



A “Deep Dive” into Public Works

Water Distribution + Water Maintenance

AssetWORKS

Public Works organizations are made up of a number of distinct work groups that have roles and responsibilities specific to their chosen fields. Each work group has a separate set of requirements that pertain to their specialty. In this white paper, we will focus on the Water Distribution and Water Maintenance groups to outline the similarities and differences between the groups, while identifying the unique assets and requirements these groups must adhere to.

A Public Works Water Department is generally made up of city/county employees which constitute the main personnel responsible for the condition and functional success of the water distribution system. The personas generally seen inside this department are:

Water Distribution Operator

Inspects, maintains, monitors and controls water system facilities and equipment both manually and remotely by computer to regulate treated water distribution and control water quality. These fully qualified operators are responsible for the efficient operation and general maintenance of a water distribution system without immediate supervision.

Water Distribution Technician

Responsible for the efficient and cost-effective installation, maintenance and repair of city water distribution systems. This position is responsible for the uninterrupted delivery of safe aesthetically pleasing water to the residents of their area.

Water Distribution Field Supervisor

Supervises a team of technicians who are responsible for the construction, repair and maintenance of water services, mainlines, fire hydrants, water valves and large and small water meters.

Water Distribution Maintenance Operator

Responsible for the installation or replacement of new water assets such services, mains, valves, hydrants and meters. This position will occasionally be working in confined spaces including water meter vaults and valve manholes. The position includes work in the public right of way, on private property inside dedicated easements and often in high traffic areas inside a work zone.



The assets which the water department are primarily responsible for include:

- Water Main – Linear pipe used to supply water to customers throughout the service area.
- Water Hydrants – Access points to provide water to emergency and commercial entities primarily.
- Water Valves – Access points to shut off and turn on water to certain service areas.
- Water Meters - Meter is owned and maintained by PWD; owners must keep the meter accessible and protected, especially from freezing.

The water department supports point and linear (length based) assets in their inventory and must devise a maintenance schedule that best suits the needs of the populace as well as the overall health of the water system as a whole. This group cannot base their maintenance strategies on a “worst first (triage)” basis as some assets do not have a high enough risk or impact on the entire system to warrant spending extra tax dollars for the repair and/or replacement.

What are the challenges experienced by these groups?

Water departments have unique challenges since their assets are considered “Networked”. What does networked mean? Networked means that a single asset failure anywhere in the city or county could have significant impacts on the other assets in the area. Results from these failures could be widespread water outages and flooding, to name a few. The most often posed questions for determining a valid asset inventory and maintenance plan are:

- What assets do I have?
- Where are they located?
- What condition is it in?
- How long are my assets supposed to last (Useful Life)?
- What is the value of my asset?

Ascertaining what assets the department is responsible for is actually much harder than it sounds, especially for those groups that have underground assets like water and sewer departments. Many departments use GIS to track their known asset inventory but completing a total asset inventory would involve an extensive CCTV inspection of the entire network to ensure all underground assets are collected. Once the department has a full inventory of their assets, information regarding its condition will need to be collected. Luckily for those departments using CCTV, both inventory and condition can be collected at the same time.

One of the main concepts of asset condition to many Water Departments is risk and failure analysis. When attempting to determine the “Value” and “Condition” of these assets, workers must establish an identification of the high risk / high consequence assets first. These assets are integral to the system and cannot operate at an acceptable level without them. This is considered business risk-driven condition assessment. One other strategy is Problem Assets-Profile, which identifies the concept that 20% of assets cause 80% of the problems inside a network system.



The National Association of Sewer Service Companies' (NASSCO) focus for many years was on sewer inspection processes, but their main focus has changed over time, now becoming the leader in "setting industry for the assessment, maintenance, and rehabilitation of underground infrastructure, and to assure the continued acceptance and growth of trenchless technologies."¹ The NASSCO coding system applies to any pipe (water, sewer, gas, etc.) and categorizes defects and features into five categories: continuous defects, structural defects, operational and maintenance, construction features and miscellaneous features coding.

- **Continuous Defect Coding:** Continuous defect coding is made up of two separate coding classifications. The first is called "Truly" continuous defects - defects that run along the sewer and the second is "Repeated" continuous defects - continuous defects that occur at regular intervals along the pipe.
- **Structural Defect Coding:** Structural defect codes include many separate coding classifications. Codes define the type of defects that are related to structural degradation of the pipe due to various reasons such as cracks (C), fractures (F), breaks (B), etc.
- **Construction Features Coding:** Construction features codes indicate features located in or around the pipe system such as tap (T), intruding seal material (IS), etc.

- **Operational and Maintenance Defect Coding:** O&M codes define the type of defects that are related to lack of maintenance such as deposits (D), roots (R), infiltration (I), etc.
- **Miscellaneous Features Coding:** Miscellaneous features coding includes many sub-coding classifications. This section uses coding to indicate miscellaneous (M) features in the pipe system. Under this subtitle, the miscellaneous designation is combined with other letters to further define the type of defect.



The severity ranking considers the immediate defect, risk of failure and rate of deterioration.

- **Severity Grade 1** – Pipe segment has minor defects - failure unlikely in the foreseeable future.
- **Severity Grade 2** – Pipe segment has minor defects - pipe unlikely to fail for at least 20 years.
- **Severity Grade 3** – Pipe segment has moderate defects - deterioration may continue, at a ten to twenty year time frame.
- **Severity Grade 4** – Pipe segment has severe defects - risk of failure within the next five to ten years.
- **Severity Grade 5** – Pipe segment has failed or will likely fail within the next five years – requires immediate attention.

Grade	Description	Estimated time to failure
1	EXCELLENT: minor defects	Unlikely in the foreseeable future
2	GOOD: defects that have not begun to deteriorate	20 years or more
3	FAIR: moderate defects that will continue to deteriorate	10 to 20 years
4	POOR: severe defects that will become grade 5 defects within foreseeable future	5 to 10 years
5	IMMEDIATE ATTENTION: defects require immediate attention	Has failed or likely to fail within 5 years



The Pipeline Assessment and Certification Program (PACP) also uses a quick rating system, which is a shorthand method of expressing the number of occurrences for the 2 highest grade levels. The quick grading system uses four numerical characters:

- The first number is the highest severity grade occurring along the entire pipe length.
 - The second number is the total number of times that the highest severity grade was noted in all of the defects along the pipe length.
 - The third number is the next highest severity grade occurring along the pipe length.
 - The fourth number is the total number of the second highest severity grade occurrences, which is formatted the same way as the second character.
- For example, a code of 3224 would mean that the pipe's worst severity grade for any defect was 3 (moderate defect) and that there were two defects identified with a severity of grade 3, and four grade 2 defects were identified in the pipe segment. This also summarizes that no grade 4 or 5 defects were found. The quick grading system allows the pipe defects to be summarized in an efficient manner.

Supporting a networked system requires the ability to understand how one asset failure causes another asset to fail or an interruption of service for all down network assets. The condition of the network is also dependent upon its pieces and each piece has a specific percentage of impact it has to the whole network based on business risk. For example, a section of water main that serves two of the largest communities in the city is more critical than a section of water main that serves one of the smallest communities in the city because of the impact to the constituency as a whole. Many more will be impacted if the first scenario occurs than in the second scenario.

Conclusion

While water distribution and water maintenance are sometimes different groups within a Public Works organization, the needs for the groups are very similar. AssetWorks EAM software can support the maintenance requirements for these areas including maintenance scheduling, repair work, testing requirements, data gathering and attribute updating for assets as individuals. AssetWorks EAM can integrate with an organization's existing tools to support the following areas where certain software requirements are used in these specific work centers:

- Permitting software for new water connections.
- Water Network Composite Condition scores based on components/network.
- Risk assessment software for determining the highest risk / lowest condition assets for immediate maintenance consideration.
- CCTV integration to build out- Codes / tests / maintenance strategies.

**To learn more about AssetWorks EAM,
please visit assetworks.com/eam.**



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