INL/RPT-24-79594-Revision-0

Lead Service Line Inventory at the Materials and Fuels Complex

August 2024

Zachary Alexander Torres

Changing the World's Energy Future

Idaho National Laboratory

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Idaho Falls, Idaho 83415

http://www.inl.gov

Prepared for the
U.S. Department of Energy
Under DOE Idaho Operations Office
Contract DE-AC07-05ID14517

Lead Service Line Inventory at the Materials and Fuels Complex

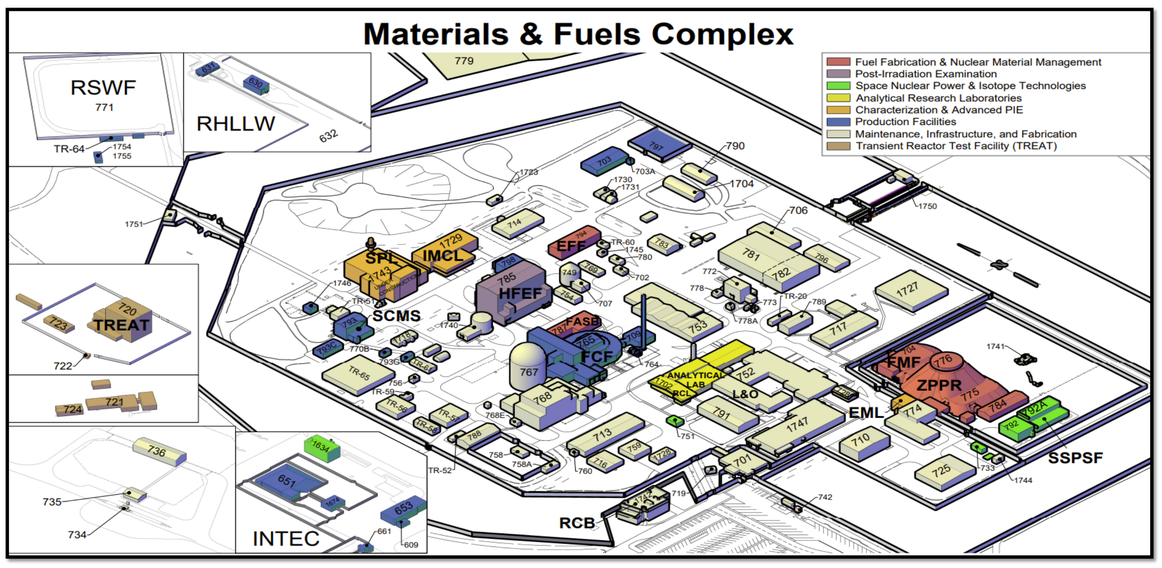
Author: Zachary A. Torres, University of Cincinnati

Mentors: Ed Hart, MFC Environmental Manager; Raj Devasirvatham, Drinking Water Program Coordinator; Courtney Rasmussen MFC Environmental Support

University of CINCINNATI
COLLEGE OF ENGINEERING AND APPLIED SCIENCE

Background:

In 1986, Congress amended the Safe Drinking Water Act prohibiting the use of lead in pipes for providing water. This was due to research on lead poisoning showing lead was extremely detrimental to the development of kids and cognitive abilities in adults. Now, because of the amendment of 1986, the EPA's 2021 Lead and Copper Rule Revision came out since then to promote progress in the inventory and elimination of lead pipes. The Idaho Department of Environmental Quality(IDEQ) adopted this rule for the state which means every community and non-transient non-community water system in Idaho falls under the new regulation. By October 16, 2024, the INL must report to the IDEQ, the pipe materials in a Lead Service Line Inventory(LSLI). If lead is found, a Lead Service Line Replacement Plan is required. This poster only specifically talks about the results for the largest site out on the desert, the Materials and Fuels Complex(MFC), as the rules also applies to ATR, INTEC, SMC, CFA, RWMC and NRF.



Methods:

Historical: Records

52/66
verified pipes

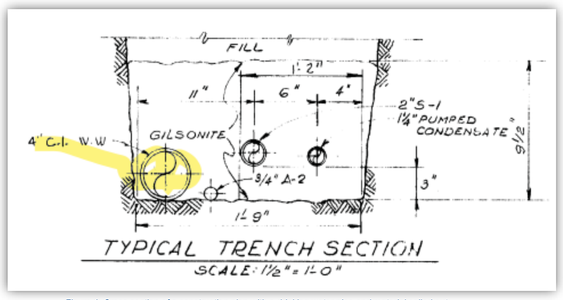


Figure 1. Cross section of a construction plan with a drinking water pipe and material called out.

The main method to verifying the pipe material. As seen above, C.I. is cast iron and W.W. is well water. Used the Electric Document Management System(EDMS) to find the proper documentation for each building. The least destructive method and most accurate when identifying pipe material.

Analytical: XRF Gun

2/66
verified pipes

The XRF gun performs a non-destructive test to find the composition of a metal using high-energy radiation to then shoot out electrons. The result of the interaction is X-Ray fluorescence which gets picked up by the gun. Different elements produce a different fluorescence to identify the element of the metal.

Figure 2. XRF gun used to characterize pipes

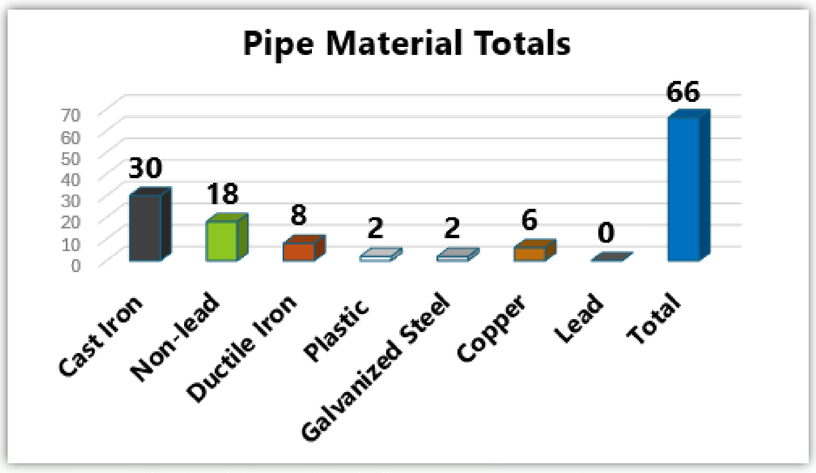
Visual: Scratch/Magnet Test

12/66
verified pipes

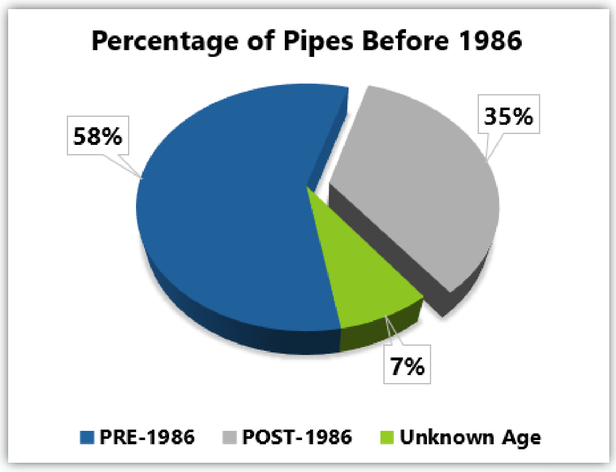
INFORMATION ON TESTING YOUR PIPES FOR LEAD :: City of Rensselaer, New York, rensselaerny.gov/City-Departments/water-and-sewer-department/lead-and-drinking-water. Accessed 16 July 2024.

First, place a magnet on the pipe. If it does not stick, it could be either copper or lead. Next, scratch the pipe with a penny, if it flakes or changes colors, it is lead. Other methods such as construction are also visual.

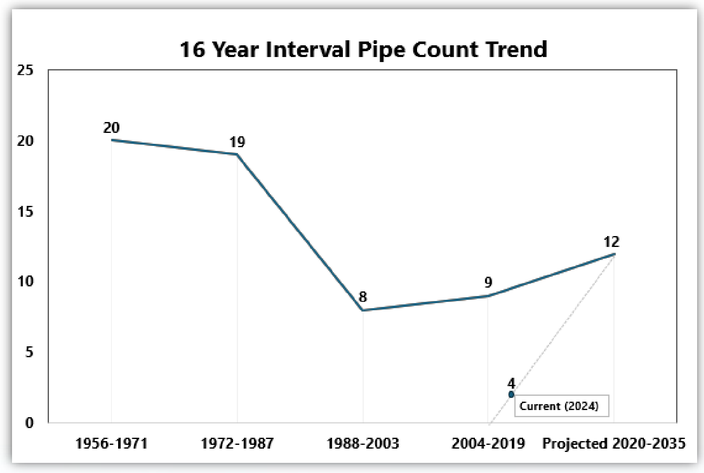
Results and Analysis:



Graph 1. Categorization of different pipe materials and their sum



Graph 2. Percentage of pipes before lead ban of 1986



Graph 3. Number of new pipes every 16 years at MFC

As seen in Graph 1, much of the pipe material was cast iron along with different materials spread throughout the different buildings on site. The "Non-lead" category has 18 pipes. This was due to a lack of documentation in EDMS because of four major transitions in site ownership since its start in 1949. Another reason is because engineering firms showed the location of the pipe but not the material used. Methods consisted of historical pipe specifications, a XRF gun, or the scratch/magnet test. The scratch test uses a penny to distinguish between a lead pipe and a copper pipe due to differences in hardness, lead is softer than copper so it would scratch easily. Due to the atomic structure of lead, it is diamagnetic, like gold and silver. If a magnet adheres to the service line, it is non-leaded material.

As seen in Graph 2, 65% of the pipes were placed or could have been placed before 1986, when lead was still used frequently for service line connections, so a thorough investigation was needed. It also shows that the Materials and Fuels Complex has a large portion of old infrastructure that needs to be maintained and updated in the future.

As seen in Graph 3, much of the construction was done during the inception of the site with the maximum at the first interval 1956- 1971 with 20 pipes. This was during the height of the Cold War and race to beat the Soviets, so funding was at an all time high. The minimum, 8 pipes, in the graph is the interval from 1988-2003 which shows the years after Chernobyl in 1986 where the funding in nuclear and trust was at an all time low. The figure defines four distinct eras and a new era for the lab and its future infrastructure to support INLs mission. It shows a positive trend, meaning that nuclear is going to grow and INL as a site is going to grow with it.

Conclusion:

The health and safety of the employees at the INL is a top priority for us. For the mission of the INL to continue, our employees must be given the best environment to work in. Lead is a possible invisible health risk to our employees and the LSLI proved that lead is not present in any service line connections. Due to the age of the site, it was assumed that at a minimum, few lead pipes would be found. The findings from the five months spent creating the LSLI, where every pipe was non-lead, was both surprising and important to the future of MFC. This would have negatively impacted the overall safety of the site and slowed down progress in research as money would be allocated to removing the lead lines instead of other projects. INL is about research and discovery for the betterment of society and the process for the LSLI embodies that drive for discovery and improvement for the future. The fact that there were none indicates that the infrastructure at MFC, although old, is well equipped to fulfill INL's mission to discover, demonstrate and secure innovative nuclear energy solutions, other clean energy options and critical infrastructure for years to come.