rochester's Lead Law: Evaluation of a Local Environmental Health Policy Innovation. *Environmental Health Perspectives.* 2011;120.

67. New York City. NYC Lead Poisoning Prevention https://www1.nyc.gov/site/doh/health/health-topics/lead-poisoning-prevention.page.

References

68. New York City. NYC Building Violation Status 2017; http://www1.nyc.gov/nyc-resources/service/1279/building-violation-status. Accessed November 28, 2017.

69. New York City Lead Prevention Program. Conversation with New York City Lead Prevention Program. September 1, 2017.

70. Milwaukee Health Department. City of Milwaukee Lead Poisoning Prevention Program 2017; http://city.milwaukee.gov/health/lead-Poisoning#.WhsoL1WnGUk. Accessed November 28, 2017.

71. State of Illinois. Illinois SB 1774 2017.

72. Jacobs DE, Tobin M, Targos L, et al. Replacing Windows Reduces Childhood Lead Exposure: Results From a State-Funded Program. *J Public Health Manag Pract.* 2016;22(5):482-491.

73. Chicago Public Health. Lead Poisoning Prevention 2017; https://www.cityofchicago.org/city/en/depts/cdph/supp_info/inspections---permitting/childhood_lead_poisoningpreventionandhealthyhomesprogram.html

74. Potash E. Conversation with Erik Potash, University of Chicago. August 31, 2017.

75. City of Philadelphia P. Philadelphia Public Health Department Lead and Healthy Homes Program 2017; http://www.phila.gov/health/childhoodlead/

76. Philadelphia Health Department. Conversation with Philadelphia Health Department. 2017.

77. Commonwealth of Pennsylvania. PA code § 27.34. Reporting cases of lead poisoning. . 2002.

78. Dickman J. *Children at Risk: Gaps in state lead screening policies 2017* 2017.

79. State of Pennsylvania Department of Public Health. *2015 Lead Surveillance Annual Report.* 2017.

80. Pediatric Providers. Conversation with pediatric providers,. 2016.

81. Lanphear B. Conversation with Bruce Lanphear, MD, MPH, Simon Fraser University, Vancouver, BC. June 30, 2017.

82. Landrigan P. Conversation with Philip Landrigan, MD, MSc. Dean of Global Health Icahn School of Medicine at Mount Sinai Hospital, NY. July 13, 2017.

83. State of New Jersey. $10 million Available for Local Health to Reduce Childhood Lead Exposure. 2017; http://www.nj.gov/health/news/2017/approved/20171017a.shtml.

84. Rhoads G. Conversation with George Rhoads, MD, MPH, Rutgers University, School of Public Health. July 20, 2017.

85. Caldwell KL, Cheng PY, Jarrett JM, et al. Measurement Challenges at Low Blood Lead Levels. *Pediatrics.* 2017;140(2).

86. Potash E. Impact of lead investigations in children with blood lead levels of 5 µg/dL-9 µg/dL. 2017. Unpublished work.

Glossary

Abatement: Any measure or set of measures designed to permanently eliminate lead-based paint hazards.

Blood Lead Test: Any blood lead draw (capillary, venous or unknown sample type) on a child that produces a quantifiable result and is analyzed by a Clinical Laboratory Improvement Amendments (CLIA)-certified facility or an approved portable device. A blood lead test may be collected for screening, confirmation, or follow-up.

Capillary Test: A blood lead testing method where a patient's blood is drawn at the fingertip using a capillary tube.

Corrosion Control: A treatment used by water systems designed to reduce the corrosivity of water toward metal plumbing materials, particularly lead and/or copper

Elevated blood Lead Level (EBLL): A single venous blood lead test at or above the current CDC reference range value of 5 µg/dL established in 2012.

Housing Provider: Any entity that provides housing to individuals, such as landlords and property management companies.

Lead-Free: The circumstance in which the interior and exterior surfaces of a property do not contain any lead-based paint and the property contains no lead- contaminated soil or lead contaminated dust

Lead exposure: In toxicology, exposure is defined as any detectable level in blood; thus, lead exposure in this document means any detectable level of lead in blood.

Lead Hazard: any condition that causes exposure to lead from lead-contaminated dust, lead contaminated soil, lead contaminated water, or lead-contaminated paint that is deteriorated or present in accessible surfaces, friction surfaces, or impact surfaces that would result in adverse human health effects.

Lead-based paint: paint or other surface coatings that contain lead equal to or greater than 1.0 mg/cm2 or 0.5 percent by weight. (Equivalent units for the weight concentration are: 5,000 µg/g, 5,000 mg/kg, or 5,000 ppm by weight.) Surface coatings include paint, shellac, varnish, or any other coating, including wallpaper that covers painted surfaces.

Lead poisoning: An acute or chronic poisoning caused by the absorption of lead into the body.

Lead Safe: The circumstance in which a property is free of a condition that causes or may cause exposure to lead from lead-contaminated dust, lead contaminated soil, deteriorated lead-based paint, deteriorated presumed lead-based paint, or other similar threat of lead exposure due to the condition of the property itself.

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

Microgram: A unit of measure equal to one millionth (1×10−6) of a gram.

NSF –certified filter: A water filter which has received third-party certification that a product complies with all standard requirements listed.

Pennsylvania National Electronic Disease Surveillance System (PA NEDSS): Pennsylvania's electronic disease reporting system, allowing for healthcare system to report diseases and investigative findings to the PA Department of Health.

Primary Prevention: reducing or eliminating all harmful sources of lead in the environment of children before exposure occurs.

Glossary

Public Water System: A system which provides water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year. A public water system may be publicly or privately owned.

Risk Assessment: an on-site investigation to determine the presence, type, severity, and location of lead-based paint hazards (including lead hazards in paint, dust, and soil) which is performed by an EPA-certified risk assessor.

Unconfirmed Test: An elevated capillary blood lead test that has not been followed-up with a more accurate venous blood draw test.

Venous Test: A blood lead testing method where a patient's blood is drawn directly from a vein.

Appendix 1: List of Experts Consulted by the Lead Task Force

Name	Organization	Subject	Date of Call
Larry Swanson	Executive Director, ACTION-Housing	Residential Policies	6/23/2017
Bruce Lanphear, M.D., M.P.H.	Clinician Scientist at the Child & Family Research Institute, BC Children's Hospital and Professor in the Faculty of Health Sciences at Simon Fraser University	Residential Sources	6/30/2017
John Zilka	President, Applied Systems	Residential - Home Investigations	7/6/2017
Philip Landrigan, M.D., M.Sc	Dean for Global Health, Professor and Chair of Preventive Medicine, and Professor of Pediatrics at Mount Sinai School of Medicine	Data	7/13/2017
George Rhoads, M.D., M.P.H	Professor Emeritus, Rutgers University, School of Public Health	Data	7/20/2017
Kristen Kurland	Professor of Architecture, Information Systems, and Public Policy at Carnegie Mellon University's Heinz College of Information Systems and Public Policy and School of Architecture	Data - Mapping	7/25/2017
Marc Edwards, Ph.D.	Charles P. Lunsford Professor, Environmental and Water Resources Engineering, Virginia Tech University	Water Sources	7/31/2017
Nancy Love, Ph.D.	Borchardt and Glysson Collegiate Professor, Civil and Environmental Engineering, University of Michigan	Lead Filters and bacteria	7/31/2017
Jeanne VanBriesen, Ph.D.	Duquesne Light Company Professor of Civil and Environmental Engineering and the Director of the Center for Water Quality in Urban Environmental Systems (Water QUEST) at Carnegie Mellon University	Water Sources	8/17/2017
Cara Ciminillo	Executive Director, Pittsburgh Association for the Education of Young Children	Child Care Facilities	8/24/2017
Brigadier General Michael McDaniel	Professor and Director of Homeland and National Security Law Programs at the Western Michigan University Thomas M. Cooley Law School	Lead Pipe replacement prioritization	8/27/2017
Eric Potash, Ph.D.	University of Chicago's Harris School of Public Policy.	Data	8/31/2017
Jonathan Burgess	Policy Director Policy Director, Urban Agriculture Program Lead, Allegheny County Conservation District	Soil	8/31/2017

Appendix 1: List of Experts Consulted by the Lead Task Force

Name	Organization	Subject	Date of Call
Richard Stehouwer, Ph.D.	Professor of Environmental Soil Science, College of Agricultural Sciences, Penn State University Extension	Soil	9/12/2017
Angela Hagy	Director of Public Health Planning and Policy, City of Milwaukee Health Department	Water Sources	9/18/2017
David Jacobs, Ph.D.	Chief Scientist, National Center for Healthy Housing	Residential Policies	9/18/2017
Katrina Korfmacher, Ph.D., and Gary Kirkmire	University of Rochester Medical Center and City of Rochester	Lead policies	9/25/2017
Jeaneen Zappa, MBA	Executive Director, Conservation Consultants, Inc	CCI Lead Recommendations	10/10/2017
David Weber, Caster Binion, and Frank Agazzio	City of Pittsburgh Housing Authority and Allegheny County Housing Authority	Housing Policies	10/31/2017

Appendix 2: Assessment of Blood Lead Level Action Levels for Home Investigations in Other Jurisdictions (As of December 2017)

Location	Responsible Agency	BLL Action Level for In-Home Investigations (µg/dL)	Notes
Austin, TX	Austin Public Health	5+	
Pontiac, MI	Oakland County	5+	
Cleveland, OH	Cuyahoga County	5+	
Newark, NJ	City of Newark	5+	NJ recently passed $10 million dollar budget item to support expansion of investigations
Chicago, IL	Chicago Health Department	6 to 10 (age dependent)	Children under 12 months receive investigations at levels of 6 µg/dL and above. Children older than 12 months receive investigations for levels of 10 µg/dL and above.
Rochester, NY	City of Rochester / Monroe County	8+	City conducts proactive testing in homes related to Certificate of Occupancy inspections regardless of BLL. County Health Department investigates for reported EBLLs 8 µg/dL and higher.
New York City, NY	New York City Department of Health	8 - 15+ (age dependent)	Children under 16 months receive investigations at levels between 8-9 µg/dL. Other children under 6 receive investigations for levels between 10-14 µg/dL. Inspections are mandated for all ages up to 18 when levels are 15 µg/dL and higher.
Ann Arbor, MI	Washtenaw County	9+	Education is provided in collaboration with local nursing students. Levels of 9+ µg/dL will trigger case management services, which includes a home visit by a nurse and coordination of environmental investigations to determine lead sources.
Columbus, OH	Franklin County	10+	
Oakland, CA	Alameda County	10+	For levels 5 -9 µg/dL, educational materials are mailed and a phone consultation is conducted. Suggested retest within 6 months. For levels 10 -19 µg/dL, a home visit occurs within 30 days, and a retest is suggested within 1-3 months. For levels 20-44 µg/dL, a home visit occurs within 7 days, and a retest is suggested within 1-2 months.

Appendix 2: Assessment of Blood Lead Level Action Levels for Home Investigations in Other Jurisdictions (As of December 2017)

Location	Responsible Agency	BLL Action Level for In-Home Investigations (µg/dL)	Notes
Philadelphia, PA	Philadelphia County	10+	
Milwaukee, WI	City of Milwaukee Health Department	10+	For levels 5-9 µg/dL, educational materials are mailed to families. Levels 10 µg/dL and higher will receive a home investigation. For levels 20 µg/dL and higher, children receive a case manager.
Rhode Island	State of Rhode Island	10+	For levels 5 µg/dL and higher, children receive non-medical case managers, similar to lead assessors, as well as nutritional information and referrals to evaluations. For levels 10 µg/dL and up, if the family is Medicaid eligible, they receive a full inspection. Non-Medicaid eligible families will receive home investigations depending on available funding.
Cincinnati, OH	City of Cincinnati	10+	
Connecticut	Connecticut Department of Public Health	20+, or 15-19 for two tests within a 3 month period	Levels are state requirements, but local jurisdictions are allowed to set more stringent standards.
San Francisco-Oakland-Hayward MSA, CA	Contra Costa County	20+, or 15-19 for two tests within 6 months	Home investigations occur at levels of 20 µg/dL and higher for a single test, or at 15-19 µg/dL if tested twice within 6 months.
Washington-Arlington-Alexandria MSA, VA	Fairfax County	20+, or 15+ if second test is 15+	Home investigations occur at levels of 20 µg/dL and higher for a single test, or at 15-19 µg/dL if tested twice.

Appendix 3

ALLEGHENY COUNTY HEALTH DEPARTMENT
OUTREACH TO FAMILIES OF CHILDREN WITH CONFIRMED BLOOD LEAD TEST RESULTS BETWEEN 5 µg/dl and 9 µg/dl

Family name_____

Address _____

Phone_____

Name of person contacted and relationship to child_____

Child Name _____Age _____

Blood Lead level _____

Additional Children in Home and ages _____

Any other child BLL test results _____

House built before 1978: yes_____ or No _____

Owner Occupied or Rental _____

Section 8 property? _____

Call attempt history (dates/times) _____

NOTE: Call Protocol is to make a minimum of 2 calls to the family at different times, on different days, leaving messages both times. With no return call within 48 hours, mark the form as such under "call attempt history" and turn in. Confirm each topic has been discussed by using the check boxes.

☐ 1. Confirm blood test results/age of child. If parent/guardian does not know if test was venous or capillary, tell them to call the physician to confirm and get advice on when child should be tested again. Tell them the ACHD recommends an elevated capillary be followed up immediately with a venous test.

☐ 2. Recommend follow up blood test in 2-3 months if they know the test was venous.

☐ 3. Review with the parent guardian child behavior

   a. Play areas – interior and exterior

   b. Chewing on window sills or guard rails

c. Any bare soil play area

d. Painted floors or porches

☐ 4. Review standard hazards:

a. Dust,

b. bare soil,

c. defective paint

d. water

☐ 5. Review common mode of ingestion- hand to mouth

☐ 6. Ask about property history:

a. planned or recently completed renovations and associated risks

b. For owner-occupants – any past lead testing or identified lead hazards?

☐ 7. Review potential alternative sources of lead exposure

a. Occupation/Hobbies of parents/guardians

b. Putting nonfood items in mouth (paint chips, soil, etc.)

c. Any other residence that might contain lead (built before 1978)

☐ 8. Talk about ways to limit lead exposure

a. Frequent hand washing for children

b. Regular weekly wet cleaning of horizontal surfaces,

c. Stress the need for regular wet cleaning of horizontal surfaces, especially child play areas twice per week plus use of HEPA VAC

d. Note areas of deteriorated paint and friction surfaces/keep children away

e. Contact water provider to see if there is a record of a public lead service line and ask to have water tested. Explain how to check for an interior lead service line.

f. Flush water (not always effective), use a NSF filter approved for removing lead, and/or use bottled water

g. Partial lead line replacements are not acceptable- might temporarily increase lead levels

h. For any renovation work, direct to EPA site for using Lead safe work practices.

☐ 10. Stress the role nutrition plays. Good diet with calcium and iron and give examples of food groups

a. lean red meat, low fat pork(iron)

b. dried beans and peas, raisins(iron)

c. iron fortified cereals and iron fortified formula

d. milk, yogurt, low fat cheese, (calcium)

e. ice cream and pudding (calcium)

11. Talk about ACED Grant Program- Encourage Application

    a. Remodeling using lead safe work practices

☐ b. Free Grant covers risk assessment

    c. Contractors hired by the County

    d. Ask permission to give name and number to Action Housing. If no, offer Action Housing intake number 412 227 5700: Verbal permission granted? _____

12. Talk about ACHD Healthy Homes Program

    a. Includes visual inspection and discussion of potential lead hazards and other hazards

☐ b. Free supplies

    c. No enforcement- voluntary participation

    d. Ask permission to give name and number to Healthy Homes. If no, offer Healthy Homes phone number 412 350 4048: Verbal permission granted? _____

13. Give phone number for Early Educational Intervention---

    1-800-692-7288

☐ 14. Would they like a mailing including Protect Your Family from Lead Booklet and/or ACED Allegheny Lead Safe Homes Grant Brochure and SHHP info (if interested)? ___Y ___N

☐ Interviewer Comments:

_____
_____
_____

Nature of questions from the family:

_____
_____
_____

Family Receptive to the call and suggested referrals to EI and HH: ___Y ___N Comment

_____
_____
_____

Mailing? ___Y ___N If yes, date mailing sent? _____ Clerical Staff Initials _____

Employee Name: _____Employee Signature: _____

Interview Date: _____

Environmental Science & Technology

Article

pubs.acs.org/est

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

Miguel A. Del Toral,*[,†] Andrea Porter,[†] and Michael R. Schock[‡]

[†]U.S. Environmental Protection Agency, Region 5, GWDWB, 77 West Jackson Boulevard, Chicago, Illinois 60604, United States

[‡]U.S. Environmental Protection Agency, ORD, NRMRL, 26 W. Martin Luther King Drive, Cincinnati, Ohio 45268, United States

Supporting Information

ABSTRACT: Comparative stagnation sampling conducted in 32 homes in Chicago, Illinois with lead service lines demonstrated that the existing regulatory sampling protocol under the U.S. Lead and Copper Rule systematically misses the high lead levels and potential human exposure. Lead levels measured with sequential sampling were highest within the lead service lines, with maximum values more than four times higher than Chicago's regulatory compliance results using a first-draw sampling protocol. There was significant variability in lead values from different points within individual lead service lines and among different lead service line sites across the city. Although other factors could also influence lead levels, the highest lead results most often were associated with sites having known disturbances to the lead service lines. This study underscores the importance and interdependence of sample site selection, sampling protocol, and other factors in assessing lead levels in a public water system.



INTRODUCTION

Background. Most lead in drinking water comes from premise plumbing materials and lead service lines (LSLs). LSLs are generally the largest source of lead in drinking water when they are present in public water systems.[1] The 1986 Safe Drinking Water Act Amendments banned new lead pipes in the potable water network, but a legacy of millions of partial or whole LSLs remains in many public water systems.[2] Where the term "lead corrosion" is used, it refers to the corrosion of lead plumbing materials that result in the transfer of dissolved or particulate lead into the drinking water.

The Lead and Copper Rule (LCR) sampling is intended to measure the lead levels in drinking water to assess the effectiveness of corrosion control treatment utilized by public water systems (PWSs) to minimize lead in drinking water. PWSs are required to use sampling sites that are presumed to be the highest-risk sites for lead release, and to optimize corrosion control to minimize lead levels at consumers' taps. Most published sampling studies typically focus on systems having high lead levels or systems that have experienced challenges in attempting to balance LCR compliance with various other treatment or water quality objectives. Except for LCR compliance data, little published data exists or is available for systems that are considered to be operating with optimal corrosion control and meeting the lead action level (AL) in the LCR. This study focuses on a system that is considered to have optimized corrosion control using a blended phosphate, with a relatively stable water quality, and compliance results historically well below the lead AL. This situation is representative of a large percentage of systems serving 100,000 or more people that utilize orthophosphate or blended phosphates for corrosion control and the vast majority of systems are meeting the lead AL based on the current sampling protocol in the LCR. Additional information on the LCR and study is available in the Supporting Information (SI). This study focused on whether (1) the current LCR compliance sampling protocol adequately captures the peak lead levels in a water system; (2) "preflushing" (PF) results in capturing lower lead levels in samples compared to samples collected under normal household usage (NHU) conditions; (3) a first-draw sampling protocol appropriately determines the adequacy of optimal lead corrosion control in water systems with LSLs; and (4) there is seasonal variability in the sampling results using the different sampling protocols.

System Information. The Chicago Department of Water Management (CDWM) operates two similar conventional surface water filtration treatment plants serving approximately 5.4 million residents, including those in 125 suburbs. Lake Michigan is the sole water source, with relatively stable water quality leaving the treatment plants and in the distribution system (Table 1). Before the LCR, CDWM utilized pH/alkalinity adjustment for corrosion control. CDWM switched to a proprietary blended phosphate at both plants between 1993 and 1994 which is still used as the primary corrosion control treatment.

The LCR requires public water systems to collect lead samples using a first-draw (FD) sampling protocol, and samples were collected almost exclusively from single-family homes with LSLs as required by the LCR sample site selection require-

Received: January 23, 2013
Revised: June 24, 2013
Accepted: July 23, 2013
Published: July 23, 2013

ACS Publications This article not subject to U.S. Copyright. Published 2013 by the American Chemical Society

Table 1. Water Quality Data 2011

	outlets		distribution	
parameter	min	max	min	max
temp (°C)	4	24	5	23
turbidity (NTU)	0.1	0.2	0.1	0.4
pH	7.5	7.8	7.7	7.8
Cl_2 residual (mg/L)	1.0	1.2	0.7	0.9
total alkalinity (mg/L as $CaCO_3$)	103	108	98	108
chloride (Cl, mg/L)	16	20	17	20
sulfate (mg/L)	29	31	29	30
Ca (mg/L)	34	39	34	39
PO_4 (mg/L)	0.4	0.6	0.5	0.5
total PO_4 (mg/L)	0.8	1.1	0.8	1.2
Al (μg/L)	34	126	29	113
Fe (μg/L)	<5	<5	<5	34
Mn (μg/L)	<3	<3	<3	<3

ments.[3] Since the initial LCR monitoring, Chicago has exceeded the lead AL only once, during July–December 1992, with an average 90th percentile compliance monitoring value between 1999 and 2010 of 6 μg/L (SI Table S2).[3]

The LCR requires 1-L, FD tap samples of water that has stood motionless in the plumbing system (i.e., has stagnated within the plumbing) for at least 6 h. The two variants of the FD sampling protocol currently used by public water systems are defined herein as the NHU first-draw sample, where water is used in a normal household manner, and then allowed to sit motionless in the plumbing for at least 6 h before the sample is collected; and the PF first-draw sample, where the water is run from the sampling tap for a specified amount of time immediately prior to the stagnation period. However, the LCR does not provide specific details on water use during the stagnation period.

Almost all PWSs in the U.S. rely on residents to collect compliance samples under the LCR and there are differences across the U.S. in how systems instruct residents not to use the water during the stagnation period prior to collecting the sample. A review of example sets of sampling instructions provided to residents by large PWSs in the U.S. found that some are instructed not to use any water *from the tap to be sampled* during the stagnation period. Others are instructed not to use *any water in the household*. Prior to 2009, CDWM used the PF first-draw sampling protocol, with a 5-min preflush preceding stagnation. Recent instructions to residents included not using water from the sampling tap or from any nearby tap until the (poststagnation) samples were collected, and to collect samples as soon as possible after the minimum required 6-h stagnation period. Regardless of the sampling protocol, resident-collected samples necessitate the use of simple instructions and make it difficult to ensure strict adherence to any sampling protocol. In addition, the diverse premise plumbing materials and configurations (SI Table S1) represent varying effects of flow rates, hydraulic flow characteristics, and possible lead sorption/particle release effects on the shapes of the lead profiles, particularly with corroded galvanized pipe locations.[4,5]

MATERIALS AND METHODS

Sampling Objectives and Protocol. Since the promulgation of the LCR, new research on lead corrosion has shown that there are many mechanisms and water quality factors involved.[1,4,6−11] Specifically, the sampling protocols used in this study were evaluated to determine if

- preflushing biases results;
- first-draw samples, with or without preflushing, capture the "worst-case" level of lead corrosion under normal use conditions; and
- seasonal variability affects lead concentrations (in this water system).

Consistent with the LCR requirements and CDWM compliance sampling, samples for this study were collected by volunteer residents from 32 single-family residences, built between 1890 and 1960, with LSLs. An additional 5 homes were sampled and determined not to have LSLs, and were therefore excluded from further sampling. All results are included in the Supporting Information, but the non-LSL sites were not used in the data analysis (SI Tables S4a, S5, S6a, S6b, and S7).

Information was requested on the specific plumbing configurations of each sampling site to a much greater extent than the regulatory requirements which simply require the plumbing material to be identified. This information, along with analyses conducted for lead, copper, iron, and zinc for each sample, facilitated a better understanding of the observed water lead levels. Residents were asked to (1) complete a plumbing profile identifying the kitchen tap and meter or internal shut-off valve, and (2) describe the internal plumbing, including any recent plumbing work (SI Figure S1). The information provided by residents along with the results of the four metals provided additional information on the sequences of plumbing materials, and the presence of in-line brass plumbing components. CDWM provided the locations of water mains, service line materials, work conducted by the city at each residence (meter installation or repair, shut-off valve repair/replacement, service line leak repair, street excavation), and monthly water use data for residences with water meters. The information provided by CDWM on water main locations was used to measure the distance from the water main to each residence, and internal plumbing information provided by residents was used along with the measured length from the water main to the residence to approximate the LSL length (SI Table S1).

Residents were provided with written sampling and reporting instructions for each sampling event (SI Figures S41–S45). One-liter, high-density polyethylene (HDPE), wide-mouth (5.5 cm, 2.2 in.) sample bottles were used to collect all samples. Residents were instructed not to remove aerators prior to sampling and not to collect samples after point-of-use or point-of-entry treatment devices.

Several prior studies have suggested that significant contributions of particulate-associated lead can be mobilized as a function of flow rate and turbulence in certain water chemistries, though studies have not developed predictive relationships to premise plumbing material, scale composition, and hydraulic flow characteristics.[6,10−15] To try to achieve the most aggressive high flow conditions under realistic field conditions, residents were instructed to collect all samples by slowly opening the cold water kitchen tap until fully open. Upon receipt, the samples were inspected by EPA for visible particulate matter prior to delivery to the laboratory.

For all first-draw samples, residents were instructed not to use any water throughout the household (i.e., no showering, washing clothes/dishes, flushing toilets, etc.) during the

dx.doi.org/10.1021/es4003636 | Environ. Sci. Technol. 2013, 47, 9300−9307

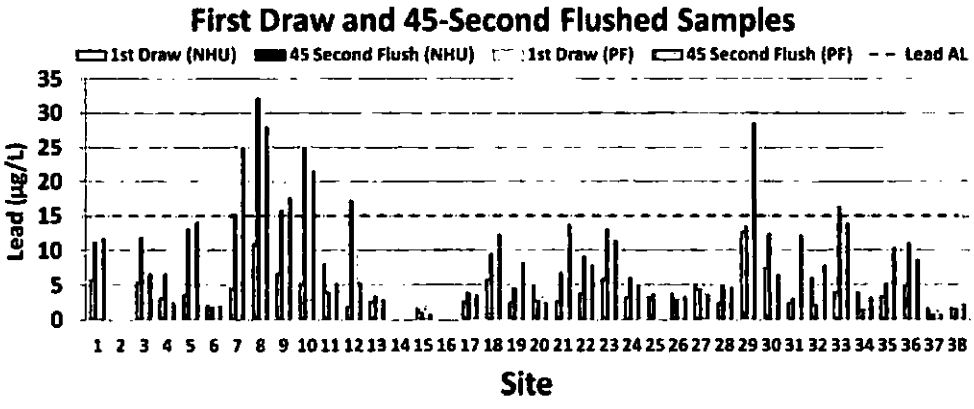


Figure 1. First round lead results for all sites.

minimum mandatory 6-h stagnation period. In this study, PF samples include a flush of at least 5 min prior to the mandatory minimum 6-h stagnation period. A NHU sample had no preflushing prior to the mandatory minimum stagnation period. Residents were instructed to allow the water to sit motionless in the household plumbing a minimum of 6 h, but not more than 24 h, and to record the dates/times the taps were flushed prior to the stagnation period, and the dates/times samples were collected following the stagnation period. First-draw samples using both variants (NHU and PF) were collected in the first and third rounds of monitoring in March/April and September/October, respectively. Additionally, 45-s flushed samples were collected in the first round to evaluate whether a second-draw sample more accurately captured the level of corrosion. Three-min, 5-min, and 7-min flushed samples were collected in the third round of sampling to provide guidance to volunteers when high lead levels were found (SI Table S7). This information can also be used to provide site-specific guidance on minimum flushing times necessary to reduce consumer exposure to lead in drinking water.

In the first round of sampling, each resident collected a NHU first-draw sample and then a second-draw (45-s flushed) sample after allowing the water to run for 45 s. On the second day, residents collected a PF first-draw sample and then a second 45-s flushed sample. EPA's current Public Notification Handbook advises[16] residents to run the water 30 s or until it turns cold before consuming, if the water has not been used for an unspecified "extended period of time", which can result in higher lead levels at the tap for consumers. It has also been previously demonstrated that in some situations, this advice can cause residents to consume the worst-case water sitting stagnant in the LSL.[17] (Figure 1)

Sites 14, 15, 16, and 37 were verified as not having LSLs and were excluded from further sampling. Site 2 was verified as not having a LSL following the June sequential sampling and was excluded from the final round of monitoring. The 45-s flushed sampling was discontinued following the March/April sampling first round due to the presence of severely corroded galvanized pipe in some of the residences (SI Figure S4) which reduced the inner pipe diameter, restricting water flow and resulting in varying volumes of water flowing through the plumbing for the same flush time.

In June 2011, each resident collected a total of twelve PF sequential samples in one day of sampling. The first PF sequential sample was also the PF first-draw sample for the data analysis. All samples were analyzed for lead, copper, zinc, and iron. The co-occurrence of the metals, along with plumbing details, was used in qualitative assessments to correlate lead results with potential sources of lead in the plumbing network (SI Figure S6).[4,10]

In September/October 2011, each resident collected a NHU first-draw sample, and a minimum of 11 PF sequential 1-L samples. Sites with high lead levels in the previous rounds collected an additional 3 or 4 PF sequential samples, and one site with a very long LSL (159 ft, 48 m) collected an additional 9 PF sequential samples. The additional PF sequential samples were collected to determine the point at which lead levels consistently dropped below the AL. All samples collected are included in the sampling summary with the numbers and types of samples collected at each site (SI Table S3).

Most stagnation times were relatively consistent across most sites at between 6 and 8.5 h, and all but two sites had stagnation times between 6 and 9 h 10 min, which facilitated unadjusted comparisons (SI Table S6c).

Additional flushed samples were collected in September/October for high lead sites in order to provide residents with guidance on minimizing lead levels in their drinking water. Recommended minimum flushing times were then estimated based on the lead levels and LSL lengths. These results are included in the Supporting Information, but not discussed here.

Sample Analyses. All samples were visually inspected for particulate matter prior to delivery to the EPA Chicago Regional Laboratory. Samples were preserved upon receipt by the laboratory using concentrated nitric acid to pH <2 and held for a minimum of 24 h prior to analysis.[18] The laboratory's Reporting Limits (RL) for lead, copper, and zinc in drinking water samples, using EPA Method 200.8, are 0.5, 1, and 10 μg/L, respectively. The laboratory's RL for iron in drinking water samples, using EPA Method 200.7, is 80 μg/L. Additional laboratory information is included in the Supporting Information.

RESULTS AND DISCUSSION

Both Variants of the First-Draw Protocol Significantly Underestimated Peak Lead Levels, and the NHU First-Draw Protocol Yielded Higher Results Overall than the PF First-Draw Protocol. The 90th percentile lead values for all three rounds of first-draw sampling using both variants were slightly higher than Chicago's historical compliance results, but still fell well below the lead AL (SI Table S4b). Only 2% of the total number of first-draw samples (3 of 151) exceeded the AL despite the presence of lead levels well above the lead action

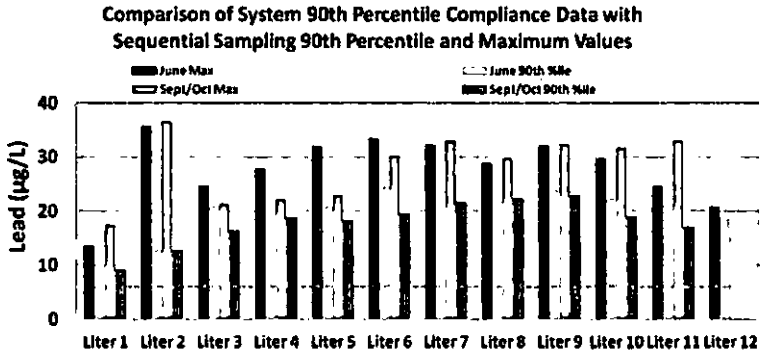


Figure 2. Comparison of 90th percentile LCR compliance data to 90th percentile values from LSL samples (across sites by liter) and maximum values from LSLs. The green dashed line indicates the average 90th percentile compliance monitoring value for Chicago between 1999 and 2010 of 6 µg/L.

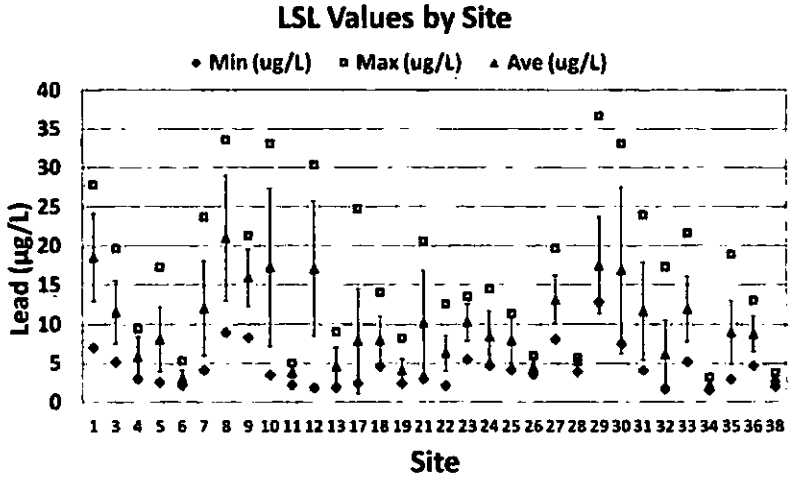


Figure 3. LSL results were highly variable within each LSL and from site to site. Error bars represent 1 standard deviation.

level within the service lines as indicated by the 45-s flushed results in the first round of monitoring and sequential sampling results in the second and third rounds.

In contrast, if the 90th percentile value of each of the successive sequential liter samples from the LSLs is computed across all sampling sites, the lead levels were up to four times higher than Chicago's average 90th percentile value using FD samples. Some peak values for each sequential liter calculated across all sampling sites were over twice the lead AL and up to six times higher than the regulatory compliance data (Figure 2). In summary, 69 of 336 (21%) of the individual sequential samples collected in June and 75 of 319 (24%) of sequential samples in September/October exceeded the lead AL, indicating that 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.

The NHU results were numerically higher overall than the corresponding PF values for most sites, but the differences were not statistically significant. The PF first-draw protocol produced lower individual results than NHU first-draw protocol in 23 of 32 sample pairs in March/April, and 20 of 27 sample pairs in Sept/Oct (SI Table S4a). Although NHU first-draw samples were collected without directing the residents to flush the tap prior to the stagnation period, NHU can involve showering, washing dishes, or doing laundry a short time prior to the stagnation period, which could clear the lead from the pipes similar to preflushing the tap. Thus a NHU sample can be effectively the same as a PF sample and yield similar results. Since the sequential sampling results from these same sites show that there is much higher lead present within the LSL at the same time that the NHU and PF first-draw samples were collected, it stands to reason that if the NHU activities were not undertaken, and a larger sample set were used, the NHU samples would yield results that were statistically higher than the corresponding PF samples. The distance from the kitchen tap to the beginning of the LSL was highly variable, ranging from approximately 3 to 87 feet (0.9 to 27 m), and the measured LSL lengths ranged from 43 to 159 feet (13 to 48 m). Consequently, for sites with shorter total plumbing lengths, the initial and final sequential samples would include relatively uncontaminated water from the water main following the 5-min tap preflushing. These samples would contain little to no LSL lead contribution, consistent with plumbosolvency and radial diffusion/flow principles.[5,19,20] A targeted LSL sampling protocol isolating only LSL contact water would likely yield a higher percentage of results above the lead AL for systems with Pb(II) pipe scale chemistry, but the specific location of the peak lead levels will necessarily vary with premise plumbing configurations.

Seasonal Variability. In a site-by-site comparison, lead concentrations were higher in Sept/Oct than in Mar/Apr or June, with the starkest statistical difference between first-draw

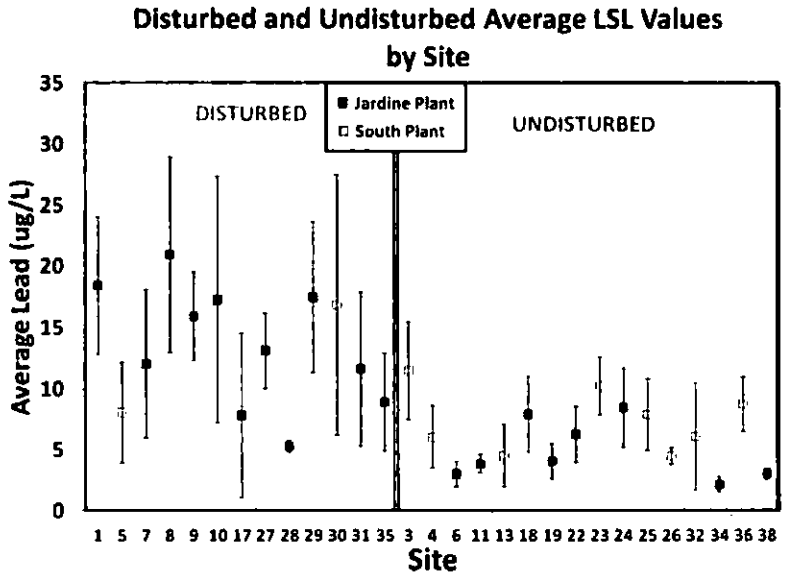


Figure 4. Average lead levels at disturbed and undisturbed sites. Error bars represent 1 standard deviation.

NHU samples collected in Mar/April and Sept/Oct (p = 0.03 for two-tailed paired Student's t-test). Overall, 68% and 69% of NHU and PF first-draw samples, respectively, were higher in Sept/Oct than in Mar/Apr, while 55% of paired sequential samples were higher in Sept/Oct than in June. Seasonal variation in lead levels consists of multiple contributing factors from the source water through the premise plumbing which could not be precisely isolated in this study, but the results in this study are consistent with other findings on seasonal variability (SI Table S6d).[21] Factors include (1) water temperature, (2) water chemistry variation, and (3) fluctuations in water usage for Sept/Oct versus June, which could increase or decrease lead levels.[22,23]

Lead Concentrations Vary Throughout Each Individual LSL and among Different LSLs Across the System. There was a high degree of variability in sequential sample results at most sites, some of which could include a particulate-bound component as reflected in spikes in some sequential sampling results (SI Figures S9–S40). For most sites, no individual sample result from within the LSL can *characterize* the lead concentrations at the site. Within the complete sampling profile results, lead levels at most sites ranged from well below to well above the AL (Figure 3). Under the LCR, this would mean that a system would meet the action level and have no additional regulatory requirements or would exceed the AL and be required to implement additional requirements, depending on which sample result is selected as the compliance sample. The variability within sites and between sites is similar in trend to that found in several other studies reporting sequential sampling conducted in water systems with different corrosion control strategies and chemistries from CDWM.[1,4,10,12,14,15,24–27]

Additional compliance data from a second large utility (City B) which exceeded the lead AL and conducted sampling using the temperature change LSL sampling protocol in the LCR,[3] yielded similar variability across the system (SI Figure S8 and Table S9). A total of 1975 LSL sites were sampled, with 1762 results (89%) below the lead AL; 128 results (6.5%) from 16 to 30 μg/L; 57 results (2.8%) from 31 to 50 μg/L; and 28 results (1.4%) between 51 and 580 μg/L. This LSL sampling protocol is similarly vulnerable to low biases, although many results were considerably higher than the AL (SI Figure S8).

Factors Affecting Lead Levels. The majority of high lead results occurred at sites with a documented physical disturbance of the LSL between 2005 and 2011 (Figure 4). The actual extent to which the LSL was physically disturbed is unknown for all sites, and the records of disturbances are based on information provided by CDWM and by the sampling volunteers (SI Figures S9–S40).

For the purpose of this study a physical LSL disturbance is defined as a meter installation or replacement, autometer-reader (AMR) installation, service line leak repair, external service shut-off valve repair or replacement, or significant street excavation directly in front of the home that could disturb the LSL. An "undisturbed" site is an unmetered site where neither the CDWM nor resident have a record or recollection of any disturbance, as defined above. A third category, "indeterminate", is used for three sites where CDWM has no record of any LSL disturbance, and the resident did not provide a response as to whether there has been any LSL disturbance. Cross-checking was important because information provided by volunteers in some cases contradicted CDWM records, and upon further investigation, the records were found to be incomplete and were corrected, which resulted in reclassification of the site.

Of the 13 disturbed sites, 11 sites had 3 or more sequential sampling results above the lead AL, two sites had 2 results each above the AL, and one site had no results above the AL. Of the 16 sites with no known disturbance, only three sites had any results above the lead AL. In the remaining 3 "indeterminate" sites, 30 of 81 sample results (37%) were above EPA's lead AL (Table 2).

A recent AWWA publication on the state of water infrastructure highlights the need for major infrastructure work.[28] This necessary infrastructure work will potentially increase the incidence of damage to the protective scales within LSLs as this work is performed. Inevitably, these physical LSL disturbances will continue to occur with increased frequency as part of daily routine water system maintenance and nonwater related community infrastructure work.

dx.doi.org/10.1021/es4003636 | Environ. Sci. Technol. 2013, 47, 9300–9307

Table 2. Lead Results for Disturbed, Undisturbed, and Indeterminate Sites[a]

disturbed sites			undisturbed sites			indeterminate sites		
no. sites	no. samples	no. above AL	no. sites	no. samples	no. above AL	no. sites	no. samples	no. above AL
13	327	117	16	372	6	3	81	30
% samples over AL: 36%			% samples over AL: 2%			% samples over AL: 37%		

[a]Most lead results above the AL were found at sites with LSL disturbances. Additional results above the AL were also found at sites where the status of the LSL (disturbed or undisturbed) could not be confirmed. Sites without LSL disturbances had few if any results above the AL.

Possible Implications of Water Conservation and Use. Information provided by CDWM and volunteers anecdotally suggests that low water usage may also play a role in high lead levels at some sites. Of the four locations with the highest average lead levels, three (Sites 1, 29, and 10) had documented low water usage. Site 1 had average monthly water usage of 3444 gallons (13 037 L) which does not appear to be low usage. However, information provided by the resident indicates that the majority of the monthly water usage occurs during a relatively small number of days during the month when there is a high volume of water usage. Site 29 had average monthly usage of 1826 gallons (6912 L), and Site 10 had an average usage of 1438 gallons/month (5443 L/month). For comparison, the mean single-family household water usage is approximately 8582 gallons/month (32 486 L/month), with a sizable standard deviation.[29]

In two locations (Sites 17 and 5), lead levels decreased with an increase in water usage. As water usage approximately doubled at Sites 17 and 5, maximum lead levels from sequential sampling decreased from 25 to 5.5 μg/L and from 17 to 12 μg/L, respectively. Although this represents a small set of samples, these observations support the idea that higher lead levels can be associated with low water usage.[30]

Extrapolating from prior research suggests the necessity of consistent flow to deliver corrosion inhibitor effectively into passivating films,[31] and correlates increased inhibitor dosages with reduced lead release.[10,32−35] Low water usage may inhibit healing of the damaged scales, and influence the rate of galvanic corrosion. Water usage effects cannot be separated from other *seasonal* effects in this study, but prior literature and the combined sequential graphs showing entire profiles shifted up or down from the June to Sept/Oct sampling suggest further investigation is warranted (SI Figures S9−S40). As conservation efforts increase, it will become increasingly important to conduct further research on the relationship between water usage and increases in lead levels.

The results in this study also indicate that more appropriate flushing guidance must be developed, based on neighborhood and premise plumbing characteristics, and whether a home has a LSL or not. Much of the current published and web-based flushing guidance inadvertently increases the risk of exposure to elevated lead levels by clearing an insufficient amount of water volume.[17] Even fully flushing LSLs may only lower lead levels to a limiting, measurable lead level, that relates to the plumbosolvency of the water, the flow rate, the length and internal diameter of the pipe,[5−7,10,19,20] and possibly effects of prior disturbances (SI Table S7).

Risk Identification and Management. Recently, CDC issued a health alert associating higher elevated blood lead levels with partial LSL replacement,[36] and also concluded that LSLs were an independent risk factor for elevated blood lead levels even when lead levels in drinking water met the LCR lead AL of 0.015 mg/L.[37] As highlighted in this study, LSLs can contribute high lead when they are disturbed in many different ways, not just due to partial LSL replacement, and water usage may also play a role in the resultant high lead levels and potential increased human exposure. In an August 2012 update on lead in drinking water and blood lead levels, the CDC notes that *"The recent recommendations from the CDC Advisory Committee on Childhood Lead Poisoning Prevention to reduce or eliminate lead sources for children before they are exposed underscore the need to reduce lead concentrations in drinking water as much as possible".*[38]

As the ultimate human and environmental health goal, LSLs should be completely removed where possible. The stability of the protective scales within LSLs depends on many factors which can change over time. For example, changes to water quality or treatment have resulted in high lead levels over a sustained period of time (years).[10,39−41] Under the current regulatory framework, elevated lead levels from disturbances, water quality, treatment, or water usage changes can potentially go undetected for up to 3 years between LCR compliance monitoring periods, which can result in increased public exposure over a significant period of time.

Proper selection of sampling sites, sampling protocol, and other site conditions is critical for evaluating the amount of lead corrosion and release that is occurring in the distribution system. Successful optimization of the plumbosolvency treatment depends on an accurate understanding of the corrosion mechanisms, pipe scale mineralogy and structure, and the consequences of LSL disturbances and water conservation efforts. No published studies could be found that systematically investigated the time and inhibitor doses/water quality adjustments necessary to overcome the disturbances and damage to the lead pipe scales that will be routinely occurring throughout cities across the U.S., as long as full or partial lead service lines remain in service.

Analyses of the Chicago LSL scales by EPA (to be reported elsewhere) reveal that the surface coatings on both lead service line and galvanized interior pipes from CDWM are primarily composed of amorphous aluminum, calcium, and phosphorus-rich deposits, and not crystalline lead(II) (or zinc)-orthophosphate phases that are predicted by conventional divalent lead plumbosolvency theory for orthophosphate dosing.[10,33,42] An understanding of the scales is essential to study and implement procedures and strategies for effective and timely repair of the protective scales damaged by LSL disturbances, and to minimize the public's exposure to high lead levels that can result from damaging the scales. Experimental evaluations are critical when scale compositions fall outside the scope of well-understood predictive corrosion control practices.

■ ASSOCIATED CONTENT

Supporting Information

Additional background information, tabular summaries of sampling results, and graphics. This material is available free of charge via the Internet at http://pubs.acs.org.

AUTHOR INFORMATION

Corresponding Author

*E-mail: deltoral.miguel@epa.gov; tel: 312-886-5253; fax: 312-692-2499.

Notes

The authors declare no competing financial interest.

ACKNOWLEDGMENTS

We wish to express special thanks to the City of Chicago Department of Water Management for the considerable time and effort put forth in providing information for this project, and to the EPA and HUD volunteers who participated in this study and opened up their homes to make this project possible, as well as the team at the EPA Chicago Regional Laboratory for their work on the sample analyses, and Mostafa Noureldin (EPA) and Kevin Sui (Northwestern University) for their valuable assistance during this project. Any opinions expressed in this paper are those of the authors and do not necessarily reflect the official positions and policies of the EPA.

REFERENCES

(1) Sandvig, A.; Kwan, P.; Kirmeyer, G.; Maynard, B.; Mast, D.; Trussell, R. R.; Trussell, S.; Cantor, A. F.; Prescott, A. *Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues*; Research Report 91229; American Water Works Association Research Foundation: Denver, CO, 2008.

(2) Triantafyllidou, S.; Edwards, M. Lead (Pb) in tap water and in blood: Implications for lead exposure in the United States. *Crit. Rev. Environ. Sci. Technol.* **2012**, *42*, 1297−1352.

(3) U.S. EPA. *National Primary Drinking Water Regulations*, 40 CFR Part 141 Subpart I—Control of Lead and Copper, 2012.

(4) Schock, M. R.; Lemieux, F. G. Challenges in addressing variability of lead in domestic plumbing. *Water Sci. Technol.: Water Supply* **2010**, *10* (5), 792−798.

(5) Van Der Leer, D.; Weatherill, N. P.; Sharp, R. J.; Hayes, C. R. Modelling the diffusion of lead into drinking water. *Appl. Math. Modell.* **2002**, *26* (6), 681−699.

(6) Cartier, C.; Arnold, R. B., Jr.; Triantafyllidou, S.; Prévost, M.; Edwards, M. Effect of flow rate and lead/copper pipe sequence on lead release from service lines. *Water Res.* **2012**, *46* (13), 4142−4152.

(7) Cartier, C.; Bannier, A.; Pirog, M.; Nour, S.; Prévost, M. A rapid method for lead service line detection. *J. - Am. Water Works Assoc.* **2012**, *101* (11), E582−E595.

(8) Elfland, C.; Scardina, P.; Edwards, M. Lead-contaminated water from brass plumbing devices in new buildings. *J. - Am. Water Works Assoc.* **2010**, *102* (11), 66−76.

(9) Sarver, E.; Edwards, M. Effects of flow, brass location, tube materials and temperature on corrosion of brass plumbing devices. *Corros. Sci.* **2011**, *53* (5), 1813−1824.

(10) Schock, M. R.; Lytle, D. A. Internal corrosion and deposition control. In *Water Quality and Treatment: A Handbook of Community Water Supplies*, 6th ed.; McGraw-Hill, Inc.: New York, 2011.

(11) Triantafyllidou, S.; Parks, J.; Edwards, M. Lead particles in potable water. *J. - Am. Water Works Assoc.* **2007**, *99* (6), 107−117.

(12) Britton, A.; Richards, W. N. Factors influencing plumbosolvency in Scotland. *J. Inst. Water Eng. Sci.* **1981**, *35* (5), 349−364.

(13) Cartier, C.; Laroche, L.; Deshommes, E.; Nour, S.; Richard, G.; Edwards, M.; Prevost, M. Investigating dissolved lead at the tap using various sampling protocols. *J. - Am. Water Works Assoc.* **2011**, *103* (3), 55−67.

(14) Clark, B.; Edwards, M. 3-D Lead profiling to characterize particulate lead risks in potable water. In *Proceedings AWWA Water Quality Technology Conference*, Toronto, ON, November 4−7, 2012.

(15) Hulsmann, A. D. Particulate lead in water supplies. *J. Inst. Water Environ. Manage.* **1990**, *4* (2), 19−25.

(16) U.S. EPA. *Revised Public Notification Handbook*; EPA 816-R-09-013, U.S. Environmental Protection Agency, Office of Water: Washington, DC, 2010.

(17) Edwards, M.; Dudi, A. Role of chlorine and chloramine in corrosion of lead-bearing plumbing materials. *J. = Am. Water Works Assoc.* **2004**, *96* (10), 69−81.

(18) Feldmann, C. R.; Walasek, J. B.; Lobring, L. B. Procedure for preserving lead in drinking water samples. *J. - Am. Water Works Assoc.* **1992**, *84* (7), 89−91.

(19) Cardew, P. T. Development of a convective diffusion model for lead pipe rigs operating in laminar flow. *Water Res.* **2006**, *40* (11), 2190−2200.

(20) Kuch, A.; Wagner, I. Mass transfer model to describe lead concentrations in drinking water. *Water Res.* **1983**, *17* (10), 1303.

(21) Deshommes, E.; Prévost, M.; Levallois, P.; Lemieux, F.; Nour, S. Application of lead monitoring results to predict 0−7 year old children's exposure at the tap. *Water Res.* **2013**, *47* (7), 2409−2420.

(22) Schock, M. R. Causes of temporal variability of lead in domestic plumbing systems. *Environ. Monit. Assess.* **1990**, *15*, 59−82.

(23) Karalekas, P. C., Jr.; Craun, G. F.; Hammonds, A. F.; Ryan, C. R.; Worth, D. J. Lead and other trace metals in drinking water in the Boston metropolitan area. *J. N. Engl. Water Works Assoc.* **1976**, *90*, 150−172.

(24) Deshommes, E.; Laroche, L.; Nour, S.; Cartier, C.; Prévost, M. Source and occurrence of particulate lead in tap water. *Water Res.* **2010**, *44* (12), 3734−3744.

(25) Douglas, I.; Campbell, A.; Muylwyk, Q. Lead control in soft water: Experience from a Canadian utility. In *Proceedings AWWA Annual Conference and Exhibition*, Toronto, ON, June 24−28, 2007.

(26) Muylwyk, Q.; Waller, M.; Spielmacher, A.; Olesiuk, J.; Suffoletta, V. Full versus partial lead service line replacement and lead release in a well-buffered groundwater. In *Proceedings AWWA Water Quality Technology Conference*, Phoenix, AZ, November 13−17, 2011.

(27) Wujek, J. J. Minimizing peak lead concentrations after partial lead service line replacements. Presentation *AWWA Water Quality Technology Conference*, San Antonio, TX, November 14−18, 2004.

(28) American Water Works Association. *Buried No Longer: Confronting America's Water Infrastructure Challenge*; American Water Works Association: Denver, CO, 2012.

(29) Rockaway, T. D.; Coomes, P. A.; Rivard, J.; Kornstein, B. Residential water use trends in North America. *J. - Am. Water Works Assoc.* **2011**, *103* (2), 76.

(30) Arnold, R. B., Jr.; Edwards, M. Potential reversal and the effects of flow pattern on galvanic corrosion of lead. *Environ. Sci. Technol.* **2012**, *46* (20), 10941−7.

(31) American Water Works Association. *Corrosion Control for Operators*; American Water Works Association: Denver, CO, 1986; p 128.

(32) Colling, J. H.; Croll, B. T.; Whincup, P. A. E.; Harward, C. Plumbosolvency effects and control in hard waters. *J. Inst. Water Environ. Manage.* **1992**, *6* (6), 259−268.

(33) Schock, M. R.; Wagner, I.; Oliphant, R. The corrosion and solubility of lead in drinking water. In *Internal Corrosion of Water Distribution Systems*, 2nd ed.; AWWA Research Foundation/DVGW Forschungsstelle: Denver, CO, 1996; pp 131−230.

(34) Hayes, C. R.; Hydes, O. D. UK experience in the monitoring and control of lead in drinking water. *J. Water Health* **2012**, *10* (3), 337−348.

(35) Hayes, C. R.; Incledion, S.; Balch, M. Experience in Wales (UK) of the optimization of ortho-phosphate dosing for controlling lead in drinking water. *J. Water Health* **2008**, *6* (2), 177−185.

(36) Triantafyllidou, S.; Edwards, M. Galvanic corrosion after simulated small-scale partial lead service line replacements. *J. - Am. Water Works Assoc.* **2011**, *103* (9), 85−99.

(37) Brown, M. J.; Raymond, J.; Homa, D.; Kennedy, C.; Sinks, T. Association between children's blood lead levels, lead service lines, and water disinfection, Washington, DC, 1998−2006. *Environ. Res.* **2011**, *111* (1), 67−74.

(38) Brown, M. J.; Margolis, S. Lead in drinking water and human blood lead levels in the United States. *Morbidity and Mortality Weekly Report* **2012**, *61* (Suppl;August 10, 2012), 1−9.
(39) American Water Works Association. *Managing Change and Unintended Consequences: Lead and Copper Rule Corrosion Control Treatment*; American Water Works Association: Denver, CO, 2005; p 39.
(40) Renner, R. Plumbing the Depths of D.C.'s Drinking Water Crisis. *Environ. Sci. Technol.* **2004**, *38* (12), 224A−227A.
(41) Triantafyllidou, S.; Lambrindou, Y.; Edwards, M. Lead (Pb) exposure through drinking water: Lessons to be learned from recent U.S. experience. *Global NEST J.* **2009**, *11* (3), 341−348.
(42) Schock, M. R. Understanding corrosion control strategies for lead. *J. - Am. Water Works Assoc.* **1989**, *81* (7), 88−100.

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

SURREBUTTAL TESTIMONY OF BRUCE LANPHEAR, M.D., M.P.H.

ON BEHALF OF

PITTSBURGH UNITED

May 17, 2019

Topics Addressed:

Lead Remediation Program

PREPARED SURREBUTTAL TESTIMONY OF BRUCE LANPHEAR, M.D., M.P.H.

Q: Please state your name, occupation, and business address.

A: Bruce Lanphear. I am currently a Professor on the Faculty of Health Sciences at Simon Fraser University and a Clinician Scientist at the Child and Family Research Institute at British Columbia Children's Hospital. My business address is Blusson Hall, 8888 University Drive, Burnaby, BC V5A 1S6, Canada.

Q: Did you previously submit testimony in this proceeding?

A: Yes. I submitted direct testimony, pre-marked as Pittsburgh UNITED Statement C-3.

Q: What is the purpose of your testimony?

A: The purpose of my surrebuttal testimony is to respond to the rebuttal testimony of Robert Weimar, offered on behalf of the Pittsburgh Water and Sewer Authority (PWSA), regarding PWSA's lead remediation program. My lack of response to any specific recommendation or position of Mr. Weimar or any other witness or party does not indicate that I am either in agreement with or opposed to that recommendation or position, nor does it waive Pittsburgh UNITED's right to address those issues in this proceeding.

Q: How is your testimony organized?

A: I begin by responding to Mr. Weimar's statements about needing time to transition into compliance with all PUC regulatory requirements and the PUC's purported lack of authority to address lead issues. I then address Mr. Weimar's statements regarding the specific recommendations made in my direct testimony about the scope of PWSA's lead service line replacement programs, the selection and prioritization of lead service lines for replacement, PWSA's filter distribution programs, PWSA's post-replacement measures, the Community Environmental Project, and the meter replacement program.

Q: What does Mr. Weimar say about PWSA needing time for a transition process?

A: Mr. Weimar states that it is not possible for PWSA to come into immediate compliance with all PUC rules and that, in some instances, PWSA may need to make gradual movement or take partial steps toward compliance.[1]

Q: How do you respond?

A: I recognize that PWSA must address many issues to come into full compliance with PUC requirements. I also appreciate that PWSA is taking its obligations seriously, particularly with respect to lead remediation, and that it has taken many positive steps to date.

At the same time, I must reiterate the urgency of the lead crisis facing PWSA and its customers. As detailed in my direct testimony, Pittsburgh residents have been and continue to be exposed to uncontrolled and persistently high levels of lead in their drinking water.[2] In five of PWSA's last six tap water testing periods, water lead levels have exceeded or equaled the lead action level of 15 parts per billion (ppb).[3] This high risk of lead exposure from drinking water is made worse by the fact that many Pittsburgh residents are already exposed to other sources of lead, such as lead-contaminated dust and soil.[4]

There is no safe level of exposure to lead.[5] Even low levels of exposure are harmful to both children and adults.[6] PWSA's customers cannot afford to wait years for PWSA to implement a comprehensive lead remediation program that will adequately minimize their exposure to lead-contaminated drinking water.

---

[1] PWSA St. C-1R, at 4.
[2] Pittsburgh UNITED St. C-3, at 11.
[3] Id. at 10-11.
[4] Id. at 11.
[5] Id.
[6] Id.

Q: What does Mr. Weimar say about the PUC's authority over lead issues?

A: Mr. Weimar states that the PUC lacks jurisdiction over water quality issues.[7] He asserts that primary jurisdiction lies instead with the Pennsylvania Department of Environmental Protection (DEP).[8] He also asserts that PWSA is complying with all DEP directives and other lead-related regulatory requirements.[9]

Q: How do you respond?

A: I have been informed by counsel that the PUC requires PWSA to provide safe, adequate, and reasonable service to its customers. I have also been informed that legal analysis of the PUC's authority over lead issues will be addressed in briefing.

To provide safe, adequate, and reasonable service, PWSA must minimize its customers' risk of lead exposure from drinking water. Basic compliance with DEP directives and other lead-related regulatory requirements does not prove whether PWSA is meeting this standard. For example, neither DEP nor the Safe Drinking Water Act's Lead and Copper Rule prohibit PWSA from performing partial lead service line replacements.[10] That does not mean that partial replacements are safe. To the contrary, partial replacements endanger public health and should be avoided.[11] This is well documented in the scientific literature and borne out by PWSA's post-replacement sampling results.[12] To satisfy its obligation to provide safe service to its customers, PWSA must implement a comprehensive, health-protective lead program consistent with the

[7] PWSA St. C-1R, at 5, 44, 47, 59-60.
[8] Id.
[9] Id. at 5, 44, 47, 53, 59-60, 65, 68.
[10] See generally Pittsburgh UNITED St. C-2, Appendix C, 1 to C, 27, Consent Order and Agreement, In the Matter of Pittsburgh Water and Sewer Authority Regarding Violations of the Pennsylvania Safe Drinking Water Act and the Rules and Regulations Promulgated Thereto Regarding the Lead and Copper Rule (Nov. 17, 2017); 40 C.F.R. pt. 141 subpt. I.
[11] Pittsburgh UNITED St. C-3, at 19-21.
[12] Id.; Pittsburgh UNITED St. C-2, at 22-24.

recommendations made in my testimony.[13]

Q: What does Mr. Weimar say about your recommendations regarding the scope of PWSA's proposed lead service line replacement programs?

A: Mr. Weimar states that he expects the PWSA Board to adopt a new lead service line policy at its May 24 meeting, which will supersede the existing policy adopted in 2018.[14] He asserts that the proposed 2019 lead service line policy will minimize the number of partial replacements PWSA conducts. This is because the proposed policy provides for the replacement of any private-side lead service line encountered during PWSA's replacement of a public-side service line, at no direct cost to the customer.[15] Mr. Weimar states that whether PWSA will replace private-side lead service lines unconnected to a public-side service line set for replacement remains an undecided issue.[16]

Mr. Weimar also states that PWSA has made extraordinary efforts to obtain customer approval for private-side lead service line replacements and that, despite these best efforts, some customers may decline a replacement, meaning that certain lead service lines will remain in the system.[17]

Q: How do you respond?

A: The Board's approval of PWSA's proposed 2019 lead service line replacement policy would address many of my concerns about partial replacements. I agree with Pittsburgh UNITED expert Gregory Welter, however, that the language in the proposed policy allowing

[13] See Pittsburgh UNITED St. C-3, at 43-47.
[14] PWSA St. C-1R, at 49.
[15] See PWSA St. C-1R, RAW/C-31, at 2-3. But see Pittsburgh UNITED St. C-2SR, at 9 n.25.
[16] PWSA St. C-1R, at 49.
[17] See id. at 47-48.

PWSA to perform partial replacements in exceptional circumstances should be clarified and very narrowly construed.[18]

Even with the Board's approval of the new policy, I remain concerned that PWSA's replacement programs will leave significant amounts of lead in the ground, posing an ongoing health risk to PWSA customers. As Mr. Weimar recognizes, the proposed 2019 policy does not address my recommendation that PWSA commit to replacing all lead service lines by 2026—including private-side lead service lines that otherwise will not be encountered through PWSA's existing lead service line replacement programs.[19] In fact, it appears that PWSA does not even know where all of the public- and private-side lead service lines are located because it still lacks an accurate lead inventory of its system.[20] Removing all lead service lines from the water system is the only effective, permanent way to protect children and other residents from lead in their drinking water. For the reasons detailed in my direct testimony and in Mr. Welter's direct testimony, PWSA's goal should be to replace all lead service lines, both public and private, by 2026.[21] If PWSA instead commits only to replacing all public-side lead service lines, it must make that goal explicit—a point I made in my direct testimony and which Mr. Weimar fails to address.[22]

In the event the Board rejects PWSA's proposed 2019 lead service line policy, the PUC should order PWSA to offer to replace all private-side lead service lines PWSA finds during its replacement of public-side service lines, at no direct cost to the customer. This is the only way

[18] PWSA St. C-1R, RAW/C-31, at 2; Pittsburgh UNITED St. C-2SR, at 8-9.
[19] See Pittsburgh UNITED St. C-3, at 22-24.
[20] See PWSA St. C-1R, at 60-61; Pittsburgh UNITED St. C-2, at 30-32.
[21] Pittsburgh UNITED St. C-3, at 21-22; Pittsburgh UNITED St. C-2, at 16-18.
[22] Pittsburgh UNITED St. C-3, at 22.

PWSA can avoid harmful partial replacements and satisfy its obligation to provide safe, adequate, and reasonable service.

Finally, as to PWSA's outreach to obtain customer approval for private-side replacements, I appreciate PWSA's efforts and recognize that they have been largely successful for the 2019 neighborhood-based replacement program. My concern is that PWSA has not indicated that it intends to conduct the same level of outreach for replacements beyond 2020.[23] As PWSA's past efforts indicate, aggressive and extensive community outreach is necessary to ensure that as many property owners as possible consent to private-side replacements. PWSA should therefore commit to pursuing at least the same level of outreach for its replacement programs for 2020 through 2026. That some property owners may nonetheless decline a private-side replacement, as Mr. Weimar points out, does not lessen PWSA's burden of providing safe water service to its customers or the reasonableness of a goal of eliminating all lead service lines from the system.

Q: What does Mr. Weimar say about your recommendations regarding the prioritization of lead service line replacements?

A: Mr. Weimar states that, for 2019, PWSA is developing a prioritization plan in consultation with the Community Lead Response Advisory Committee.[24] He states that, for 2020, PWSA has already selected small diameter water main replacement areas and that any attempt to further prioritize or change these areas will result in program delays.[25]

[23] See id. at 23.
[24] PWSA St. C-1R, at 62.
[25] Id. at 63.

Q: How do you respond?

A: Mr. Weimar fails to adequately explain why the areas selected for inclusion in PWSA's small diameter water main replacement program for 2020 cannot be prioritized. Of the selected areas, those with higher concentrations of vulnerable populations could be scheduled for replacement ahead of those with lower concentrations of vulnerable populations. Even within each area, certain blocks could be prioritized for replacement over others. A similar approach was utilized in the rate case settlement. Although PWSA had already selected the neighborhoods for the 2019 lead service line replacement program at the time of settlement, it agreed to consult with the Committee and prioritize replacements among those neighborhoods.[26] Mr. Weimar acknowledges that this approach has been successful.[27]

Mr. Weimar says nothing about my recommendation that PWSA prioritize lead service line replacements for at-risk customers between 2021 and 2026. As detailed in my direct testimony, PWSA should incorporate data on blood lead levels in children, drinking water lead levels, water main age, parcel age, income, and homes containing pregnant women and young children into its GIS database as part of the planned upgrade, and weigh these factors heavily in the small diameter water main prioritization model developed as part of the Water Distribution System Master Plan.[28] PWSA should also prioritize at-risk customers for any service line replacements conducted separately from its small diameter water main replacement program. Doing so is necessary to protect the health of PWSA's customers and especially those most

[26] PUC v. PWSA, Docket Nos. R-2018-3002645, -3002647, Recommended Decision, at14 ¶ C.1.a.v (order entered Jan. 17, 2019).
[27] See PWSA St. C-1R, at 62.
[28] Pittsburgh UNITED Statement C-3, at 26-27.

vulnerable to lead exposure, including children, pregnant women, minorities, and low-income individuals.[29]

Q: What does Mr. Weimar say about your recommendations that PWSA maintain a neighborhood-based lead service line replacement program after 2020?

A: Mr. Weimar states that the introduction of orthophosphate is expected to bring water lead levels under the U.S. Environmental Protection Agency's (EPA) lead action level, such that PWSA will no longer be mandated to accelerate its lead service line replacements.[30] As a result, PWSA intends to begin replacing lead service lines as part of its small diameter water main replacement program beginning in 2020 and to discontinue its neighborhood-based program.[31] Mr. Weimar asserts that, with the orthophosphate treatment in place, DEP and EPA are expected to view the health impacts related to lead as "acceptable."[32]

Q: How do you respond?

A: While the addition of orthophosphate may reduce lead levels below EPA's lead action level, that does not mean that the health impacts from exposure to lead in drinking water will be "acceptable." First, it could take up to a year for orthophosphate to bring lead levels down and several years for its benefits to be fully realized.[33] Second, corrosion control is not a foolproof treatment method. Changes in source water or treatment can cause corrosion control to fail, as PWSA's previous treatment did.[34] Third, even assuming the orthophosphate reduces lead levels consistently below the lead action level, Pittsburgh residents may still be at risk of suffering adverse health impacts from exposure to lead in their drinking water. As detailed in my direct

[29] Id. at 25-26.
[30] See PWSA St. C-1R, at 51.
[31] Id. at 51-52.
[32] Id. at 51.
[33] Pittsburgh UNITED St. C-3, at 21, 34; Pittsburgh UNITED St. C-2, at 16-18.
[34] Pittsburgh UNITED St. C-3, at 21, 34; Pittsburgh UNITED St. C-2, at 16-18.

testimony, the lead action level is not a health-based standard.[35] The scientific evidence confirms that there is no safe level of lead exposure, and that even low levels of exposure can diminish IQ levels and cause death from cardiovascular disease.[36] For this reason, PWSA cannot rely solely on orthophosphate treatment to control lead levels.[37] Removing all lead service lines from the system is the only permanent solution to preventing the release of lead into drinking water.[38]

As both Mr. Welter and I discussed in our direct testimony, the small diameter water main replacement program is insufficient because its reach is limited.[39] We therefore recommended that PWSA maintain a neighborhood-based lead service line replacement program beyond 2020.[40] Mr. Weimar does not meaningfully respond to this recommendation or dispute that the small diameter water main replacement program will miss a number of lead service lines, both public and private. Instead, he suggests that the small diameter water main replacement program is a more cost-effective approach and that the orthophosphate treatment will mitigate any public health harms.[41] As I discuss above, however, orthophosphate treatment will not necessarily protect Pittsburgh residents from exposure to harmful levels of lead. PWSA should maintain a neighborhood-based replacement program to supplement the lead service line replacements completed through the small diameter water main replacement program. Such a program would also allow PWSA to more effectively prioritize lead service line replacements for sensitive populations.[42]

[35] Pittsburgh UNITED St. C-3, at 9, 11.
[36] Id. at 9.
[37] Pittsburgh UNITED St. C-3, at 21.
[38] Id.
[39] Id. at 23; Pittsburgh UNITED St. C-2, at 26-27.
[40] Pittsburgh UNITED St. C-3, at 23-24.
[41] PWSA St. C-1R, at 51.
[42] Pittsburgh UNITED St. C-3, at 27.

Q: What does Mr. Weimar say about your recommendations regarding PWSA's water filter distribution policies?

A: I recommended that PWSA improve outreach efforts for the test kit and low-income filter programs. In response, Mr. Weimar states that the existing voucher system reduces costs and gauges customers' interest in using a filter in the first place, and that PWSA already informs customers who request and return tap water sampling kits that they will receive a free filter and replacement cartridge if their sampling results are above 15 ppb.[43] I also recommended that PWSA run a public education campaign to teach customers how to use their filters and replacement cartridges properly and follow up with customers to ensure that they are doing so. Mr. Weimar states that clear instructions are already provided with filter kits and that PWSA provides instructional videos on its website.[44]

Q: How do you respond?

A: With respect to the voucher system, I am concerned that Mr. Weimar underestimates the burden placed on customers to "make[] a phone call or visit[] a website" in order to receive a filter.[45] Many low-income customers simply lack the time and resources to complete these steps; for example, many low-income households lack access to stable telecommunication services.[46] The burden of implementing a health-protective filter program should instead rest with PWSA, consistent with its obligation to provide safe service to customers.[47]

Additionally, Mr. Weimar confirms that customers are only told that they will be sent a free filter under the tap water filter program when the sample results are sent to them.[48] That is

[43] PWSA St. C-1R, at 67-68.
[44] Id. at 67.
[45] Id.
[46] Pittsburgh UNITED St. C-3, at 32-33; Pittsburgh UNITED St. C-1, at 49; Pittsburgh UNITED St. C-1SR, at 7.
[47] Pittsburgh UNITED St. C-3, at 32.
[48] PWSA St. C-1R, at 68.

precisely the problem I identified in my direct testimony. Customers must be told before they request a tap water sample that they might be eligible to receive a free filter depending on their sampling results.[49] Otherwise, many customers may lack an incentive to request the sampling kit to begin with, meaning that the test kit filter program could be substantially underutilized.

Finally, it is impossible to gauge the adequacy of PWSA's existing education efforts unless PWSA follows up with customers to verify whether they are using their filters properly. As discussed in my direct testimony, filters do not provide their intended health benefits unless they are used correctly.[50] Accordingly, PWSA should collect data on water filter use, as I recommended, to determine whether its filter programs are achieving a health-protective result and whether additional education efforts are necessary.[51]

Q: What does Mr. Weimar say about your recommendations regarding PWSA's post-replacement measures?

A: Regarding my recommendation that PWSA increase participation in its post-replacement water sampling program, Mr. Weimar states that PWSA places a follow-up door hanger at homes that received a partial replacement but failed to return a water sample, and makes follow-up phone calls to all other homes that received replacements but failed to return water samples.[52] Mr. Weimar also states that it would be difficult for anyone other than a homeowner to collect a post-replacement water sample because the water must stagnate for at least six hours before it is collected.[53] Regarding my recommendation that PWSA use lower thresholds for additional tap water samples and for providing customers with flushing assistance and bottled water, Mr.

[49] Pittsburgh UNITED St. C-3, at 33.
[50] Id. at 34.
[51] Id.
[52] PWSA St. C-1R, at 57-58.
[53] Id. at 57.

Weimar states that PWSA is willing to reduce the threshold for providing bottled water and flushing assistance from 100 ppb to 50 ppb, but that PWSA otherwise will not alter its thresholds for requesting follow-up water samples unless required to do so by EPA.[54]

Q: How do you respond?

A: With respect to sampling participation rates, Mr. Weimar ignores that, despite PWSA's outreach efforts, only 5.6% of households collected and returned a tap water sample within three days of a lead service line replacement.[55] This low rate of participation is troubling because it means that both PWSA and customers lack critical information about water lead levels following replacement.[56] Additional outreach is plainly needed to achieve a robust sampling program.

Mr. Weimar discounts my suggestion that PWSA fund local, trusted community groups to collect the samples themselves (with customer permission).[57] While the logistics are difficult, they are not impossible; these groups could arrange to collect samples first thing in the morning, after the water has been stagnant for six hours. These groups could also help with sample collection in other ways, such as by coordinating customer collection efforts or issuing additional reminders.[58] Mr. Weimar fails to recognize this suggestion or identify any other solutions to PWSA's disappointing post-replacement sampling program participation rate.

With respect to providing bottled water and flushing assistance to customers, PWSA's willingness to lower the triggering threshold from 100 ppb to 50 ppb is a welcome improvement to its current practices. However, the threshold should be even lower than 50 ppb to be

[54] Id. at 58-60.
[55] Pittsburgh UNITED St. C-3, at 36.
[56] Id. at 36-37.
[57] PWSA St. C-1R, at 57.
[58] See Pittsburgh UNITED St. C-3, at 37.

sufficiently health protective. Likewise, as detailed in my direct testimony, PWSA should use lower thresholds for requesting follow-up water samples from customers.[59]

Q: What does Mr. Weimar say about your recommendations regarding improving outreach for the Community Environmental Project?

A: Mr. Weimar states that PWSA already conducts extensive outreach for the Community Environmental Project and asserts that canvassing efforts would be impractical and unduly expensive.[60]

Q: How do you respond?

A: To begin, Mr. Weimar misconstrues my direct testimony. He states that canvassing all houses would be a waste of resources because only a fraction of homes is eligible for the Community Environmental Project.[61] For precisely that reason, I recommended that PWSA send canvassers only to eligible homes.[62] I also suggested that PWSA contract with local community groups or colleges to potentially lessen the burden of this additional outreach.[63]

While Mr. Weimar touts PWSA's existing outreach efforts for the Project, it is clear that these efforts are ineffective. Despite the "amount of interest" generated,[64] the fact remains that PWSA had only conducted 18 private-side lead service line replacements under the Project as of March 6, 2019, out of a possible 200, and that the Project's funds will expire in November 2020.[65] PWSA cannot continue its same approach to outreach and expect different results. Instead, it must adopt new outreach methods, such as those recommended in my direct testimony, to ensure that all available funds get used before they expire. And, as Pittsburgh

[59] Id. at 38.
[60] PWSA St. C-1R, at 44-45.
[61] Id. at 45.
[62] Pittsburgh UNITED St. C-3, at 40.
[63] See id.
[64] PWSA St. C-1R, at 45.
[65] Pittsburgh UNITED St. C-3, at 39.

UNITED expert Mitchell Miller recommends, PWSA should continue to consult with both the Community Lead Response Advisory Committee and the Low Income Assistance Advisory Committee to develop new outreach efforts.[66]

Q: What does Mr. Weimar say about your recommendations regarding the meter replacement program?

A: Mr. Weimar agrees that particulate lead may be dislodged during meter installation, but states that PWSA is not aware of any measurable lead impacts that would result.[67] Mr. Weimar states that while PWSA replaces meters at the same time it conducts lead service line replacements, PWSA's goal of completing 50,000 meter replacements prevents it from limiting meter replacements to lead service line replacement sites.[68] Mr. Weimar nonetheless states that PWSA will consider delaying meter replacements when it encounters lead service lines.[69]

Q: How do you respond?

A: It is unclear from Mr. Weimar's conflicting statements whether PWSA will commit to conducting meter replacements at homes that have non-lead service lines or in coordination with lead service line replacements, as I recommend, or whether PWSA will conduct meter replacements at homes that have lead service lines.[70] It is also unclear how PWSA could know whether meter replacements are causing measurable lead impacts since PWSA has not conducted any sampling analyses of water lead levels following meter replacements performed at homes with lead service lines. Indeed, Mr. Weimar's acknowledgment that meter replacements could dislodge particulate lead underscores the importance of my recommendation that, if PWSA

[66] Pittsburgh UNITED St. C-1, at 46.
[67] PWSA St. C-1R, at 54.
[68] Id.
[69] Id. at 54-55.
[70] See Pittsburgh UNITED St. C-3, at 41.

1 performs a meter replacement at a home that has a lead service line, PWSA should distribute a
2 free filter, replacement cartridges, and tap water sampling kit, and analyze the sampling results to
3 determine whether and to what extent water lead levels spike following a meter replacement.[71]
4 PWSA must also ensure that all new meters meet EPA's definition of "lead free."[72]

5 **Q: Do you have any other responses to Mr. Weimar's testimony?**

6 A: Yes. I note that, in a few instances, Mr. Weimar mistakenly attributes Mr. Welter's
7 recommendations to me.[73]

8 **Q: Does this conclude your surrebuttal testimony?**

9 A: Yes.

[71] Id.
[72] Id.
[73] See PWSA St. C-1R, at 55.

8/21/19

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

SUPPLEMENTAL REBUTTAL TESTIMONY OF BRUCE LANPHEAR, M.D., M.P.H.

ON BEHALF OF

PITTSBURGH UNITED

August 14, 2019

Topics Addressed:

Lead Remediation Program

PREPARED SUPPLEMENTAL REBUTTAL TESTIMONY OF BRUCE LANPHEAR, M.D., M.P.H.

Q: Please state your name, occupation, and business address.

A: Bruce Lanphear. I am currently a Professor on the Faculty of Health Sciences at Simon Fraser University and a Clinician Scientist at the Child and Family Research Institute at British Columbia Children's Hospital. My business address is Blusson Hall, 8888 University Drive, Burnaby, BC V5A 1S6, Canada.

Q: Did you previously submit testimony in this proceeding?

A: Yes. I submitted direct testimony, pre-marked as Pittsburgh UNITED Statement C-3, and surrebuttal testimony, pre-marked as Pittsburgh UNITED Statement C-3SR.

Q: What is the purpose of your supplemental testimony?

A: This testimony responds to the supplemental testimony of Robert Weimar, offered by PWSA, regarding changes to PWSA's lead remediation program. My lack of response to any specific recommendation or position of Mr. Weimar or another witness does not indicate that I am either in agreement with or opposed to that recommendation.

Q: How is your testimony organized?

A: First, I discuss the public health impacts of PWSA's income-based reimbursement program for private-side lead service line replacements. Second, I respond to Mr. Weimar's discussion of PWSA's most recent tap water testing conducted under the federal Lead and Copper Rule.

I. PWSA's Income-Based Reimbursement Program for Private-Side Lead Service Line Replacements

Q: Please describe PWSA's new income-based reimbursement program for private-side lead service line replacements and how it relates to PWSA's existing programs.

A: As discussed in my direct testimony, PWSA has run a neighborhood-based lead service line replacement program since 2018.[1] In 2020, PWSA will discontinue the neighborhood-based lead service line replacement program and start conducting most lead service line replacements through its small-diameter water main replacement program. Under that program, PWSA will select certain small-diameter water mains for replacement. When PWSA replaces a water main, it will replace all public-side service lines connected to that main. PWSA will also replace any private-side lead service lines connected to those public-side lines at no direct cost to the customer.[2]

PWSA's neighborhood-based and small-diameter water main replacement programs will exclude certain homes with lead service lines from eligibility for a no-cost replacement.[3] The neighborhood-based program excludes households with private-side-only lead service lines, that is, pipes where the private side of the service line is made of lead but the public side of the service line is not.[4] The small-diameter water main replacement program excludes any lead service line not connected to a water main scheduled for replacement.[5]

Instead of replacing these and other private-side lines through new or existing programs, PWSA proposes to begin reimbursing residents who choose to replace the lines themselves.[6] If

[1] See generally Pittsburgh UNITED St. C-3.
[2] PWSA St. C-1SD, at 26-27.
[3] Pittsburgh UNITED St. C-2, at 26-27.
[4] Id.
[5] Id.
[6] PWSA St. C-1SD, at 26, 30-31.

approved by the Commission, PWSA's proposal would reimburse customers on an income-based sliding scale as follows:

Income Level	Reimbursement Amount
< 300% of the Federal Poverty Level (FPL)	100% of the cost of the replacement
301-400% of the FPL	75% of the cost of the replacement
401-500% of the FPL	50% of the cost of the replacement
> 500% of the FPL	$1,000 stipend[7]

Any PWSA customer who initiates a private-side lead service line replacement after January 1, 2019 is eligible for reimbursement under this new program.[8]

Q: Do you support PWSA's decision to adopt an income-based reimbursement program for customer-initiated private-side lead service line replacements?

A: No.

Q: Why not?

A: Pittsburgh residents remain at serious risk of lead exposure. Thousands of customers still have lead service lines, and PWSA's tap water monitoring continues to show high concentrations of lead.[9] As I've explained in my direct testimony, low-income customers, minorities, and tenants in particular have a higher risk of lead exposure.[10] This is because they are more likely to live in older, poorly maintained housing that contains lead plumbing and paint.[11]

[7] Id.
[8] Id. at 30.
[9] See id. at 23 (describing PWSA's most recent tap water testing results); LTIIP, at 28 (estimating that over 6,000 lead service lines will remain in PWSA's system after 2019).
[10] See Pittsburgh UNITED St. C-3, at 7-8, 11-14.
[11] Id.

In view of these risks, PWSA should focus its efforts on supporting low-income communities and reducing the burdens they face in obtaining lead service line replacements.[12] Instead, PWSA's income-based reimbursement program will do the opposite. As Pittsburgh UNITED expert Mitchell Miller testifies, such a program is likely to disadvantage and disproportionately exclude low- and moderate-income residents because they cannot pay for the high costs of a service line replacement up front.[13] A significant proportion of PWSA's customers will be negatively impacted by this program: PWSA estimates that more than half of the households in its service area have income levels below 300% of the FPL, and another 12.1% have income levels between 301% and 400% of the FPL.[14]

PWSA's program will also disproportionately affect renters and communities of color. As Mr. Miller explains, the poverty rate among black and Latinx Pittsburghers is roughly double that of white residents.[15] And the program's use of landlords' income, rather than tenants' income, to determine eligibility for reimbursements will make it less likely that low-income renters will receive private-side lead service line replacements because landlords are more likely to fall in higher income brackets that receive only a partial subsidy and so may not be willing to pay thousands of dollars to replace the line.[16]

By disproportionately excluding these residents, PWSA's program will put low-income customers, black and Latinx residents, and renters at a greater risk of suffering the harmful health effects of lead exposure than a program in which PWSA offers to replace all private-side lead service lines at no direct cost to customers. Living in a home that has a lead service line is an

[12] Id. at 25-27, 32-33; see also Pittsburgh UNITED St. C-3SR, at 6.
[13] Pittsburgh UNITED St. C-1SUPP, at 5-8.
[14] See PWSA St. C-1SD, at 31.
[15] Pittsburgh UNITED St. C-1SUPP, at 7.
[16] Id. at 10-11.

independent risk factor for elevated blood lead levels (≥ 5 μg/dL), even when the lead level for the broader water system is below EPA's lead action level.[17] Many low-income, black, and Latinx residents and renters are already exposed to other sources of lead, such as lead-contaminated dust and soil. The continued presence of a lead service line will compound these residents' high risk of lead exposure because the effects of lead exposure are cumulative.[18]

Q: Do you have any other concerns about PWSA's income-based reimbursement program?

A: Yes. I am concerned that many residents may not choose to participate in the program because they do not fully understand the exposure risks presented by their lead service line. For example, residents may understandably believe that if a tap water lead test kit shows water lead levels below EPA's lead action level, then their water is safe to drink. But EPA's lead action level is not a health-based standard. There is no safe level of exposure to lead.[19] A single tap water sample showing low lead levels is not necessarily a clean bill of health, either; lead levels can fluctuate, sometimes dramatically.[20] Residents may not realize this, and so may suffer from a false sense of security about their risks of lead exposure. A 2017 report by the Controller's Office of Allegheny County is revealing: although PWSA had already met or exceeded EPA's lead action level for three consecutive monitoring periods, the report found that most residents remained "unaware of the risks posed by lead contaminated drinking water and how to remediate" those risks.[21]

[17] PWSA St. C-1SD, Stip Doc – 4, at 15.
[18] Pittsburgh UNITED St. C-3, at 11-12.
[19] Id. at 11.
[20] Pittsburgh UNITED St. 5, at 34; PWSA St. C-1SD, Stip Doc – 4, at 26.
[21] PWSA St. C-1SD, Stip Doc – 4, at 16-17.

Q: In view of these concerns, what do you recommend?

A: To protect its customers from lead exposure, I recommend that PWSA discontinue its income-based reimbursement program and instead offer to conduct private-side lead service line replacements for all residents, free of charge.[22]

II. PWSA's Tap Water Testing Results January-June 2019

Q: Please describe PWSA's tap water testing results for its most recent monitoring period, January-June 2019.

A: I understand that PWSA analyzed 176 samples during this monitoring period and the 90th percentile level of lead concentration was 17.5 parts per billion (ppb).[23]

Q: You previously testified that PWSA's tap water testing results show that its customers are being exposed to dangerous and persistently high lead levels.[24] Do these recent testing results change your opinion?

A: No. PWSA's tap water testing results over the past three years show consistently high levels of lead, and these recent results continue that trend. A lead concentration of 17.5 ppb at the 90th percentile well exceeds EPA's 15 ppb lead action level.[25] And, as I noted above, EPA's lead action level is not a health-based standard; it is simply a threshold that triggers additional requirements under the Lead and Copper Rule.[26]

In my opinion, Pittsburgh residents continue to be exposed to uncontrolled and dangerously high levels of lead in their drinking water.

---

[22] See Pittsburgh UNITED St. C-2SUPP, at 7-8.
[23] PWSA St. C-1SD, at 23.
[24] See Pittsburgh UNITED St. C-3, at 10-11.
[25] 40 C.F.R. §§ 141.2, 141.80(c)(1).
[26] Pittsburgh UNITED St. 5, Appendix D, 13, EPA Office of Water, Lead and Copper Rule Revisions White Paper 11-12 (2016) (confirming that the lead action level is not health based and recommending that EPA establish a health-based benchmark for lead in drinking water); Pittsburgh UNITED St. 5, Appendix D, 14, Adrienne Katner et al., Weaknesses in Federal Drinking Water Regulations and Public Health Policies That Impede Lead Poisoning Prevention and Environmental Justice, 9 Envtl. Just. 1, 3 (2016).

Q: Does this conclude your supplemental testimony?

A: Yes.

BEFORE THE PENNSYLVANIA PUBLIC UTILITY COMMISSION

Implementation of Chapter 32 of the Public Utility Code Re Pittsburgh Water and Sewer Authority	:	Docket No.	M-2018-2640802 M-2018-2640803
Petition of the Pittsburgh Water and Sewer Authority for Approval of Its Long-Term Infrastructure Improvement Plan	:	Docket No.	P-2018-3005037 P-2018-3005039

VERIFICATION

I, Bruce Lanphear, M.D., M.P.H., hereby state that the facts set forth by me in the foregoing documents:

- Pittsburgh UNITED Statement C-3, the Direct Testimony of Bruce Lanphear on Behalf of Pittsburgh UNITED
- Pittsburgh UNITED Statement C-3SR, the Surrebuttal Testimony of Bruce Lanphear on Behalf of Pittsburgh UNITED
- Pittsburgh UNITED Statement C-3-SUPP-R, the Supplemental Rebuttal Testimony of Bruce Lanphear on Behalf of Pittsburgh UNITED

are true and correct to the best of my knowledge, information, and belief, and that I expect to be able to prove the same at a hearing held in this matter. I understand that the statements made herein are subject to the penalties of 18 Pa. C.S. § 4904 (relating to unsworn falsifications to authorities).

Bruce Lanphear, M.D., M.P.H.
Witness on behalf of Pittsburgh UNITED

August 20, 2019