COLUMBIA | SIPA
School of International and Public Affairs

COLUMBIA CLIMATE SCHOOL
Climate, Earth, and Society

NYC Council Introduction 942: **Replacement of Lead Water Service Lines**

Final Report

Workshop in Applied Earth Systems Management
Summer Term 2025

Advised by Dr. Steven Cohen

Prepared by:
Margot Francini, Ansha Pathak, Beiyi Zhou, Evonne Deng, Ismail Hidayat, Josh Argentine, Kapil Kumar Narula, Noam Shapiro, Selene Li, Zihuan Tang

ACKNOWLEDGEMENTS

This report was developed by the following candidates in the Master of Public Administration in Environmental Science and Policy at Columbia University's School of International and Public Affairs.

Margot Francini (Manager), Ansha Pathak (Deputy Manager), Josh Argentine, Yiwen Deng, Ismail Hidayat, Yanrong Li, Kapil Kumar Narula, Noam Shapiro, Zihuan Tang, Beiyi Zhou

We thank our faculty advisor, **Dr. Steven Cohen**, for his guidance and support throughout the research process. We are grateful to **Mae Stevens** for her insight on lead service line replacement and water infrastructure policy. We extend our appreciation to Columbia University librarians **Ben B. Chiewphasa** and **Emily Schmidt** for their help with research questions throughout the semester.

EXECUTIVE SUMMARY

Each day, over 1 billion gallons of fresh, clean water is delivered to New York City. This water travels through thousands of miles of pipes until it arrives at service lines, the water pipes that connect individual households or buildings to the city-owned water mains. While most New Yorkers never think about the pipes that carry water into their homes, every drop of water that comes out of their taps passes through their service line. Prior to 1961, service lines in New York City were predominantly made of lead. Although most service lines are now made of copper, many older buildings still use their original lead service lines. The lead in these pipes can dislodge and dissolve, making its way along the plumbing and into people's drinking water.

The negative health effects of lead exposure are well-documented. According to the U.S. Department of Environmental Protection, there is no safe dose of lead exposure for any person. Children and pregnant women are disproportionately endangered by lead because of the chemical's effect on organ and brain development. Kidney damage, decreased IQ, increased blood pressure, and cognitive disorders like attention-deficit/hyperactivity disorder (ADHD) are just a few of the negative health outcomes associated with chronic lead exposure in children.

While there are steps that can minimize the amount of lead exposure in water, the only true solution is to replace all lead service lines with pipes made of other materials. Other cities across the U.S., including Newark, NJ, and Madison, Wisconsin, have achieved this remediation with varying levels of success.

NYC Council Introduction 942: Replacement of Lead Service Lines ("the bill") aims to provide a framework and enforcement mechanism for the city to address the environmental and public health hazard posed by lead pipes. Through mandated replacement, fines for non-compliance, subsidies for disadvantaged communities, and education, the bill aims to replace all the lead service lines in New York City within a 10–year time frame.

This report provides a comprehensive overview of how the bill attempts to address the logistical, health-related, and socio-economic dimensions of the problem of lead service lines in New York City. We begin by assessing the scale of the problem and the science behind lead poisoning in drinking water. The report then identifies the health effects of exposure to lead in drinking water. From there, we analyze the proposed solution and its associated complications. After determining metrics to measure this bill's success, we compare this legislation with two case studies to assess the bill's limitations. Finally, the report recommends potential revisions to the bill to strengthen the policy's potential implementation and success.

TABLE OF CONTENTS

INTRODUCTION

Photo by Bayram Er from Pexels

I. INTRODUCTION

New York City has long touted its tap water system as the "champagne of drinking water" (New York City Department of Environmental Protection [NYC DEP], 2024). Only 10% of the City's water is filtered, whereas water from the Catskills and Delaware Systems is so clean that it arrives at taps unfiltered. However, despite New York City's $1 billion investment to protect its municipal water system, thousands of New Yorkers are exposed to lead-contaminated water on a daily basis (Hu, 2018). This is because an estimated 14% of the city's water service lines are made of lead, and up to 29% are potentially made of lead (New York League of Conservation Voters Education Fund [NYLCVEF], 2024). When New York's water supply hits lead service lines, it picks up dislodged lead particles, which end up in drinking and bathing water. Although the city banned the installation of new lead pipes in 1961, thousands of lead service lines are still in use today. These pipes are present throughout the city, but are highly concentrated in disadvantaged communities. Despite the city's claim that it has the "best, safest, cleanest water in the world," lead water service lines are poisoning New Yorkers, and most people are unaware of this public health crisis (City of New York, 2024).

According to the New York City Department of Environmental Protection (NYC DEP), there are 130,000 confirmed privately owned lead service lines in New York City. The DEP estimates that there might ultimately be as many as 150,000 lead service lines, which is the number it uses for replacement planning and cost estimates (Aggarwala, 2024). This inventory was created in response to New York City's Local Law 65 of 2019 (2019), which required the city to compile and publish an inventory of each service line and its composition. There are no lead service lines in the city's water system or on any city property, including schools and public housing properties such as those managed by the New York City Housing Authority. The New York City Department of Parks & Recreation has also remediated public outdoor water fountains (New York City Department of Parks & Recreation, 2025).

Figure 1. Official X Account of NYC Water (X, 2023)

Figure 2. Official X Account of Mayor Eric Adams (X, 2022)

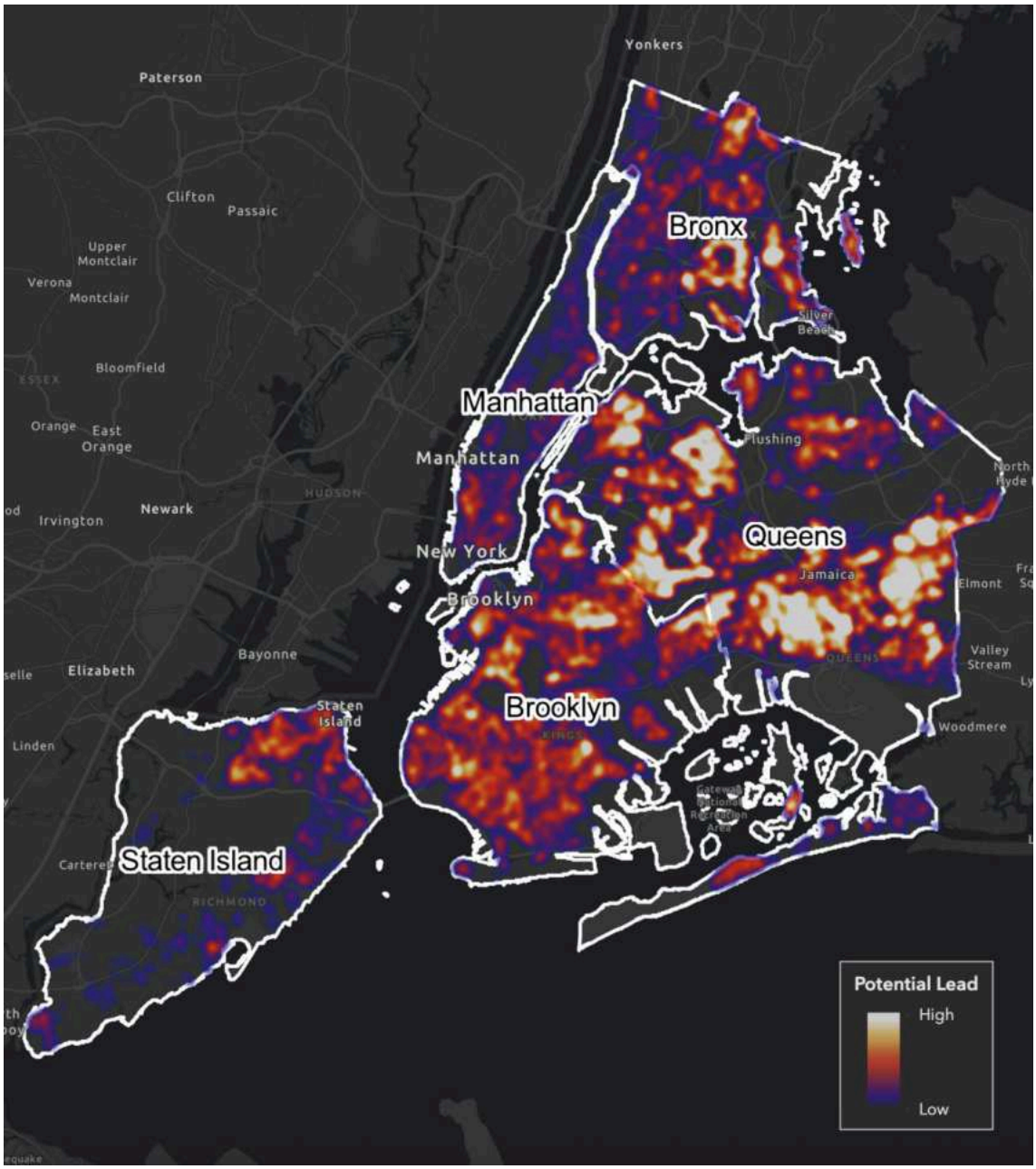


Figure 3. Map of NYC Water Service Lines (NYCLCVEF, 2024)

BILL OVERVIEW

Photo by Sora Shimazaki from Pexels

II. BILL OVERVIEW

Proposed by New York City Council Member James F. Gennaro (District 24), Introduction 942:
"*A Local Law to amend the administrative code of the city of New York, in relation to the replacement of lead water service lines*" (2024) requires all property owners other than the City of New York to replace lead water service lines with copper or approved alternatives within 10 years of the law's effective date. Within the 10–year period, property owners must obtain and submit to the Commissioner of the DEP a certification from a licensed Master Plumber that no lead water service line exists on their property. The proposed bill applies to property owners because New York City water service lines are considered private property (City of New York, 2025).

Under the directive of the bill, the DEP will oversee enforcement of the mandate, handle lead service line replacements in certain cases (i.e., for properties with childcare facilities or properties where the DEP is already performing work), test for lead in service lines upon the request of the property owner, provide financial aid for owners earning under 50% of the Area Median Income, and waive permit fees involved in lead pipe replacements. The DEP will ensure resident awareness through targeted educational programs, website updates, and accessible materials in English and other citywide languages.

Property owners will face fines if they do not replace the lead service lines and obtain certification by the ten-year deadline. A penalty of $1,000 will be imposed for not complying with the replacement mandate. A penalty of $500 will be imposed for not complying with the certification mandate. The bill is effective 180 days after it becomes law.

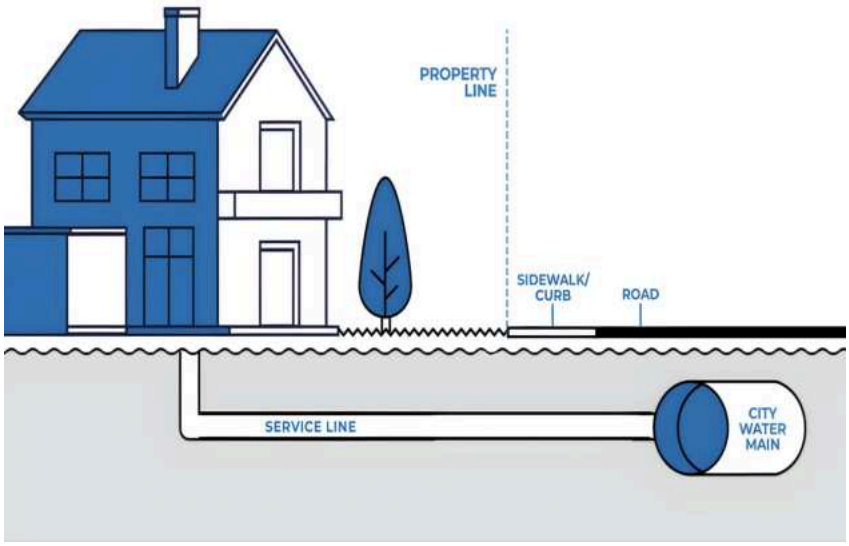


Figure 4. Schematic showing how water is delivered from the city water main to building through a service line, which can sometimes be made of lead (City of New York, 2024)

THE PROBLEM

Lead Service Lines Contaminating Clean Drinking Water

Photo by Bruce Peter Morin from Getty Images

III. THE PROBLEM

Lead Service Lines Contaminating Clean Drinking Water

Figure 5. Examples (from left to right) of a lead pipe, a corroded steel pipe, and a lead pipe treated with protective orthophosphate (U.S. EPA Region 5)

Lead pipes, once preferred for their durability, workability, and resistance to corrosion, are now a health hazard in our drinking water systems. In lead water pipes, lead dissolves into drinking water due to changes in temperature, pH, or chemical reactions. Scientific studies have shown that no level of lead exposure is safe. This is of utmost importance for children who are vulnerable to even small amounts that can cause irreversible neurological harm. Lead can accumulate in bones through what is known as "the reservoir effect," resulting in changes to the signaling proteins that regulate cellular activities in the body and brain.

History of Lead Water Service Lines in NYC

In the mid-1800s, cholera and typhoid outbreaks from dirty water were common in New York City. In response to this public health crisis, the city built the Croton Reservoir in 1842 to separate the water supply from urban pollution. The city selected lead pipes to transport and distribute the water supply because lead was cheap, malleable, and readily available (NYLCVEF, 2024). Despite warnings by experts, regulations as late as 1936 required the city to use lead pipes. In 1961, NYC finally banned new lead service lines. Although many New York City properties

have been renovated since the 1960s, an estimated 29% of water service lines are either confirmed to contain lead or potentially contain lead (NYLCVEF, 2024). Some boroughs, such as the Bronx, Queens, and Brooklyn, have higher concentrations of confirmed lead service lines, with certain areas reporting rates as high as 20% (NYLCVEF, 2023).

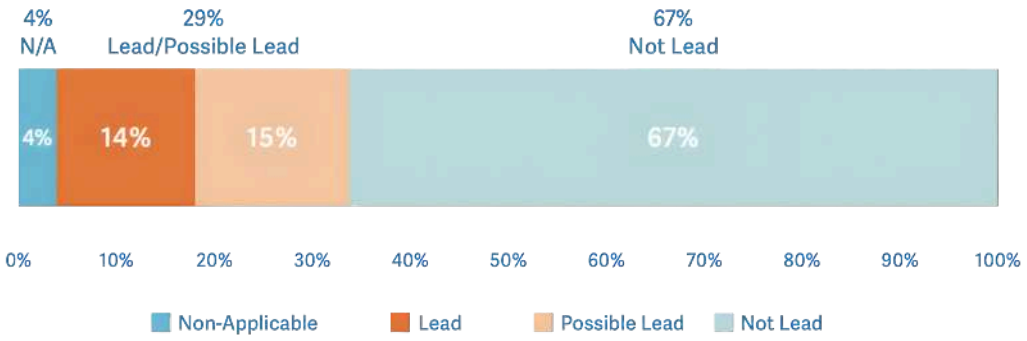


Figure 6. NYC Service Lines Citywide by Material (NYLCVEF, 2024)

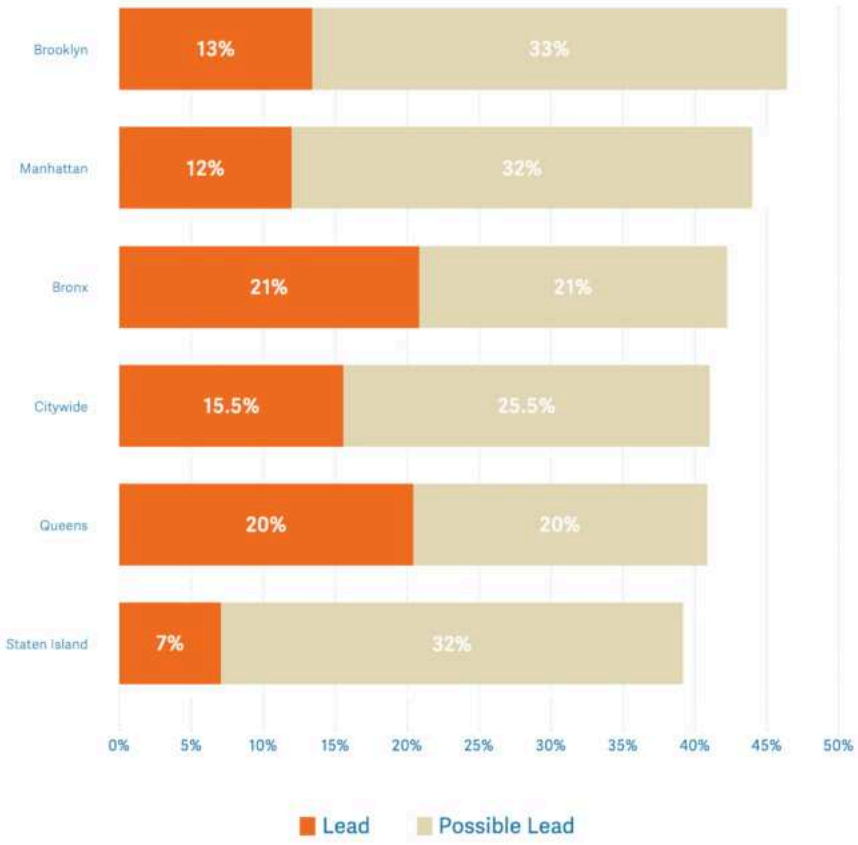


Figure 7. NYC Service Lines Citywide by Borough (NYLCVEF, 2024)

Fate and Transport of Lead in Pipes

Inorganic contaminants typically build up on the inside walls of service line pipes, creating layers called “scales.” These scales act as a protective layer against contamination of water by harmful compounds in the pipes themselves, such as lead, but can also corrode when the chemical or physical properties of the water change (Schock et al., 2008).

Water treatments such as orthophosphates react with dissolved metals like lead, magnesium, and aluminum, binding them to the inner walls of the pipes to build up as scale (United States Environmental Protection Agency [US EPA], 2024). Under certain conditions, however, like the omission of phosphate binder, a decrease in water pH, an increase in water temperature, and stagnancy, the metals can dissolve back into the water from the scale (Del Toral et al., 2013). For example, in Flint, Michigan, lead was released into the water supply from lead service lines due to a change in the system's drinking water source, and the subsequent omission of an anti-corrosion orthophosphate solution. This caused a degradation of the service lines’ scale and an increase in lead water poisoning (Olson et al., 2017).

Even if lead is not bound within the protective scale itself, the breakdown of non-lead scale within a lead pipe can be equally problematic. This scenario is most relevant to the risk being addressed in New York City. Any change in water conditions, flow rates, or disturbance in the physical conditions can lead to detachment of the scale, exposing the water to the original lead pipe material (Snoeyink et al., 2021). Consequently, lead from the pipe wall can dissolve into the water, particularly under low pH, high temperature, or prolonged stagnation, thus contaminating the otherwise pure tap water.

The risk of scale breakdown is heightened in older buildings with service lines that have not been serviced for an extended period. Over time, the scale builds up and can start detaching in clumps, exposing any bare lead pipe (Snoeyink et al., 2021). Exposed lead pipes can build up lead in the scale of the indoor plumbing, increasing legacy contamination and complicating remediation.

Interaction of Lead Pipes with the Environment

Lead pipes not only contaminate drinking water, but can also leach lead into the soil and surrounding environment. Joint or connector failures are a key concern, especially since older water infrastructure systems often used lead components, like lead goosenecks connecting the main to the service line, and lead-based solder in joints (US EPA, 2017). Over time, these connectors can develop cracks or loosen, creating points where water carrying dissolved or particulate lead can leach into the soil (Central Florida Restoration Solutions, 2021).

In addition, physical degradation of the lead pipe may also result in leaks (Hussein Farh et al., 2023). Lead is a soft metal and can develop fatigue cracks or pinholes over time, especially if disturbed during construction. When leaks occur, lead-contaminated water can seep out through the cracks into the surrounding soil.

A 2011 study in Critical Reviews in Environmental Science and Technology suggests that although lead might migrate short distances in soil pore water, the chances of it reaching groundwater are exceedingly rare (Clausen et al., 2011). Therefore, while water pipe leakage or cracks could potentially lead to soil contamination, this is likely not the primary cause of lead contamination in US soil.

Exposure and Health Risk

The complexity of lead is attributed to some of its unique chemical properties, including high density (which makes it heavy), high malleability and ductility (enabling it to be formed into sheets and wires), resistance to corrosion, relatively low melting point (compared to other metals), and low solubility in pure water. While these properties allow lead to be widely used in a variety of medical and industrial settings, they also make lead hazardous to human health.

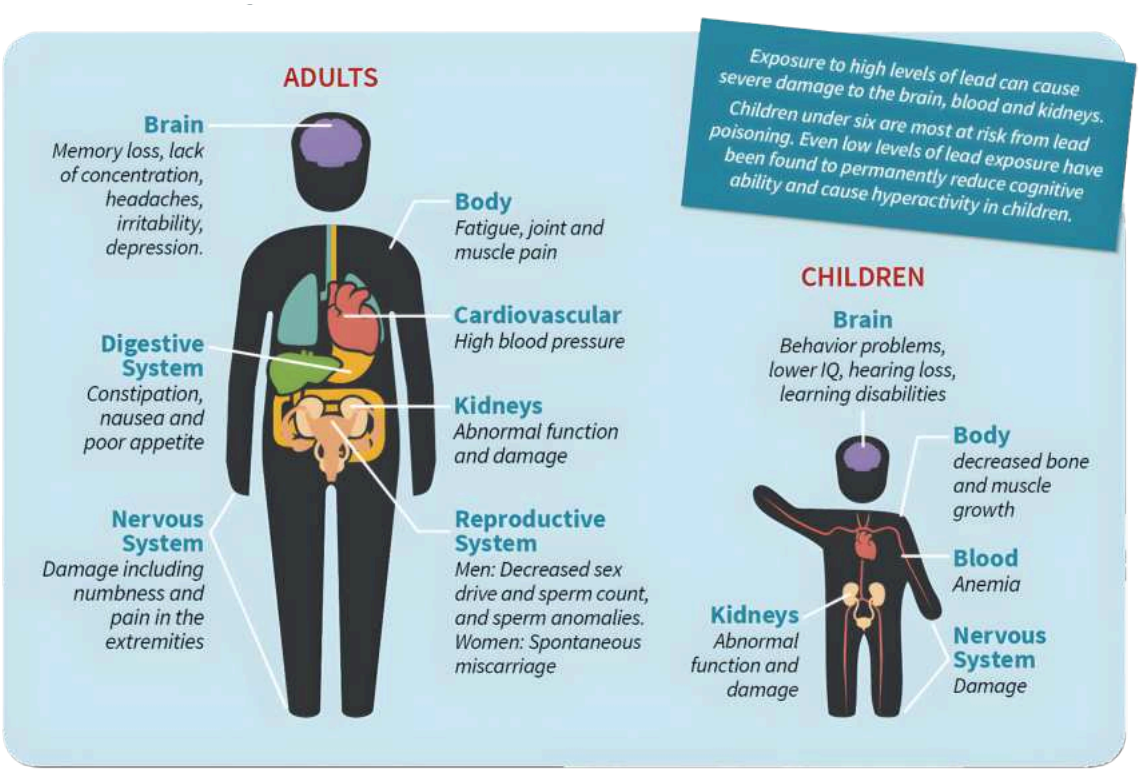


Figure 8. Health impacts of lead exposure in adults and children (Clean Water Action, n.d.)

One of the most concerning of these properties is lead's ability to mimic calcium, a vital mineral involved in neurological development and bone growth (Goodsell, 2016). The chemical similarities between lead and calcium enable lead to interfere with calcium-dependent processes, such as nerve signaling, muscle contraction, and neurological function related to mood regulation and decision-making (Goodsell, 2016; Needleman, 2004). Children are particularly vulnerable to this mimicry as their rapidly developing systems are more susceptible to toxic exposures (World Health

Organization [WHO], 2024; Needleman, 2004). The same is true for pregnant women. The effects of lead are systematic and cumulative, affecting multiple organs, including the brain, kidneys, liver, and bones (WHO, 2024). Lead can remain in the bloodstream for days or months and in human tissues and bones for as much as 25 years (Agency for Toxic Substances and Disease Registry, 2020).

High Risk Groups

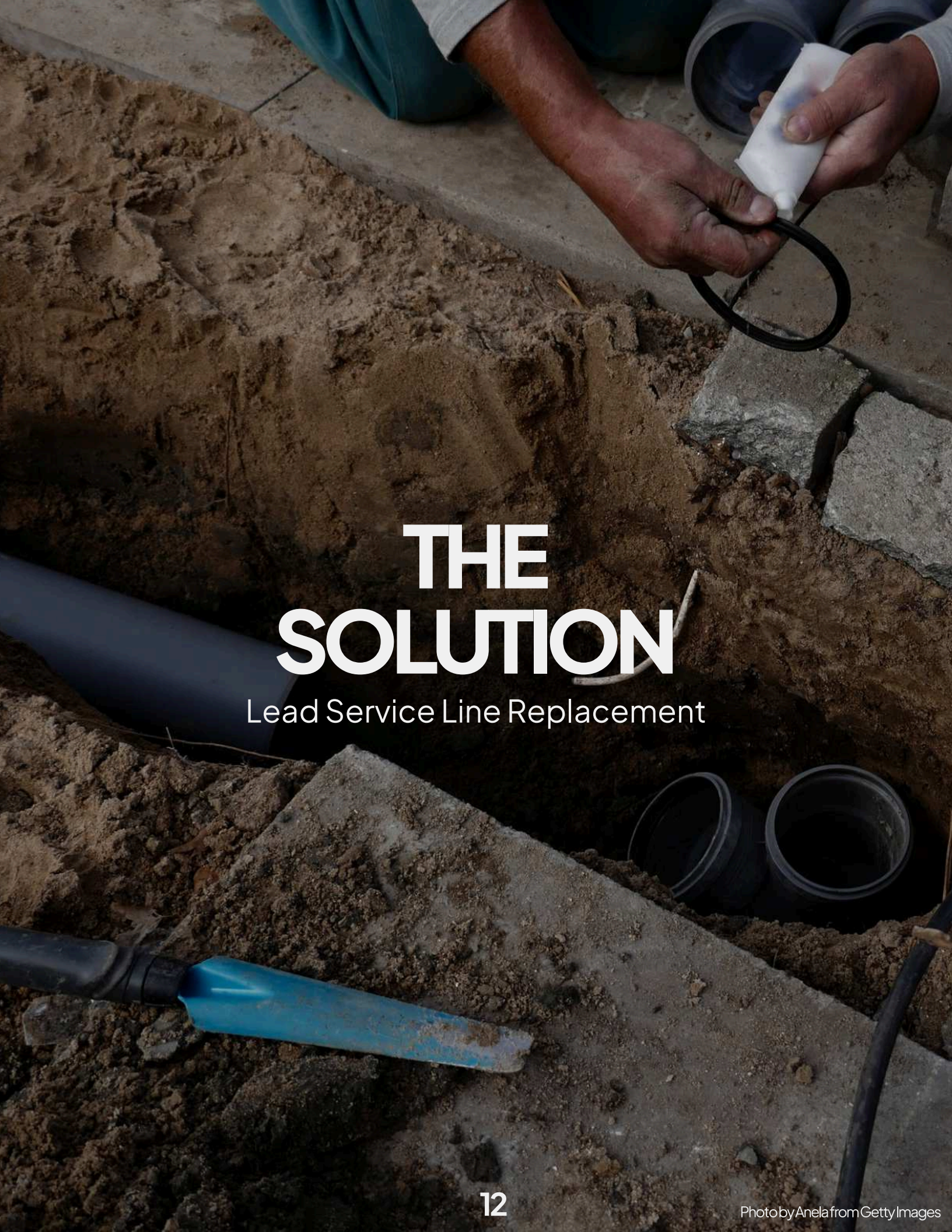
Children under 6 are at greatest risk for health problems from lead exposure (Centers for Disease Control and Prevention [CDC], 2025). This is because younger children are in a critical and continuous growth stage. The Childhood Lead Poisoning Prevention Act (2004) addresses this vulnerability by requiring that building owners investigate units and common areas where lead-based paint might be present, specifically focusing on units with children under six years old. Research consistently shows that children living in low-income and historically marginalized communities are disproportionately likely to have high blood lead levels, and exposure through contaminated drinking water could exacerbate this preexisting load (Arnold, 2023).

About 41% of known lead service lines are located in "disadvantaged communities," where residents are more likely to be low-income and face multiple barriers to remediation (NYLCVEF, 2024). This means that approximately 59% of known lead service lines impact middle- to high-income residents. Although disadvantaged communities might encounter greater barriers to remediation in terms of cost and access to educational services, lead service lines are a city-wide public health issue.

Regulatory Standards

Due to lead's chemical toxicity, no level of exposure is considered safe. This is particularly true for children, where even low-level exposure has been associated with reduced IQ, attention deficits, and behavioral issues (Needleman, 2004). Reflecting these risks, toxicological and biomedical experts have set the federal Maximum Contaminant Level Goal (MCLG) for lead in drinking water at zero (US EPA, 2025). However, because lead is found virtually everywhere, even at near-zero levels, the U.S. Environmental Protection Agency (US EPA) has set an action level of 0.015 mg/L (15 ppb). This means that if more than 10% of tested households exceed this level, corrective action must be taken. Under the US EPA's 2024 Lead and Copper Rule Improvements, all drinking water systems must "proactively" replace lead service lines within ten years (US EPA, 2025).

In New York State, more stringent standards exist to protect vulnerable populations, such as a lower action level of 5 ppb for lead in public school drinking water to minimize children's exposure (New York State Department of Health, 2021). Despite efforts to modernize infrastructure, as highlighted in the NYC Drinking Water Supply and Quality Report, aging service lines still seriously threaten public health (NYC DEP, 2024).



THE SOLUTION

Lead Service Line Replacement

Photo by Anela from Getty Images

IV. THE SOLUTION

Lead Service Line Replacement

Figure 9. Worker installing copper pipes underground (CDM Smith, 2024)

Introduction 942 requires property owners other than the City of New York to fully replace lead service lines and obtain a certification by a licensed Master Plumber stating that the property does not have a lead service line within ten years of the law taking effect. Private property owners—excluding those who qualify for financial assistance from the DEP under the bill—are required to pay the full cost of replacement. New pipes must be made out of copper or "any other material approved by the commissioner" of the DEP (Int. 0942-2024, 2024).

To facilitate compliance, the DEP will manage a financial assistance program for property owners with an annual gross income of no more than 50% of the Area Median Income (AMI), adjusted for household size (Int. 0942-2024, 2024). The process of applying for financial assistance and the amount of financial assistance per household is undefined by the bill. Additionally, the city will waive any permit fees required to replace a service line. Separate from Introduction 942, the DEP administers a free residential lead testing program. Upon request, the DEP must send residents a kit with instructions for collecting a drinking water sample, including a pre-paid return label (City of New York, 2025).

The DEP will replace lead service lines for free if:

1. The DEP is notified that there is a lead service line in a property where a child care program is located
2. The DEP conducts work on or affecting a property with a lead service line.

Should the city fail to meet its obligation to administer these free services, the relevant property owner will not be liable for any penalties (Int. 0942–2024, 2024).

The bill requires the DEP to establish and engage in outreach and education efforts related to lead service lines. These efforts will target primary stakeholders, including but not limited to, property owners, child care programs, licensed master plumbers, and contractors specializing in water service line replacement. Resources must be available in English, as well as in all ten designated citywide languages, and must be posted on the DEP's website (Int. 0942–2024, 2024).

Upfront Costs and Available Resources

Replacing lead service lines is expensive. The DEP estimates that replacing all of the lead service lines will cost about $2 billion. The cost of replacing an individual lead service line in New York City ranges from $10,000 to $15,000 (Aggarwala, 2024).

Since 2021, the DEP has secured $20 million in federal grants and $24 million in zero-interest loans as part of the federal Bipartisan Infrastructure Law (BIL) to improve its water infrastructure. In 2024, the city anticipated receiving another $72 million, bringing the city's total to $120 million ($50 million in grants and $70 million in low-interest loans) (Aggarwala, 2024). Over the five years of anticipated BIL funding, the DEP expects to replace approximately 7,300 lead service lines, including 600 lines it has already replaced in low-income communities in the Bronx and Queens (Adams, 2024). Additionally, the city has received $28 million in state grants to identify and replace lead service lines (Hochul, 2024). Even with these funds, the DEP has concluded that it will never have sufficient resources to cover all private replacements.

The reliability of these funds is complicated by President Trump's Executive Order 14154, which risks impounding over $100 billion in EPA funds, including for clean water infrastructure (Murray, 2025). As a result, the additional $72 million in federal funding is in question. President Trump's FY2026 budget request reduced funding for the State Clean Water and Drinking Water State Revolving Fund programs by 89% from $2.76 billion to $305 million (Gladsone, 2025). Regardless, existing federal funding accounts for approximately 10% of the total funds required to address lead service lines nationwide, and New York State places limits on the amount of federal funding New York City can receive (Aggarwala, 2024).

Since the entire service line is considered private property in New York City, a majority of homeowners will be left to foot the bill for replacement. For owners without sufficient savings or access to credit, this one-time cost could create financial strain or result in partial service line replacements, which are ineffective at reducing lead exposure (Roper, 2018).

Logistical and Economic Considerations

Introduction 942 allows property owners to determine when they wish to replace their service line. Owners can do so without coordinating with their neighbors. Over a ten-year period, a single block could be opened up several times.

Once a street in New York City is repaved, it becomes a "protected street" for five years. During this period, the DOT will not issue street opening permits for protected streets, except for emergencies (NYC DOT, 2025). Although Introduction 942 specifies that fees associated with lead service line replacements will be waived, it does not address fees regarding protected streets. The fee to open a protected street is $380 (NYC DOT, 2025). If the fee is not waived, multiple owners could end up paying to dig up the same street.

The cost of replacing a water service line generally, but not always, includes the cost of excavating and filling the construction trench or pit (New York State Department of Health, 2021). Introduction 942 does not specify whether the property owner or the New York City Department of Transportation must pay for repaving the roadway and sidewalk after the water line is serviced.

During construction, some properties might elect to install a temporary water line, also known as a mainline water bypass, during the replacement process. Such a system enables fresh water to flow into a property and waste water to flow out of a property during construction. Bypasses add additional costs, although it is difficult to estimate this number since it depends on water usage, location, and the scale and length of the project.

Given the number of confirmed lead service lines in the city, the bill's ten-year timeframe, and the DEP's current backlog in processing applications for free lead testing kits, temporary solutions will be necessary to mitigate lead exposure. Property owners or residents might need to purchase water filters that are certified by the National Sanitation Foundation or UL Solutions. Lead filters can be handheld pitchers, attached to faucets, or installed under a sink. (NYC DEP, 2025). Pitchers and sink filters range from $20 to $130, with replacement filters costing between $5 and $25 (Watsky & Adams, 2025).

In New York City, property owners might pass on the cost of lead service line replacement to renters by raising the rent or reducing maintenance. Co-ops and condos might pass on the cost of lead service line replacement to shareholders by increasing the maintenance fee. The bill does not provide any rent-stabilization or tenant-protection provisions.

Stakeholders

When the property addresses for confirmed lead service lines are matched against consumer and voter databases, an estimated 318,800 households comprising 669,200 individuals are impacted by lead service lines (NYLCVEF, 2023).

Citywide, 26% of households include children (Statistical Atlas, 2025). This means that, of the roughly 318,800 households exposed to confirmed lead service lines, approximately 82,800 of these households have children. Citywide, there are an average of 1.2 children

per household. From this, we estimate that approximately 99,400 children are exposed to confirmed lead service lines across the city.

According to NYLCVEF (2024), 41% of the confirmed lead service lines are located in "disadvantaged communities," broadly defined by New York State as communities with low to moderate income households that are burdened by environmental and climate change risk factors. It follows that an estimated 40,700 of the children exposed to confirmed lead service lines live in low to moderate-income households. Across New York City, approximately 1.4 million children live in low- to moderate-income households, compared to around 240,000 in high-income households. This leads us to believe that the number of children in low- to moderate-income households impacted by lead service lines is potentially higher than our calculations suggest.

As of 2021, there were 1,151 licensed Master Plumbers in New York City (City of New York, 2021). The DEP has 5,600 employees, with a 13% vacancy rate. Of these, roughly 4,000 employees work in the city (Aggarwala, 2024). The bill does not contain provisions regarding the training of new Master Plumbers or the hiring of more DEP employees.

Figure 10. Number of Estimated Lead/Possible Lead Households and Population (NYLCVEF, 2024)

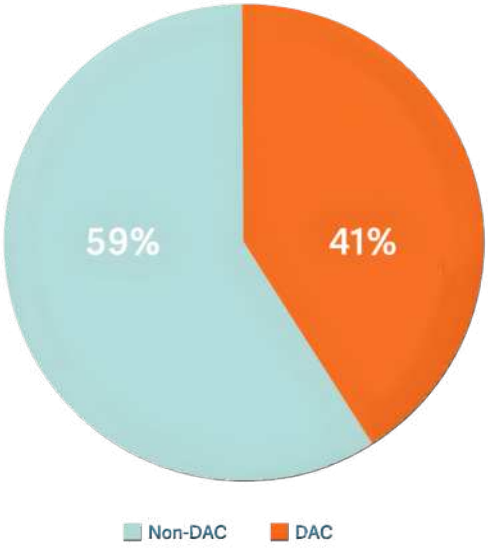


Figure 11. LSLs in DACs vs Non-DACs (NYLCVEF, 2024)

There is strong grassroots political opposition to Introduction 942's proposed solution to lead service lines. The NYLCVEF calls Introduction 942 the "rotten apple bill" and has testified against the bill before the New York City Council (Earthjustice, 2024). This coalition includes major environmental advocacy organizations, such as the Natural Resources Defense Council, Earthjustice, the New York League of Conservation Voters Education Fund, and the Legal Aid Society.

NYLCVEF argues that the bill treats lead service line removal as a private concern rather than a public health issue, and objects to the city shifting responsibility to property owners. The coalition also argues that the bill will exacerbate inequality by privileging wealthy property owners who can afford replacement and create opportunities for dishonest contractors to overcharge individual customers (NYLCVEF, 2023). Additionally, the coalition criticizes the bill for leaving open the possibility of replacing lead service lines with plastic PVC pipes, which studies have shown might not be a healthy alternative (Wilcox, 2023).

Figure 12. Lead members of the New York City Coalition to End Lead Poisoning (NYCCELP) (Cooper Square, 2022)

Although the Plumbing Foundation of the City of New York generally supports Introduction 942, it has raised concerns that the current fine for owners who fail to comply is insufficient (McIver, 2024).

For its part, the DEP calls Introduction 942 "a great start" and "an important tool," arguing that a fully centralized, fully publicly funded plan is neither the most cost-effective or efficient approach (Aggarwala, 2024).

Lead Pipe Replacement Techniques and Materials

Removing the entire lead service line with non-lead materials from the household to the water main is the most effective way to eliminate lead contamination in tap water. Although partial replacement might sound more affordable, it risks increasing lead contamination in the water due to galvanic corrosion resulting from joining two pipe materials (i.e. copper and lead) together. Full replacement is the preferred policy target because it completely eliminates service lines as sources of lead exposure risk (Baehler et al., 2022).

Full Pipe Replacement Techniques

Lead service line replacement techniques consider several factors, including engineering feasibility, occupational safety, environmental impact, financial costs, and social acceptability. A comparative assessment of three dominant techniques illustrates the trade-offs between trenchless pull-through, directional boring, and conventional open-trench excavation.

Figure 13. Schematic showing the pull-through technique used for lead service line replacement (Adams, 2020)

Table 1. Pipe Replacement Techniques' Performance Analysis

Factor	Trenchless Pull-Through	Open-Trench Excavation	Boring / Push Method
Safety (worker risk)	**Low** – Only small pits at the curb and sidewalk are needed, so the chance of trench collapse or related injury is very low.	**High** – Full-length trenches pose major hazards. Cave-ins are the leading cause of worker injury in pipe work, and open cuts in busy streets raise accident risks.	**Low** – Like other trenchless methods, it uses small pits only. There's minimal collapse risk. Workers stay above ground during drilling.
Environmental Impact	**Low** – Very little soil or vegetation is disturbed. Trenchless methods minimize disruption to the surroundings.	**High** – Requires digging up roads/sidewalks along the pipe's whole route, uprooting plants, and hauling away spoil. Large-scale trenching also generates dust and often requires repaving.	**Low** – Similar to other trenchless methods, only a narrow bore path is made. Surface impacts are minimal.
Time (duration)	**Low (Fast)** – Replacement can often be done in a day or less. Only small pits need backfilling.	**High (Slow)** – Excavating a long trench and then restoring pavement/landscaping can take several days or weeks.	**Medium** – Drilling setup and pit excavation take extra time, so it is generally slower than pull-through but still faster than digging a full trench.
Cost	**Medium** – Specialized equipment is expensive, but much of the cost of open-cut work (paving repair, sod replacement) is avoided.	**Medium** – Uses simpler equipment, but a large portion of the expense comes from restoring streets (often up to ~70% of total cost).	**High** – Requires heavy drilling rigs and multiple pits, so equipment costs are high. There may be more man-hours than simple pipe bursting.
Community Disruption	**Low** – Only a curb-cut and small sidewalk pit are needed. Traffic and parking are barely affected. Nearby residents experience little noise or vibration.	**High** – Streets must be closed for the length of the trench; noise, dust, and vehicle detours are significant. Business access and parking are often blocked during work.	**Low** – Like pull-through, only two or three small excavations are opened. Traffic impacts are minimal. Surface disruptions are limited to the drill entry and exit pits.

Based on our synthesis of literature data and analysis among readily available materials, the trenchless pull-through technique offers the most favorable balance of safety, cost, schedule, and environmental footprint for full lead service line replacement on dense urban blocks.

Alternative Pipe Materials

According to the City of New York plumbing code's Rules § 20-03 Water Service Pipes, there are specific pipe types permitted for new or replaced service lines:

Table 2. City of New York Rules § 20-03 Water Service Pipes Approved Pipe Material

Pipe Material	Maximum Diameter for Use	Typical Application
Type K and L Copper	Up to 2 inches	Most household/domestic services
Brass	Up to 2 inches (rarely), >2 inches	Larger residential, special cases
Ductile Iron	Greater than 2 inches	Large buildings, fire mains

The regulation mandates full material continuity in the replacement of the lead pipe, and caps lead content in any fitting at 0.25% by weight. These boundaries aim to ensure public-health protection but constrain the optimisation space for cost and ease of installation.

Beyond regulatory approval, there are other tradeoffs to consider when choosing an ideal alternative pipe material, including material cost, corrosion resistance, lifespan, lead leaching potential, and mechanical strength. While fiberglass is not yet approved under NYC's administrative code, the material is included in the table on the following page for its cost-effectiveness and potential for wide-scale adoption.

Introduction 942 specifically mentions copper replacement, likely because it meets NYC code status, resists corrosion, possesses a significant lifespan, and prevents lead leaching. Our synthesis of literature data and analysis among readily available materials confirms copper as the optimal pipe material for New York City's lead service line replacement program.

One consideration is the universal 50% tariffs on imports of semi-finished copper products (such as copper pipes) and copper-intensive derivative products (including pipe fittings) levied by President Trump on July 30th, 2025. As of this report's publication, the tariffs will go into effect on August 1st, 2025. The US currently imports approximately 45% of its copper (Berg, Hernandez-Roy, & Ziemer, 2025).

Table 3. Pipe Materials' Performance Analysis

Property	Copper	Brass	Ductile Iron	Fiberglass
NYC Code Status	Approved (≤2 inch)	Approved (≤2inch, >2inch)	Approved (>2 inch)	Not approved
Cost compared to Plastic Pipe	High	High	High	Medium
Corrosion Resistance	Excellent	Good (dezincification risk)	Excellent (with lining)	Excellent
Lifespan	50–100 yrs	40–70 yrs	75–100+ yrs	40–60+ yrs
Lead Leaching	None	Possible (lead)	None	None
Mechanical Strength	High	High	Very high	Moderate
Weight	Moderate	Moderate	Heavy	Light
Installation	Skilled labor	Skilled labor	Skilled labor	Easier, more joints

Lead Pipe Disposal Process

A regulated pathway determines the fate of removed lead pipes, beginning with licensed Master Plumbers or city-authorized contractors extracting the lead pipes from the ground during service line replacement (NYLCVEF, 2024). After temporary storage in secure containers at work sites, pipes are transported to facilities authorized to either recycle scrap metal or manage hazardous waste according to New York State Department of Environmental Conservation (NY State DEC) and NYC regulations (NYC DEP, n.d.; NY State DEC, 2020; US EPA, 2025b).

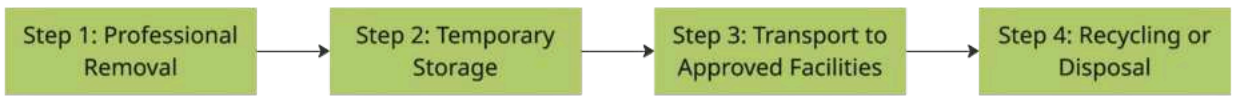


Figure 14. Fate of lead service lines after removal

The critical decision point between recycling and hazardous waste disposal depends on Toxicity Characteristic Leaching Procedure (TCLP) testing, which determines if lead leaching exceeds the regulatory limit of 5.0 mg/L, and therefore, must be handled as hazardous waste under the Resource Conservation and Recovery Act.

If TCLP results fall below this threshold, the pipes can be classified as non-hazardous and sent to recycling facilities, where the lead is processed for potential reuse in industrial applications. Lead pipes can often be simply melted due to their purity, while complex materials require full smelting—a more expensive and extensive process (Thornton et al., 2001). This economic incentive has made lead one of the most effectively recycled materials, with more lead now produced through recycling than mining.

The concentration of lead-handling facilities in vulnerable or disadvantaged communities should be assessed and monitored, as nearby residents typically face airborne lead exposure from nearby recycling operations. These types of facilities are disproportionately found in environmental justice communities (Jacobs et al., 2002; Environmental Health News, 2024).

Lead Exposure During and After Replacement

The lead service line replacement process, while ultimately beneficial, may pose health risks for both residents and workers during the construction phase.

Worker Health and Safety

Some studies of lead service-line replacement consistently find that cutting, pulling, or otherwise disturbing legacy pipe generates respirable dust and resuspends contaminated soil. Both of these media readily transfer from clothing, boots, and tools to workers' homes, placing family members, especially children, at secondary risk. Even a single day of replacement work can elevate blood-lead levels (BLLs) to 5–6 µg/dL, a range already linked to neuro-behavioral deficits and peripheral neuropathy (Health Hazard Evaluation Program, 2011). Thus, the National Institute for Occupational Safety and Health recognizes that personal protective equipment is vital for worker safety during lead pipe replacement.

Residential Exposure Risk

When old service lines are disturbed or removed, accumulated lead scale and particles that have built up inside pipes over decades can break loose and enter household water supplies. This disturbance can cause lead levels to spike dramatically, with elevated concentrations persisting for weeks or even months after replacement.

The Centers for Disease Control has specifically warned that children living in homes undergoing pipe replacement face heightened exposure risks due to the spike in lead concentrations in tap water, with documented cases of elevated blood lead levels during and after construction (Renner, 2010). With full lead service line replacement, however, lead levels drop by more than 50% within 3 days and continue declining thereafter (Trueman et al., 2016).

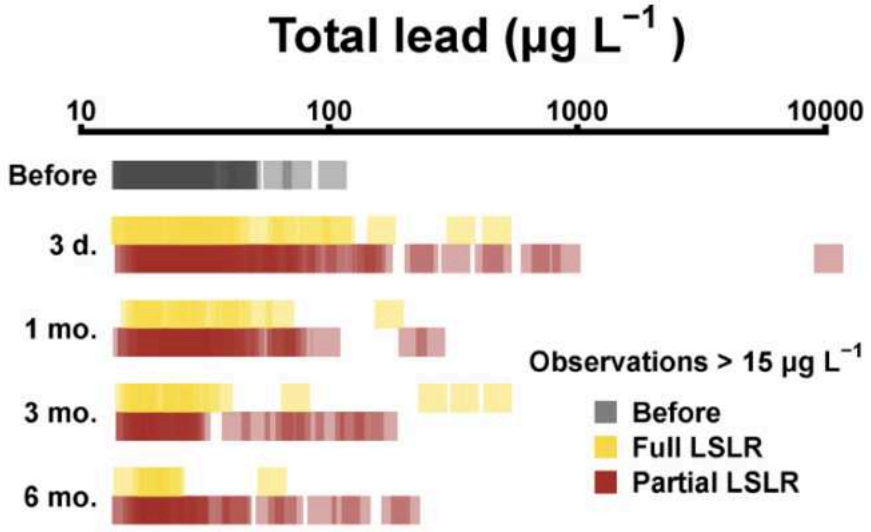


Figure 15. Total lead concentration pre- and post-replacement in both full and partial lead service line replacements (Trueman et al., 2016)

Beyond waterborne exposure, the construction process generates airborne lead hazards that affect both workers and residents. Lead dust is released during excavation and pipe cutting operations, with risks particularly acute in confined spaces like basements where ventilation is limited. This airborne lead can spread throughout homes, settling on surfaces and in carpets where it poses ongoing exposure risks, especially for young children who play on floors and frequently put their hands in their mouths. Without proper containment protocols, this contamination can persist long after construction ends, creating a secondary exposure pathway that extends the health risks beyond the replacement period.

Interim Exposure Mitigation: Water Pitchers and Flushing Protocols

The NYC DEP provides free pitcher filters and replacement cartridges to eligible households immediately after replacement, recommending their use for at least 6 months as a safeguard. The effectiveness of these filters varies depending on multiple factors. While faucet-mounted filters certified to NSF/ANSI Standard 53 can reduce lead concentrations to below 1 µg/L, pitcher filters show much more variable performance.

Studies indicate pitcher filters reduce lead concentrations by only 55% to 90% (Doré et al., 2021), with effectiveness depending on water quality conditions, filter maintenance, and the specific type of lead particles present in the water. In addition to using a pitcher filter, the DEP also advises residents to flush all household taps for at least 30 minutes after lead service line replacement and periodically clean faucet aerators.

Free DEP provided pitchers, filters, and follow-up testing are not mentioned in Introduction 942.

MEASURING SUCCESS

Exposure Mitigation and Improved Health Outcomes

V. MEASURING SUCCESS

Exposure Mitigation and Improved Health Outcomes

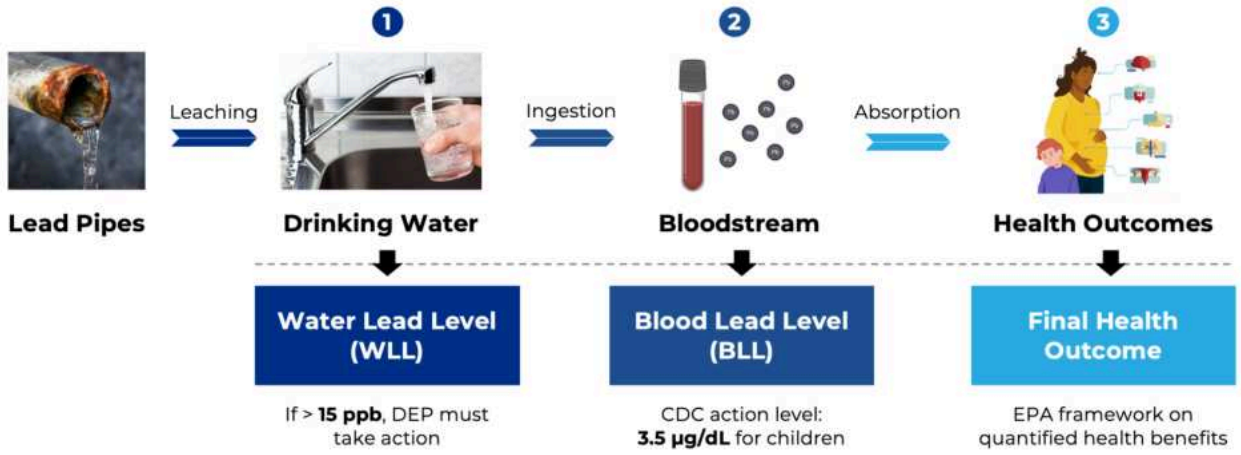


Figure 16. Scientific indicators for lead service line replacement success. WLLs and BLLs show immediate outputs; health outcomes reflect long-term impact.

Key Metrics

To determine whether New York City's lead pipe replacement program would be successful, the city must track progress across environmental, biological, and health domains. This can be accomplished through monitoring water lead levels (WLLs) and blood lead levels (BLLs) in the short-term, and final health outcomes in the long-term.

The WLL, measured in parts per billion (ppb), is the most direct environmental indicator of lead exposure risk from drinking water. Under the federal Lead and Copper Rule, the DEP is required to conduct at least annual testing of tap water in households with known lead service lines (NYC Independent Budget Office, 2018). If more than 10% of the samples in the compliance pool exceed the action limit of 15 parts per billion (ppb) in a one-liter tap water sample, action needs to be taken by the DEP to remediate those high-risk homes.

The BLL is a biological marker that reflects cumulative lead exposure from all sources, not just drinking water. Critical thresholds for action vary between children and adults due to differing vulnerabilities and exposure profiles. The BLL for children was recently updated to 3.5 µg/dL (CDC, 2025). There exists no action level for BLL in adults in the general public, but the BLL action level for construction workers is 50 µg/dL and 60 µg/dL for general industry workers (1910.1025 - Lead., n.d.). Ultimately, if BLLs for both children and workers remain below critical levels during and post-replacement, then the lead service line replacement program could be considered a success in mitigating lead exposure. New York State public health law 1370-e already requires BLL testing and reporting from laboratories for children who are 1 and 2 years old. When assessing the success of this bill, infant BLL levels could be used as a proxy for overall BLL levels in a given

property. Therefore, the evaluation of regional BLL exposure in New York City following widespread lead pipe removal would not require the implementation of an entirely new testing program.

While WLL and BLL are exposure indicators, final health outcomes measure the ultimate goal of the policy: improved population health. In children, key metrics include reductions in low birth weight, ADHD incidence, and population-level IQ loss. For adults, the most relevant outcome is a reduction in premature mortality from cardiovascular disease (CVD), which is strongly associated with chronic low-level lead exposure (Levin, 2023). These four indicators are highlighted by the U.S. Environmental Protection Agency (EPA) in its Final Lead and Copper Rule Improvements Technical Fact Sheet: Summary of Benefits and Costs as the most policy-relevant long-term outcomes (EPA, 2024). The EPA's cost-benefit analysis suggests that the projected monetary benefits of lead pipe replacement are higher than the estimated cost of $2 billion.

Final LCRI Benefit	*Annual Quantified Benefits Once Fully Implemented*
Annual ADHD Benefits	$162.7 - $419.6 million
Annual Adult CVD Premature Mortality Benefits	$7.70 - $17.04 billion
Annual IQ Benefits	$5.62 - $7.68 billion
Annual Low-Birth Weight Benefits	$3.9 - $4.4 million

Note: This table shows the quantified health benefits of the final rule. EPA expects there are significant additional non-quantified health benefits that are not included but would result in a much greater number of avoided illnesses or deaths once the rule is fully implemented.

Figure 17. Benefit-Cost Analysis on Final Lead and Copper Rule Improvement (LCRI) (EPA, 2024)

Case Studies: Successful Lead Service Line Replacement in the United States

Two case studies are useful in evaluating the success of lead water service line replacement policies. We examined the policies pursued by city governments in Madison, Wisconsin, from 2000 to 2012, and by Newark, New Jersey, from 2019 to 2022.

Madison, Wisconsin

Over a twelve-year period, the city of Madison, Wisconsin, replaced 8,000 lead service lines at a cost of approximately $15.5 million. In Madison, water service lines are split between the city and property owners. The city required property owners to replace their side of the service line at their own expense within ten years. Replacement was centralized, with city utility crews replacing the public side of service lines first and leaving trenches open for private plumbers to complete the project shortly thereafter. This approach maximized efficiency and minimized overall cost. Madison prioritized high-risk properties, including homes with high lead levels, multi-unit housing, public housing, and schools (City of Madison Water Utility, 2016).

The average private-side cost of a lead service line replacement in Madison was $1,300, or approximately $2,400 when adjusted for inflation. Madison provided 50% reimbursements for all private replacements, averaging $670, but up to $1,000. Since Madison's Public Service Commission did not allow the city to use rate-payer dollars to fund customer reimbursements, Madison Water Utility generated revenue by renting out space on water towers to phone companies for antenna usage. Madison levied fines ranging from $50 to $1,000 per day for noncompliance with the mandate (City of Madison Water Utility, 2016)

The process spanned over a decade because of logistical complications, regulatory and legal delays, and initial community opposition. In 2012, Madison became the first major U.S. city to replace all of its lead water service lines (US EPA, 2019). Nevertheless, Madison still identifies several lead lines per year during routine infrastructure projects, highlighting the ongoing difficulty of ensuring 100% removal (Integrated Water Resource Management, 2018).

Newark, New Jersey

Over a three-year period, Newark, New Jersey, replaced 23,000 lead service lines with a total cost of approximately $170 million. In March 2019, Newark initiated a voluntary program aimed at replacing all lead service lines within 8 to 10 years. During this first phase, owners could elect to have their lead service lines replaced for $1,000. The strategy was unsuccessful, with only 3% of owners signing up (Kearney, 2025). This resulted in only 650 service line replacements over a seven-month period, at a rate of 1.3 lines per day (Cunningham, 2022). In September of that year, Newark mandated lead service line replacements. Owners could either hire contractors at their own expense or participate in the city's free replacement program. Noncompliance was punished with fines ranging from $250 to $1,000, a jail sentence of up to 90 days, or a community service requirement of up to 90 days (Cunningham, 2022).

The cost of service line replacement in Newark ranged between $5,000 and $10,000 (City of Newark, 2019). Newark provided the replacements at no cost by securing a $120 million municipal bond from Essex County, in conjunction with federal funding through the State Revolving Fund program. Newark also struck a $155 million lease agreement with the New York Port Authority to service the debt on the bond (Cunningham, 2022). Fines up to $1,000, jail sentence, or community service for noncompliance (City of Newark, NJ, 2019).

Newark's ordinance enabled occupants, not just landlords, to grant the city entry to properties to replace lead service lines. Since 77% of Newark residents rent, this allowed the project to move forward even if landlords refused replacement, were absent, or were unresponsive (U.S. Census Bureau, 2025). Newark ultimately replaced its lead service lines ahead of schedule, reducing the work to under 36 months.

Comparison to Introduction 942

Madison and Newark's lead replacement policies share several similarities. The policies were mandatory, centralized, and either fully or significantly subsidized. The programs were funded through a combination of local, state,

and federal sources. There were strong penalties for noncompliance.

When New York City's proposed solution is compared to these case studies, several differences emerge. Introduction 942 is decentralized. Replacements are the responsibility of property owners. Subsidies are limited to individual property owners earning under 50% AMI, and the amount of funding is unspecified. New York City is restricted in its use of municipal resources for nongovernmental, private undertakings (Beller, 2009). It is therefore unclear if water rate revenue can fund service line replacements (Aggarwala, 2024). There is no provision to allow renters to consent to service line replacements if landlords refuse or are unresponsive. New York City has at least 5.7 times more service lines to replace than Newark. Lead service line replacements in the city cost up to 6.25 times more in 2025 than they did in Madison in 2000.

Table 4. Case study comparison to NYC Introduction 942

City	Mandatory	Centralized	Subsidized	Penalties	External Funding
New York, NY	✓	✗	?	$500 - $1K fine	$120M federal $28M state
Newark, NJ	✓	✓	✓ Full cost	$250 - $1K fine; jail time; community service	$120M city bond $155M lease with PANYNJ
Madison, WI	✓	✓	✓ Up to $1,500	$50 - $1,000 daily fine	Revenue from city leases

CONCLUSION

Moving from Introduction Towards Implementation

Photo by Anil Karakaya from Pexels

VI. CONCLUSION

Moving from Introduction Towards Implementation

NYC Council Introduction 942 represents an important first step towards mitigating exposure to lead through drinking water in New York City. The bill addresses the city's funding shortage for replacements by obligating property owners to cover the costs of replacements. The bill mandates compliance and anticipates associated equity concerns by instructing the DEP to develop and maintain a financial assistance program for owners earning under 50% of AMI. The bill acknowledges that education and outreach will be critical to the success of this solution by instructing the DEP to create and disseminate materials to stakeholders.

If the bill is implemented, it has the potential to improve the lives of an estimated 318,800 households, comprising 669,000 individuals, approximately 99,400 of whom are children (No Excuses, NYC, 2024). The bill's success would be measured not only by the number of pipes replaced, but by decreased lead levels in residents' tap water and blood, as well as improved health outcomes and saved healthcare costs over time.

By mandating lead service line replacement, providing subsidies for qualifying property owners, and requiring the dissemination of educational materials about the problem, the bill provides a framework for addressing an ongoing public health issue in New York City. However, the bill also fails to address or specify key aspects of a successful lead service line replacement program:

- There are no follow-up tap water testing requirements.
- The application procedures for subsidies and permit waivers are undefined
- The financial assistance program's funding source is unspecified.
- The bill does not provide specific economic incentives for property owners.
- The civil penalties for noncompliance are likely insufficient to ensure compliance.
- There is no mechanism for renters to initiate or permit service line replacement.

To effectively implement a lead service line replacement program in New York City, these gaps should be investigated and addressed. Both supporters and opponents of Introduction 942 have suggested revisions and alternative measures. Councilmember Gennaro concedes that Introduction 942 will likely require amendments to provide more financial assistance to owners and establish channels for state and federal funding (Walter-Warner, 2024). The DEP suggests that public assistance programs should be created for different populations and be flexible enough to adapt based on the policy's rollout (Aggarwala, 2024). Adding such amendments could increase the bill's potential for success. We suggest collecting more data to assess the true scale of the program, soliciting bids from Master Plumbers and water filtering companies to explore the city's potential economies of

scale, and investing in educational initiatives to build buy-in from New Yorkers.

Ultimately, decision-makers in New York City must decide whether to prioritize long-term strategies over short-term fixes. Short-term solutions such as orthophosphate dosing, filters, and flushing are relatively inexpensive, quick to deploy, and provide immediate reductions in lead levels. However, they require continuous operational costs, careful oversight, and are vulnerable to failure. Most importantly, they do not guarantee the removal of lead from the city's otherwise pure drinking water system.

In contrast, long-term investments like the lead service line replacement program proposed by Introduction 942 seek to address the root cause of contamination. While the initial costs are substantial, full lead service line replacement ensures permanent risk reduction, eliminates the need for ongoing interim measures, and improves both public health and public trust. Despite the bill's current limitations, NYC Council Introduction 942 charts a path for the city to earn its claim to the "champagne of drinking water."

REFERENCES

Photo by trgowanlock from Getty Images

REFERENCES

Adams, E. (2024, October 9). *Mayor Adams Expands Free Program to Replace Private Lead Water Lines in Low-Income Neighborhoods* [Press release]. City of New York. https://www.nyc.gov/office-of-the-mayor/news/746-24/mayor-adams-expands-free-program-replace-private-lead-water-lines-low-income-neighborhoods#/0

Arnold, C. (2023, November 3). Digging into exposure disparities: Mapping lead service lines in New York City. *Environmental Health Perspectives*, 131(11), Article CID: 114001. https://ehp.niehs.nih.gov/doi/10.1289/EHP13735

Agency for Toxic Substances and Disease Registry (ATSDR). (2020). *Toxicological profile for lead*. U.S. Department of Health and Human Services. https://www.atsdr.cdc.gov/toxprofiles/tp13.pdf

Aggarwala, R. T. (2024, June 18). *Testimony before the New York City Council Committee on Environmental Protection, Resiliency, and Waterfronts*. New York City Department of Environmental Protection. https://www.nyc.gov/site/dep/news/061824/testimony-rohit-t-aggarwala-commissioner-new-york-city-department-environmental-protection

Active Licensed Master Plumbers as of September 2021. (2021, September). NYC Gov. https://www.nyc.gov/assets/buildings/pdf/master-plumbers.pdf

Beller, J. (2009). *Use of Municipal Resources for Personal Purposes*. Municipal Lawyer, 23(2). https://nysba.org/wp-content/uploads/2020/03/EthMuniLawSpr09.pdf?srsltid=AfmBOoq3RAYNfm1sTRVPKimggRuIg65rA58y0Opd-qKnyLKY0oZ-dUj-

Berg, R. C., Hernandez-Roy, C., & Ziemer, H. (2025, July 29). *Tariffs on copper imports will affect 45 percent of U.S. copper needs*. Center for Strategic and International Studies. https://www.csis.org/analysis/tariffs-copper-imports-will-affect-45-percent-us-copper-needs

City of Madison Water Utility. (2016). *Information for utilities on lead service replacement*. https://www.cityofmadison.com/water/water-quality/lead-copper-in-water/information-for-utilities-on-lead-service-replacement

City of New York. (2025). *Request water test kit*. LeadFreeNYC. https://www.nyc.gov/content/leadfree/pages/request-water-test-kit

City of New York. (2025). *Water service line map FAQs*. LeadFreeNYC. https://www.nyc.gov/content/leadfree/pages/maps-faq

City of Newark. (2019, September 10). *Lead Service Line Replacement Program*.

https://www.newarkleadserviceline.com/replacement

Committee on Environmental Protection, Resiliency, and Waterfronts Report on Int. 942. (2024). New York City Council. https://legistar.council.nyc.gov/View.ashx?M=F&ID=13038614&GUID=123E8D39-8E98-4E8F-BCC4-783767A72795

Columbia University Mailman School of Public Health. (2024, March 27). *Lead service lines disproportionately impact Latino communities.* https://www.publichealth.columbia.edu/news/lead-service-lines-nyc-disproportionately-impact-hispanic-latino-communities-children-already-risk-lead-exposure

Centers for Disease Control and Prevention (CDC). (2025, March 21). *Risk factors and children*. https://www.cdc.gov/lead-prevention/risk-factors/children.html

Central Florida Restoration Solutions (CFRS). (2021). *The most common water damage: Leaky and burst pipes.* https://cfrsfl.com/blog/the-most-common-water-damage-leaky-and-burst-pipes

Cunningham, M. (2022, February 10). *Echoing Newark: How American Cities Can Replicate Newark's Success in Replacing Over 23,000 Lead Pipes in Under Three Years.* Environmental Policy Innovation Center. https://www.policyinnovation.org/insights/echoing-newark-how-american-cities-can-replicate-newarks-success-in-replacing-over-23000-lead-pipes-in-under-three-years

Clausen, J. L., Bostick, B., & Korte, N. (2011). Migration of Lead in Surface Water, Pore Water, and Groundwater With a Focus on Firing Ranges. *Critical Reviews in Environmental Science and Technology*, *41*(15), 1397–1448. https://doi-org.ezproxy.cul.columbia.edu/10.1080/10643381003608292

Del Toral, M. A., Porter, A., & Schock, M. R. (2013). Detection and evaluation of elevated lead release from service lines: A field study. *Environmental Science & Technology, 47*(16), 9300–9307. https://doi.org/10.1021/es4003636

Gladsone, S. (2025, May 2). *Trump's 2026 Budget Plan Nearly Eliminates Federal Funding for Clean Water in America*. Food & Water Watch. https://www.foodandwaterwatch.org/2025/05/02/trumps-2026-budget-plan-nearly-eliminates-federal-funding-for-clean-water-in-america/

Goodsell, D. S. (2016). Lead poisoning. RCSB Protein Data Bank. https://doi.org/10.2210/rcsb_pdb/mom_2016_4

Governor Hochul Announces Nearly $90 Million to Replace Lead Service Lines and Protect Drinking Water Across New York. (2024, September 27). Press Release.

https://www.governor.ny.gov/news/governor-hochul-announces-nearly-90-million-replace-lead-service-lines-and-protect-drinking

Hu, W. (2018, January 18). *A Billion-Dollar Investment in New York's Water—The New York Times.* The New York Times, 19.

Hussein Farh, H. M., Ben Seghier, M. E. A., Taiwo, R., et al. (2023). *Analysis and ranking of corrosion causes for water pipelines: A critical review.* npj Clean Water, 6, 65. https://doi.org/10.1038/s41545-023-00275-5

Int. 0942-2024, Int 0942-2024, New York City Council 2024 (2024). https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=6713078&GUID=079DF318-CB47-4320-B0C2-088DE4025897&Options=&Search=#:~:text=Summary%20of%20Int.%20No.%20942

Integrated Water Resource Management. (2018). *Case Study: Madison Lead Pipe Replacement Program.* CNT. https://cnt.org/sites/default/files/pdf/CaseStudy_Madison.pdf

Kearney, B. (2025). *Getting the Lead Out: Newark's Three-Pronged Approach.* CDM Smith. https://www.cdmsmith.com/en/client-solutions/projects/getting-the-lead-out-in-newark-nj

Lieberman-Klein, M. (2024, June 18). *NYC Proposes Bill to Shift Cost of Lead Pipe Replacement to Property Owners*. Earthjustice. https://earthjustice.org/press/2024/nyc-proposes-bill-to-shift-cost-of-lead-pipe-replacement-to-property-owners

Local Law No. 65 of 2019, Local Law. No 65, City Council of New York, Administrative Code (2019). https://intro.nyc/local-laws/2019-65

Murray, P. (2025, February 15). *Week 4: Trump Continues to Block Hundreds of Billions of Dollars Owed to Communities Across America*. United States Senate Committee on Appropriations. https://www.appropriations.senate.gov/news/minority/week-4-trump-continues-to-block-hundreds-of-billions-of-dollars-owed-to-communities-across-america

McIver, A. (2024, June 18). *Testimony on behalf of the Plumbing Foundation of New York*. New York City Council Oversight Hearing on Lead Service Lines. https://legistar.council.nyc.gov/LegislationDetail.aspx?ID=6713078&GUID=079DF318-CB47-4320-B0C2-088DE4025897&Options=&Search=#:~:text=Hearing%20Testimony%206/18/24

Needleman, H. L. (2004). Lead poisoning. *Annual Review of Medicine*, 55, 209-222. https://doi.org/10.1146/annurev.med.55.091902.103653

Nigra, A. E., Lieberman-Cribbin, W., Bostick, B. C., Chillrud, S. N., & Carrión, D. (2023). *Geospatial assessment of racial/ethnic composition, social vulnerability, and lead water service lines in New York City.* Environmental Health Perspectives, *131*(8), Article 12276. https://doi.org/10.1289/ehp12276

New York City Department of Parks & Recreation. (2025). *LeadFreeNYC: Drinking fountains*. https://www.nycgovparks.org/about/health-and-safety-guide/lead

New York City Department of Transportation. (2025). *Application Procedures for a Street Opening Permit*. https://streetworksmanual.nyc/chapter-three/application-procedures-street-opening-permit

New York City Department of Transportation. (2025). *Street and Roadway Construction*. https://www.nyc.gov/html/dot/html/infrastructure/construction.shtml

New York City Department of Environmental Protection (NYC DEP). (2024). *Drinking Water Supply and Quality Report*. https://www.nyc.gov/assets/dep/downloads/pdf/water/drinking-water/drinking-water-supply-quality-report/2024-drinking-water-supply-quality-report.pdf

New York City Department of Environmental Protection (NYC DEP). (2025). *Monitoring for lead*. https://www.nyc.gov/site/dep/water/monitoring-for-lead.page

New York City Department of Environmental Protection (NYC DEP). (2025). *Lead Service Line Replacement*. https://www.nyc.gov/site/dep/water/lead-service-line-replacement.page

New York City Department of Environmental Protection (NYC DEP). (n.d.). *Drinking Water*. Retrieved June 28, 2025, from https://www.nyc.gov/site/dep/water/drinking-water.page

New York City Coalition to End Lead Poisoning & New York League of Conservation Voters Education Fund (NYLCVEF). (2024). *No excuses, NYC: Replace lead drinking water pipes now*. https://nylcvef.org/wp-content/uploads/no-excuses-lead-report.pdf

New York League of Conservation Voters Education Fund (NYLCVEF). (2024, November 19). *Report: Almost 30 percent of the drinking water service lines in New York City are or may be made of lead*. https://nylcvef.org/citizens-toolkit/report-almost-30-percent-of-the-drinking-water-service-lines-in-new-york-city-are-or-may-be-made-of-lead/

New York State Department of Environmental Conservation (NYSDEC). (n.d.). *New York City Water Supply*. Retrieved July 15, 2025, from https://dec.ny.gov/nature/waterbodies/watersheds/management/new-york-city-water-supply

New York State Department of Health. (2021). *Lead in drinking water in schools*. https://www.health.ny.gov/environmental/water/drinking/lead/lead_testing_of_school_drinking_water.htm

New York State Department of Health. (2021, August). *Lead Service Line Replacement Program: Frequently asked questions*. Retrieved June 8, 2025, from https://health.ny.gov/environmental/water/drinking/lslrp/faq.htm

Olson, T. M., Wax, M., Yonts, J., Heidecorn, K., Haig, S.-J., Yeoman, D., Hayes, Z., Raskin, L., & Ellis, B. R. (2017). *Forensic estimates of lead release from lead service lines during the water crisis in Flint, Michigan.* Environmental Science & Technology Letters, 4(9), 356–361. https://doi.org/10.1021/acs.estlett.7b00226

Roper, C. (2018, March 12). *The hidden costs & dangers of partial lead pipe replacements*. Natural Resources Defense Council. https://www.nrdc.org/bio/cyndi-roper/hidden-costs-dangers-partial-lead-pipe-replacements

RCSB Protein Data Bank. (2025). *Molecule of the month: Lead poisoning.* Molecular explorations through biology and medicine. Retrieved June 2025, from https://pdb101.rcsb.org/motm/196

Schock, M. R., Hyland, RActive Licensed Master Plumbers. N., & Welch, M. M. (2008). *Occurrence of contaminant accumulation in lead pipe scales from domestic drinking-water distribution systems.* Environmental Science & Technology, 42(12), 4285–4291. https://doi.org/10.1021/es702488v

Statistical Atlas. (2025). *Household types in New York, New York (City)*. https://statisticalatlas.com/place/New-York/New-York/Household-Types

Snoeyink, V. L., Tang, M., & Lytle, D. A. (2021). *Lead pipe and lead–tin solder scale formation and structure: A conceptual model.* AWWA Water Science, 3(5), e1246. https://doi.org/10.1002/aws2.1246

U.S. Census Bureau. (2025). *QuickFacts: Newark City, New Jersey*. https://www.census.gov/quickfacts/newarkcitynewjersey

U.S. Environmental Protection Agency (EPA). (2017). *Sources of lead in drinking water*. https://www.epa.gov/sites/default/files/2017-08/documents/epa_lead_in_drinking_water_final_8.21.17.pdf

U.S. Environmental Protection Agency (EPA). (2019, September 13). *LSLR Financing Case Study: Madison, WI.* https://www.epa.gov/dwreginfo/lslr-financing-case-study-madison-wi

U.S. Environmental Protection Agency (EPA). (2019, October). *Strategies to achieve full lead service line replacement* (EPA 810-R-19-003).

https://www.epa.gov/sites/default/files/2019-10/documents/strategies_to_achieve_full_lead_service_line_replacement_10_09_19.pdf

U.S. Environmental Protection Agency (EPA). (2020). *Lead in soil*. https://www.epa.gov/sites/default/files/2020-10/documents/lead-in-soil-aug2020.pdf

U.S. Environmental Protection Agency (EPA). (2021). *Lead and copper rule revisions*. https://www.epa.gov/ground-water-and-drinking-water/revised-lead-and-copper-rule

U.S. Environmental Protection Agency (EPA). (2023). *Why do water systems add phosphate to drinking water? What are the health effects of drinking water containing phosphates?* https://www.epa.gov/lead/why-do-water-systems-add-phosphate-drinking-water-what-are-health-effects-drinking-water

World Health Organization (WHO). (2021). *Lead poisoning and health*. https://www.who.int/news-room/fact-sheets/detail/lead-poisoning-and-health

Watsky, D., & Adams, B. (2025, June 14). *The best water filter pitcher for 2025*. CNET. https://www.cnet.com/home/kitchen-and-household/best-water-filter-pitcher/

Walter-Warner, H. (2024, BaehlerJune 18). *Council Bill Would Force NYC Owners to Replace Lead Pipes*. The Real Deal. https://therealdeal.com/new-york/2024/06/18/council-bill-would-force-nyc-owners-to-replace-lead-pipes/

Wilcox, M. (2023). *The Perils of PVC Plastic Pipes*. Beyond Plastics. https://www.beyondplastics.org/publications/perils-of-pvc-pipes

APPENDIX

Photo by Engin Akyurt from Pexels

APPENDIX

The following terms are defined in the bill:

- Area median income- income limits set annually by the United States Department of Housing and Urban Development for the New York, NY HUD Metropolitan Fair Market Rent Area.
- Child care program- Non-residential regular care for children under 12 years of age by non-relatives, for less than 24 hours per day.
- Commissioner- The Commissioner of the New York City Department of Environmental Protection.
- Department- The New York City Department of Environmental Protection (DEP).
- Licensed master plumber- A person holding a current master plumber license issued by the New York City Department of Buildings or someone working under their direct supervision.
- Property owner- Any individual, limited liability company, or other entity that owns real property in New York City, excluding the City of New York.