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Know Your Pipe: Gas Inventory, Record Quality and Methane

Building the pipe inventory from the utility's own records, surfacing the records that contradict themselves, and estimating methane as an honest range

PRODUCT	Grid Data Enhanced Analytics
AUDIENCE	Gas integrity and asset managers, environmental and regulatory teams, executives

The questions everyone is asking

How much cast iron is left in the ground? How much bare or unprotected steel? How much of the plastic comes from the early vintages known for brittle failures? And what does the system emit?

Regulators ask these questions. So do investors, rating agencies, city councils and the utility's own board. Replacement programs, many with cost recovery attached, are argued in miles of legacy pipe. Emissions commitments are argued in methane, in CO2-equivalent, and in emissions per unit of gas delivered.

Every one of those answers starts in the same place: the utility's asset records.

Why it's hard

The records disagree with themselves. Material and installation year are often entered by different people, in different decades, for different reasons. The result can be a record that can't be right as written, such as a main recorded as cast iron with an installation year decades after the utility stopped laying cast iron. Either the material is wrong or the date is. Every inventory built on that record inherits the error, and so does every filing built on the inventory.

Some of what matters isn't recorded at all. Service lines are the classic gap. Many utilities know where their services are but not what they are made of. Steel records often don't say whether the pipe was ever cathodically protected. Both gaps matter, because material drives replacement priority and emissions alike.

A single number invites false confidence. An emissions estimate built on unknown service materials can still be presented as one precise figure. That figure looks authoritative and hides the fact that much of the uncertainty is a records question, one the utility could work to close.

Hazard and emissions are different rankings. A leak register grades leaks by hazard. A dangerous leak next to a building may emit very little, while a large non-hazardous leak under a road may emit for years. Programs built to find hazards are now asked to reduce volume too, and the two work lists are not the same.

The work is spread across teams. Integrity owns the leak register. Asset management owns GIS. The environmental team owns the emissions estimate. Each keeps its own copy of the pipe inventory, and the copies drift apart.

Principles of a good approach

1. **Build the inventory from the system of record.** One inventory by material class, from the utility's own asset records, so replacement, integrity and emissions work from the same numbers.
2. **Treat contradictions as findings.** A record that contradicts itself should be surfaced for someone to resolve, not quietly counted in one class or dropped.
3. **Say "possibly" when the record can't say more.** If a record can't confirm a fact that matters, such as whether steel is protected, report the uncertainty rather than guessing either way.
4. **Estimate emissions as a range.** Where the records leave a question open, let the range show it instead of hiding it in one number.
5. **Normalize.** Emissions per unit of gas delivered is the figure regulators and investors compare across utilities and years.
6. **State what isn't estimated.** List the gaps next to the number, and show which gap widens the range most.
7. **Report, don't rewrite.** Analytics should point at the record that needs fixing. The fix belongs to the people who own the record.

What it looks like in Grid Data Enhanced Analytics

Grid Data Enhanced Analytics (GDEA) joins the utility's GIS network model, SCADA telemetry and AMI data into one live picture of electric, gas and water networks. Its pipe and emissions analytics read the gas network's own asset records.

The inventory. GDEA builds the pipe inventory by material class from the utility's records, including cast iron, unprotected steel and vintage plastic, with the length of main in each class and the mains behind every total. Services are inventoried too, including how many have no recorded material.

Contradictions as findings. When a main's record contradicts itself, GDEA raises a records finding, names the main, and shows it alongside the inventory. GDEA doesn't change the record. The asset team decides which field is wrong and corrects it in GIS, and the inventory follows.

Methane as a range. GDEA estimates methane emissions from the utility's own records and reports them as a range, in methane and in CO2-equivalent, broken down by source. It also reports emissions per unit of gas delivered, using the throughput the utility already measures. Next to the range, GDEA states plainly what is not estimated. Services with no recorded material are often the main reason the range is wide, and steel with no recorded protection status adds to it. Emissions from individual leaks are not estimated, because the leak register records a hazard grade, not an emission rate. The result is a planning estimate the utility checks against its own reporting method before anything is filed.

Connected to replacement and the leak register. The inventory sits next to GDEA's graded leak register, with leak history by material and vintage. A replacement program can see which cohorts leak most, which mains carry them, and which records under those mains need fixing before the program's mileage goes into a filing.

GDEA is monitoring-only. It reports the inventory, the contradictions and the estimate. It doesn't edit asset records, file reports or dispatch crews.

> **ILLUSTRATIVE EXAMPLE (HYPOTHETICAL)**
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> Ahead of a rate case, an asset manager pulls the cast iron total for the replacement filing. GDEA shows the total with a records finding beside it: one main's record contradicts itself. The asset team checks the as-built drawings, finds the main is plastic, and corrects GIS. The inventory updates, and the mileage in the filing is right the first time. The same week, the environmental team reviews the methane estimate. The range is wide, and GDEA shows why: most of the spread comes from services with no recorded material. Rather than report one number that hides the gap, the team presents the range with its reason and makes the case for a service-line records project to narrow it next year. Meanwhile, the integrity team sees that the cohort leaking most per mile sits largely under a few mains, and moves them up the replacement discussion.

Questions to ask any vendor

- Is the pipe inventory built from our own asset records, by material class?
- Does it flag asset records that contradict themselves?
- Does it change our records, or report them for our team to fix?
- How does it treat steel whose protection status isn't recorded?
- Are methane emissions reported as a range, and does it explain what drives the width?
- Does it report emissions per unit of gas delivered?
- Does it say plainly what is not estimated?
- Can the inventory be seen next to leak history for the same materials and mains?

Closing

Regulators, investors and the public all want to know what is in the ground and what it emits. The honest answer starts with records that agree with themselves, an inventory everyone shares, and an emissions estimate that shows its uncertainty instead of hiding it. That is a stronger position in a rate case, an emissions report or a board meeting than a precise number no one can defend.

Learn more about Grid Data Enhanced Analytics at perinimble.com/grid-data-enhanced-analytics/, or talk with our team at perinimble.com/contact/.

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