

Guidance for Using Statistical Analysis to Evaluate Unknown Service Lines

INTRODUCTION

Wisconsin Public Water Systems (PWSs) are required to develop and submit a baseline service line inventory in accordance with NR § 809.545(1n), Wis. Adm. Code by November 1, 2027, and submit annual updates to the inventory thereafter until certain conditions are met. Draft 2026 EPA guidance¹ published in April 2026 offered the use of statistical analysis as one possible method for a PWS to classify the material of lead-status-unknown² (LSU) service lines as non-lead lines without physically inspecting every location.

A service line can be categorized as confirmed non-lead³ in a PWS's baseline inventory if it is determined through an evidence-based record, method, or technique to not be a lead or galvanized-requiring-replacement (GRR) service line.⁴ This document⁵ is intended to outline the use of an evidence-based method that the department approves for PWSs to classify a group of service lines as non-lead lines without physically inspecting every location. This document establishes the criteria that Wisconsin PWSs may use to determine if this statistical approach is appropriate for them, and if it is, the steps to follow in order to demonstrate a minimum statistical confidence level of 95 percent.

¹ [EPA Factsheet – Service Line Inventory Tips](#)

² A lead-status-unknown service line is a service line whose pipe material has not been demonstrated to be a lead service line, galvanized-requiring-replacement service line, or non-lead service line [NR 809.04(46)(f) Wis. Adm. Code].

³ A service lines can be categorized as confirmed non-lead, if the service line is determined through an evidence-based record, method, or technique not to be a lead or GRR service line. The water supplier is not required to identify the specific material of a non-lead service line; however, the water supplier may use the material, such as plastic or copper, as an alternative to categorizing it as non-lead [NR 809.545(1n)(d)3. Wis. Adm. Code].

⁴ NR § 809.545(1n)(d)3, Wis. Adm. Code.

⁵ This document was developed based on similar guidance from the Washington Department of Health ([Statistical Analysis Guidance for Lead Service Line Inventory](#)) and Oregon Center for Health Protection ([Statistical Guidance for Evaluating Unknown Service Lines](#)).

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WHO CAN CONSIDER USING STATISTICAL ANALYSIS?

This method may be appropriate for a PWS that meets all of the criteria listed below:

- PWS has no known lead service lines currently in their distribution system;
- PWS has no records of lead service line (LSL) replacement (i.e. no LSLs ever previously existed in their distribution system);
- PWS has at least four (4) street-side LSU service lines, and insufficient resources to physically verify all of them by 2037, or by the PWSs' other shortened or deferred deadline.⁶
- PWS staff have confidence that there are no LSLs in their distribution system based on review of all available records and their institutional knowledge, but have insufficient records to support this; and
- PWS has conducted a review of all existing evidence-based records listed in NR § 809.545(1n)(b), Wis. Adm. Code.

LIMITATIONS OF STATISTICAL ANALYSIS

Statistical analysis will only be approved as a method for classifying street-side LSU service lines. Service lines on the property side should be visually inspected in the home or building if there are no records or other available methods to identify the service line material.

⁶ NR § 809.545 (2)(d)5-6, Wis. Adm. Code.

STATISTICAL ANALYSIS STEP-BY-STEP PROCESS

Step 1: Identify and Classify All Known Service Lines

Before using a statistical approach to identify LSU service lines, a PWS must first review all existing available evidence-based records listed in NR § 809.545(1n)(b), Wis. Adm. Code (See **Appendix A**).

Step 2: Identify All Service Lines of Lead-Status-Unknown Material

Make a list of all street-side service lines that could not be classified as confirmed non-lead or as a specific non-lead material, such as copper or plastic, by reviewing the records described in Appendix A.

Step 3: Identify the Number of Lead-Status-Unknown Service Lines That Must be Physically Inspected

Use the following table to determine the number of street-side LSU service lines that must be physically inspected in order to achieve a 95 percent confidence level.

Total Number of Street-Side LSU Service Lines in Distribution System	Number of Street Side-LSU Service Lines to Physically Inspect
Fewer than 15	3
15 -1,499	20% of unknown lines
1,500 to 2,000	322
2,001 to 3,000	341
3,001 to 4,000	351
4,001 to 6,000	361
6,001 to 10,000	371
10,001 to 50,000	381
>50,001	384

Step 4: Randomly Select Service Lines for Physical Inspection

Randomly select street-side LSU service lines from the list developed in Step 2 to physically inspect until there are enough to reach a confidence level of 95% (number identified in step 3). Selection must be uniformly random and not selected based on any specific criteria that could introduce bias.⁷ Use the process described in **Appendix B** to generate a uniformly random set of service lines for inspection.

Step 5: Fill Out and Submit the “Statistical Analysis Eligibility Screening and Planning Form” to the DNR

Fill out and submit the “Statistical Analysis Eligibility Screening and Planning Form” to the DNR. The department will review your responses and determine whether it approves the use of this method for your water system under NR 809.545 (1c)(c) Wis. Adm. Code. The DNR’s determination will be based on whether or not the PWS meets all of the criteria on page 2 of this document.

Step 6: Conduct Physical Inspections

Conduct at least a one-point physical inspection of each street-side LSU service line using methods such as excavation or potholing. Identify and record the observed material at each location.

If one or more of the original randomly selected sites cannot be physically inspected, the PWS must replace it by randomly generating a new site using the process described in **Appendix B**.

During this process, if ANY LSLs are discovered, statistical analysis is no longer a valid method for classifying LSU service lines. Do not proceed to Step 8 if any LSLs are discovered; instead, refer to **Appendix C** for next steps.

⁷ Although it may be tempting to introduce “logic” to the site selection process, such as by selecting within periods of construction or targeting certain portions of town, doing so can unintentionally bias the data set.

Step 7: Track the Results of the Physical Verification Process

Using a spreadsheet or other tracking tool, enter the observed service line material (lead, plastic, copper, galvanized, etc.) at each randomly selected site. The basis of material classification for physically verified service lines should be listed as “Field Inspection Only” in the inventory.

Step 8: Classify Remaining Unknown Service Lines

If no LSLs are discovered during the verification process, then the remaining street-side LSU service line materials can be classified as non-lead.⁸ The basis of material classification for these non-lead service lines should be listed as ‘Statistical Analysis’ in the inventory.⁹

Step 9: Add Service Lines classified as Non-Lead via Statistical Analysis to the Non-Lead Validation Pool

Add all service lines classified as non-lead using the statistical analysis method to the non-lead validation pool. A PWS using statistical analysis to classify service lines as non-lead cannot identify their non-lead validation pool¹⁰ or conduct non-lead validation¹¹ prior to completing this step.

Step 10: Retain Documentation of Statistical Analysis

Retain documentation of all service line identification efforts associated with steps one through seven, described herein. The DNR may ask PWSs to produce or submit these records to support their inventory submittal.

All LSU service lines must be identified by December 31, 2037, unless the system is subject to a shortened deadline or is eligible for a deferred deadline.

⁸ The final EPA Lead and Copper Rule Improvements (LCRI) require all water systems to use a validation process to test the reliability and accuracy of service lines classified as non-lead [NR 809.454(1r)(e)]. This process requires physical inspection of a subset of service lines classified as non-lead. Service lines classified as non-lead using the statistical method will be required to be included in the non-lead validation pool.

⁹ NR § 809.545(1n)(i), Wis. Adm. Code.

¹⁰ NR § 809.545(1r)(e)1, Wis. Adm. Code.

¹¹ NR § 809.545(1r)(e)2, Wis. Adm. Code.

FOLLOW-UP ACTIVITIES

Consumer Notifications

PWSs should clearly communicate the level of confidence in their inventory to consumers. The DNR strongly recommends that within a year of completing the statistical analysis, PWSs send a consumer notice to each consumer whose SL is identified as ‘non-lead’ through the statistical method that clearly communicates the level of confidence in their service line classification. The DNR also recommends that PWSs offer to physically inspect these service lines upon request, as well as explain what information the statistical method provides. The following is an example of a way to inform consumers:

The street-side portion of your drinking water service line was identified as non-lead using statistical analysis. [Water system name] found [number] out of [number] randomly selected service lines were not lead. Therefore, we are 95% confident that fewer than 1% of the unknown street-side service lines in our distribution system are lead. Therefore, we have classified all street-side service lines with unknown material in our distribution system as non-lead. We will continue to identify and track service line materials in the future during routine operations. If you would like [Water system name] to physically inspect your service line to verify the material, please contact us at [phone number].

Ongoing Service Line Material Identification and Tracking

1. Develop standard operating procedures to continuously identify and document service line materials during routine operations and maintenance activities and during distribution system upgrades. Record materials and update the basis of material classification for any service line whose verification method was previously identified as ‘Statistical Analysis’ to ‘Field Inspection Only’ when appropriate.
2. If a PWS discovers an LSL that was previously classified as non-lead, the PWS must update their inventory and notify the DNR within 60 days of discovering the LSL.¹²
3. If more than 1% of service lines classified as non-lead using statistical analysis are discovered to be inaccurately classified, all service lines classified using this method must be reclassified as lead-status-unknown.

¹² NR § 809.55(c), Wis. Adm. Code.

Appendix A

Evidence-Based Records

For the baseline inventory, PWSs must conduct a review of information sources that provide information about service line and connector materials and locations, including all of the following:

- a. All construction and plumbing codes, permits, and records or other documentation that indicate the service line and connector materials used to connect structures to the distribution system.
- b. All PWS records on service lines and connectors, including distribution system maps and drawings, recent or historical records on each service connection and connector, meter installation records, historical capital improvement or master plans, and standard operating procedures.
- c. All records of inspections in the distribution system that indicate the material composition of the service connections and connectors that connect a structure to the distribution system.
- d. Any information on lead, galvanized iron, and galvanized steel materials that the water supplier has identified under s. NR 809.119.
- e. Additional information if required or approved by the department.

PWSs must include any information on service line and connector materials from all applicable information sources described above in the baseline inventory.

Appendix B

Generating a Uniformly Random Set of Service Lines for Inspection

Use a spreadsheet (such as Microsoft Excel or Google Sheets) to generate a uniformly random set of locations of LSU service lines for inspection using the following Microsoft Excel steps (the same formulas and method work for Google Sheets).

1. In the first column of a spreadsheet, list every unique service line of street-side LSU material. They can be listed by address, service line ID, or other identification method.
2. In the second column, generate uniformly random numbers, so that each service line is associated with a randomly generated number. Follow these steps:
 - a. Enter the formula =RAND() into the second column next to each location and press Enter. This generates a number between 0 and 1 for each service line.
 - b. Select the second column (the column with the random values) and copy it.
 - c. With the second column still selected, right click and select 'paste special' then select 'values.' This will ensure your random numbers remain static.
 - d. Right click in the second column and click 'sort smallest to largest' to list the randomly generated numbers from lowest to highest.
3. Select only the top ranked service lines, equal to the number requiring inspection. For example, if you need to inspect 20 service lines, select the first 20 service lines on the list. These are the 20 uniformly random service lines to be inspected.

See this brief [online tutorial](#) for generating random samples in Microsoft Excel.

Appendix C

What to do if an LSL is encountered during the statistical analysis process

If an LSL is encountered during the statistical analysis process, the PWS is not allowed to use the statistical analysis method. Additionally, the PWS must update their service line inventory to reflect the new information before their next annual inventory update is due¹³, and submit the updated inventory to the department by the due date. The inventory must include all of the updated items listed below.

- Update service line material(s) to include newly identified LSL(s).
- Update the service line material(s) to include services lines confirmed to be non-lead through field investigations
- Update the basis of material classification to reflect field inspections completed during the statistical analysis process
- Continue to classify all LSUs that were not field verified as LSU.

The PWS must continue working to identify all LSU service lines from its inventory using other methods, before the mandatory service line replacement deadline.¹⁴

¹³ NR § 809.545(1r), Wis. Adm. Code.

¹⁴ The deadline is December 31st, 2037 for most water systems except those subject to a shortened or deferred deadline (NR § 809.545(2)(d), Wis. Adm. Code.).