



## MINIMUM SERVICE LINE MATERIAL VERIFICATION REQUIREMENTS

A reliable inventory of potable water service line materials is important for service line replacement planning, effective asset management, and notification of citizens served by lead service lines. Reliability and completeness of service line records can vary both across and within water supplies; therefore, it is important that supplies take steps to verify service line materials and records. Water supplies are not expected to physically verify every service line, but rather a statistically sound subset. To effectively evaluate the accuracy of service line records and/or predict service line materials, a representative, uniformly random number of service lines must be physically verified.

Information gathered through random material verification processes provides:

- A verified estimate of the proportion of each service line material and material configuration across the distribution system, providing a sound basis for planning service line replacement and notification efforts.
- A basis for evaluating the reliability of existing service line material records and identifying areas where additional physical verification or information may be needed. For water supplies with high confidence in existing records, this may serve to demonstrate that records are, in fact, reliable.
- A baseline data set for predicting materials at other locations (in combination with other information).

This random material verification process does **NOT** provide:

- The service line material configuration of every building served; or
- The extent to which specific areas of the distribution system may differ from the system-wide average occurrence rate of each service line material.

### Verification Exceptions:

- A water supply may avoid the material verification process if all potable water service lines within the water supply meet the strict definition of “known” described below.
- Water supplies may exclude from this verification service lines four inches or more in diameter. Guidance for addressing these service lines as part of the Complete Distribution System Materials Inventory (CDSMI) will be provided separately.

### Timing of Verification:

It is recommended that water supplies conduct this verification early enough in the CDSMI process to allow sufficient time for additional work, as needed, before the CDSMI is due to the Michigan Department of Environment, Great Lakes, and Energy (EGLE) by January 1, 2025. Consider completing this verification by the end of 2022, thereby allowing an additional two years to undertake any additional activities that may be necessary to complete the inventory.

### Random Material Verification Process

To evaluate the accuracy of potable water service line records and/or predict service line materials, a statistically sound, uniformly random number of service lines should be physically verified. Some supplies have already conducted recent physical verifications and/or have controls in place that dictate service line materials, resulting in a very high level of confidence in the materials of some

service lines. In recognition of this, the following protocol requires random verification of only those service lines of “unknown” material.

For the purpose of this verification, a **conservative** approach is used to determine when a service line’s material can be characterized as “known” and be excluded from the verification process.

To be considered “known,” and therefore excluded from the pool of sites from which a random sample will be drawn, a service line must meet criteria 1 or 2 below:

1. The service line was recently<sup>1</sup> physically verified and all of the following apply:
  - **ALL** points, as defined in Step 5 below, were recently physically verified;
  - The physical verification was **well documented** as to the material at each point; **AND**
  - The water supply has **not observed deviations** from these records during operations and maintenance.

**OR**

2. Ordinances or controls were in place and all of the following apply:
  - Ordinances<sup>2</sup> or other controls<sup>3</sup> were in place at the time the service line was installed specifying materials used in service line construction **AND**
  - The water supply has **not observed deviations** from these ordinance(s) or control(s) during operations and maintenance.

**Any service line that does not meet one of the two criteria above is considered “unknown” for the purpose of this verification process** and should be included in the list of locations from which a set of sites will be uniformly randomly selected for verification.

**>>NOTE:** Service lines four inches or more in diameter may be excluded from the verification process.

**>> NOTE:** This definition of “known” and the three- or four-point verification process described below in Step 5 **are specific to this baseline verification process** and may not apply to other aspects of the CDSMI. Further guidance on completing the rest of the CDSMI will be provided at a later date.

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<sup>1</sup> “Recently” in this context is water supply-specific. Supplies must define recent to include a time after which its records have been demonstrated to be reliable. No records prior to 1989 may be considered recent for the purpose of this portion of the verification process. The use of lead service lines was officially prohibited in Michigan in 1988; therefore, the health risk due to unreliable records is higher before this date. This does not mean service line records prior to 1989 have no value. They may have great value in finalizing a system’s CDSMI, but they cannot be used to exclude a location from the pool of sites from which random sites are selected for this verification.

<sup>2</sup> An ordinance is defined as: A law, statute, or regulation enacted by a municipal corporation. An ordinance is a law passed by a municipal government. A municipality, such as a city, town, village, or borough, is a political subdivision of a state within which a municipal corporation has been established to provide local government to a population in a defined area.

<sup>3</sup> A control, for the purposes of this guidance, is defined as: A general set of approved specifications or binding construction documentation that explicitly demonstrates that there were controls in place dictating the material usage in all public and private portions of a service line. Any controls must first have been explicitly adopted by the water system or directly defined for each blueprint used in construction.

## **Material Verification Process Steps**

### **Step 1: Identify all potable water service lines of “unknown” material.**

Identify all potable water service lines of “unknown” material (i.e., those not meeting the criteria of “known” provided above). Determine the total number of these “unknown” service lines. Service lines four or more inches in diameter may be excluded from this verification process.

Note: For the purpose of this verification process, assumed service line materials cannot be used to classify a service line as “known.”

### **Step 2: Identify how many service lines should be physically verified.**

- Water supplies with fewer than 1,500 “unknown” service lines must physically verify at least 20 percent of the total number of “unknown” lines.
- Water supplies with 1,500 or more “unknown” service lines must physically verify enough lines to reach a 95 percent confidence level. See **Appendix A** to determine the number of service lines requiring verification.

### **Step 3: Randomly select service lines for physical verification.**

From the list of “unknown” service lines identified in Step 1, randomly select enough service lines to at least meet the number requiring physical verification as determined in Step 2. Selection must be uniformly random and not selected based on any specific criteria which can introduce bias. In other words, each “unknown” service line must have an equal chance of being chosen for verification.

See **Appendix B** for an easy way to generate a uniformly random set of locations for verification.

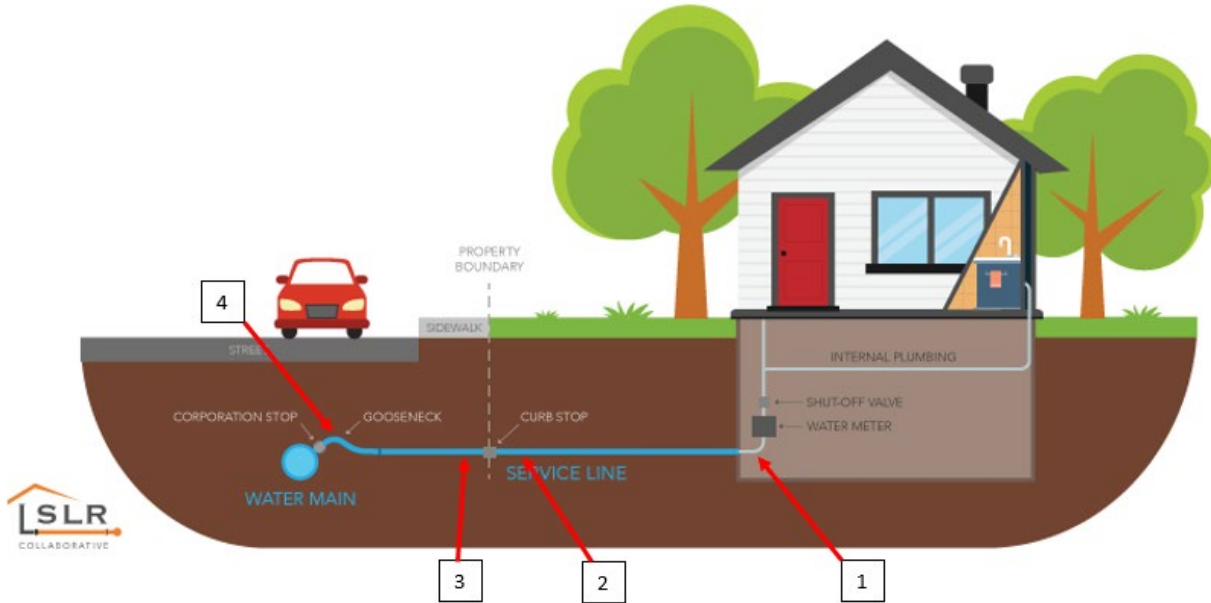
Note: It may be tempting to introduce a “logic” to the site selection process, such as selecting within periods of construction or targeting portions of town. However, doing so can unintentionally bias the data set. Be certain to use a truly random selection method such as the one described in Appendix B.

### **Step 4: Create a tool for tracking records and materials during verification.**

Create a spreadsheet (or other tracking mechanism) containing the randomly selected locations identified in Step 3. Include columns or fields for tracking both existing records and results of the physical verification. In this step, enter currently available information about service line materials based on pre-verification records. See **Appendix C** for an example spreadsheet.

### **Step 5: Conduct three- or four- point physical verification.**

Three or four points of physical verification are required for each service line. Physical verification methods may include potholing (by a variety of methods including hydro-vac, air-knifing, hand digging, etc.), trenching, televising, and in-home inspections. Always record the actual material observed for each point described below, even if the material was as expected. Do not use “non-lead” to describe the material.



Each service line requiring verification **must have the following three or four points physically verified** (numeric bullets refer to the numbered location in the illustration above):

1. **Interior portion** of the service line up to the first shutoff valve or 18 inches inside the building, whichever is shorter;
2. **Curb stop to building**, a minimum of 18 inches from the curb stop; and
3. **Main to curb stop**, a minimum of 18 inches from the curb stop.
4. **Lead connector (gooseneck/pigtail)**, if present. In this context, a gooseneck or pigtail is a short section of material, typically not exceeding two feet, which can be bent and used for connection between a rigid fitting (corporation stop) and the service line piping.

If a lead connector is present, a water supply must **EITHER**:

- Conduct a physical verification;

**OR**

- Have a control that was in place demonstrating they were never used;

**OR**

- Assume locations with galvanized service lines between the main and curb stop contain (or previously contained) a lead connector. If a water supply makes this assumption, they may skip physical verification of the gooseneck material.

**Note:** Unless assuming the current or previous presence of a lead gooseneck, most water supplies with galvanized service lines between the main and curb stop must physically verify the connector material.

**Step 6: Record results of physical verification in the spreadsheet created in Step 4.**

In the spreadsheet or tracking tool created in Step 4, enter the service line material observed at each point of the service line during the physical verification conducted in Step 5. Always record the actual material observed, such as lead, copper, plastic, galvanized steel, or other. Do not use “non-lead.”

**Step 7: Evaluate results of physical verification.**

This representative, uniformly random sample of service line materials should be, with a high probability, representative of service line materials from the portion(s) of the system from which the random set was selected. You can use this information to assess the reliability of your existing records and make sound assessments/decisions as you complete a system-wide inventory.

**Assess Reliability of Existing Records:**

Compare the historical records of your randomly selected sites with the new physically verified materials for those sites to evaluate the reliability of your water supply’s historical records. For example, what percent of the time did the physical verification match the historical records? If historical records are found to be unreliable, additional physical verification may be necessary.

**Predict Service Line Materials at Other Locations:**

The results of this verification, in combination with other available information, can be used to predict service line materials at other sites. Water supplies may need assistance with this process. Additional information will be provided in a separate guidance document.

**Retain Verification Records:**

Create, compile, and retain documentation of your verification efforts. You may be asked by EGLE to produce or submit these records.

**Beyond This Verification:**

This is not the end of the CDSMI process. As noted in Step 7, additional verification may be necessary if records are found to be unreliable, additional work may be needed to build-out the inventory, notifications to residents may be necessary, reporting to EGLE will be required, etc. Additional guidance on these steps will be provided later.

**Lead Service Line Notification Reminder:**

Written notification must be provided to the owner and occupant(s) of any building with a service line known, or assumed, to contain lead in any portion.

*This guidance was created in collaboration with the University of Michigan and with consideration of the ASDWA/BlueConduit white paper “Principles of Data Science for Lead Service Line Inventories and Replacement Programs” which can be found at: <https://www.asdwa.org/2020/09/25/asdwa-blueconduit-release-white-paper-on-lsl-data-methods>.*

**Appendix A: Minimum Number of Service Lines Requiring Physical Verification**

Number of "Unknown" Service Lines*	Number to Physically Verify
Fewer than 1,500	20% of "unknown" lines
1,500	306
1,600	310
1,700	314
1,800	317
1,900	320
2,000	322
2,200	327
2,400	331
2,600	335
2,800	338
3,000	341
3,500	346
4,000	351
4,500	354
5,000	357
6,000	361
7,000	364
8,000	367
9,000	368
10,000	370
15,000	375
20,000	377
30,000	379
40,000	381
60,000	382
90,000	383
225,000 or more	384

\* For the purposes of this verification process, this represents the number of service lines that do **NOT** meet the criteria for "known" service lines described at the beginning of this document. If the number of "unknowns" falls between two values on the chart, either interpolate or round up to the higher number.

## **Appendix B: Generating a Uniformly Random Set of Service Lines for Verification**

You can use a spreadsheet (such as Microsoft Excel or Google Sheets) to generate a uniformly random set of “unknown” locations for verification using the following steps:

1. In the first column of a spreadsheet, list every unique service location of “unknown” 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, using the following steps:
  - a. Enter the following formula in the second column: =RAND( )
  - b. Put the ‘=RAND( )’ formula next to each location.
  - c. This generates a number between 0 and 1 for each location.
  - d. Then select the column with the random values and use the spreadsheet’s “Copy” feature.
  - e. Then use the “Paste Special” option to “Paste Values Only” in the same column that you have already selected. This will ensure your random numbers remain static.
  - f. Then use the “Sort” feature to list the randomly generated numbers from lowest to highest. If the “Sort Warning” appears, select “Expand the selection,” then “Sort.”
3. Select only the top N homes, where N is the number requiring verification. For example, if you need to verify 20 locations, select the first 20 locations on the list. These are the 20 uniformly random locations requiring verification.

Here is a short [online tutorial](#) for generating random samples in Microsoft Excel. The same formulas and method work for Google Sheets.

**Appendix C: Example Field Verification Tracking Spreadsheet**

Service Line ID & Location		Service Line Material Based on HISTORICAL RECORDS							Service Line Material Based on FIELD VERIFICATION					
Parcel ID/ Service Line ID	Address	Connector (gooseneck)	Historical Record Main-to- Curbstop	Historical Record Curbstop- to-Home	Interior (18" or 1 <sup>st</sup> shutoff)	Date of Historical Record	Type of Record	Year Built	Connector (gooseneck)	Verified Material Main-to- Curbstop	Verified Material Curbstop- to-Home	Interior (18" or 1 <sup>st</sup> shutoff)	Date Verified	Method
123456789	23 Main St	NA	Copper	Copper	Unknown			1958	NA	Copper	Copper	Copper	1/2/2020	Hydrovac
123456790	60 1st Ave	NA	Copper	Copper	Unknown	12/1/1956	Note card	1951	NA	Copper	Copper	Copper	12/6/2019	Hydrovac
123456794	12 Michigan Ave	Unknown	Unknown	Copper	Copper			1927	Lead	Galvanized	Lead	Lead	6/20/2020	Excavation
123456795	34 2nd Ave	Lead	Galvanized	Copper	Copper				NA	Copper	Copper	Copper	11/22/2020	Hydrovac
123456796	941 W Main St	NA	Copper	Copper	Copper	3/15/1986	Permit	1954	NA	Copper	Copper	Copper	11/13/2019	Hydrovac
123456798	24 North St	Lead	Galvanized	Copper	Copper			1935	Lead	Galvanized	Lead	Lead	10/25/2020	Excavation
123456800	26 Grand Ave	Unknown	Unknown	Copper	Unknown	6/15/1929	Note card	1926	NA	Copper	Lead	Copper	11/28/2019	Excavation
123456803	13 24th St	Lead	Galvanized	Copper	Unknown	1/11/1952	Note card	1871	NA	Lead	Galvanized	Galvanized	5/25/2020	Hydrovac

NOTE: This table is only an example. Water supplies must document the location, existing records (if available), and findings of the physical verification. Water supplies should consider adding any additional columns that will capture data useful to the verification process or completion of the CDSMI.