

Lead Exposure and Infrastructure Reconstruction

July 19, 2017



Ed Quatrevaux, Inspector General

July 19, 2017

Mayor Mitch Landrieu
1300 Perdido Street
New Orleans, LA 70112

Sewerage and Water Board
625 St. Joseph Street
New Orleans, LA 70165

RE: *Lead Exposure and Infrastructure Reconstruction*

Dear Mayor Landrieu and Members of the Sewerage and Water Board of Directors:

The Office of Inspector General (OIG) has been engaged in an inspection of Sewerage and Water Board (S&WB) water quality testing. In the course of conducting that project, the OIG learned of a serious public health risk due to the partial replacement and/or disturbance of lead service lines. Related findings and recommendations are included in the attached report, *Lead Exposure and Infrastructure Reconstruction*.

The report's scope was limited to infrastructure reconstruction, but the City should take steps to protect residents who may have already been exposed to elevated levels of lead due to the partial replacement or disturbance of lead service lines. Also, the City's current infrastructure reconstruction program will not replace service lines at all properties, and the potential for exposure to lead will remain for those residents at properties with lead service lines. Ultimately, the City needs to develop a long-term strategy to replace all lead service lines in New Orleans.

I urge you to take immediate action to implement the recommendations included in this report. Further, I urge you to construct a record of where lead service lines have been replaced in the past two years and advise residents serviced by recently replaced lines, especially those most vulnerable to lead, to have their blood tested. In addition, the S&WB should perform sequential sampling of water at those locations.

The actions recommended in this report are not required by law; they are best practices endorsed by the EPA, the American Water Works Association, and numerous other professional and research organizations and municipalities. I am sure you will agree that compliance with law, though essential, is insufficient when public safety or public health is at risk.

I certify that the inspector general personnel assigned to this project are free of personal or other external impairments to independence.

Sincerely,



E.R. Quatrevaux
Inspector General

cc: Jeff Hebert, Chief Administrative Officer, City of New Orleans
Rebecca H. Dietz, City Attorney, City of New Orleans
Marsha Broussard, Director of New Orleans Health Department
Cedric Grant, Executive Director, Sewerage and Water Board
Nolan Lambert, Special Counsel, Sewerage and Water Board
Joseph Becker, General Superintendent, Sewerage and Water Board

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ADDITIONAL RESOURCES

[City and Sewerage and Water Board Notifications](#)

[Partial Lead Service Line Replacement Examples and Resources](#)

**[Greater Cincinnati Water Works Enhanced
Lead Service Line \(LSL\) Mitigation Strategies](#)**

[Frequently Asked Questions](#)

During an inspection of the Sewerage and Water Board's (S&WB) water quality testing practices, the OIG became aware of an imminent risk to public health. The OIG produced this report for the purpose of informing city officials, S&WB managers, and the public of this risk.¹

The City of New Orleans and the S&WB have embarked on \$2.4 billion of infrastructure reconstruction projects. In addition, numerous ongoing road construction projects have been completed or are currently underway. Many of these projects involve repairing and/or replacing components of the water supply system. These water supply system components may include pipes (service lines) that carry water from the water main to a residence/property.²

In New Orleans an undetermined number of homes have service lines made of lead (Pb). Lead is a dangerous neurotoxin and ***no level of lead exposure is deemed safe***. Lead service lines are the main contributor of lead in water at the tap. The S&WB does not have complete or accurate records of where lead service lines are located, and many older New Orleans homes may be serviced by lead service lines (LSLs).

S&WB and city contractors replace the portion of service lines owned by the S&WB (from the water main to the meter or the property line) routinely when replacing water mains. The S&WB may also replace the publicly-owned portion of LSLs when it encounters them in the course of other maintenance work or when there is a leak in the line. In both of these scenarios, the privately-owned portion of the service line is left in place, even if it is made of lead, because it is the responsibility of the property owner.

According to the Environmental Protection Agency (EPA) Science Advisory Board, replacing only a portion of an LSL may elevate the risk of exposure to lead for weeks or months following the replacement, and intermittent high spikes in lead

¹ The results of the OIG inspection of S&WB's water quality testing procedures will be released in a forthcoming report.

² The City's RoadWork NOLA website provides a list, timeline, and map of the more than 200 slated projects. Project categories are Full Depth Reconstruction; Patch, Mill and Overlay; Patch Concrete; Incidental Road Repairs; Bridges; Non-Paving Incidentals; and Streetscapes. See "RoadWork NOLA: Types of Repairs," City of New Orleans, <https://roadwork.nola.gov/types-of-repairs/>.

levels may occur.³ Other infrastructure work that mechanically or hydraulically disturbs LSLs can also cause spikes in lead levels at the tap.

Water systems that fail to meet EPA water quality standards during federally-required water testing may be required to replace the public portion of LSLs (involuntary replacement).⁴ In that event, the systems must notify affected residents in advance of the increased risk of lead exposure, implement an extensive public education protocol that highlights the potential risk, and conduct post-construction water quality testing at those locations.

However, when water systems voluntarily replace lead services lines or engage in other activities that may disrupt service lines in the course of planned infrastructure projects or ongoing maintenance, they are not currently legally required to notify affected residents, implement a public education program, or conduct water quality testing.⁵

Whether the construction work is voluntary or involuntary, ***the potential public health and water quality implications of a partial LSL replacement or disturbances to LSLs are the same.***

The OIG found that the City and the S&WB have not alerted residents to the risk of increased exposure to lead in water caused by the partial replacement or disturbance of LSLs. Nor have they complied with industry best practices by providing citizens with ways to reduce the risk of increased lead exposure.⁶

³ EPA Science Advisory Board, *Evaluation of the Effectiveness of Partial Lead Service Line Replacement* (Washington, D.C.: EPA Science Advisory Board, 2011), 11, https://www.epa.gov/sites/production/files/2015-09/documents/sab_evaluation_partial_lead_service_lines_epa-sab-11-015.pdf.

⁴ 40 CFR §141.80 et seq. The 1991 Lead and Copper Rule (LCR) set goals and action levels (AL) for lead and copper, regulating the amount of lead and copper that can be present in drinking water. “Control of Lead and Copper,” U.S. Government Publishing Office, current as of March 23, 2017, <http://www.ecfr.gov/cgi-bin/text-idx?SID=531617f923c3de2cbf5d12ae4663f56d&mc=true&node=sp40.23.141.i&rgn=div6> For a history and discussion of the EPA’s Safe Drinking Water Act as a response to water quality safety concerns, see Environmental Protection Agency, *25 Years of the Safe Drinking Water Act: History and Trends* (Atlanta, GA: EPA, 1999), <https://nepis.epa.gov/Exe/ZyPDF.cgi/200027R1.PDF?Dockkey=200027R1.PDF>.

⁵ For a summary of the LCR regulations, see U.S. Environmental Protection Agency National Drinking Water Advisory Council, *Lead and Copper Rule Revisions White Paper* (Washington, D.C.: EPA Office of Water, 2016), A3-A4, https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf.

⁶ Evaluators met with the S&WB Executive Director in late April 2017 and were invited to attend a mid-May meeting with city and S&WB representatives. At the May meeting the City’s Director of

As a result, New Orleans residents living where infrastructure construction projects occur may be—or may have been—unknowingly exposed to elevated levels of lead in drinking water.

The American Water Works Association (AWWA), the EPA, the Centers for Disease Control (CDC), the scientific literature, and numerous other municipalities recommend additional public health safety measures including intensive communications and educational efforts when water systems contemplate LSL replacement. These recommendations reflect an emerging consensus about the risks associated with partial LSL replacement and disturbances to LSLs.

Based on the best practices and guidance set forth by industry, scientific, and public health experts, the OIG recommends that the City and the S&WB develop a strategic public health initiative that includes (1) communication strategies for educating residents about the potential for increased lead exposure, and (2) immediate steps to mitigate residents' ongoing risk of elevated lead exposure. At a minimum the plan should include the following short- and intermediate-term actions:

- Alert residents about the significant public health risks associated with partial LSL replacement and other infrastructure work that may disturb LSLs.
- Notify residents in advance of partial LSL replacement or activities that may disturb LSLs.
- Provide residents with detailed instructions on how to flush exterior service and interior plumbing lines after a partial LSL replacement or LSL disturbance.
- Distribute water filter kits and refills to residents who may be—or may have been—recently exposed to elevated lead levels as a result of partial LSL replacement or LSL disturbance.
- Perform water quality testing at locations affected by partial LSL replacements or LSL disturbances until there is sufficient evidence that temporary lead increases have subsided.

The steps listed above consist of practical, short-term strategies designed to alert residents to and provide them with the means to mitigate exposure to lead caused

Special Projects and Strategic Engagement provided evaluators with informational flyers about LSL replacement developed in “the last month or so.” The City/S&WB have developed additional materials since that meeting. See [Additional Resources: City and S&WB Notifications](#) on the OIG website.

by partial LSL replacement or LSL disturbance. However, the only long-term solution is to remove all existing LSLs, and the OIG found no evidence that the City and S&WB have engaged residents in a collaborative effort to facilitate the full removal of all LSLs.

Water systems across the country have encountered obstacles when faced with the challenge of removing all LSLs, and many have implemented creative solutions. The City and the S&WB should examine the approaches employed by other municipalities and implement strategies that increase property-owners' ability to participate in full LSL replacement.

The magnitude of ongoing and upcoming reconstruction work requires the City and the S&WB to mobilize resources quickly to develop a comprehensive, strategic public health education initiative. The S&WB should engage the City of New Orleans Health Department, subject matter experts, and public health experts to overcome the "substantial economic, legal, technical and environmental justice challenges" presented by partial LSL replacement and disturbances to LSLs.⁷

⁷ EPA, *Lead and Copper Rule Revisions White Paper*, 9.

I. OBJECTIVES, SCOPE, AND METHODS

During an inspection of the Sewerage and Water Board's (S&WB) water quality testing practices, the City of New Orleans Office of Inspector General (OIG) learned of an imminent risk to public health due to the partial replacement or disturbance of lead service lines (LSLs). As a result, the OIG conducted an evaluation of S&WB policies and procedures regarding infrastructure work that may involve partial LSL replacement or disturbance of LSLs.

The OIG's objectives were to:

- determine the extent and nature of an increased risk of exposure to lead in drinking water associated with partial LSL replacement or the disturbance of LSLs;
- identify regulations, industry standards, and best practices for reducing the risk of exposure to lead in drinking water associated with partially replacing or disturbing LSLs;
- determine whether the S&WB had policies and procedures regarding partial LSL replacement and the documentation of LSLs uncovered during reconstruction work consistent with regulations, industry standards, and best practices; and
- determine whether the S&WB had effective procedures to inform residents about and mitigate the increased risk of exposure to lead in drinking water associated with partial LSL replacement and the disturbance of LSLs.

Pursuant to Sections 2-1120(12) and (20) of the Code of the City of New Orleans and La. R.S. 33:9613, evaluators interviewed S&WB networks, plumbing, engineering, and communications personnel and obtained documents from the S&WB. Specifically, evaluators reviewed the following records available through April 2017:

- S&WB standard drawings and general specifications delineating materials and requirements for reconstruction work;
- publicly available information regarding the locations of recent and upcoming infrastructure reconstruction, and water system maintenance and repair work;

- printed and online information available through April 2017 pertaining to reconstruction work, water quality communications, potential risks associated with lead in water, and water quality testing;
- information available through April 2017 on City of New Orleans, S&WB, and other cities' websites about the risks of lead exposure in general and risks related to LSLs;
- federal, state, and local regulations regarding water quality and monitoring for lead in drinking water;
- scientific articles and publications by public health professionals and government agencies relating to the health risks of lead exposure, lead in drinking water, and exposure to lead from the replacement or disturbance of LSLs; and
- Environmental Protection Agency (EPA) and industry standards regarding increased exposure to lead from partial LSL replacements and LSL disturbances.

This report includes findings and recommendations to reduce the potential risk of exposure to increased lead in drinking water as a result of infrastructure reconstruction work in New Orleans. OIG staff were greatly assisted in the preparation of this report by the full cooperation of S&WB and city employees and officials.

OIG staff would like to express their appreciation for technical assistance provided by Miguel A. Del Toral, Regulations Manager, United States Environmental Protection Agency (EPA) Region 5; Marc A. Edwards, Ph.D., Charles P. Lunsford Professor of Environmental and Water Resources Engineering, Virginia Tech University; and Adrienne Katner, Ph.D., Assistant Professor of Environmental and Occupational Health Sciences, Louisiana State University School of Public Health.

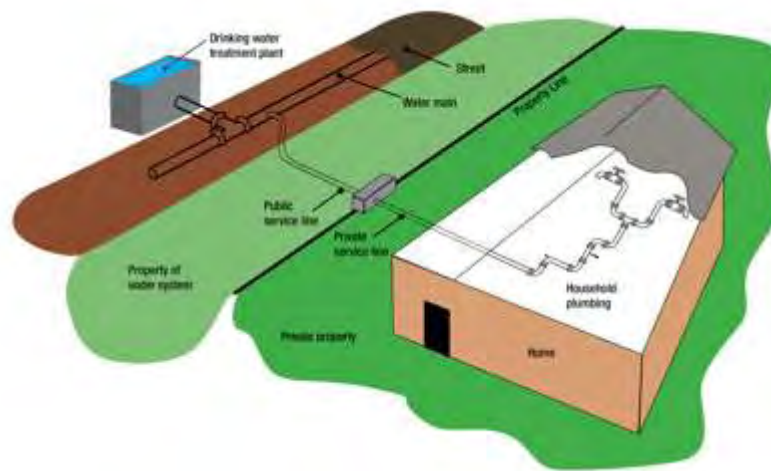
This evaluation was performed in accordance with Principles and Standards for Offices of Inspector General for Inspections, Evaluations, and Reviews.⁸

⁸ Association of Inspectors General, "Quality Standards for Inspections, Evaluations, and Reviews by Offices of Inspector General," Principles and Standards for Offices of Inspector General (New York: Association of Inspectors General, 2014), <http://inspectorsgeneral.org/files/2014/11/AIG-Principles-and-Standards-May-2014-Revision-2.pdf>.

II. BACKGROUND

Service lines supply water from the water main in the street to the property. As in many cities, in New Orleans the portion of the service line that runs under public property is the responsibility of the utility; the portion that runs under private property is the property owners' responsibility.

Figure 1. Water distribution system from the treatment plant to household plumbing with service line on public property connecting at the water meter⁹



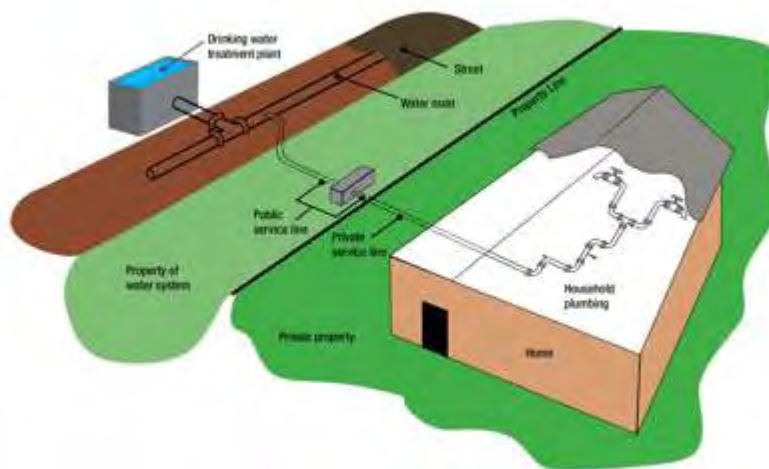
Source: Original diagram by EPA, reprinted in GAO "Drinking Water," and revised by New Orleans OIG

Figures 1 and 2 depict common service line scenarios in New Orleans.¹⁰ In Figure 1 the water meter is located at the property line, dividing the publicly-owned portion from the privately-owned portion of the service line. Figure 2 illustrates a scenario in which the publicly-owned portion of the service line continues past the water meter for as long as the service line remains in the public right of way.

⁹ Government Accountability Office, *Drinking Water: EPA Should Strengthen Ongoing Efforts to Ensure That Consumers Are Protected from Lead Contamination* (Washington, D.C.: GAO, 2006), 8, <http://www.gao.gov/assets/250/248883.pdf>.

¹⁰ Water meters may also be located on private property, in which case the public and private portions of the service line would be joined at the property line.

Figure 2. Water distribution system from the treatment plant to household plumbing with a portion of public service line extending past the water meter¹¹



Source: Original diagram by EPA, reprinted in GAO "Drinking Water," and revised by New Orleans OIG

A 1994 court challenge by the water industry to language in the U.S. Environmental Protection Agency's (EPA) Lead and Copper Rule resulted in the public/private division of responsibility for water service lines.¹² The Court opinion stated:

The AWWA (American Water Works Association) challenges ... the EPA's inclusion of water lines owned by others in the definition of distribution facilities under the 'control' of a public water system, and thus subject to the lead line replacement regulations.

...We grant the AWWA's petition because the EPA failed to provide adequate notice that it might adopt a broad definition of control.¹³

Some water utilities used lead piping for water service lines into the 1980s. Lead was dense, durable, and pliable, making it long-lasting and easy to work with. Lead was also used for a wide array of other purposes, including in paint, solders, batteries, radiation shielding, pesticides, and as a gasoline additive. Its prevalence was linked to a sharp rise in childhood blood lead levels in the early 1970s as environmental lead contamination increased. Resulting federal regulations

¹¹ GAO, *Drinking Water*, 8.

¹² *American Water Works Ass'n v. E.P.A.*, 40 F.3d 1266 (D. C. Cir. 1994).

¹³ *Ibid.*

reduced the amount of environmental lead by limiting the use of lead, including limiting its use in water pipes and plumbing fixtures.¹⁴

HEALTH EFFECTS OF LEAD

Lead is universally acknowledged to be a potent neurotoxin that attacks the nervous system and can impair the cognitive functioning of both adults and children.¹⁵ However, lead exposure is especially harmful for children.¹⁶

Children's developing nervous systems make them especially susceptible to lead toxicity. The Centers for Disease Control and Prevention (CDC) concluded that "new studies and re-interpretation of past studies have demonstrated that it is not possible to determine a threshold below which BLL [blood lead level] is not inversely related to IQ" or cognitive defects.¹⁷ Even blood lead levels <5 µg/dL "are associated with diagnosis of attention-related behavioral problems, ... and decreased cognitive performance."¹⁸

¹⁴ Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Department of Health and Human Services, *Toxicological Profile for Lead* (Atlanta, GA: Agency for Toxic Substances and Disease Registry, 2007): Ch. 1, 2, and 294-297, <https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf>; Mary Jean Brown and Stephen Margolis, "Lead in Drinking Water and Human Blood Lead Levels in the United States," *Centers for Disease Control and Prevention MMWR-Morbidity and Mortality Weekly Report* (August 10, 2012): 1, <https://www.cdc.gov/mmwr/pdf/other/su6104.pdf>; Simoni Triantafyllidou and Marc Edwards, "Lead (Pb) in Tap Water and In Blood: Implications for Lead Exposure in the United States," *Critical Reviews in Environmental Science and Technology*, 42 (2012): 1300, <http://dx.doi.org/10.1080/10643389.2011.556556>.

¹⁵ National Toxicology Program (NTP), National Institute of Environmental Health Sciences, *NTP Monograph on Health Effects of Low-Level Lead* (Research Triangle Park, NC: National Institute of Environmental Health Sciences, June 2012), xv-xxiv, https://ntp.niehs.nih.gov/ntp/ohat/lead/final/monographhealtheffectslowlevellead_newissn_508.pdf; Brown and Margolis, "Lead in Drinking Water," 1-7; and ATSDR, *Toxicological Profile for Lead*, 8-10 and 21-31.

¹⁶ Centers for Disease Control and Prevention Advisory Committee on Childhood Lead Poisoning Prevention, *Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention* (Atlanta, GA: Centers for Disease Control and Prevention, 2012), 4-9, https://www.cdc.gov/nceh/lead/acclpp/final_document_030712.pdf; ATSDR, *Toxicological Profile for Lead*, 9-10; and "Lead Poisoning and Health," World Health Organization, 1-2, last modified September 2016, <http://www.who.int/mediacentre/factsheets/fs379/en/>.

¹⁷ CDC, *Low Level Lead Exposure Harms Children*, 7. See also, Centers for Disease Control and Prevention, *Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women* (Atlanta, GA: Centers for Disease Control and Prevention, November 2010), 10-11, <https://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf>; and Brown and Margolis, "Lead in Drinking Water," 2.

¹⁸ NTP, *Monograph on Health Effects of Low-Level Lead*, xviii and xxi. See also, ATSDR, *Toxicological Profile for Lead*, 23 and 25.

In 2015 Orleans Parish reported blood lead level test results for only 25.4 percent of children six and under. Results showed that 11.2 percent of the 6,963 children tested had blood lead levels greater than or equal to 5 µg/dL.¹⁹

Moreover, “evidence from several prospective studies suggests that the adverse effects of early childhood exposure on neurodevelopment persist into the second decade of life.”²⁰ The effects are not only significant at the individual level; according to the CDC, “the public health impact of low level lead-exposure on the distribution of intelligence in society is considerable.”²¹

For adults, adverse health effects occur across a range of health outcomes. Lead exposure is associated with decreased renal function, increased blood pressure, reduced cardiovascular and renal/kidney function, and hypertension. Ingested lead or inhaled lead dust enters the blood stream and travels first to soft tissues and organs. It is then stored in bones and teeth, where some of it remains for decades.²² During pregnancy and lactation, lead stored in the mother’s bones mobilizes and may be redistributed into blood, potentially exposing the developing fetus to lead.²³ Maternal blood lead levels less than 5 µg/dL may reduce fetal growth or lower birth weight.²⁴

According to the World Health Organization, “**there is no known level of lead exposure that is considered safe** [emphasis added].”²⁵ The EPA agreed: “In terms

¹⁹ Louisiana Department of Health and Hospitals, *Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program Surveillance System Report, 2015* (Baton Rouge, LA: LA DHH, 2015), 2, <http://www.dhh.louisiana.gov/assets/oph/Center-PHCH/Center-PH/genetic/LEAD/NewsandUpdates/Laleadreport2015.pdf>.

²⁰ Brown and Margolis, “Lead in Drinking Water,” 2. See also, CDC, *Identification and Management of Lead Exposure*, 12.

²¹ CDC, *Low Level Lead Exposure Harms Children*, 8; and CDC, *Identification and Management of Lead Exposure*, 12.

²² NTP, *Monograph on Health Effects of Low-Level Lead*, xviii-xxiii; and ATSDR, *Toxicological Profile for Lead*, 7. In adults, approximately 94 percent of total lead in the body is contained in bones and teeth, predominantly in bones; in children, about 73 percent is stored in their bones.

²³ CDC, *Identification and Management of Lead Exposure*, 10-11; and NTP, *Monograph on Health Effects of Low-Level Lead*, 9-11.

²⁴ NTP, *Monograph on Health Effects of Low-Level Lead*, xviii and xxii-xxiii.

²⁵ WHO, “Lead Poisoning and Health,” 1; Brown and Margolis, “Lead in Drinking Water,” 1; U.S. Environmental Protection Agency, *Lead and Copper Rule Revisions White Paper* (Washington, D.C.: EPA Office of Water, 2016), https://www.epa.gov/sites/production/files/201610/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf; Triantafyllidou and Edwards, “Lead (Pb) in Tap Water,” 1319; and Enrico Rossi, “Low Level Environmental Lead Exposure—A Continuing Challenge,” *Clinical Biochemistry Review* 29 (May 2008): 63-64, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2533151/pdf/>.

of health impacts, the EPA has consistently emphasized that the health-based maximum contaminant level goal (MCLG) for lead in the current LCR [Lead and Copper Rule] is zero and that there is no safe level of lead exposure.”²⁶

WATER AS A SOURCE OF LEAD (Pb)

As federal regulations progressively limit other environmental sources of lead, researchers note that “the relative contribution of lead in water to lead in blood is expected to become increasingly important”:²⁷

Drinking water consumption is believed to account for up to 20% of total lead exposure nationally (U.S. Environmental Protection Agency, 1993). But ... for infants consuming formula it may account for more than 50% of their total lead exposure Recent work has demonstrated that in some cases, lead from water can be the dominant source of exposure in children with EBL [elevated blood lead].²⁸

The primary source of lead in drinking water comes from lead service lines (LSLs) used in the water supply system.²⁹ In a study sponsored jointly by the American Water Works Association Research Foundation and the EPA, researchers and industry professionals found that “lead service lines were the major contributor

²⁶ “The LCR [Lead and Copper Rule] set a health-based maximum contaminant level goal of zero ... [and] established [an] action level of 0.015 mg/L (15 ppb) for lead ..., based on the 90th percentile sample. ... Whereas an MCL is an enforceable level that drinking water cannot exceed without violation, an action level [AL] is a screening tool for determining when certain treatment technique actions are needed.” EPA, *LCR Revisions White Paper*, 6 and 11.

²⁷ Triantafyllidou and Edwards, “Lead (Pb) in Tap Water,” 1297. See also, Mary Jean Brown, et al., “Association between children’s blood lead levels, lead service lines, and water disinfection, Washington, DC, 1998-2006,” *Environmental Research* 111 (2010): 67-68.

²⁸ Triantafyllidou and Edwards, “Lead (Pb) in Tap Water,” 1298. See also, Ronnie Levin, et al., “Lead Exposures in U.S. Children, 2008: Implications for Prevention,” *Environmental Health Perspectives* 10 (October 2008): 1287, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2569084/pdf/ehp-116-1285.pdf>.

²⁹ EPA, *LCR Revisions White Paper*, 5. See also, Miguel A. Del Toral, Andrea Porter, and Michael R. Schock, “Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study,” *Environmental Science & Technology* 47 (2013): 9300, <https://www.epa.gov/sites/production/files/2015-10/documents/lead-service-lines-study-20130723.pdf>; and Anne Sandvig, et al., *Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues* (Denver, CO: American Water Works Research Foundation): 17, <https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf>.

to lead levels measured at the tap during sequential sampling, contributing an average of 50 to 75 percent of the total mass of lead measured at the tap.”³⁰

Galvanized pipe (zinc-coated steel) may also be a source of lead in older homes because lead from LSLs can build up in galvanized pipes used inside and outside of homes.³¹ According to the EPA’s Science Advisory Board,

Pb [lead] can accumulate in interior plumbing downstream from an LSL [lead service line], especially in galvanized pipes. This phenomenon ... occurs when dissolved and particulate Pb are released from an LSL and captured downstream by various mechanisms.

It is now widely recognized that a large fraction of the Pb in a given water sample may be present in particulate form, and that particulate Pb can be sporadically released into the water from LSLs or from Pb-contaminated household plumbing downstream from an LSL.³²



Effective corrosion control, required of large water systems by the Lead and Copper Rule, creates a protective layer of corrosion scale (lead rust) in water lines that substantially minimizes the amount of lead released into water as it flows through the pipes.³³

The S&WB’s 2015 Water Quality Report states that water leaves its treatment plants “lead free.” However, “once water leaves the treatment plant it may pass through lead service lines between the water main and the residence or building. The pipes do, however, have a protective coating and corrosion control chemicals are used to minimize lead



³⁰ Sandvig, et al., *Contribution of Service Line and Plumbing Fixtures to LCR Compliance*, 2 and 17.

³¹ Ibid., 19. The authors noted that “the presence of a lead service line affects the amount of lead derived from the various lead sources in the system.” See also, Kelsey J. Pieper, Min Tang, and Marc A. Edwards, “Flint Water Crisis Caused by Interrupted Corrosion Control: Investigating ‘Ground Zero’ Home,” *Environmental Science and Technology* 51, no. 4 (February 1, 2017): 2007 and 2012, <http://pubs.acs.org/doi/pdf/10.1021/acs.est.6b04034>.

³² EPA Science Advisory Board, *Review of the Effectiveness of Partial Lead Service Line Replacements* (Washington, D.C.: EPA Science Advisory Board, 2011), 11, https://www.epa.gov/sites/production/files/2015-09/documents/sab_evaluation_partial_lead_service_lines_epa-sab-11-015.pdf.

³³ Sandvig, et al., *Contribution of Service Line and Plumbing Fixtures to LCR Compliance*, 20; and Pieper, Tang, and Edwards, “Flint Water Crisis Caused by Interrupted Corrosion Control,” 2007.

contamination.”³⁴ The Report identifies lime as the corrosion control chemical used.

VARIABILITY OF LEAD LEVELS IN TAP WATER

The Louisiana Department of Health and Hospitals certified 2010, 2013, and 2016 S&WB water quality testing results below the action level [AL].³⁵ However, water quality testing under the Lead and Copper Rule requires a single sample from taps in 80 homes in New Orleans once every three years, and the protocol may not adequately test for lead exposure.³⁶

The Lead and Copper Rule calls for testing “first-draw” samples after water has been stagnant in the pipes for at least six hours. However, recent studies demonstrate that these “sampling protocols developed for regulatory purposes” may miss “important fluctuations in water lead levels.”³⁷ Further, field tests show LSLs to be the main contributor to high lead levels since “consistently low first-draw results indicate low ... contribution” from household plumbing.³⁸

The EPA is considering whether the “rule should include a variety of tap sampling protocols,” including “sequential sampling to characterize lead levels in drinking water that has been in contact with premise plumbing and the LSL” and “random daytime samples.”³⁹

³⁴ Sewerage and Water Board, *2015 Water Quality Report* (New Orleans, LA: S&WB, 2016), 8 and 1, https://www.swbno.org/getfile.asp?documents/Reports/2015_qualitywater.pdf. S&WB’s Water Quality Report fulfills the legal requirement that each water system issue an annual Consumer Confidence Report (CCR). 42 U.S.C. § 1414(c)(4)(A-B) (2002).

³⁵ The Lead and Copper Rule requires large water systems to *optimize* corrosion control treatment in order to *minimize* lead and copper levels at the tap. This is a higher standard than the lead action level (AL), which requires less than 0.015 mg/L (15 ppb) lead in water test results from 90 percent of homes tested. However, according to an EPA official, most water systems “have not attempted to ‘minimize’ lead levels as required” but work to stay below the AL in order not to prompt additional mandatory compliance measures. Miguel Del Toral, e-mail message to OIG, March 30, 2017. See 40 CFR §141.2 and §141.81(d).

³⁶ Del Toral, Porter, and Schock, “Detection and Evaluation of Elevated Lead Release,” 9300 and 9304; Del Toral, Miguel. “Sampling for Lead in Drinking Water.” Webinar, National Drinking Water Advisory Council LCR Working Group, September 9, 2014, 8-23; and Brandi Clark, Sheldon Masters, and Marc Edwards, “Profile Sampling to Characterize Particulate Lead Risks in Potable Water,” *Environmental Science & Technology* 48 (May 27, 2014): 6836 and 6841, <http://pubs.acs.org/doi/abs/10.1021/es501342j>.

³⁷ Brown and Margolis, “Lead in Drinking Water,” 7.

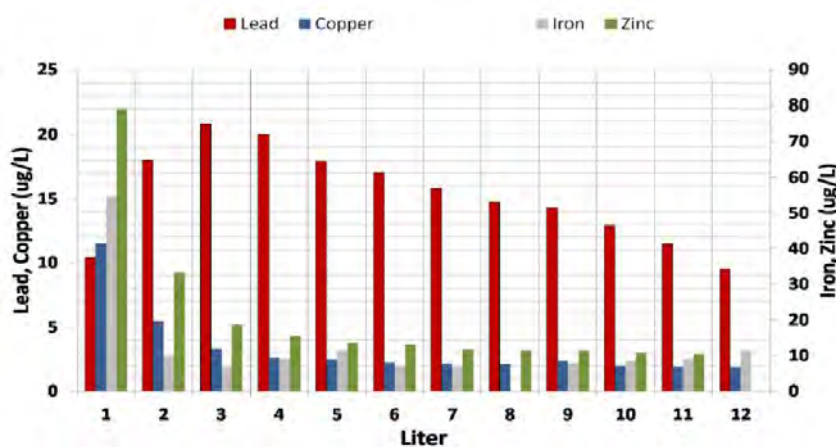
³⁸ Del Toral, “Sampling for Lead in Drinking Water,” 5.

³⁹ EPA, *LCR Rule Revisions White Paper*, 13-14.

A recent field study in which EPA researchers sequentially sampled tap water in homes with LSLs 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” and will “often considerably underestimate the peak lead levels and overall mobilized mass of waterborne lead in a system with lead service lines.” They concluded that “no individual sample result from within the LSL can *characterize* the lead concentrations at the site.”⁴⁰

Figure 3 depicts an example of the lead level in sequential liters of water drawn from a single tap. Number 1 is the “first draw” sample that federal regulations instruct water systems to collect. Of the 12 samples, it captured the second lowest level of lead.

Figure 3. Level of lead and other metals in sequential water samples drawn from a single tap

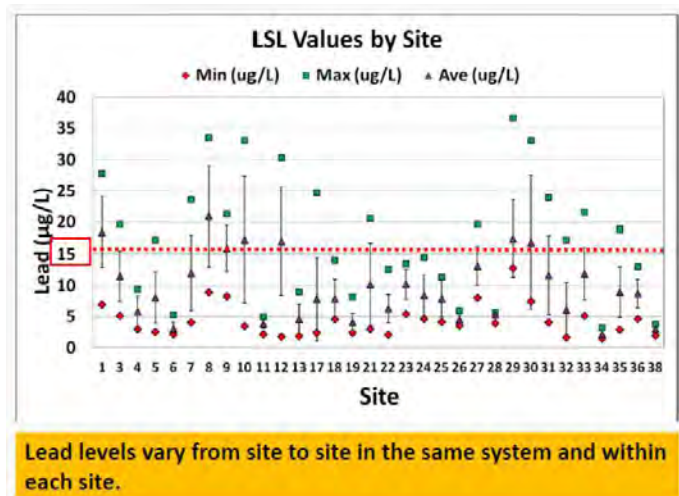


Source: Del Toral, Miguel. “Sampling for Lead in Drinking Water,” 11.

⁴⁰ Del Toral, Porter, and Schock, “Detection and Evaluation of Elevated Lead Release,” 9300 and 9303-9304. See also, EPA, *Evaluation of the Effectiveness of PLSLR*, 13. The authors note that the Lead and Copper Rule’s sampling protocols were designed to determine lead content using a specific sampling method and “may fail to produce samples containing representative concentrations of particulate Pb” and that “the limitations of current sampling methods should be carefully considered in future revisions to the LCR.”

Figure 4 illustrates the range of lead content found in sequential water samples taken from 38 sites during the study.

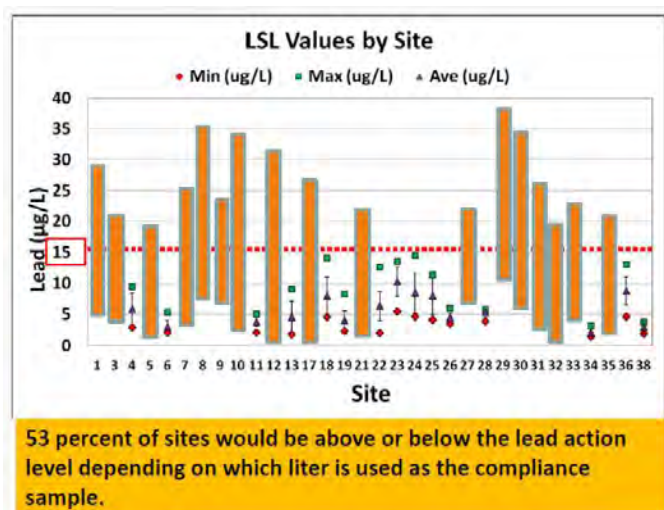
Figure 4. Variability in the level of lead in water at each of 38 sites and across sites



Source: Del Toral, Miguel. "Sampling for Lead in Drinking Water," 14.

As Figure 5 shows, whether a site tests above or below the lead action level (AL) varies depending on which sample is used, and a single sample may not accurately depict the level of lead exposure at the site. For 53 percent of the sites sampled, the site could test above the AL depending on which sample was used to determine compliance.

Figure 5. Variability in level of lead in water drawn from the tap at each of 38 sites



Source: Del Toral, Miguel. "Sampling for Lead in Drinking Water," 15.

The LSL contributes varying degrees of lead to each liter of water passing through the lead line. The amount of lead released from a lead service line into tap water

depends on a number of variables, including whether the site has been disturbed, the length of the lead service line, the amount and pattern of water usage at an individual site, the flow rate of the sampled water, the amount of pipe between the service line and the interior tap, and changes in water quality.⁴¹

⁴¹ Del Toral, "Sampling for Lead in Drinking Water," 9-10, 12-13.

III. PARTIAL LEAD SERVICE LINE REPLACEMENT & DISTURBANCES TO LSLs

I oftentimes say that [lead service line replacement] is the most important thing happening in water right now. ... [R]eplacing lead service lines is actually quite complicated, but it is a possible thing to do. Individual communities will come up with their own solutions, and we know that those solutions are made better when we share best management practices

David LaFrance, CEO, American Water Works Association⁴²

Any disturbance of LSLs can dislodge the protective layer of corrosion scales into the water and may result in high water lead levels.⁴³ These disturbances occur during service line replacements.⁴⁴ According to the EPA Science Advisory Board, “the weight of the evidence indicates that PLSLR [partial lead service line replacement] often causes tap water Pb [lead] levels to increase significantly for a period of days to weeks, or even several months.”⁴⁵ Partial LSL replacements create an increased risk of releasing both dissolved and particulate lead into the property’s water lines.⁴⁶

Research also confirms that significant disturbances in the vicinity of service lines may also occur when infrastructure maintenance or construction work is done

⁴² David LaFrance, “Lead Service Line Replacement: Vital Tips from Leading Utility Managers” (YouTube video, 1:15:10, American Water Works Association conference on May 3, 2016, posted by AWWA, May 18, 2016), https://www.youtube.com/watch?v=fwq4_yPjHMs.

⁴³ Sandvig, et al., *Contribution of Service Line and Plumbing Fixtures to LCR Compliance*, 17 and 40. The authors note that mechanical disturbances such as “vibrating or striking the pipe” frequently occur during service line replacements. Sponsored jointly by the AWWA Research Foundation and the EPA, the authors conducted a “comprehensive literature review and national survey of lead source characteristics and jurisdictional issues; conduct[ed] case, pilot, and field studies; and perform[ed] basic research on corrosion by-product scales found on lead based material” (xv).

⁴⁴ EPA Science Advisory Board, *Effectiveness of PLSLRs*, 11; Triantafyllidou and Edwards, “Lead (Pb) in Tap Water,” 1300.

⁴⁵ EPA Science Advisory Board, *Effectiveness of PLSLRs*, 2; Benjamin F. Trueman, Eliman Camara, and Graham A. Gagnon, “Evaluating the Effects of Full and Partial Lead Service Line Replacement on Lead Levels in Drinking Water,” *Environmental Science and Technology* 50 (2016): 7393-7394.

⁴⁶ EPA Science Advisory Board, *Effectiveness of PLSLRs*, 10; Del Toral, Porter, and Schock, “Detection and Evaluation,” 9300 and 9304. In one study a Tulane University professor conducted laboratory simulations of partial lead service pipe replacements using lead pipes recovered from service in New Orleans, LA. The researchers ran New Orleans water through the lead pipes and tested it. Results showed elevated lead levels that exceeded the action level immediately following the simulated LSL replacement. In most cases, continuous flushing for extended periods was relatively effective in reducing total lead in the water below the AL. See Glen R. Boyd, et al., “Pb in Tap Water Following Simulated Partial Lead Pipe Replacements,” *Journal of Environmental Engineering* 130, no. 10 (October 2004): 1188-1189.

that includes jackhammering or other mechanical actions that cause “physical trauma” to the service line.⁴⁷ In this scenario, lead particles concentrated in the corrosive scale lining the lead pipe are jarred loose, potentially releasing large amounts of lead into the water lines.

The problem is magnified if the property has galvanized plumbing lines downstream of the service line, as free-floating lead particles then adhere to the rusted interior of older galvanized pipe and can be captured in the bends and crevices of the interior plumbing. Once present in the interior pipes, these deposits can detach from the interior pipes at any time, elevating for an “unknown period of time” the level of risk of exposure to lead.⁴⁸

INFRASTRUCTURE RECONSTRUCTION IN NEW ORLEANS

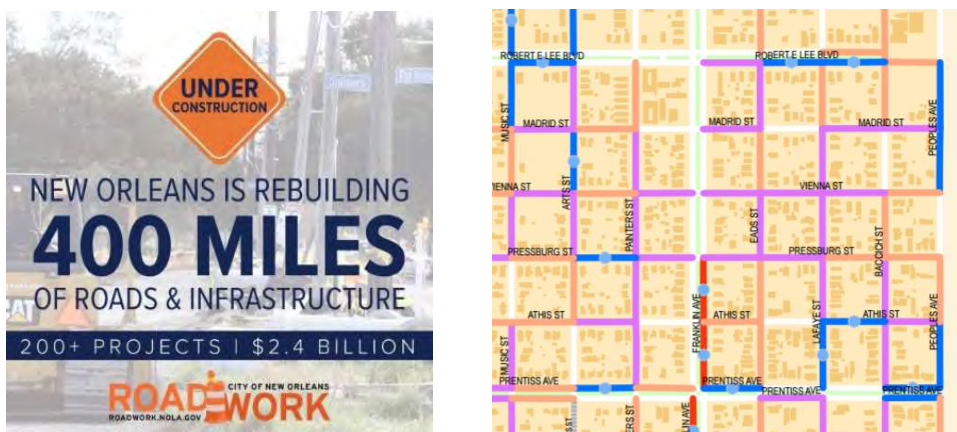
The City of New Orleans and the S&WB have embarked on \$2.4 billion of infrastructure reconstruction projects. The City’s RoadWork NOLA website lists more than 200 construction projects covering over 400 miles of roads and infrastructure.⁴⁹ In addition, numerous road construction projects funded by bonds and the capital budget have been completed or are currently underway.

⁴⁷ Miguel Del Toral, telephone interview by OIG, New Orleans, March 29, 2017. The finding is also discussed in Del Toral, Porter, and Schock, “Detection and Evaluation.”

⁴⁸ Del Toral, OIG telephone interview.

⁴⁹ The website provides a list, timeline, and map of the more than 200 slated projects. Project categories include Full Depth Reconstruction; Patch, Mill and Overlay; Patch Concrete; Incidental Road Repairs; Bridges; Non-Paving Incidentals; and Streetscapes. See “Types of Repairs,” RoadWork NOLA, City of New Orleans, last modified March 2017, <http://roadwork.nola.gov/types-of-repairs/>.

Figure 6. Images from City of New Orleans RoadWork NOLA website⁵⁰



Many of these projects involve repairing and/or replacing components of the water supply system. These components may include pipes (service lines) that carry water from the water main to a residence/property. According to the S&WB's 2015 Water Quality Report, there are approximately 143,000 service lines that supply water from the water main in the street to customers' premises throughout New Orleans.⁵¹

An unknown number of these service lines are made of lead (LSLs), and the S&WB does not have complete or accurate records of where LSLs are located. "We don't know how many LSLs we have. We don't know where they are," said one S&WB official.⁵² S&WB officials stated that the practice of using LSLs in New Orleans

⁵⁰ "About the Capital Improvement Program," RoadWork NOLA, <http://roadwork.nola.gov/about/> and <http://roadwork.nola.gov/roadwork/media/Documents/Maps/ByNeighborhood/rr130.pdf>. Locations of water line replacements (water main and service lines) appear as blue dots. Other work that could disturb LSLs may include patch mill/overlay (blue lines), patch concrete (red lines), incidental road repairs (peach), and non-paving incidentals (purple).

⁵¹ S&WB, *2015 Water Quality Report*, 7.

⁵² S&WB officials confirmed that the S&WB does not know how many lead service lines the system has, either on the public or private side. One of the principles guiding EPA's revisions to the Lead and Copper Rule is transparency, including "better access for consumers to information related to the location of LSLs" Also, the EPA is "evaluating a number of important issues, including: ... requiring drinking water utilities to update their distribution system material inventory to identify the number and location of LSLs in their system." EPA, *LCR Revisions White Paper*, 4 and 10. In December 2016 the S&WB began collecting information about service line materials when Networks crews conducted work in the field. As of March 31, 2017, the S&WB estimated that the material composition of 2,500 to 3,000 service lines (out of approximately 143,000 service connections) had been entered into its work order database.

stopped during the 1950s.⁵³ According to the Data Center, 44 percent of New Orleans homes were built prior to 1949; therefore, many properties in New Orleans are likely serviced by LSLs.⁵⁴

When installing new water mains, contractors and S&WB personnel install new service lines on the public side of the property line, including replacing all LSLs. Also, when S&WB crews encounter LSLs in the course of maintenance or repair work, the standard practice is to remove the LSL on the public side of the property line and replace it with a new service line. According to standard drawings provided by the S&WB, the public portion of the service line must be replaced with polyethylene or copper pipe.⁵⁵

Contractors and S&WB personnel leave the privately-owned portion of the service line in place, even if it is made of lead, because property owners are legally responsible for those costs.⁵⁶ However, residents who are left with an LSL on their property are at risk for exposure to elevated levels of lead in water.

Regardless with whom the responsibility lies, ***the practice of conducting partial LSL replacements and disturbing LSLs exposes residents to risk if they are unaware of the likelihood of increased exposure to lead in their drinking water.***

Finding 1: The City and the S&WB have not alerted residents to or provided them with information to reduce the risk of increased exposure to lead in water caused by the partial replacement or disturbance of lead service lines.

The EPA has acknowledged that “there is a compelling need to modernize and strengthen ... its public health protections” in the Lead and Copper Rule and

⁵³ Evaluators were unable to find documentation to confirm that the installation of LSLs stopped in the 1950s.

⁵⁴ “Who Lives in New Orleans and Metro Parishes Now? Year Housing Built,” Data Center, 29, published September 27, 2016, <http://www.datacenterresearch.org/data-resources/who-lives-in-new-orleans-now/>. An additional 42 percent of homes were built between 1950 and 1989, when the federal lead ban went into effect; a portion of these homes is also likely to contain service lines or plumbing fixtures that contain lead.

⁵⁵ Sewerage and Water Board of New Orleans, “Standard Drawings,” Revised October 9, 2015, DWG. No. 7134-W, p 26. S&WB officials told the OIG that polyethylene (PE) piping is used for service line connections. Bid documents and the Department of Public Works General Specifications for Street Paving confirmed the use of PE piping. See <https://www.nola.gov/dpw/documents/dpw-general-specifications-final-jan-4-2016/>.

⁵⁶ *American Water Works Ass’n v. E.P.A.*, 40 F.3d 1266 (D. C. Cir. 1994).

identified partial LSL replacements as a “key issue” the EPA should address in Rule revisions. Of particular concern were locations where there is a concentration of children, such as day care centers and schools.⁵⁷

The Lead and Copper Rule currently only requires water systems to inform residents when partial LSL replacements are required due to exceedances of lead action levels (i.e., involuntary replacements). In the case of these involuntary LSL replacements, the Lead and Copper Rule requires water systems to notify residents in advance and conduct an extensive educational effort targeted to affected residents.⁵⁸

When partial LSL replacements are performed during the course of normal maintenance activities or as part of larger planned infrastructure improvement projects (i.e., voluntary replacements), the Lead and Copper Rule currently does not require water systems to notify residents of the impending work or warn them of the potential increased risk of lead exposure.⁵⁹

Regardless of why a lead service line is replaced or disturbed, the same health risks apply. According to the American Water Works Association,

[T]he developing scientific and regulatory landscape suggests that water utilities should communicate lead exposure risks in a proactive and targeted manner not only when lead service lines are repaired or replaced, but also when routine maintenance work on water mains may disturb lead service lines. This change may dramatically alter the frequency of direct-to-customer lead communications and requires a new level of planning by utility managers and communicators.⁶⁰

Effective risk communication requires urgent and frequent messaging to engage the public. However, the City and the S&WB did not have an effective communications and outreach strategy to alert the public of the increased risk of

⁵⁷ EPA, *LCR Revisions White Paper*, 15-16. See also, Triantafyllidou and Edwards, “Pb in Tap Water,” 1298, 1309-1312, 1340; and CDC, *Identification and Management of Lead Exposure*, 44.

⁵⁸ 40 C.F.R. § 141.84 and § 141.85 (2016).

⁵⁹ Ibid.

⁶⁰ American Water Works Association, *Communicating About Lead Service Lines: A Guide for Water Systems Addressing Service Line Repair and Replacement* (Denver, CO: American Water Works Association, 2014), iii., <https://www.awwa.org/portals/0/files/resources/publicaffairs/pdfs/finaleadservicelinecommguide.pdf>.

exposure to lead in drinking water resulting from infrastructure reconstruction work that included partial replacements and disturbance of LSLs.⁶¹

The OIG found limited references intended to alert residents to elevated lead levels in the S&WB's 2015 Consumer Confidence Report (CCR). The CCR noted that residents whose homes have "recently undergone plumbing renovation may experience elevated lead concentrations in their tap water," but it did not explain that residents would be at risk due to partial LSL replacements or LSL disturbances associated with infrastructure improvement projects.⁶²

The electronic version of the 2015 CCR (available on the S&WB's website) also included a separate section titled "Waterline Replacement: New Orleans Leads Nation in Replacing Aging Infrastructure." It described the upcoming infrastructure reconstruction projects as "the most massive waterline replacement in the city's history."⁶³ The discussion contained no mention of increases in lead levels due to partial LSL replacements or LSL disturbances.

The only mention of the risk associated with service line replacements occurred on a separate page of the report near the bottom of a section titled "Tips for Reducing Lead Exposure from Drinking Water." Of the ten tips listed, number nine acknowledged "that service line replacements may cause a temporary increase in lead in your drinking water."⁶⁴

However, the language preceding this warning limited its audience to residents at locations where S&WB water testing had already found elevated lead levels (Figure 6). It informed residents that the S&WB would replace the public portion of the LSL but reminded them that the private portion was their responsibility. The tip did not connect the increased risk of lead exposure caused by partial LSL

⁶¹ The S&WB notified residents 48 hours in advance that a disruption of water service might occur and communicated locations of road closures caused by construction. It did not notify residents when a partial LSL replacement or LSL disturbance could occur. S&WB's Deputy Director of Communications informed evaluators in late March 2017 that S&WB personnel knocked on doors and spoke with residents if they answered, but workers left no written information behind.

⁶² S&WB, *2015 Water Quality Report*, 6. The Safe Drinking Water Act requires water systems to distribute an annual Consumer Confidence Report (CCR), and the S&WB's 2015 CCR was mailed to customers with water bills in June 2016. 42 U.S.C. § 1414(c)(4)(A-B) (2002). According to the cover letter attached to the CCR, the report was mailed to customers, advertised in the Times Picayune, posted on the S&WB's website, and made available at government offices and libraries.

⁶³ S&WB, *2015 Water Quality Report*, 8.

⁶⁴ *Ibid.*, 6.

replacements or LSL disturbances to infrastructure reconstruction or maintenance.

Figure 7. Excerpt from S&WB 2015 Consumer Confidence Report



The City and the S&WB did not have a communications strategy that included notifying residents in advance of impending LSL work. It provided only minimal information about the risk of lead exposure in the annual CCR, which failed to convey a sense of urgency. In addition, it did not provide residents with information about how to mitigate the risk of increased lead exposure caused by partial LSL replacements or LSL disturbances.⁶⁵

As a result, *New Orleans residents may be—or may have been—unknowingly exposed to elevated levels of lead in drinking water.*

⁶⁵ Evaluators met with the S&WB Executive Director in late April 2017 and were invited to attend a mid-May meeting with city and S&WB representatives. At the May meeting the City's Director of Special Projects and Strategic Engagement provided evaluators with informational flyers about LSL replacement developed in "the last month or so." (See [Additional Resources for City and S&WB Notifications.](#))

Recommendation 1: The City and the S&WB should develop and implement a strategic public health initiative that reduces the risk of exposure to lead in water caused by the partial replacement or disturbance of lead service lines.

The risk of exposure to elevated lead levels associated with partial LSL replacements endangers public health, especially the health of pregnant women, infants, and young children. Although not legally required, this public health risk should compel the City and the S&WB to develop a strategic public health initiative that includes (1) communication strategies for educating residents about the potential for increased lead exposure and (2) immediate steps to mitigate residents' ongoing risk of elevated lead exposure.

The S&WB should examine initiatives and programs developed by other cities that face challenges presented by LSLs. For example, in early 2016 the Greater Cincinnati Water Works completed a planning process that resulted in a 22-page strategic plan titled *Detailed Report on the Greater Cincinnati Water Works Enhanced Lead Service Lines (LSLs) Mitigation Strategies, Including Short-Term, "Low Hanging Fruit," and Long-Term Initiatives*.⁶⁶ (See [Additional Resources](#) for the full report.)

The strategies are divided into two categories: (1) Tier 1 strategies that include "communication action items which mainly focus on customer education and outreach," and (2) Tier 2 strategies that "focus on strategies designed to reduce the risks presented by the presence of LSLs as well as to provide mechanisms to encourage eventual removal of all lead service lines." The stated goal is "to become a 'lead safe' water City, greatly minimizing the presence, and therefore risk, of lead through our properties, homes, and businesses."⁶⁷

Tier 2 strategies include short-term ("low hanging fruit"), immediate steps that can be implemented "fairly quickly to impact and reduce the number of [LSLs] as well as build a foundation for ultimately achieving complete removal of lead

⁶⁶ Greater Cincinnati Water Works (GCWW), "Final Council Report on the Greater Cincinnati Water Works LSL Replacement Strategies" City of Cincinnati Council Online, May 22, 2016), <http://city-egov.cincinnati-oh.gov/Webtop/ws/council/public/child/Blob/45076.pdf;jsessionid=BCCC796C519FAFB20D718F93C6C1C56A?m=43860>.

⁶⁷ Ibid., 2.

services.”⁶⁸ Tier 2 long-term strategies require “planning, resources, and a funding source for implementation and program administration.”⁶⁹ Planning for the long-term strategies includes 5-, 10-, and 15-year projections of resource needs and costs to accomplish the goal of a “‘lead safe’ water city.” The program focuses “solely on identifying water main replacement candidates based on lead service densities.”⁷⁰

Cincinnati’s plan also recognizes that “infants and school-age children are one of the most susceptible groups to lead,” and “although not mandated by any current regulations,” GCWW’s action plan includes working with schools to train and educate school officials and to develop plumbing profiles and water sampling plans in schools.⁷¹

To coordinate the multiple elements of its strategic plan, Greater Cincinnati Water Works hired a Lead Program Manager, who will “play a key role in the Enhanced Lead Program.”

There are many components included in the program that work in conjunction with each other, including water sampling and testing, communications and outreach, lead service line replacement, records, information technology, and customer service. His responsibility is to unify these efforts and work towards a lead-safe Cincinnati.⁷²

The American Water Works Association, the EPA, the Centers for Disease Control (CDC), the scientific literature, and numerous other municipalities recommend public health safety measures and policies to implement in advance of work that could disturb lead service lines. (See [Additional Resources for Partial LSL Replacement](#) for examples and resource materials.)

Immediate steps to educate residents and mitigate the ongoing risk of elevated lead exposure should include at minimum:

⁶⁸ Ibid., 7.

⁶⁹ Ibid., 15.

⁷⁰ GCWW, *Enhanced LSLs Mitigation Strategies*, 2 and 15.

⁷¹ Ibid., 13. These steps follow the EPA guidance in: EPA, *3Ts for Reducing Lead in Drinking Water in Schools* (Washington, D.C.: EPA, revised 2006), 13, https://www.epa.gov/sites/production/files/2015-09/documents/toolkit_leadschools_guide_3ts_leadschools.pdf.

⁷² “H2OConnection,” Greater Cincinnati Water Works, January 2017, http://cincinnati-oh.gov/water/assets/File/2017_January_H2Oconnection.pdf.

- a thorough and persuasive public education plan that includes risk communication strategies;
- advance notification of impending infrastructure work;
- detailed instructions for flushing service lines;
- distribution of water filter kits and refills certified to remove lead; and
- water quality testing post-LSL replacement or disturbance.

DEVELOPING AN EFFECTIVE RISK COMMUNICATION PLAN

According to the EPA,

The goal of risk communication in a democracy should be to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented, and collaborative; it should not be to diffuse public concerns or replace action.⁷³

The American Water Works Association developed a set of basic communications principles that the City and the S&WB should consider before engaging with residents about the risks associated with LSLs.⁷⁴ Taking initiative in providing consistent, “honest, accurate, and comprehensive information” are among the guidelines’ key principles. The guidelines also highlight the need to design outreach materials for residents with varying levels of education and residents whose primary language is not English.⁷⁵

⁷³ EPA, *Seven Cardinal Rules of Risk Communication* (Washington, D.C.: EPA, 1988), 2, https://archive.epa.gov/care/web/pdf/7_cardinal_rules.pdf.

⁷⁴ AWWA, *Communicating About LSLs*, 4.

⁷⁵ City and S&WB materials developed shortly before this report’s release had not been translated into languages other than English. (See [Additional Resources for City and S&WB Notifications](#).)

Figure 8. American Water Works Association Guidelines for Effective Risk Communications

1. Take the initiative in providing information to your community.
2. Plan your efforts in advance, test them before any “crisis” exists, and evaluate them upon completion.
3. Listen to your community members and acknowledge their concerns.
4. Be a reliable source of information.
5. Provide honest, accurate, and comprehensive information.
6. Partner with trusted sources in your community.
7. Provide timely and accurate information to the media.
8. Provide consistent messages.
9. Select representatives designated to speak to customers, officials and media very carefully and train them well.
10. Ensure your materials are easy to read and understandable for people with differing educational levels, and available in other languages if applicable.

Tip: Take steps to ensure that non-English speakers will have access to information. In particular, translate key messages and direct non-English speakers to sources of assistance.

Source: AWWA, *Communicating About Lead Service Lines: A Guide for Water Systems Addressing Service Line Repair and Replacement*, 2014.

A second American Water Works Association publication begins its discussion of public communications by endorsing a directive from a large water system:

Do not embark on a lead service line replacement project without thoroughly and broadly educating the public on the issue. Merely informing them through written media and the Consumer Confidence Report is not sufficient.⁷⁶

It advises that a “targeted communications plan” must be “characterized by repetition” and that communications must be “informative and persuasive.” Further, different methods of communication “have varying levels of effectiveness in getting their intended message across to the target audience.” The publication

⁷⁶ American Water Works Association, *Strategies to Obtain Customer Acceptance of Complete Lead Service Line Replacement* (Denver, CO: American Water Works Association, 2005), 12, <https://www.awwa.org/Portals/0/files/legreg/documents/StrategiesforLSLs.pdf>. Although the publication focuses on communicating the need for full lead service line replacements, the principles apply to any communications to residents about the risks associated with lead service line replacements or disturbances.

provides a matrix of communications strategies and assesses the “anticipated effectiveness” of each (see Figure 9).⁷⁷

Figure 9. Effectiveness of Selected Communications Options⁷⁸

Medium	Option	Anticipated Effectiveness
One-on-One Contact	Utility staff (e.g. inspector, field service representative) meets with property owner on individual basis	High
	Utility representative works directly with plumber hired by property owner	Low-Moderate
Partner with Community-Based Organization(s)	Utilize communications and outreach expertise of the Organization(s)	High
Web-Based Information	Utility website with information about lead service line replacement	Moderate-High
	Internet information about lead	Moderate
Telephone Contact	Utility contacts property owner by telephone to discuss service line replacement	Moderate
Public Meetings	Public meetings/hearings to provide forum for information exchange	Moderate
Written Correspondence	Door Hangers/Postcard affixed to door	Moderate
	Bill inserts with information about lead service line replacement	Low
	Consumer Confidence Report – section devoted to lead	Low
	Direct Letter to homeowner	Low
Mass-Media	Television-news items, public service announcements about service line replacement	Low
	Newspaper-articles and notices about service line replacement	Low

Source: AWWA, *Strategies to Obtain Customer Acceptance of Complete Lead Service Line Replacement*, 2005.

Only two of the strategies are deemed highly effective. The first requires the water system to have its representatives meet one-on-one with property owners and communicate complete and accurate information about the risks of exposure to lead from LSLs and the importance of full LSL replacements.

One-on-one meetings must be planned in advance to ensure customer contact. Trained water system representatives should provide specific information about LSL replacement and reducing risk of exposure to lead. For example, Lansing,

⁷⁷ AWWA, *Strategies to Obtain Customer Acceptance*, 12, 13, and 14.

⁷⁸ The S&WB provides minimal information about lead in water on its website, but it is not readily available on the website’s home page. In late March 2017 the S&WB’s Deputy Director of Communications stated that the S&WB did not use door hangers because they were ineffective; it used other communication approaches deemed by the AWWA to be low to moderately effective including radio, website, television, bill inserts, and outreach meetings to inform residents and businesses of planned work.

Michigan’s Board of Water and Light flushes the new service line, and before it is reconnected to the property’s plumbing, representatives meet with the customer to explain the protocol for flushing the property’s interior plumbing.⁷⁹

The second strategy urges water systems to partner with community-based organizations that have an established presence in neighborhoods and have communications and outreach expertise reaching their audiences. According to the American Water Works Association: “Managing community lead exposure has a long history in many communities. Consequently, there are existing community organizations that can aid in outreach efforts on lead.”⁸⁰

Outreach messages should offer both a compelling reason for taking action and specific steps that residents can take to alleviate concerns:

By clearly communicating the purpose for action and immediately offering concrete actions that homeowners can take, outreach efforts can effectively reach affected homeowners. Programs which create a sense of anxiety about the quality of the water, without offering the consumer a way to resolve the problem, are counterproductive.⁸¹

ADVANCE NOTIFICATION

New Orleans residents will not be able to reduce potential increases in exposure to lead in drinking water unless the City and the S&WB provide advance notice of service line replacements and other activities that may disturb LSLs.

The American Water Works Association developed a guide to help water systems communicate these risks to residents.⁸² The guide includes a sample letter that accomplishes the following:

- informs residents that work will begin in **45 days** [emphasis added];
- notifies them that they may have an LSL;
- alerts them to the likely increase in lead exposure due to work on an LSL;
- and
- encourages them to replace the private portion of the LSL.

⁷⁹ Randy Roust, “Lead Service Line Replacement: Vital Tips from Leading Utility Managers” (YouTube video, 1:15:10, American Water Works Association conference on May 3, 2016, posted by AWWA, May 18, 2016), https://www.youtube.com/watch?v=fwq4_yPjHMs.

⁸⁰ AWWA, *Strategies to Obtain Customer Acceptance*, 14.

⁸¹ *Ibid.*, 12-13.

⁸² AWWA, *Communicating About LSLs*.

The letter closes by directing residents to the utility's website for additional information about LSLs and "the harmful effects of lead and steps [that can be taken] to protect against lead exposure."⁸³

The letter could be customized to address other planned water system or infrastructure work that may disturb LSLs. For example, New Orleans residents should be notified in advance of any water, drainage, or sewerage line work; street construction; or sidewalk repairs/replacement that may include activities such as jackhammering in the vicinity of LSLs and are likely to result in disturbance of public or private portions of an LSL.⁸⁴

Recognizing that a single notification letter sent to residents more than six weeks before the start of construction may not be sufficient, the American Water Works Association guide also includes a sample door hanger that repeats the same information and is intended to be distributed 48 hours before the work is performed.⁸⁵

Given that the S&WB does not have complete and accurate information about the location of LSLs, the City and the S&WB should take the steps outlined above to notify any resident for whom the composition of the service line is unknown that work is anticipated.

DETAILED INSTRUCTIONS FOR FLUSHING THE SERVICE LINES

New Orleans residents need information about follow-up actions they can take to reduce their exposure to lead after a partial LSL replacement has been performed or LSLs may have been disturbed. According to the American Water Works Association, "the gap in current lead communications is when service lines are disrupted and/or replaced and the need for specific guidance to customers about flushing their lines following that type of work."⁸⁶

⁸³ Ibid., A-8. The notice period in the sample letter (45 days) is consistent with the Lead and Copper Rule notification requirements for involuntary partial LSL replacements performed as a result of lead action level exceedances. S&WB notifications provided to evaluators in May 2017 were designed for distribution *after* LSL replacement.

⁸⁴ Del Toral interview by OIG.

⁸⁵ AWWA, *Communicating About LSLs*, A-9.

⁸⁶ AWWA, *Communicating about LSLs*, C-9.

To ensure that particulate lead does not enter a household's interior plumbing, residents should be instructed to turn off their water before infrastructure work that may disturb LSLs begins. At the completion of work, residents should flush their lines at a point *before* it enters the residence.⁸⁷

Flushing the service line before it connects to the property's interior plumbing helps prevent particulate lead from becoming trapped in the crevices and joints of household plumbing or snagged along the walls of rusty galvanized pipes. Particulate lead caught in the house's interior plumbing has the potential to be released at any time into the home's tap water. An exterior faucet connecting with or close to the service line should be used if available.⁸⁸

Following flushing the exterior service lines, high velocity flushing of indoor plumbing reduced the concentration of particulate lead present after completion of a partial LSL replacement.⁸⁹ Consistent with these findings, the American Water Works Association recommends residents take the following steps:

Beginning in the lowest level of the home, [residents] should remove faucet aerators and fully open the cold water taps throughout the home, letting the water run for at least 30 minutes at the last tap. Then they should turn off each tap starting with the taps in the highest level of the home.⁹⁰

The American Water Works Association has developed a sample door hanger with flushing instructions that can be distributed to residents affected by partial LSL replacements or disturbances of LSLs.⁹¹ Water systems in Denver, Colorado and Saint Paul, Minnesota have developed informational brochures that describe a similar flushing technique.⁹²

⁸⁷ Del Toral interview by OIG.

⁸⁸ Ibid.

⁸⁹ Richard A. Brown and David A. Cornwell, "High-Velocity Household and Service Line Flushing Following LSL Replacement," *Journal-American Water Works Association* 107 no. 3 (Denver, CO: American Water Works Association, 2015), <https://www.awwa.org/publications/journal-awwa/abstract/articleid/48275368.aspx>.

⁹⁰ AWWA, *Communicating about LSLs*, 15.

⁹¹ Ibid., A-10.

⁹² Flushing time needed to clear the service lines will depend on the distance of the water main to the tap. Brochures developed by Denver and Saint Paul recommend a 10-minute flushing interval. For Denver's brochure, see <http://www.denverwater.org/docs/assets/0E691104-155D-01CB-0C82DF956073CCB5/lead-flushing-instructions.pdf>; for Saint Paul's brochure, see https://www.stpaul.gov/sites/default/files/Media%20Root/Water%20Services/2016_SPRWS%20Partial%20Lead%20Brochure.pdf.

WATER FILTER KITS AND REFILLS

Another approach the City and the S&WB should use to prevent lead exposure is to encourage residents affected by partial LSL replacements or LSL disturbances to drink filtered water.⁹³ According to the EPA,

One of the insights that has emerged from work in response to the crisis in Flint, Michigan, is the efficacy of point-of-use household filters in reducing lead levels at the tap. There are a broad array of point-of-use filters that are certified by independent third party labs for lead reduction. Recently, [the] EPA collected samples from these filters installed on taps in Flint, Michigan, and verified that these filters are effective in reducing lead levels.⁹⁴

NSF International is a “public health and safety organization that tests and certifies residential drinking water systems.”⁹⁵ The NSF International identified three products that were distributed to residents in Flint, Michigan as certified for lead reduction.⁹⁶

Figure 10. NSF International-certified Water Filters Distributed to Residents in Flint, Michigan

<u>Product Name</u>	<u>Model Number</u>
Brita Faucet Filtration System	SAFF-100
PUR Faucet Mount	FM-3700B
ZeroWater 23-Cup Dispenser	ZD-018

⁹³ The City and S&WB added information about filtering water to the printed materials developed shortly before this report’s release. (See [Additional Resources for City and S&WB Notifications](#).)

⁹⁴ EPA, *LCR Revisions White Paper*, 12.

⁹⁵ “Statement Regarding Flint Water System Lead Issue and Certification to NSF/ANSI Standard 53,” NSF International, news release, October 7, 2015, <http://www.nsf.org/newsroom/statement-regarding-flint-water-system-lead-issue-and-to-certification-nsf>. The American National Standards Institute (ANSI) accredits NSF International. “Accreditations and Quality,” NSF International, <http://www.nsf.org/about-nsf/accreditations>. The Water Quality Association (WQA) also certifies water treatment products. “Find WQA-Certified Water Treatment Products,” WQA, <https://www.wqa.org/find-products#/>.

⁹⁶ “Statement Regarding Flint Water System Lead Issue,” NSF International. NSF International’s website provides additional information about and a search page for NSF/ANSI 53 “Drinking Water Treatment Units” at <http://info.nsf.org/Certified/DWTU/>. See also, EPA, *LCR Revisions White Paper*, 12.

An official from the NSF International confirmed that *some* certified NSF/ANSI Standard 53 products were effective at reducing lead.⁹⁷ NSF International’s website includes lists of [water pitcher kits](#) and [faucet-mounted filters](#) that are certified for lead reduction.

However, not all NSF/ANSI Standard 53 certified products filter for lead. Consumers should look for NSF/ANSI Standard 53 certification **and** wording on the packaging that specifically states the product effectively filters for lead.

In accordance with best practice, cities such as Denver, Colorado and Saint Paul, Minnesota provide residents with filter kits that include six months of cartridge refills.⁹⁸ The American Water Works Association noted that providing water filter kits may be appropriate when a service line is replaced or disturbed.⁹⁹ The S&WB should move swiftly to purchase and provide to residents water filter kits that effectively filter for lead along with clear instructions for their use.

Figure 11. Distribution of water filter kit, Saint Paul Water Department¹⁰⁰



Source: Image provided by the City of Saint Paul, Minnesota.

WATER TESTING POST-PARTIAL LSL REPLACEMENT AND LSL DISTURBANCES

The EPA Science Advisory Board has concluded that partial LSL replacement often causes lead levels to “increase significantly for a period of days to weeks, or even

⁹⁷ Lizabeth Nowland-Margolis, NSF International Communications Director, telephone interview with OIG, New Orleans, May 10, 2017.

⁹⁸ For Denver and Saint Paul, see brochures cited in note 84.

⁹⁹ AWWA, *Communicating about LSLs*, 15. Filtering water can only be effective at reducing contaminants, including lead, if filters are changed according to manufacturer instructions.

¹⁰⁰ “Partial Lead Service Line Replacement,” (YouTube video, 4:56, City of Saint Paul Communications Services, published September 22, 2016), https://www.youtube.com/watch?v=fwq4_yPJHMs.

several months.”¹⁰¹ Flushing instructions and water filter kits are temporary measures that provide residents with tools to protect themselves. However, these measures do not provide residents with assurance that elevated lead levels have subsided.

Only proactive water quality testing can provide assurance that lead levels have decreased. The Lead and Copper Rule requires water systems to collect and test water samples for lead within 72 hours after completion of an involuntary partial LSL replacement.¹⁰² The S&WB should follow this protocol and initiate water quality testing within 72 hours of voluntary partial LSL replacements and LSL disturbances. In addition, the S&WB should report testing results to the property owner and residents within three business days after receiving the results, as required for involuntary partial LSL replacements.¹⁰³

Some utilities concerned about lingering effects of partial LSL replacements and LSL disturbances do more. Water systems in Denver and Washington, D.C. provide residents with testing kits four and five months, respectively, following service line replacements to determine whether lead increases caused by partial LSL replacements or LSL disturbances have subsided. The OIG recommends that the S&WB conduct additional water quality testing at similar intervals after partial LSL replacement or LSL disturbances. In cases where lead levels are high, testing should continue at regular intervals until elevated water lead levels diminish.

¹⁰¹ EPA Science Advisory Board, *Effectiveness of PLSLRs*, 10.

¹⁰² Testing following voluntary partial LSL replacement is not currently required by the Lead and Copper Rule. 40 C.F.R. § 141.84(d)(1) (2016).

¹⁰³ *Ibid.*

IV. FULL LEAD SERVICE LINE REPLACEMENT

The steps listed above consist of practical, short-term strategies to alert residents to the health risks of partial LSL replacement and to provide them with information to mitigate exposure to lead caused by partial LSL replacement or LSL disturbances. However, experts agree that the only long-term solution is to “get the lead out” completely. According to the CEO of the American Water Works Association,

Our communities will be safer in the long run with no lead pipes in the ground. ...

As long as there are lead pipes in the ground or lead plumbing in homes, some risk remains.¹⁰⁴

Finding 2: The City and the S&WB have not developed a long-term lead reduction strategy that includes encouraging and providing support for property owners to replace privately-owned portions of LSLs.

Given the risk of elevated lead levels associated with partial LSL replacement, the National Drinking Water Advisory Council recommended that the EPA require all public water systems to:

Establish an LSLR [lead service line replacement] program that effectively informs and engages customers to encourage them to share appropriately in fully removing LSLs, unless the system can demonstrate that LSLs are not present in their system.¹⁰⁵

The LSLR Collaborative consists of 24 national health, environmental, and water industry organizations, including the American Water Works Association, the Association of Metropolitan Water Agencies, the Environmental Defense Fund, the National Center for Healthy Housing, the National Conference of State

¹⁰⁴ David LaFrance, “Together, let’s get the lead out,” AWWA Connections, March 15, 2016, <https://www.awwa.org/publications/connections/connections-story/articleid/4081/together-lets-get-the-lead-out.aspx>.

¹⁰⁵ EPA, *LCR Revisions White Paper*, 9. The Board of the AWWA, which represents drinking water utilities, voted unanimously in March 2016 to support the National Drinking Water Advisory Council recommendations outlined in the *LCR Revisions White Paper*. The EPA has stated that it is considering “an evaluation of whether a potential change to the definition of ‘control’ under the SDWA [Safe Drinking Water Act] would facilitate full LSLR [lead service line removal]” (10).

Legislatures, Clean Water Action, the Natural Resources Defense Council, and the Water Research Foundation.

The Collaborative acknowledges that LSL replacement is a challenging enterprise and emphasizes the need for strong leadership and persistence:

Developing and implementing an effective lead service line (LSL) replacement program represents a significant undertaking by a utility and community. While the long-term benefits make it worthwhile, it takes leadership and sustained effort.¹⁰⁶

The EPA identified cost as the primary obstacle and acknowledged that full LSL replacement programs present “substantial economic, legal, technical and environmental justice challenges.”¹⁰⁷ Lower income residents in cities like New Orleans may be unable to afford replacing their LSLs. In addition, property owners who lease their properties to others may be reluctant to invest in full LSL replacement, leaving renters vulnerable to lead exposure.¹⁰⁸

Estimates vary, but the cost of replacing the privately-owned portion of an LSL can run as high as several thousand dollars. The cost depends on variables that include length of the service line and any obstacles encountered during excavation and replacement, such as hard surfaces, landscaping, and/or other utility lines.¹⁰⁹

The OIG found no evidence that the S&WB had engaged residents in a collaborative effort to facilitate full LSL replacement. The 2015 Water Quality Report suggests replacing privately-owned LSLs in two places, one in the list of “Tips for Reducing Lead” (see Figure 6), and the other in the last paragraph of the

¹⁰⁶ “Encouraging Local Leadership and Collaboration,” LSLR Collaborative, <http://www.lslr-collaborative.org/local-leadership-collaboration.html>.

¹⁰⁷ EPA, *LCR Revisions White Paper*, 9.

¹⁰⁸ According to the Data Center, more than 50 percent of New Orleans residents rent. “Who Lives in New Orleans and Metro Parishes Now? Home Ownership,” *Data Center*, published September 27, 2016, <http://www.datacenterresearch.org/data-resources/who-lives-in-new-orleans-now/>.

¹⁰⁹ Estimates by the EPA range from \$2,500 to \$8,000; the AWWA estimated \$600 to \$4,000. EPA, *LCR Revisions White Paper*, 9; and Sandvig, *Contribution of Service Line and Plumbing Fixtures*, 33. See also, Rebecca Renner, “Reaction to the Solution: Lead Exposure Following Partial Service Line Replacement,” *Environmental Health Perspectives* 118, no. 5, (May 2010): A 204, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2866705/pdf/ehp-118-a202.pdf>; “Lead Pipe Replacement and Safer Drinking Water,” Washington, D.C. Department of Energy and Environment, <https://doee.dc.gov/service/lead-pipe-replacement-and-safer-drinking-water>; and Matt Rocheleau, “\$100m loan program aims to replace Mass. lead water lines,” *Boston Globe*, March 21, 2016, <https://www.bostonglobe.com/metro/2016/03/20/program-aims-replace-lead-service-lines-dozens-mass-cities/VfQtzU2A2XjdsukDWBeVl/story.html>.

discussion of “Waterline Replacement.”¹¹⁰ Neither reference explains the risks of partial LSL replacement, the benefits of full LSL replacement, or offers financial assistance to property owners who might be interested in replacing the privately-owned portion of the LSL.

According to the Executive Director of the S&WB, the water leaves the plant lead-free, and after leaving the city’s water system, the water quality is left up to the homeowner. “I am not responsible for what goes from the meter to them. I’m ready to assist, I’m ready to provide information, ... [but] it’s a customer responsibility at that point.”¹¹¹

City and S&WB materials developed shortly before this report’s release reflect the Executive Director’s statement.

Figure 12. City of New Orleans and S&WB recommendation regarding replacement of privately-owned LSLs



- You may also want to have a Licensed Master Plumber inspect your service line from the meter to your home. If it is a lead line, we suggest you have it replaced.

The S&WB has conducted no visible, sustained effort that encouraged property owners to invest in full LSL replacements. First, residents would be unable to participate in full LSL replacement without having been informed that they have an LSL. Second, they would be unlikely to invest in full LSL replacement unless they were aware of the risks of not doing so and that it is the most effective long-term solution.

¹¹⁰ S&WB, *2015 Water Quality Report*, 6 and 8.

¹¹¹ “Flint crisis raises concerns over New Orleans’ water,” Manuel Bojorquez, *CBS Evening News*, aired January 29, 2016, <http://www.cbsnews.com/news/lead-flint-michigan-water-concerns-safety-new-orleans/>.

Recommendation 2: The City and the S&WB should persuade residents of the advantages of full LSL replacement and encourage property owners to replace privately-owned LSLs by offering options that ease the financial burden.

Water systems across the country have encountered obstacles similar to those described above and implemented creative solutions. The American Water Works Association's *Strategies to Obtain Customer Acceptance of Complete LSL Replacement* highlights key elements of successful full LSL replacement programs.¹¹² According to the American Water Works Association,

A number of utilities have implemented successful replacement programs. A feature common to each is an approach that incorporates elements of thorough preparation, financial incentives, effective public communications, follow-up interactions with homeowners and efficient recordkeeping practices.¹¹³

The EPA has recognized three cities for developing innovative approaches to challenges associated with full service line replacement programs: Boston, Massachusetts; Madison, Wisconsin; and Lansing, Michigan.¹¹⁴ In addition, the American Water Works Association highlighted the efforts of cities such as Cincinnati, Ohio and Halifax, Nova Scotia.¹¹⁵

The American Water Works Association describes strategies to ease the financial burden on property owners, including incentives such as deferred payment programs, customer reimbursements, low-interest or interest-free loans, and rebates.¹¹⁶ Federal and state grant funding may be available to assist in these and other efforts.¹¹⁷ The City and the S&WB should review these options and develop

¹¹² AWWA, *Strategies to Obtain Customer Acceptance*.

¹¹³ AWWA, *Strategies to Obtain Customer Acceptance*, 5.

¹¹⁴ EPA, *LCR Revisions White Paper*, 9.

¹¹⁵ "Lead Service Line Replacement," YouTube video, AWWA. In addition to Cathy Bailey, Director of Greater Cincinnati Water Works (Cincinnati) and Reed Campbell, Director of Water Services (Halifax), Randy Roust, Principal Planner for Water Operations, Lansing Board of Water and Light, represented Lansing, MI, and John Sullivan, Chief Engineer, Boston Water and Sewer Commission, represented Boston.

¹¹⁶ AWWA, *Strategies to Obtain Customer Acceptance*, 8-12. See also, "City of Philadelphia Water Department," www.phila.gov/water/wu/drinkingwater/lead/Pages/programs.aspx.

¹¹⁷ *Ibid.*, 8-10. The EPA established the Drinking Water State Revolving Fund, which is administered by state agencies to assist water systems with "achieving or maintaining compliance with Safe

a strategy that increases property-owners' ability to participate in full LSL replacement.

The City and the S&WB should then educate property owners about the options available when considering full service line replacements, "Make it easy for the homeowner to take advantage of the financial incentives that have been offered. Provide the homeowner with simple, specific information about the terms of the incentive program" ¹¹⁸

York Water Company in Pennsylvania initiated an accelerated LSL replacement program in late 2016. A clear call to action, the brochure depicted in Figure 12 communicates urgency and demands attention. It includes offers to test water and financial assistance to homeowners who replace their privately owned LSL. The inside of the brochure explains why the service line is owned by the customer, offers a 200 gallon per month "flushing credit" until the LSL is replaced, includes instructions for determining whether the owner has an LSL, and repeats the offer to test the water. ¹¹⁹

Drinking Water Act (SDWA) requirements and furthering the public health objectives of the SDWA." The State of Louisiana was eligible for an \$11.4 million grant in federal fiscal year 2016. The S&WB did not have any projects on the January 2017 list of applicants.

¹¹⁸ Ibid., 11.

¹¹⁹ York Water Company, *How do I check to see if I have a customer-owned lead service line?* (York, PA: York Water Company, updated April 19, 2017), <https://www.yorkwater.com/YWC.Lead.Service.Lines.pdf>. York water quality testing in 2016 revealed that out of 50 homes tested, six exceeded the action level (AL) of 15 ppb; one more home exceeded the AL than the five permitted by the Lead and Copper Rule. The homes that exceeded the AL were built before 1935 and serviced by LSLs. As a result, York immediately implemented an accelerated program to eliminate all the city's LSLs. A small percentage of York's service lines are lead.

Figure 13. Brochure encouraging private LSL replacement with incentives¹²⁰



The City and the S&WB should notify property owners and encourage them to replace the privately-owned portion of the service line well in advance of performing a partial LSL replacement.¹²¹ Although responsibility for the expense would still be borne by property owners, they might be more likely to participate when given sufficient notification of the opportunity for full replacement and offered payment options and/or assistance.

¹²⁰ Reprinted with the permission of The York Water Company.

¹²¹ This practice is consistent with the Lead and Copper Rule notification requirements for involuntary partial LSL replacements performed as a result of lead action level exceedances. AWWA provides water systems with sample letters that may be customized. The AWWA's initial notification letter alerts residents **six to 12 months in advance** that service line replacement on the public side is planned and recommends full LSL replacement; a second letter is sent to the property owner **one to three months prior** to planned work. AWWA, *Strategies to Obtain Customer Acceptance*, 29 and 30.

To convince property owners of the need to act, representatives from the City and S&WB may need to emphasize that there are health risks associated with not replacing the privately-owned portion of the LSL even if water quality tests show the lead is below the EPA action level.

At a 2016 American Water Works Association conference, one water system director voiced what recent research has shown: “compliance sampling tells us absolutely nothing about what the lead exposure is for our customers ... we think it is very complex ... and the partial replacements do make things worse.”¹²²

Successful implementation of this recommendation will allow the City and the S&WB to begin a deliberate, long-term effort to encourage property owners to accept the need for and participate in removing privately-owned LSLs in New Orleans.

¹²² Reed Campbell, Director of Water Services, Halifax Water, “Lead Service Line Replacement: Vital Tips from Leading Utility Managers,” (YouTube video, 1:15:10, American Water Works Association conference on May 3, 2016, posted by AWWA, May 18, 2016), https://www.youtube.com/watch?v=fwq4_yPjHMs.

V. CONCLUSION

The City of New Orleans and the S&WB have embarked on \$2.4 billion of infrastructure reconstruction that includes 200 construction projects covering over 400 miles of roads. Also, numerous ongoing road construction projects have been completed or are currently underway. Many of these projects involve repairing and/or replacing the service lines that carry water from the water main to a residence/property.

In New Orleans an undetermined number of properties have lead service lines, but neither the City nor the S&WB have notified residents of previous or impending service line work or the resultant risk of increased exposure to lead in water due to partial LSL replacements and disturbances to LSLs. It has not followed industry best practices or the model practices of numerous other cities facing this challenge.

As a result, ***New Orleans residents may be—or may have been—unknowingly exposed to elevated levels of lead in drinking water.***

It is the responsibility of public officials to protect the public's health and safety. The OIG acknowledges the City/S&WB for its initial efforts to respond to this report, but much work remains.

The recommendations included in this report are designed to reduce the public's exposure to elevated levels of lead in water due to partial LSL replacement or disturbances to LSLs. They reflect the best practices and guidance set forth by industry, scientific, and public health experts and have been implemented by a number of cities in the U.S. The City and the S&WB should take immediate steps to follow these recommendations to ensure that New Orleans residents are not needlessly endangered by elevated levels of lead in drinking water.

A planned, sustained effort is needed to alert residents about the risks associated with partial LSL replacements and disturbances to LSLs.

City Ordinance Section 2-1120(8)(b) provides that a person or entity who is the subject of a report shall have 30 days to submit a written explanation or rebuttal of the findings before the report is finalized, and that such timely submitted written explanation or rebuttal shall be attached to the final report.

The OIG distributed an Internal Review Copy of this report to the entities who were the subject of the evaluation on May 22, 2017 so that they would have an opportunity to comment prior to the public release of this final report. The OIG received comments from the City/S&WB that are included herein.

Since the receipt of this OIG report, the S&WB and City have taken the first steps to alert residents to the danger of exposure to increased lead levels in water as a result of the partial replacement of or disturbances to LSLs. The OIG acknowledges the S&WB and City for its initial efforts to respond to this report, but much work remains.

The OIG would like to make the following specific points in response to the City/S&WB's comments:

LEAD AND COPPER RULE TESTING AND COMPLIANCE WITH REGULATIONS

The City/S&WB response stated that the drinking water industry is “heavily regulated and closely monitored by the State of LA Department of Health and the EPA.” It also stated that “as noted in this IG’s report, the quality of S&WB water is in compliance with all state and federal regulations” and referred only to tests done under the requirements of the Lead and Copper Rule (LCR).

- The OIG report does **not** state that the quality of the S&WB’s water is in compliance with “all state and federal regulations.” In fact, the OIG is in the process of inspecting S&WB’s 2010, 2013, and 2016 water quality testing under the LCR. A report on those findings will be issued later this year.
- Further, the OIG report points out that LCR testing would not capture spikes in lead levels following the disturbance or partial replacement of LSLs because water quality testing for LCR compliance is conducted only on one sample from 80 New Orleans residences—out of 140,000 service connections—every three years.

The City/S&WB response stated that “the water quality sampling suggested in the report [i.e., sequential sampling] is not currently allowed under the EPA’s [LCR] for determining compliance with state and federal regulations for testing for lead in drinking water.”

- The OIG did not recommend that the S&WB should use sequential sampling for determining compliance with the LCR. However, the LCR does not preclude the S&WB from doing additional testing.
- The OIG recommended that the City/S&WB use sequential sampling for water quality testing following construction work that results in the disturbance or partial replacement of LSLs to ensure that any potential increases are detected. The Chicago Department of Water Management has implemented a sequential sampling process for water testing post-partial LSL replacement (<http://www.chicagowaterquality.org/>).

S&WB MINIMIZED THE NUMBER OF AFFECTED RESIDENTS

In its response the City/S&WB narrowed the scope of residents potentially affected by partial LSL replacements or disturbances.

- The City/S&WB noted that the first FEMA-funded project began on May 12, 2017 and did not include water service line replacements. However, ***ALL*** work that includes partial LSL replacements or disturbances increases the risk of exposure to lead in drinking water ***regardless of funding source***.
- Over the last several years, the S&WB and City have replaced LSLs during the course of DPW and S&WB water line replacement projects and routine/ongoing maintenance to the water supply infrastructure. However, ***they did not alert residents to the potential for increased exposure to lead in drinking water***.
- The \$2.4 billion Capital Improvement Program (CIP) prompted the OIG to conduct this evaluation because the CIP would substantially increase the number of residents who might be affected by the potential risk of exposure to elevated lead levels, resulting in an imminent health risk for many New Orleans residents.

PUBLIC FUNDS FOR PRIVATE PURPOSES

The City/S&WB noted that the OIG “has been explicit that S&WB cannot expend public funds for private purposes” and that the “S&WB has no legal authority for subsidizing replacement of LSLs on private property.”

- The OIG report acknowledged that there are restrictions on the use of public funds for private purposes. However, other jurisdictions are having success overcoming similar challenges by actively pursuing creative solutions.¹²³
- A persuasive argument could be made that using public funds for these purposes serves the public interest to protect public health by reducing the number of infants and young children who might suffer decreased cognitive performance and behavioral problems from exposure to lead in drinking water, a significant contributor to blood lead levels for these populations.
- Making public funds available based on need further increases the likelihood that water filter pitcher kits or even the replacement of private service lines could be permissible uses of public funds, since the Louisiana Constitution makes an exception “for programs of social welfare for the aid and support of the needy.”

CITY HALL LEAD REMEDIATION WORKING GROUP

The City/S&WB response referred to a working group consisting of thirteen city departments and agencies (including the S&WB) that works to reduce lead exposure.

- OIG evaluators met with members of the working group in May 2017. Working group members identified the exposure to lead through paint and soil as the focus of the working group’s educational and outreach efforts. In addition, they deemphasized the contribution of lead in water to blood lead levels.
- OIG evaluators were provided with two sets of printed materials at the meeting:
 - A set of three trifold brochures developed by the New Orleans Health Department that generally outlined sources of lead and health risks associated with lead but did not mention the risk associated with partial LSL replacement or disturbance.
 - Three recently developed flyers about potential exposure to elevated levels of lead as a result of partial LSL replacements that the OIG included in the report.

¹²³ For example, the City of Pittsburgh and the state of Wisconsin have assertively pursued creative options.

MULTI-PLATFORM COMMUNICATIONS STRATEGY

The City/S&WB made several references to its “multi-platform communications strategy” designed to “inform residents of the potential for increased exposure to lead in water caused by partial replacement or disturbance of LSLs”

- The City/S&WB described a communications strategy, but it was **not a risk communications strategy** that focused on partial replacement or disturbance of LSLs. The communications strategy to date had failed to inform residents of the risks associated with increased exposure to lead in drinking water from partial LSL replacements or disturbances.
- Moreover, because it has only recently begun gathering this information the S&WB has not informed residents about the location of LSLs. As a result, residents receiving notices of construction work had no way of knowing whether the information provided applied to them.
- **Also, there was no mechanism to inform residents when LSLs would be replaced during infrastructure reconstruction work.** The City/S&WB produced two brochures designed for distribution before and after the replacement of LSLs immediately prior to the release of this report, but the OIG did not find evidence that those notifications or any other flyers with information had been distributed to residents. (See [Additional Resources: City and S&WB Notifications](#) included in “Comments on OIG Report.”)
- In its response, the City/S&WB say they “will work to provide customers 45 days’ notice” but only if the “LSL has been previously identified.” The pool of verified LSL locations is a **very** small percentage of S&WB’s 140,000 service connections; to protect residents from unnecessary exposure to lead in water, the S&WB must immediately inform residents when LSLs are discovered during the course of repairs or reconstruction so that residents can be alerted **in advance** of work that disturbs the lead service line.
- The OIG found no evidence of information regarding the disturbance or partial replacement of LSLs in any City/S&WB social media messaging.

OFFICIAL COMMENTS FROM THE S&WB AND THE CITY



"RE-BUILDING THE CITY'S WATER SYSTEMS FOR THE 21ST CENTURY"

Sewerage & Water Board OF NEW ORLEANS

MITCHELL J. LANDRIEU, President
SCOTT JACOBS, President Pro-Tem
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June 21, 2017

Mr. E. R. Quatrevaux
New Orleans Office of Inspector General
525 St. Charles Avenue
New Orleans, LA 70130

Mr. Quatrevaux:

In response to your office's report, *Lead Exposure and Infrastructure Reconstruction*, attached please find Sewerage and Water Board's Management Response to your findings and recommendations.

The City of New Orleans and the Sewerage and Water Board of New Orleans (S&WB) are acutely aware of the potential risks of lead exposure to the community and fully committed to taking all necessary steps to protect the health and well-being of the city's hundreds of thousands of residents and tens of millions of visitors.

S&WB's highest priority is to provide constant, safe and high quality drinking water to the general public. To ensure public safety, S&WB's work is heavily regulated and closely monitored by both the State of Louisiana Department of Health (LDH) and the United States Environmental Protection Agency (EPA) who set the state and federal standards for drinking water respectively.

As noted in your office's report, the quality of S&WB's water is in compliance with all state and federal regulations. Samples in New Orleans have consistently been below EPA's action levels and as a result, LDH has reduced the monitoring frequency for lead from once every six months to once every three years. S&WB has never been issued any citations or violations by EPA or LDH related to lead service lines (LSLs). To ensure its water is safe for public consumption, S&WB continually tests and monitors water quality throughout the purification and distribution process. There is no imminent health risk to the public. Simply put, New Orleans drinking water is safe and S&WB is fully compliant with all state and federal rules, processes and laws.

To ensure constant, safe and high quality water, S&WB employs a variety of methods which include: sampling according to state and federal law, implementation of corrosion control chemicals and the safe replacement of LSLs when located in the public right-of-way.

Members of the Board: ALAN ARNOLD • ROBIN BARNES • ERIC BLUE • MARION BRACY • DR. TAMIKA DUPLESSIS • SCOTT JACOBS
RALPH W. JOHNSON • KERRI KANE • MITCHELL J. LANDRIEU • JOSEPH PEYCHAUD
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The City and S&WB have taken proactive steps to inform residents of the potential for increased exposure to lead in water caused by partial replacement or disturbance of LSLs, as well as the steps the public should take to reduce the impacts of that temporary elevated lead exposure. Together, the City and S&WB have engaged the public through a multi-platform communications strategy in order to maximize its reach, including online, direct mail, newsletter, social media, neighborhood engagement, educational brochures and with the establishment of a dedicated hotline and email.

Under Mayor Mitch Landrieu's leadership, the City and S&WB have implemented national best practices and data to make informed decision-making to reduce lead exposure to vulnerable communities. In 2016, an internal New Orleans City Hall Lead Remediation Working Group was assembled, composed of thirteen City departments and agencies including S&WB, to specifically address and reduce lead exposure. The priorities of the Lead Remediation Working Group include establishing an inventory of all previous and ongoing lead remediation efforts, gathering data on vulnerable populations and existing statistics and developing comprehensive, cross-agency programs for lead remediation. Through these combined efforts, the City of New Orleans continues to take a holistic approach to tackling lead exposure in our community.

S&WB is extremely proud of its long history of service to the residents and visitors of New Orleans and its consistent record of compliance with all state and federal laws in this heavily regulated industry. S&WB appreciates the Inspector General's acknowledgement of that compliance in this report. Reducing exposure to lead is pivotal to the health and well-being of everyone, and as such, S&WB welcomes the Inspector General's engagement on this issue. S&WB will continue its business practice to not only educate its customers about the risks of exposure to lead, but also to reduce the risks of exposure to lead in this community.

Sincerely,



Cedric S. Grant
Executive Director
Sewerage & Water Board of New Orleans

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Sewerage and Water Board of New Orleans Management Response
Lead Exposure and Infrastructure Reconstruction
7/13/17

The City of New Orleans and the Sewerage and Water Board of New Orleans (S&WB) are acutely aware of the potential risks associated with lead exposure and are fully committed to taking all necessary steps to protect the health and well-being of the city's hundreds of thousands of residents and tens of millions of visitors.

Lead is a naturally occurring element that can be found throughout the environment – in air, soil, water and inside homes and businesses. Much of this exposure comes from human activities such as fossil fuels including past use of leaded gasoline, some types of industrial facilities and past use of lead-based paint. Lead and lead compounds have been used in a wide variety of products found in and around homes and businesses, including paint, ceramics, pipes and plumbing materials, solders, gasoline, batteries, ammunition and cosmetics. Even though its use in products was banned decades ago, lead may enter the environment from past and current uses. While anyone can be at risk of lead poisoning, the most vulnerable are children under the age of 6 years and pregnant women. Lead poisoning has been shown to cause early birth, stunted growth, learning delays, behavioral problems and even death in cases of extreme exposure.

New Orleans is not alone in addressing the health challenge that lead exposure may present. Cities and communities across the nation, with regulatory oversight by numerous state and federal agencies including the United States Environmental Protection Agency (EPA), are working to reduce lead exposure.

Under Mayor Mitch Landrieu's leadership, the City and S&WB have implemented national best practices and data to make informed decision-making to reduce lead exposure to vulnerable communities. In 2016, an internal New Orleans City Hall Lead Remediation Working Group was assembled, composed of thirteen City departments and agencies, including S&WB, to specifically address and reduce lead exposure. Participating departments and agencies include: the Mayor's Office, Chief Administrative Office, Health Department, S&WB, Department of Public Works, Capital Project Administration, Office of Resilience and Sustainability, Office of Criminal Justice Coordination, Department of Safety and Permits, Office of Performance and Accountability, Office of Community Development, the Housing Authority of New Orleans and the New Orleans Redevelopment Authority. The priorities of the City Hall Lead Remediation Working Group include establishing an inventory of all previous and ongoing lead remediation efforts, gathering data on vulnerable populations and existing statistics and developing comprehensive, cross-agency programs for lead remediation. Through these combined efforts, the City of New Orleans continues to take a holistic approach to tackling lead exposure in our community.

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New Orleans Water is Safe:

S&WB's highest priority is to provide constant, safe and high quality drinking water to the general public. To ensure public safety, S&WB's work is heavily regulated and closely monitored by both the State of Louisiana Department of Health (LDH) and EPA who set the state and federal standards for drinking water respectively.

As noted in this Inspector General's report, the quality of S&WB's water is in compliance with all state and federal regulations. The report specifically acknowledged that, **"the Louisiana Department of Health and Hospitals certified in 2010, 2013, and 2016 S&WB water quality testing results below the action level."** Furthermore, samples in New Orleans have consistently been below EPA's Action Level and as a result, LDH has reduced the monitoring frequency for lead from once every six months to once every three years. S&WB has never been issued any citations or violations by EPA or LDH related to lead service lines (LSLs).

To ensure its water is safe for public consumption, S&WB continually tests and monitors water quality throughout the purification and distribution process. Simply put, New Orleans drinking water is safe and S&WB is fully compliant with all state and federal rules, processes and laws.

In this Inspector General's report, the water quality sampling suggested is not currently allowed under the EPA's Lead and Copper Rule for determining compliance with state and federal regulations for testing for lead in drinking water. If S&WB were to utilize these methods, those tests would be invalid.

The City and S&WB have taken proactive steps to inform residents of the potential for increased exposure to lead in water caused by partial replacement or disturbance of LSLs, as well as the steps the public should take to reduce the impacts of that temporary elevated lead exposure. Together, the City and S&WB have engaged the public through a multi-platform communications strategy in order to maximize its reach, including online, direct mail, newsletter, social media, neighborhood engagement, educational brochures and with the establishment of a dedicated hotline and email.

To ensure constant, safe and high quality water, S&WB employs a variety of methods including: sampling according to state and federal law, implementation of corrosion control chemicals and the safe replacement of LSLs when located in the public right-of-way.

S&WB's Purification Process:

River water from the Mississippi River is pumped to S&WB's Carrollton and Algiers Water Purification Plants from two large river pumping stations. River water pumped from the two river pumping stations is delivered to the Carrollton and Algiers Plants through several large pipelines. Mississippi River water contains large amounts of suspended solids.

- **Step 1 – Coagulation:**

As the river water enters the Carrollton Plant, the purification process begins with the addition of coagulant chemicals: ferric sulfate and polyelectrolyte. These chemicals are added to the process at very precise dosages and mixed rapidly with the river water to ensure efficient and complete coagulation. Coagulant chemicals cause the very fine particles that make up the suspended solids present in the river water to clump together, or coagulate. Ferric sulfate is the primary coagulant, and polyelectrolyte is used as a coagulant aid.

- **Step 2 – Flocculation:**

After the raw water has been coagulated, it is gently mixed by large mechanical paddles in a process called flocculation. Flocculation causes the fine, light particles that were created during the coagulation process to mature into larger, denser, stable particles that will settle quickly.

- **Step 3 – Sedimentation:**

The flocculated water then travels into primary settling basins or clarifiers. In the primary settling basins, the large, dense particles formed during the coagulation and flocculation processes settle allowing the clarified water to be separated and forwarded on through the remainder of the water treatment process. The settled particles form a sludge layer on the bottom of each primary settling basin. This sludge is periodically removed from the basins and returned to the Mississippi River through a permitted discharge.

- **Step 4 – Disinfection:**

After the clarified water leaves the settling basins, the disinfection process begins with the addition of chlorine. Ammonia is added following the chlorine addition, producing chloramine. The chloramine disinfected water passes through a second set of basins to provide detention time for the disinfection process to go to completion.

- **Step 5 – Corrosion Control (pH Adjustment):**

The next step in the process is adjustment of the pH of the water. Lime, also known as calcium oxide, is added during this step to achieve the desired target pH. Adjusting the pH makes the water more basic and less corrosive to the pipes in the water distribution system and the plumbing in customers' homes, as well as extends the life of the disinfectant residual in the distribution system. A small amount of polyphosphate solution is also added with the lime. Polyphosphate is used as a sequestrant, which helps to keep the lime in dissolved in the water.

- **Step 6 – Fluoridation:**

After the water exits the secondary settling basins, it is treated with fluorosilicic acid. A small dose of fluorosilicic acid is added at this point in the treatment process, which adds fluoride to the drinking water to aid in the prevention of dental cavities.

- **Step 7 – Filtration:**

The final step in the purification process is filtration through rapid gravity filters. This type of filter uses granular filter media (sand and anthracite at S&WB facilities) to remove any remaining suspended particles in the water. This step in the treatment process consists of passing the water through a filter at a controlled rate. Any particles remaining in the water adhere to the filter media and are removed from the water.

After filtration, the purification process is complete.

Filtered water is collected from the many filters in service and flows to one of several pumping stations located on the plant grounds, where it is pumped and delivered to customers to provide water for drinking and for fire protection.

S&WB also operates a water treatment plant on the west bank of the Mississippi River in Algiers. The purification process at the Algiers Water Plant is similar to that of the Carrollton Water Plant, utilizing the same water treatment chemicals.

The Carrollton Water Plant normally yields about 135 million gallons per day of finished water for the east bank of Orleans Parish. The Algiers Water Plant, which serves the predominantly residential west bank portion of the parish, purifies about 11 million gallons per day of water. Combined, the two plants treat approximately 54 billion gallons of water per year, removing 18,000 tons of solid material from the raw river water.

The treated water at the two plants is pumped through more than 1,610 miles of mains to more than 100,000 service connections. It is delivered to approximately 300,000 people on the east bank of Orleans Parish and approximately 53,000 people on the west bank.

S&WB's EPA-Approved Sampling Process:

The EPA mandates that S&WB test 80 addresses in New Orleans (50 on the east bank and 30 on the west bank). Because of S&WB's interest in gaining more information about possible lead issues impacting customers, S&WB voluntarily exceeded the mandatory number of households tested. Under S&WB's 2016 drinking water lead and copper monitoring program, it tested 107 addresses. S&WB informs each participating address if lead levels present are above or below the EPA's Action Level of 15 parts per billion (ppb). Of the 107 water samples taken, only two were found to be above the EPA's Action Level. S&WB replaced the S&WB's portion of those customers' LSLs and offered to monitor the water quality after the LSLs were replaced. S&WB also provided

those customers with educational literature about replacing the privately owned LSL between the water meter and their structure.

EPA regulations indicate that 90 percent of the homes sampled must have no greater than 15ppb of lead in the drinking water. Samples are collected on both the east and west banks of New Orleans: for the east bank, the 90th percentile is 7ppb and for the west bank, the 90th percentile is 3ppb. While EPA's Lead and Copper Rule does not require S&WB to inform customers if LSLs are present or require them to be replaced, S&WB informs its customers that this service is provided upon the customer's request.

Structures built with LSLs or copper pipes and lead solder installed between 1982 and 1988 qualified for testing. Due to the age of the water distribution system, some water service lines that connect to S&WB's utility water mains underneath the street are made of lead. If a home or business was constructed before 1987, lead plumbing or solder may exist inside the structure and/or between the meter and the structure. Structures built after 1988 were not allowed to use lead, which up until then, had been a standard of the industry.

In instances where LSLs are located on private property, it is the property owner's responsibility to replace them. The State Constitution prohibits the S&WB from expending public money on private property. Currently, S&WB has no legal authority for subsidizing replacement of LSL on private property or right-of-entry to make any replacements. Despite these constraints, S&WB takes several steps to help its customers understand the risks of lead and what steps they can take to protect themselves. These steps are outlined within this response and actively communicated to the public through a multi-platform communications strategy.

Implementation of Corrosion Control Chemicals:

S&WB utilizes a corrosion control treatment program to prevent lead from leaching into the water from water service lines or customers' plumbing. Using calcium hydroxide to adjust the pH, the water is less corrosive to metals and forms a protective coating on the interior of water service lines in the distribution system. This creates a barrier between the metal pipes and the water traveling through it, thereby effectively delivering safe, reliable water. The corrosion control treatment program utilized by S&WB is approved by LDH and is one of the reasons why S&WB is in compliance with all the state and federal laws concerning the presence of lead in potable water. S&WB has used calcium hydroxide to adjust the pH since 1989, in advance of the EPA's Lead and Copper Rule which was officially issued in 1991. Prior to this, S&WB used lime softening, which is also an effective corrosion control treatment for lead and copper.

Safe Replacement of Lead Service Lines:

For decades, use of lead pipe was the industry standard, and subsequently, public water utilities did not keep or maintain complete records of where LSLs were installed. S&WB does not have a detailed record of the composition of every water service line pipe feeding the water meter from the water main. Furthermore, S&WB does not have detailed information on the composition of pipe inside privately owned structures.

According to S&WB records, since 2004, over 7,000 publicly owned water service lines have been replaced. However, it is unclear which lines were lead and which were not. While not enumerated, S&WB has replaced a significant number of LSLs through a very aggressive \$188 million waterline replacement program. This post- Hurricane Katrina program was designed not only to replace old and damaged mains, but also the LSL connections that service the customer's meter.

While there is no lead in the water leaving S&WB's treatment facilities or in the system's water main distribution lines, there may be lead pipes, smaller in diameter, which extend from the water main underneath the street to the water meter. Furthermore, there may be lead pipes on the property owners' side of the water meter or even in their structure.

At the request of the Mayor, S&WB has begun taking an inventory of the approximately 140,000 water service lines across New Orleans in fall 2016 using GIS mapping. Through this initiative, S&WB's goal is to determine which water service lines are composed of lead. This will allow S&WB to be able to better plan for any future LSL replacements and better facilitate customer communications to encourage them to consider replacing the privately-owned portion of the LSL on their property. To date, over 3,000 water service lines have been recorded and of them approximately 800 service lines have been discovered to be composed of lead.

As part of regular water quality sampling, if lead levels present are at or above EPA's Action Level of 15 parts per billion (ppb), it is standard operating procedure for S&WB to replace S&WB's portion of the LSL and offer to monitor the water quality after the LSL is replaced. Furthermore, S&WB provides customers with educational literature about replacing the LSLs between the water meter and their structure.

Through the course of general maintenance, repairs and capital improvements, it is standard operating procedure for S&WB to notify the customer that a LSL has been discovered and inform the customer that it will be replaced and proactive steps they should take to protect themselves.

S&WB's Annual Water Quality Report:

Each year, S&WB publishes and distributes a consumer confidence report, in line with LDH and EPA regulations and guidelines, to every S&WB customer by U.S. mail. This report is also published on S&WB's website and a full-page advertisement is placed in the newspaper of record, *The Times-Picayune*. In addition, an insert was included with bills with tips for how customers may reduce lead exposure, including encouraging property owners to consider replacing lead plumbing.

Information Posted Online:

S&WB regularly posts information on its website www.swbno.org to keep customers informed on the quality of New Orleans' drinking water, in addition to important tips on how they can reduce the risk of lead exposure. Since June 2016, these online pages have received over 19,000 page views.

Conclusion:

S&WB is extremely proud of its long history of service to the residents and visitors of New Orleans and its consistent record of compliance with all state and federal laws in this heavily regulated industry. S&WB appreciates the Inspector General's acknowledgement of that compliance in this report. Reducing exposure to lead is pivotal to the health and well-being of everyone, and as such, S&WB welcomes the Inspector General's engagement on this issue. S&WB will continue its business practice to not only educate its customers about the risks of exposure to lead, but also to reduce the risks of exposure to lead in this community.

OIG Finding 1: The City and the S&WB have not alerted residents to or provided them with information to reduce the risk of increased exposure to lead in water caused by partial replacement or disturbance of lead service lines.

OIG Recommendation 1: The City and the S&WB should develop and implement a strategic public health initiative that reduces the risk of exposure to lead in water caused by the partial replacement or disturbance of lead service lines.

S&WB Response to Finding 1:

The City and the S&WB have taken several steps to alert residents and to reduce the risk of exposure to lead in water caused by partial LSL replacement or the disturbance of LSLs and are committed to take additional steps to ensure effective and detailed communication to residents and businesses. The current efforts of the S&WB include: developing a map of LSLs across New Orleans; public communication about the partial replacement of LSLs and steps the homeowner can take to reduce the risk of lead exposure; encouraging homeowners to replace privately owned lead lines; and incorporating notices of partial LSL replacement into the communications plan for the CIP.

Right now, the City and S&WB are gearing up for an unprecedented, \$2.4 billion Capital Improvement Program (CIP) composed of over 200 projects that will result in 400 miles of repaired streets and / or subsurface infrastructure including water, sewer and drainage lines. This program is the result of years of hard work negotiating with FEMA to repair damage caused by Hurricane Katrina in addition to careful strategic planning to improve the City and S&WB's finances. Fixing New Orleans' aging and damaged infrastructure is a top priority and this work will be a major down payment on the city's future so New Orleans can continue to grow economically and become more resilient.

There will be several types of construction: **Full Depth Reconstruction; Patch, Mill and Overlay; Patch Concrete; Incidental Road Repairs; and Non-Paving Incidentals.** Depending on the type of construction, S&WB may be making water line replacements between the water main and the residential or business water meters. If the water service being replaced is composed of lead, a temporary increase in lead exposure may result lasting several weeks to months. The City and S&WB will continue to communicate these risks and the associated acceptable mitigation procedures to property owners, as has been done historically.

The City and S&WB have taken proactive steps to inform residents of the potential for increased exposure to lead in water caused by partial replacement or disturbance of LSLs, as well as the steps the public should take to reduce the impacts of that temporary elevated lead exposure. Together, the City and S&WB have engaged the public in a multi-platform communications strategy in order to maximize its reach, including online, direct mail, newsletter, social media, neighborhood engagement, educational brochures and establishment of a dedicated hotline and email.

As construction begins on the \$2.4 billion CIP, these communications strategies will be essential to keeping the public informed of the work happening across New Orleans.

Through the activities of the Lead Remediation Working Group previously referenced, the City and S&WB are continuously seeking opportunities to expand existing efforts to reduce the risk of exposure to lead not just in water, but throughout New Orleans.

Developing an Inventory of Lead Service Lines:

As mentioned earlier, S&WB does not have a detailed inventory of the location of every LSL in New Orleans. At the request of the Mayor, S&WB began taking an inventory of the approximately 140,000 water service lines across New Orleans in fall 2016 using GIS mapping. Through this initiative, S&WB's goal is to determine which water service lines are composed of lead. This will allow S&WB to be able to better plan for any future LSL replacements and better facilitate customer communications to encourage them to consider replacing the privately-owned portion of the LSL on their property. To date, over 3,000 service lines have been recorded and of them approximately 800 service lines have been discovered to be composed of lead.

Public Communications for Partial LSL Replacements:

When a LSL is discovered, S&WB notifies the property owner that the publicly-owned portion of the LSL will be replaced. To reduce the risk of increased exposure to lead, property owners are then provided instructions to follow via a door hanger. These steps include:

- Run the cold water at a high flow at each faucet for at least five minutes, one at a time, starting with the faucet closest to the water meter, to remove any lead particles that may have gotten into your plumbing when the service line was replaced. This includes outside faucets.
- After flushing your faucets, clean your faucet's aerators where lead particles may be trapped. Simply unscrew the aerator from the tip of the faucet, rinse and replace. Continue flushing for at least a month, at one faucet, for 10 minutes before using the water for drinking and cooking after the repair has been completed.
- Have a Licensed Master Plumber inspect your service line from the meter to your home. If it is a lead service line, we suggest you have it replaced.
- You may also request to have your water tested by contacting S&WB's Water Quality Lab at (504) 865-0420 or WaterInfo@swbno.org.
- Consider obtaining an NSF-certified water filter that is rated to remove lead. These can be purchased at local retail outlets or hardware stores.
- For more tips on reducing lead in drinking water visit our website at www.swbno.org or the Environmental Protection Agency's website at www.epa.gov/safewater/lead. For more information call 52-WATER (504-529-2837) or 658-ROAD (504-658-7623).

Incorporating Public Notification of Partial LSL Replacements into CIP Communications Strategy:

As part of the CIP, the City and S&WB are jointly coordinating on a multi-platform communications strategy to keep customers well informed before and throughout the construction period. The S&WB has incorporated information about the potential risk of lead exposure in water and from partial LSLs into the communications strategy for the CIP by adding information to roadwork.nola.gov and notifying the public of potential partial LSL replacements in CIP pre-construction public meetings. Although the Inspector General's report cites a twelve year old 2005 chart on the "*Effectiveness of Selected Communications Options*", the very basis of the CIP communications strategy is rooted in more recent research on how people receive communication, particularly in the digital age:

- According to the State of the News Media 2013, the average time spent watching local news is 12 minutes; and it's about the same for national news.
- According to the Pew Research Center Project for Excellence in Journalism in Collaboration with the Economist Group, more than 60% of the people surveyed are getting their news and other information via electronic devices.
 - We are in a day and age where in the U.S., 40% of all cell phone owners use their device to access a social networking site; and 28% do so every day.

As a result of the above mentioned data, the CIP team designed the program's website to be mobile friendly. Furthermore, ensuring a diverse social media strategy is executed is paramount. The following are some of the strategies and tactics being utilized to engage the community around the CIP:

- **User-Friendly Website:** roadwork.nola.gov website includes fact sheets, FAQs, current activities, construction impacts / mitigation, how to get engaged, etc. Information about service line replacements is included on the "About the Program" tab and as a static right-hand link.
- **Direct Mail:** An overview of the CIP (less lead piece) was included in the December 2016 S&WB mailing to nearly 140,000 households. A direct mail piece with general information about the possibility of LSL replacements will be disseminated in July 2017 and every quarter going forward in perpetuity.
- **Customer Service Management System:** Through S&WB's new online Customer Service Management System (CSMS), in addition to online billing, S&WB has access to additional features to push out information and notices to customers. Through the CSMS, S&WB will be actively distributing information on LSL replacements.
- **First Programmatic Construction Newsletter Distributed in March 2017:** Distributed monthly with project updates, construction activities and their anticipated impacts, etc. Information about LSL replacements was added to the monthly newsletter homepage in May 2017.

- **Social Media (Facebook, Twitter, Next Door, YouTube):** Established social media platforms to post real-time updates, respond to inquiries, share photos and videos, and link to resources. Links are regularly posted driving traffic to the roadwork.nola.gov website.
- **Neighborhood Engagement:** Together with the Mayor's Office of Neighborhood Engagement, S&WB partners with neighborhood association presidents / leaders to establish an open line of communication throughout the program. Information has been shared during meetings about LSL replacements.
- **Educational Brochures:** Distributed approximately 4,000 educational brochures to 14 New Orleans Public Libraries, 4 City of New Orleans Health Clinics, 12 NORDC locations, 15 New Orleans Council on Aging senior centers, 10 Daughters of Charity health centers, Ideal Missionary Baptist and Educational Association, Jewish Community Center, Youth Empowerment Algiers, New Orleans public buildings like City Hall One Stop Shop and S&WB Plumbing Department. Before the fall semester begins, information will be distributed to New Orleans public and private schools.
- **Dedicated Construction Hotline & E-mail:** Established an official construction hotline between the hours of 7:30 and 5:00 pm that provides a "lifeline" for residents; responding to calls within 24-hours. 504-658-ROAD (7623); established an official construction e-mail roadwork@nola.gov.

Furthermore, information about the possibility of LSL replacements will be disseminated at all CIP pre-construction meetings where water service line replacements are included in the scope of work. The first FEMA-funded project in the CIP began on May 12, 2017; this project does not include water service line replacements.

As noted in the Inspector General's report, this information is in S&WB's Consumer Confidence Report, and a sample door hanger is attached with this information.

Enhanced Noticing of LSL Replacements:

Through the course of the CIP, S&WB will work to provide customers 45 days' notice if a LSL has been previously identified for replacement as part of this program. However, this noticing goal is not feasible when previously unidentified LSLs are discovered during the course of repairs which often require for them to be replaced as soon as possible. In these circumstances, S&WB will provide customers as much notice as possible and educational material so they make take proactive measures to protect themselves.

At this time, S&WB is investigating the capabilities of its recently launched Customer Service Management System to send individualized notifications by phone, direct mail and email to inform customers if they can expect replacement of LSLs in their neighborhood, in addition to providing educational information on the risks of lead and steps they can take to protect themselves.

Additional Water Testing Following LSL Replacement:

As part of S&WB's communication strategy, it is widely advertised that S&WB provides free water testing to all customers who request it. In the event water sample testing finds the presence of lead above EPA's Action Level, S&WB will replace the publicly-owned portion of the LSL between the water main beneath the street and the home or business water meter. In addition to providing educational materials, S&WB will also offer water kits to test immediately after the LSL replacement and make a commitment to providing timely results so customers are informed if there are elevated levels of lead present in their water and what they can do to better protect themselves during this temporary exposure.

Water Filters:

At this time, the City and S&WB are investigating how a water filter program for those addresses experiencing temporary elevations in lead might be financed and implemented.

Consistency of Outreach:

S&WB is committed to keeping its customers informed and prepared for the infrastructure improvements that will be coming to their neighborhood in the coming years. This includes informing them of the potential risks associated with LSL replacement so they can take proactive steps to protect themselves. Furthermore, the City and S&WB are committed to ensuring consistency of outreach regardless of the type of construction.

IG Finding 2: The City and S&WB have not developed a long-term lead reduction strategy that includes encouraging and providing support for property owners to replace privately-owned portion of LSLs.

IG Recommendation 2: The City and S&WB should persuade residents of the advantages of full LSL replacement and encourage property owners to replace privately-owned LSLs by offering options that ease the financial burden.

S&WB Response to Finding 2:

The City and S&WB are developing a long-term strategy for LSL's on private property but must address the challenges described below.

Legal and Policy Issues:

S&WB has no legal authority to pay for replacement of the privately owned LSL or right-of-entry to make any replacements. In the past, the Inspector General has been explicit that S&WB cannot expend public funds for private purposes.

Legal and policy barriers currently exist complicating the establishment of any customer assistance programs that might utilize funds collected through water service rates paid by S&WB's ratepayers to pay for private improvements like the replacement of privately owned LSLs. In addition, S&WB serves a community in which approximately 27% of the population has an annual income below the federal poverty level, according to the U.S. Census Bureau.

S&WB must develop a host of legal, financial and operating policies, in collaboration with multiple stakeholders. At this time, S&WB is researching whether legislation is necessary at the state level to address affordability programs in clear, unambiguous terms that would not make it subject to legal challenges.

Financial Resources:

At this time, the City and S&WB are researching if financial resources are available from the Drinking Water State Revolving Fund (DWSRF) for LSL replacements on private property. LSL replacements are an eligible expense.

In addition, S&WB is currently pursuing the establishment of a 501(c)(3) nonprofit foundation to possibly solicit philanthropic funding to advance S&WB's goals of making this public utility stronger. Through this foundation, it is S&WB's intention to pursue additional financial support to further advance research efforts, workforce development goals and benchmarks to make New Orleans healthier and safer. Through the establishment of the foundation, proceeds may be collected from the sale of S&WB water meter trademarked products that could be used to support programs designed to assist lower income communities reduce their exposure to lead. The foundation may also be able to support a broader water filter program to provide the public further peace of mind that their water is safe for consumption.

The City and S&WB are acutely aware of the potential risks associated with lead exposure. As previously stated, Mayor Landrieu assembled an internal City Hall Lead Remediation Working Group to address the presence of lead in our community. The priorities of the Lead Remediation Working Group include establishing an inventory of all previous and ongoing lead remediation efforts, gathering data on vulnerable populations and existing through the activities of the Lead Remediation Working Group, the City and S&WB are continuously seeking opportunities to expand existing efforts to reduce the risk of exposure to lead from all sources throughout New Orleans.

As part of the S&WB's long-term efforts to reduce lead exposure from water, the City and the S&WB are undertaking the following efforts: free water testing for all S&WB customers; replacement of public water service lines discovered to be composed of lead; developing an inventory of public LSLs and public communications notifying the public if a LSL has been discovered and steps to reduce risk of increased exposure to lead. In addition, S&WB is coordinating with the American Water Works Association, water industry subject matter experts and other public water utilities to further advance strategies to clear regulatory and financial hurdles with the goal of reducing the impacts of lead in the New Orleans community as much as possible.

S&WB Offers Free Water Testing:

As part of S&WB's communication strategy, it is widely advertised that S&WB provides free water testing to all customers who request it. In the event water sample testing finds the presence of lead above EPA's Action Level, S&WB will replace the publicly-owned portion of the LSL between the water main beneath the street and the home or business water meter. As previously noted, when a LSL is discovered, S&WB notifies the property owner and the publicly-owned portion of the LSL is replaced. To reduce the risk of increased exposure to lead, property owners are then provided instructions to follow. In addition, educational information is provided encouraging the property owner to consider replacing the privately-owned portion of the LSL.

Developing an Inventory of LSLs:

As stated before, the use of lead pipe was the industry standard nationwide for decades. Like water utilities across the United States, S&WB does not have a detailed record of the composition of every water service line pipe feeding the water meter from the water main. Furthermore, S&WB does not have detailed information on the composition of pipe inside privately owned structures.

In fall 2016, S&WB began taking an inventory of the approximately 140,000 water service lines across New Orleans using GIS mapping. Through this initiative, S&WB's goal is to determine which water service lines are composed of lead. This will allow S&WB to be able to better plan for any future LSL replacements and better facilitate customer communications to encourage them to consider replacing the privately-owned portion of the LSL on their property. To date, over 3,000 water service lines have been recorded and of them approximately 800 service lines have been discovered to be composed of lead.

City Hall Lead Remediation Working Group:

Through the City Hall Lead Remediation Working Group, S&WB is collaborating with the City of New Orleans Health Department (NOHD) to reduce lead exposure, particularly among children where it is most harmful.

NOHD is leading efforts to inform New Orleans area pediatricians and doctors' offices about the importance of lead testing in children. NOHD partnered with the state's Louisiana Healthy Homes and Childhood Lead Poisoning Prevention Program (LHHCLPPP) to conduct an outreach program to local pediatrician clinics aimed at increasing the percentage of children properly screened for lead exposure. Many of the clinics visited cared primarily for children insured by Medicaid (LaCHIP). NOHD has also led efforts to increase lead testing at NOHD's WIC clinics.

NOHD recently partnered with the LDH in an application for a U.S Centers for Disease Control and Prevention (CDC) grant to increase outreach efforts, including funding a full-time NOHD employee to increase outreach efforts local medical clinics and the broader community. The grant focuses on increasing blood testing efforts with an emphasis on children insured by Medicaid/CHIP.

Using this information from the NOHD, the City's Office of Performance and Accountability is developing a citywide lead risk mapping tool to record data on areas of increased lead risk. This will allow City outreach teams to zero-in on these hotspots. This data will be combined with S&WB's GIS mapping of identified LSL locations to provide a comprehensive overview of New Orleans and where the risks of lead exposure currently exist.

Public Communications:

As mentioned before, in the course of capital improvements or routine maintenance and repairs, when S&WB discovers a LSL, it notifies the property owner and the publicly-owned portion of the LSL is replaced via a door hanger. Property owners are then provided instructions to follow to reduce the risk of increased exposure to lead. The property owner is also provided with information encouraging them to consider replacing the LSL on their property. The Inspector General's report notes that S&WB does not have the legal authority to replace any portion of a LSL on private property because property owners are legally responsible.

S&WB recognizes that through the course of the \$2.4 billion CIP to repair and improve 400 miles of City streets and subsurface infrastructure, it will undoubtedly discover previously unrecorded LSLs between the water main and customers' water meters which will need to be replaced. That is why S&WB is proactively notifying customers that this partial LSL replacement may result in a temporary increase in lead exposure and the steps the public should take to protect themselves.

S&WB is working with the American Water Works Association and other public water utilities that are embarking on lead replacement strategies to develop a long-term,

comprehensive LSL reduction strategy based on sound legal, regulatory and funding framework.