

Asset Intelligence for for Water Utilities

Transforming Asset Management
with Geospatial Intelligence

Fall 2026



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Executive Summary

More than six million miles of pipe¹ hidden below ground for drinking water,² wastewater,³ and stormwater⁴ systems across the United States are creating a management challenge of massive scale. This is enough pipe to wrap around the Earth 240 times, an invisible lifeline spanning the nation and quietly delivering safe water to communities every second. Yet it is aging beneath our feet and demands urgent attention to maintain the systems we depend on every day. The value of these water and wastewater system assets exceeds \$1 trillion.⁵ Every decision a utility makes, from maintenance to capital investment, depends on knowing what assets exist, where they are, and how they are performing. However, many organizations still operate without a complete, accurate picture of their systems. The reality is simple. Our industry cannot effectively manage, maintain, or prioritize repairs for six million miles of pipe if we do not know exactly where they are or their condition.

Geographic information system (GIS) technology has long served as the foundation for managing water utility assets by providing a location-based inventory of infrastructure. Over time, GIS has evolved from a mapping system into an enterprise platform that connects assets, people, processes, and data. Today, GIS enables utilities to visualize, analyze, and manage infrastructure within its geographic context, providing a common operating picture across the organization.

Historically, asset information has been scattered across disconnected systems and institutional knowledge, limiting visibility and leading to inconsistent decisions. Modern asset management depends on accurate, accessible, and shared data. GIS addresses this challenge by serving as a centralized system of record that connects assets to location, captures relationships, and provides context for operational and environmental conditions.

As asset management programs mature, GIS becomes more than a repository of asset information. It provides the foundation for strategic decision-making by integrating data across systems, supporting risk-based planning, and improving visibility into infrastructure performance. By connecting operational, financial, and spatial information, GIS helps utilities prioritize investments, allocate resources effectively, and improve service reliability.

Utilities that invest in GIS-enabled asset management gain the visibility needed to manage infrastructure proactively, reduce risk, and support long-term resilience. As regulatory requirements, infrastructure needs, and customer expectations continue to grow, GIS provides the foundation for informed decisions and sustainable management of critical water assets. ■

¹ <https://www.gp-radar.com/article/improving-and-investing-in-americas-water-wastewater-and-stormwater-infrastructure>

² <https://www.asce.org/advocacy/priority-issues/water-infrastructure>

³ <https://infrastructurereportcard.org/cat-item/wastewater-infrastructure/>

⁴ <https://infrastructurereportcard.org/cat-item/stormwater-infrastructure/>

⁵ <https://infrastructurereportcard.org/cat-item/wastewater-infrastructure/>



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Asset Management Maturity

Effective asset management in water utilities is grounded in a set of well-established best practices, yet many utilities continue to face challenges in consistently applying them. These practices include maintaining an accurate and complete inventory of assets, understanding condition and risk, aligning investments with levels of service, and integrating planning with operations and maintenance. While the principles are widely recognized, advancing maturity remains difficult due to fragmented data systems, limited resources, and competing operational priorities. As a result, many utilities operate reactively rather than strategically, limiting their ability to optimize performance, reduce risk, and demonstrate compliance.

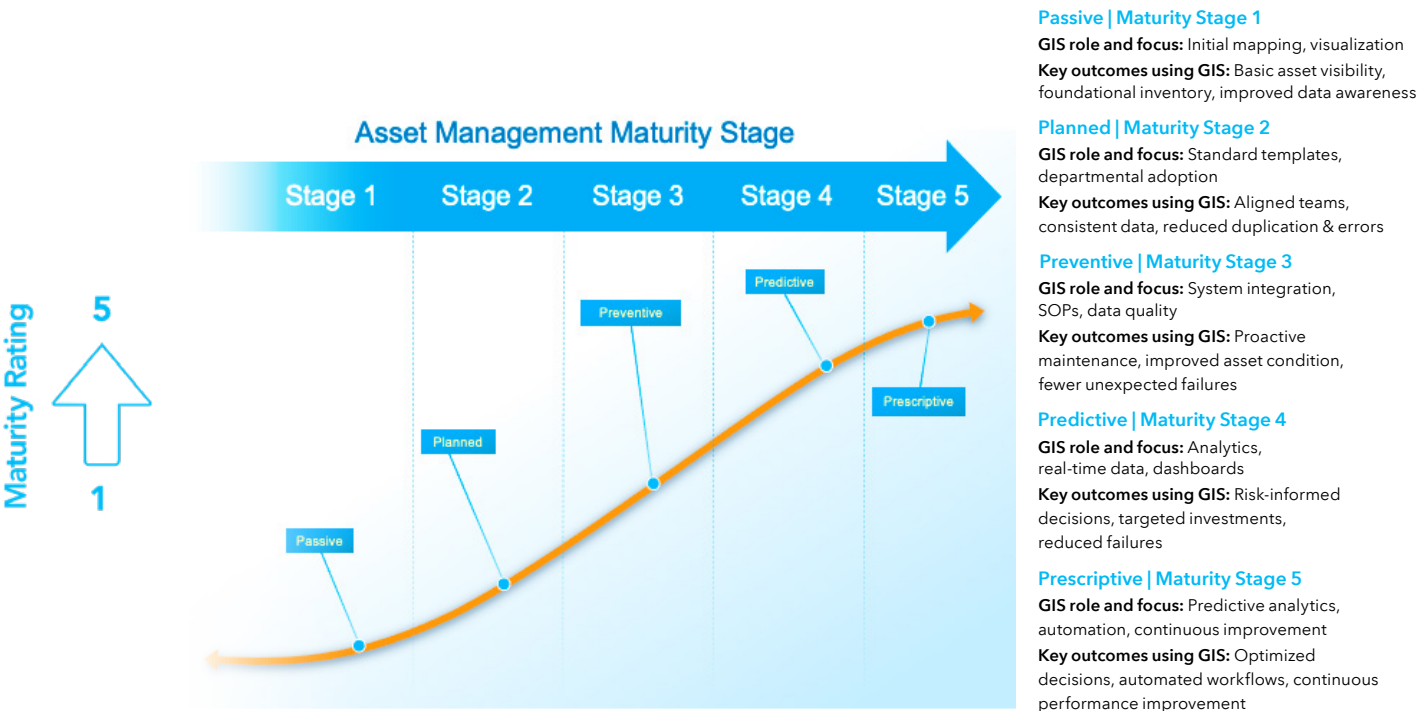
Asset management maturity progresses from Level 1 (Passive) and Level 2 (Planned), where asset data is incomplete, processes are inconsistent, and decisions are largely driven by immediate needs or asset failures, to Level 3 (Preventive), where standardized practices, centralized data, and documented processes begin to

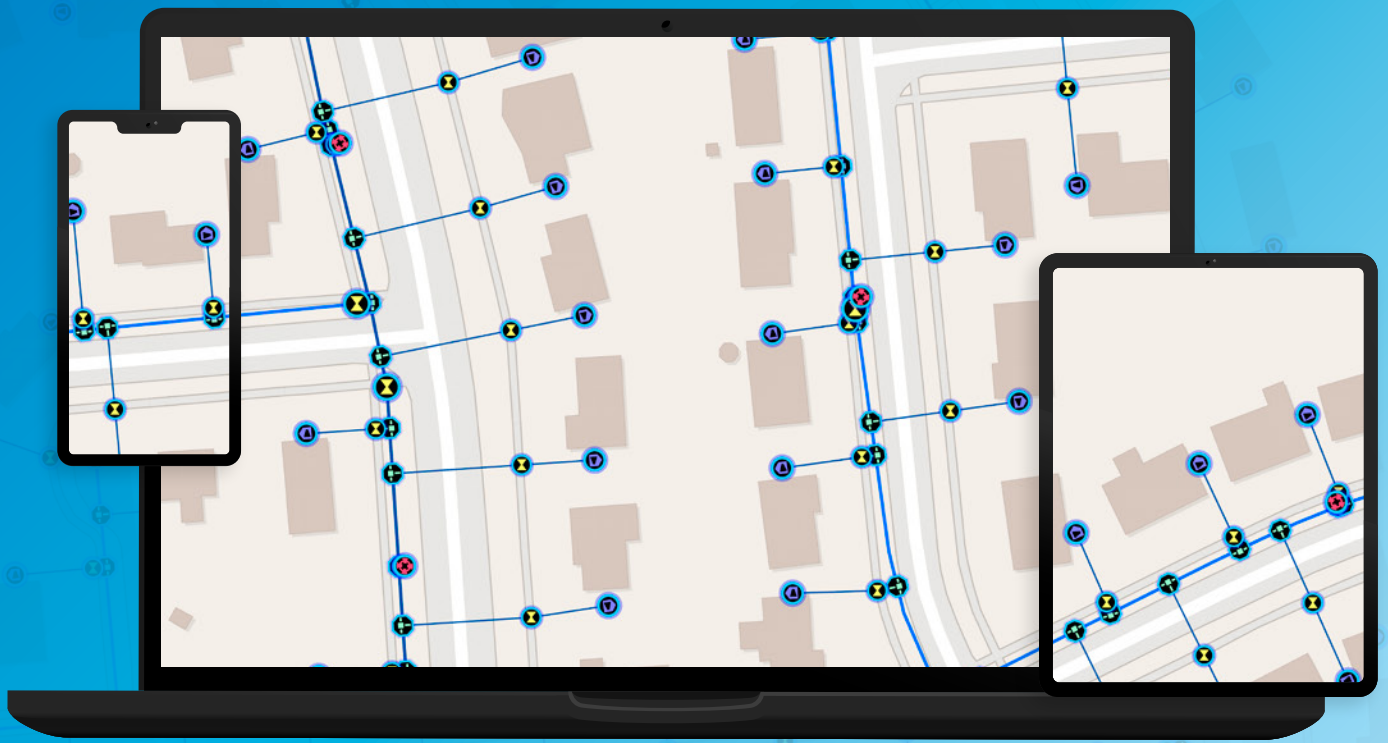
guide capital improvement project (CIP) planning and operations. At Level 4 (Predictive) and Level 5 (Prescriptive), utilities leverage integrated systems, advanced analytics, and performance metrics to anticipate risk, optimize life cycle investments, and continuously improve outcomes aligned to service levels and regulatory requirements.

Level 1: Passive (Basic Awareness)

A passive maintenance plan is often referred to as run to failure. The asset is not set to any planned maintenance schedule. This is applied when risk is low and the cost to maintain outweighs the cost to replace. Asset information is limited, decentralized, and largely static. There is no formal approach to managing assets across their life cycle, and decisions are reactive.

What it means: A utility is just getting its assets mapped and documented. Information may exist in paper records, PDFs, or scattered files. GIS is mainly used as a map viewer. ▶





Asset Management Maturity (continued)

Outcome: The utility can see where assets are and has a basic inventory, but the data is incomplete, inconsistent, and not trusted for decision-making.

How GIS moves them forward: GIS replaces paper and disconnected data with a central, digital system of record. This creates a single source of truth and builds trust in the data, which is required before any coordination can happen.

Level 2: Planned (Standardized and Shared)

A planned maintenance program is applied when an asset is set to a scheduled maintenance program. Typically, this is defined by the manufacturer and is set at a defined time-based interval. Asset data is standardized and governed through defined data models and processes. Coordination begins across departments, though integration between systems and life cycle management practices is still limited.

What it means: The utility agrees on how to store and manage asset data. Different teams are using the same maps, structures, and workflows.

Outcome: The utility works more consistently. Engineering, operations, and asset management are aligned, reducing confusion, duplicate work, and data conflicts.

How GIS moves them forward: GIS provides standard data models, templates, and shared access, which breaks down silos. This allows teams to collaborate using the same information, setting the stage for system integration.

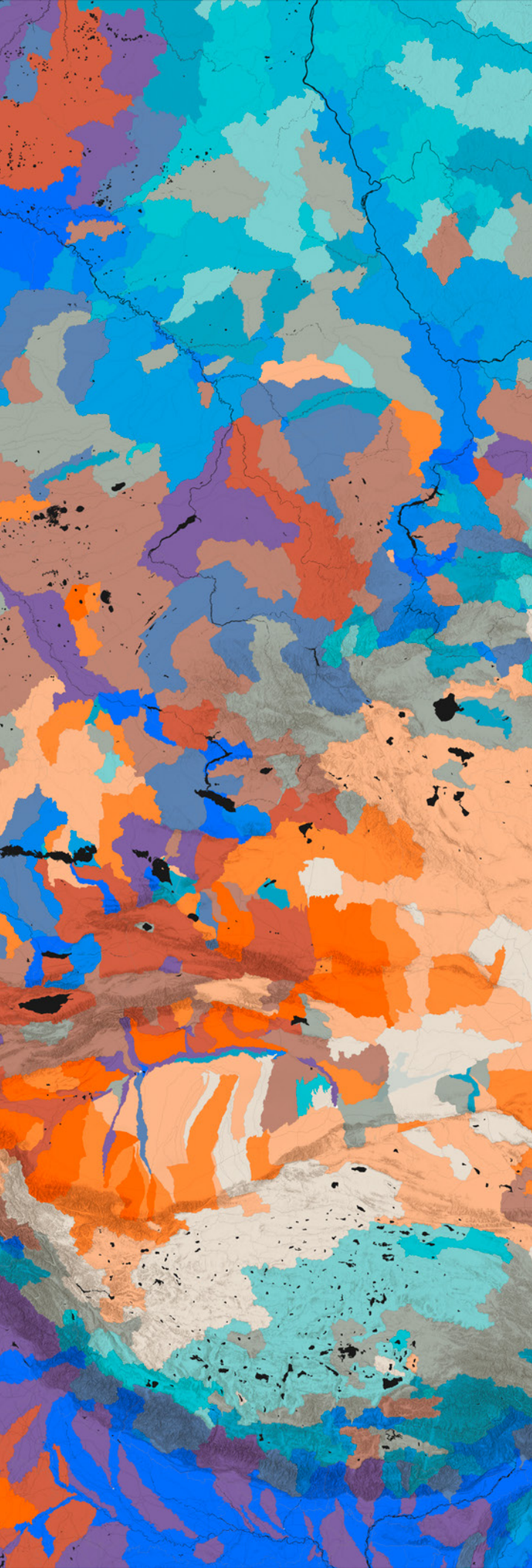
Level 3: Preventive (Operational and Maintained)

A preventive maintenance program requires additional information to derive an assessment of the asset's current operating condition. The utility has formalized asset life cycle processes with routine maintenance, inspections, and condition tracking supported by integrated systems. Data is actively managed, updated, and used to support operational planning.

What it means: The utility uses GIS in daily work. Mobile crews update data, inspections are tracked, and systems are connected.

Outcome: The utility maintains assets on a schedule instead of reacting to failures. Data is current, workflows are defined, and staff rely on GIS to do their jobs.

How GIS moves them forward: GIS connects to asset management, work orders, and mobile tools, ensuring data flows between office and field. This enables routine inspections and preventive maintenance, reducing unexpected failures. ▶



Asset Management Maturity (continued)

Level 4: Predictive (Insight-Driven)

A predictive asset management program is risk based and data-driven, using condition, performance, and criticality to forecast asset behavior and prioritize investments.

What it means: The utility uses data to anticipate problems before they happen. Utility staff understand which assets are most likely to fail and why.

Outcome: The utility reduces risk, avoids costly failures, and prioritizes spending based on actual need rather than guesswork.

How GIS moves them forward: GIS integrates real-time data, condition data, and spatial analysis to identify patterns and risks. This allows the utility to predict failures and target investments, improving reliability and performance.

Level 5: Prescriptive (Optimized and Automated)

A prescriptive asset management program is optimized and continuously improved through advanced analytics, automation, and decision-support systems that recommend actions asset life cycle and align with other programs including capital expenditure and refurbishment.

What it means: The system not only predicts problems but also recommends what to do next. Many processes are automated.

Outcome: The utility operates proactively and efficiently, continuously improving performance while reducing costs and risk.

How GIS moves them forward: GIS uses automation, machine learning, and advanced analytics to recommend actions, optimize maintenance plans, and adjust operations in real time. GIS is the strategic platform for decision-making and continuous improvement.

As utilities advance in asset management maturity, the need for structure, accountability, and consistency grows. Industry standards provide a framework for turning asset management principles into measurable practices that support informed decision-making, effective governance, and long-term performance. GIS helps operationalize these standards by connecting asset data, workflows, and performance to location, enabling utilities to align daily operations with strategic goals, demonstrate compliance, and drive continuous improvement. ■



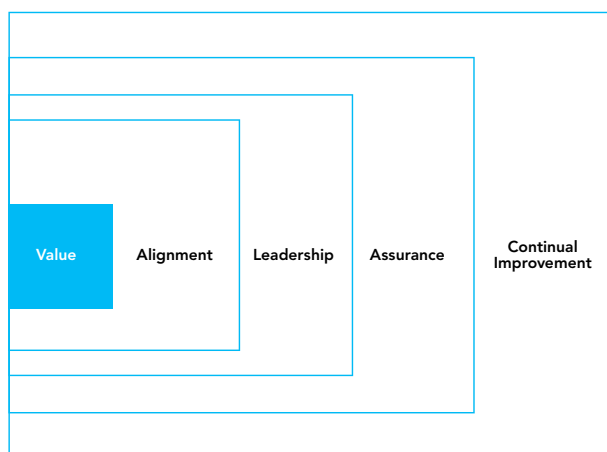
Industry Standards

As water utilities mature their asset management programs, success depends on aligning operations with industry standards such as ISO 55000 and CMOM (capacity, management, operations, and maintenance). These frameworks provide a structured approach for balancing risk, cost, and service levels while supporting regulatory compliance, organizational alignment, and long-term sustainability.

GIS helps utilities put these standards into practice by connecting assets, activities, and performance within a single system. By translating standards into location-based workflows, GIS enables consistent execution, performance tracking, and measurable outcomes, which turns industry guidance into day-to-day operational improvement.

ISO 55000

GIS helps ensure ISO 55000 compliance by providing a single, authoritative system to identify, visualize, manage, and govern assets in compliance with the standard's core principles:



Value: ISO 55000 requires assets to deliver value aligned to organizational objectives.

How GIS enables this:

- Links assets to the customers and service areas they support, so utilities can quantify service impact (e.g., customers affected by a main break).
- Integrates condition, failure history, and criticality to calculate risk-based value of maintenance or replacement.
- Supports scenario modeling, such as which capital projects reduce the most risk or improve level of service.

Investment decisions are prioritized based on service impact and risk reduction, not just age or intuition, identified through geospatial analysis or modeling in GIS.

Alignment: The standard emphasizes alignment between asset management activities and business goals.

How GIS enables this:

- Connects enterprise systems such as computer maintenance management system (CMMS), SCADA, financial systems, and hydraulic models into a geospatial context
- Provides a shared operational picture across engineering, operations, finance, and leadership
- Maps capital improvement and maintenance directly to strategic goals like regulatory compliance or level of service targets

Utilizing GIS for alignment ensures departments are working from the same data and contributing to clearly defined, organization-wide objectives. ►

Industry Standards (continued)

Leadership: ISO 55000 calls for clear accountability, governance, and organizational commitment.

How GIS enables this:

- Acts as the system of record for asset ownership, responsibility, and data stewardship, and provides structure to asset onboarding and visualization standards
- Provides easy-to-use and understandable dashboards and mobile applications that translate technical asset data into business metrics
- Supports transparent decision workflows, so leadership can trace how and why decisions are made

GIS provides leadership visibility into asset performance and risk, enabling informed, defensible decisions.

Assurance: The assurance standard requires confidence in asset information, processes, and outcomes.

How GIS enables this:

- Maintains authoritative asset inventories with version control, audit trails, and validation rules
- Standardizes data models and workflows to ensure consistency across the organization
- Provides traceability from field data collection to reporting, supporting audits and regulatory compliance

After asset information is collected and validated in GIS, that GIS data is reliable, workflow processes are repeatable, and both are defensible, which reduces compliance risk and improves audit readiness.

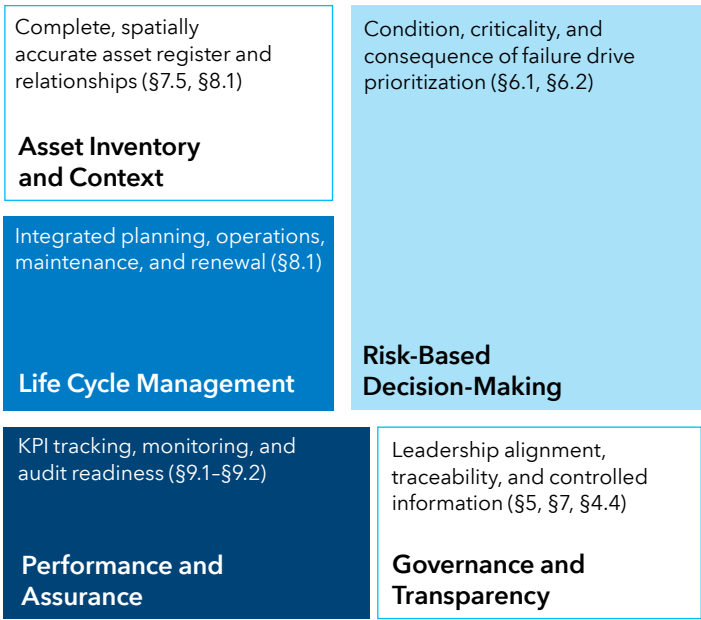
Continual Improvement: ISO 55000 emphasizes ongoing evaluation and optimization through continuous improvement practices.

How GIS enables this:

- Captures real-time and historical data on asset performance, failures, and work activities
- Enables spatial analysis to identify trends, such as recurring failures in specific soil conditions
- Supports feedback loops where maintenance outcomes inform future planning and design

GIS empowers utilities to shift from reactive to predictive and prescriptive asset management, continually improving performance and reducing costs.

GIS Enables ISO 55000 by:



GIS operationalizes ISO 55000 by turning policy and governance requirements into actionable, location-based asset intelligence. ▶

Capacity, Maintenance, Operations, and Management (CMOM)

GIS ensures adherence to CMOM (capacity, maintenance, operations, and management) plans by providing a unified spatial system that documents assets, monitors system performance, prioritizes risk, and tracks compliance activities across the wastewater network.

GIS operationalizes CMOM plans by turning regulatory requirements into measurable, location-based actions that are auditable, defensible, and repeatable.

GIS-Enabled CMOM

Capacity

Mapping collection system assets, service areas, and flows to identify bottlenecks, surcharge risks, and capacity constraints

Maintenance

Scheduling, tracking, and spatially verifying inspections, cleaning, and rehabilitation activities (e.g., CCTV, root control)

Operations

Enabling real time situational awareness for overflows, blockages, and alarms by linking SCADA, work orders, and field data to location

Management

Providing dashboards, audit trails, and reporting to demonstrate regulatory compliance, risk reduction, and continuous improvement

Regulatory Compliance

GIS helps ensure regulatory compliance in the water, wastewater, and stormwater industries by acting as a system of record that links regulatory requirements to assets, activities, and performance, both spatially and operationally.

Program-Specific Compliance Support:

- **Drinking Water:** track sampling locations, pressure zones, monitoring results, and compliance boundaries
- **Wastewater:** supports CMOM, sanitary sewer overflows (SSOs), permit conditions, and consent decree reporting
- **Stormwater:** manages municipal separate storm sewer system (MS4) assets, drainage networks, impaired waters, and best management practice (BMP) inventories

GIS operationalizes regulatory compliance by transforming rules and permits into measurable, location-based actions that reduce risk, improve accountability, and support long-term system sustainability. ►

GIS-Enabled Compliance Provides:

Authoritative asset inventory	Maintain a complete, location-based record of regulated assets (pipes, valves, maintenance holes, facilities, outfalls) required under permits and consent decrees.
Inspection, maintenance, and documentation	Spatially track inspections, work orders, and corrective actions to demonstrate required maintenance and response activities.
Risk, performance, and prioritization	Link condition, criticality, and consequence of failure to location to support risk-based, defensible decision-making aligned with regulatory expectations.
Reporting, auditability, and transparency	Produce maps, dashboards, and reports that provide traceable, repeatable evidence for regulators, audits, and public reporting.





Case Study

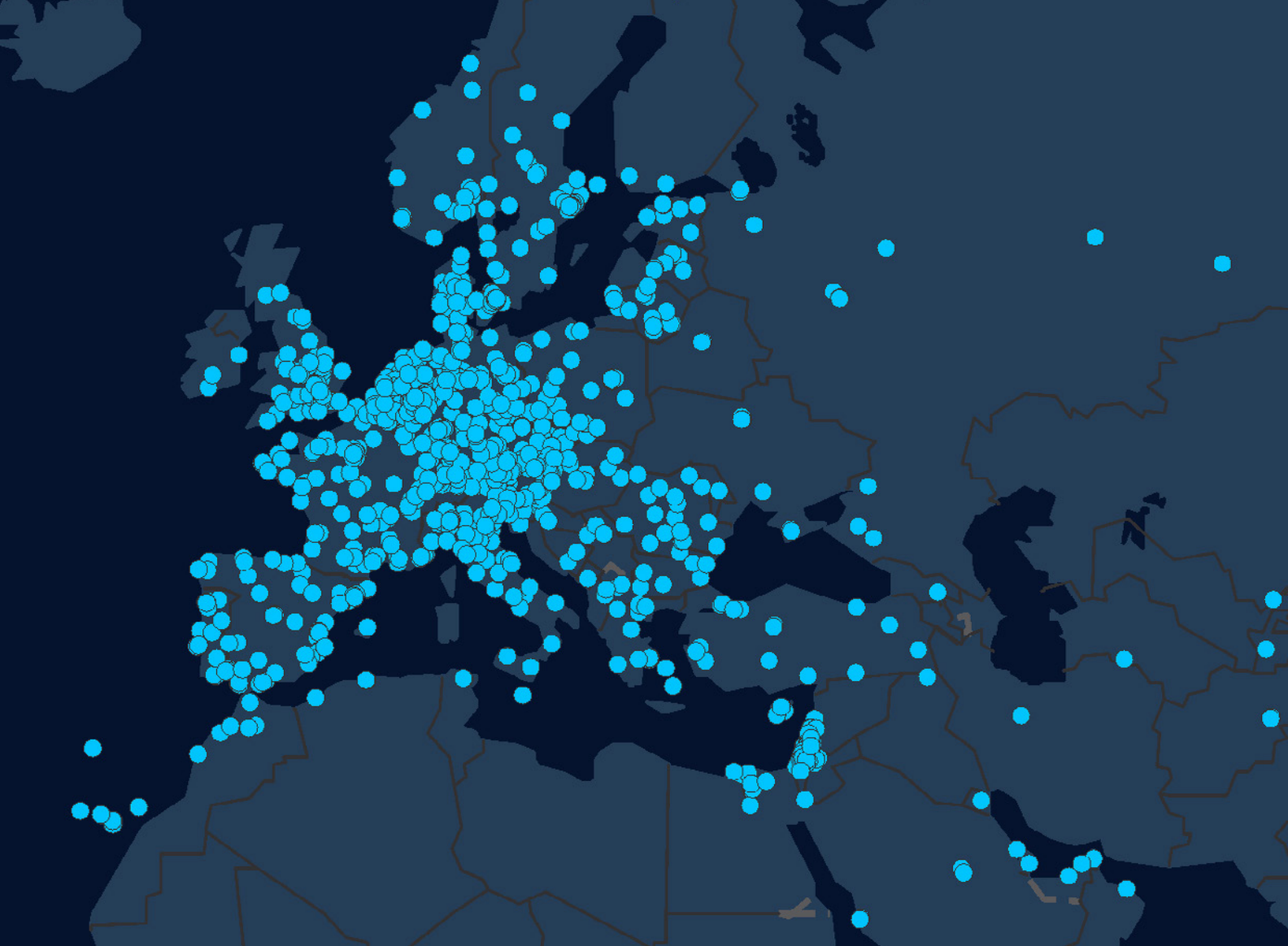
City of Pomona

Permitting Compliance Solution Enabled by GIS

The City of Pomona's stormwater program shows how GIS can turn regulatory compliance into a foundation for stronger asset management. To support National Pollutant Discharge Elimination System (NPDES) permit requirements across the Santa Ana and San Gabriel watersheds, the city replaced paper forms, spreadsheets, and manual reporting with ArcGIS® software-based field workflows, dashboards, and centralized asset data. Mobile crews now inspect stormwater assets, document maintenance, capture photos, track debris removal, and update asset conditions directly from the field. This improved data accuracy, reduced annual reporting effort, and gave managers better visibility into completed work, outstanding needs, and infrastructure priorities. Pomona's experience demonstrates that compliance workflows can do more than satisfy reporting requirements. When supported by modern GIS, they create defensible records, improve accountability, and help utilities make more informed decisions about maintenance, investment, and long-term system performance. ■



[Read the full story](#)



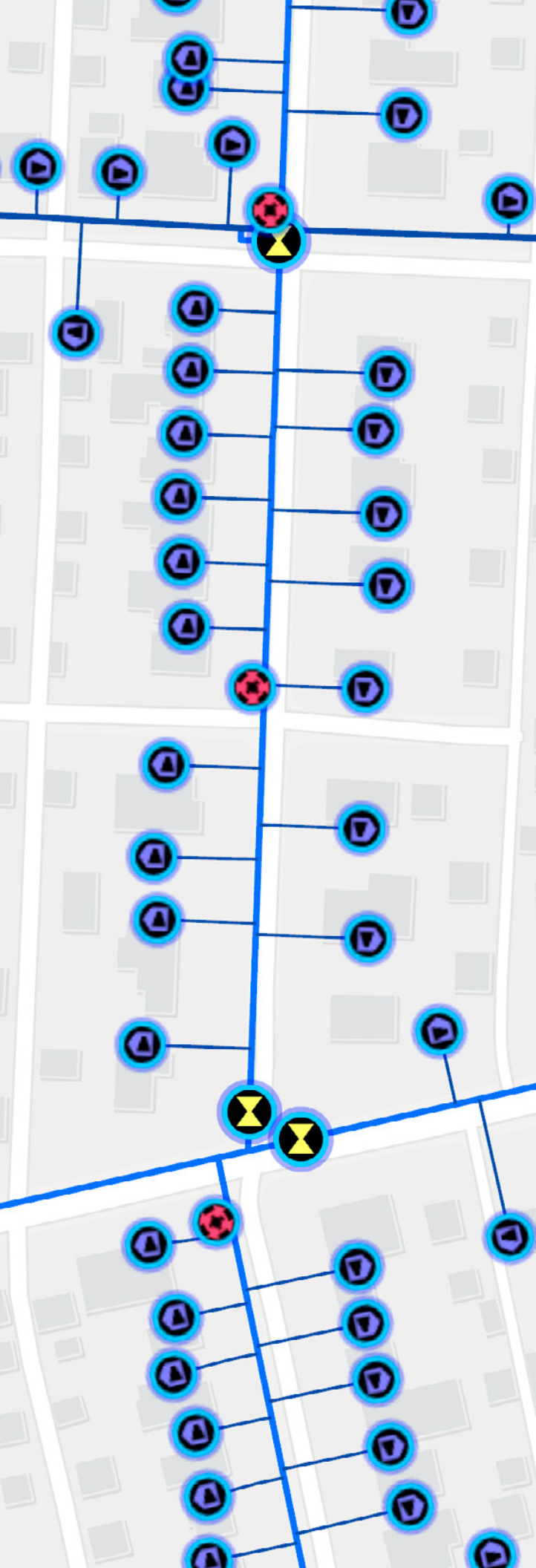
Modern Geospatial Capabilities

Water utilities are reaching the limits of traditional asset management approaches. Static maps, paper-based workflows, and siloed data cannot scale as asset inventories grow and experienced staff retire. Modern geospatial technologies address these challenges by connecting asset information across the life cycle, preserving institutional knowledge, and improving visibility into infrastructure performance.

At the center of this transformation is ArcGIS Utility Network, which provides a system of record for asset connectivity and supports advanced network tracing, system analysis, and enterprise integration. This enables utilities to better understand system behavior, improve operational coordination, and make more proactive, data-driven decisions.

Integrating building information modeling (BIM) with 3D GIS extends these capabilities by linking engineering designs to real-world spatial context. Utilities can visualize assets in three dimensions, validate designs before construction, and maintain asset intelligence from planning through operations and renewal.

Geospatial AI further enhances decision-making by applying machine learning and advanced analytics to network, sensor, and imagery data. These capabilities help utilities identify patterns, assess risk, predict failures, and automate analysis. Together, ArcGIS Utility Network, BIM and 3D GIS, and GeoAI provide a modern foundation for improving reliability, reducing costs, and managing aging infrastructure more effectively. ►



Modern Geospatial Capabilities (continued)

ArcGIS Utility Network

Modernized network management enables water utilities to model, manage, and maintain complex infrastructure systems with greater accuracy and confidence. ArcGIS Utility Network provides a system of record for asset connectivity, capturing how assets are physically and operationally connected across drinking water, wastewater, and stormwater systems. This connectivity model supports advanced network tracing to understand flow paths, identify upstream and downstream dependencies, and assess the impact of planned or unplanned events. As a result, utilities gain greater visibility into system behavior, improving engineering analysis, risk assessment, and operational planning.

ArcGIS Utility Network also serves as a foundation for integrating GIS with enterprise systems such as asset management, work management, customer information, and SCADA. By bringing these systems together within a common operating environment, utilities can support consistent data sharing and coordinated workflows across departments. Mobile crews, engineers, and asset managers can operate from a shared, authoritative source of information, improving service interruption and overflow response, streamlining maintenance prioritization, and supporting condition-based asset management. This integrated approach helps utilities move from reactive operations to proactive, data-driven decision-making throughout the asset life cycle. ▶



Modern Geospatial Capabilities (continued)

Tualatin Valley Water District Applies Utility Network Tracing to Drive Smarter Capital Planning

Tualatin Valley Water District (TVWD) implemented ArcGIS Utility Network to improve capital planning, system resilience, and outage management. By replacing manual analysis with automated network tracing, the utility can evaluate valve placement, identify single-feed areas, quantify outage impacts, and assess system redundancy. Custom trace analyses reveal how shutdowns affect customers, assets, and pipe segments, helping prioritize capital investments such as new valves and looping projects. The result is a more proactive, data-driven approach to risk reduction, operational planning, and long-term infrastructure management.



[Read the full story](#)

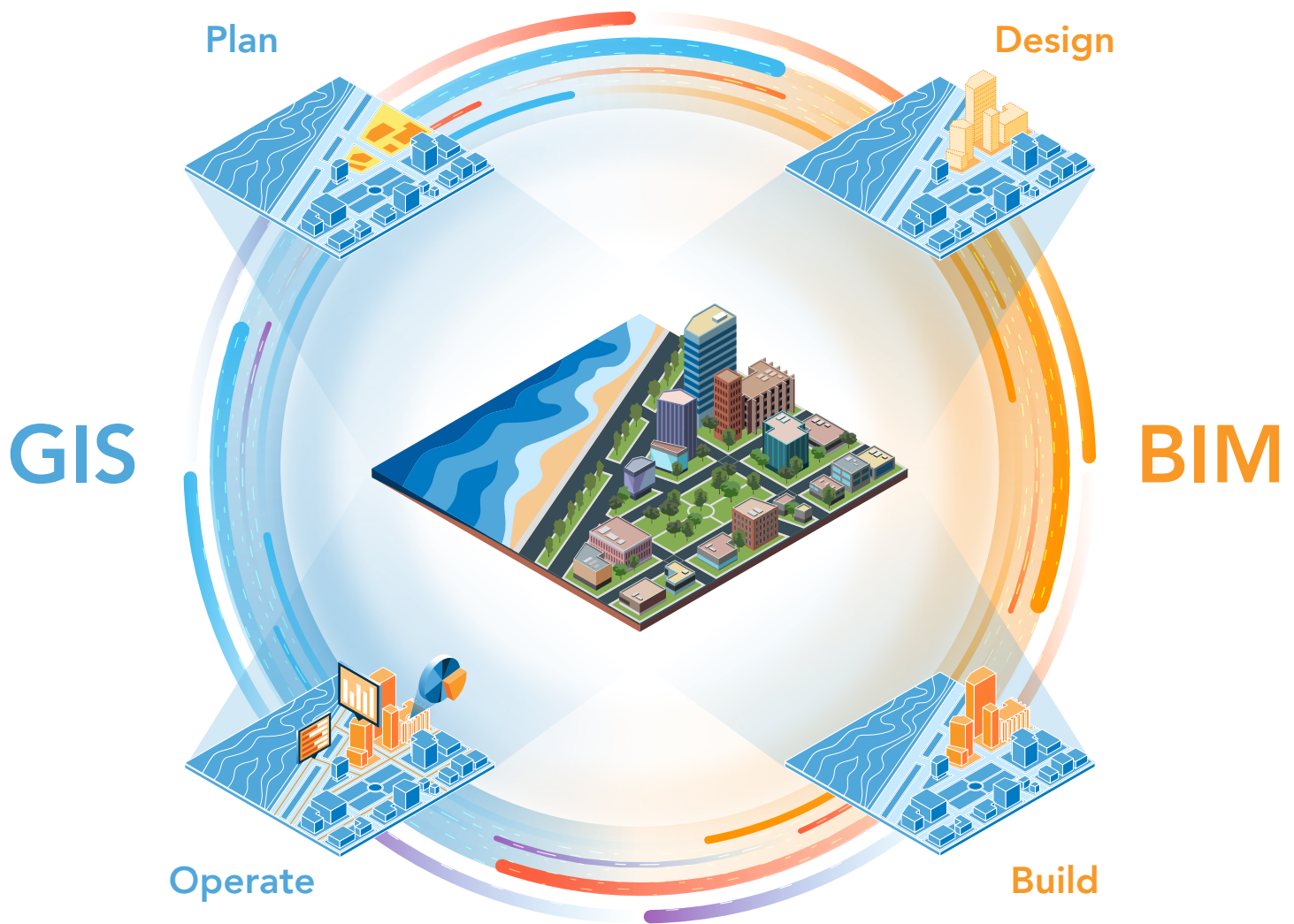
Building Information Modeling/3D GIS

Building information modeling (BIM) is a digital representation of infrastructure assets created during design and engineering. Unlike traditional drawings, BIM contains detailed information about asset geometry, materials, specifications, and relationships. For water utilities, BIM provides a comprehensive

view of facilities, pump stations, pipelines, and other infrastructure before construction begins. When integrated with GIS, BIM combines engineering detail with real-world spatial context, creating a complete view of assets throughout planning, construction, operations, and maintenance.

Together, BIM and GIS enable utilities to visualize infrastructure in three dimensions, validate designs, and identify conflicts before construction. GIS adds critical context such as terrain, existing infrastructure, and environmental constraints, helping ensure designs reflect real-world conditions. This integrated approach reduces rework, improves project coordination, accelerates delivery, and strengthens collaboration across engineering, operations, and mobile teams.

As assets move from construction to operation, 3D GIS becomes a key link between engineering and asset management for water utilities. It enables organizations to carry forward detailed design information into their system of record, supporting more informed inspections, maintenance planning, and capital improvement decisions. With 3D visualization and spatial analysis, teams can better assess asset condition, identify risks, and evaluate scenarios in a real-world context. This approach improves data continuity across the asset life cycle, strengthens coordination between departments, and supports more proactive and life cycle-based asset management strategies. ►



Modern Geospatial Capabilities (continued)

Geospatial AI

Geospatial AI combines artificial intelligence and machine learning with GIS to analyze spatial data, identify patterns, and automate complex workflows. Using imagery, sensor feeds, and network data, utilities can detect asset changes, predict failures, identify inflow and infiltration, and prioritize infrastructure investments.

By integrating data from SCADA systems, IoT sensors, and hydraulic models, geospatial AI supports continuous monitoring, risk assessment, and predictive maintenance. Embedded within maps, dashboards, and operational workflows, these capabilities help utilities improve reliability, reduce costs, and manage aging infrastructure more proactively.

Modern geospatial capabilities also extend beyond network management to the land that supports utility operations. By managing property, easements, rights-of-way, and infrastructure within a unified GIS

environment, utilities can improve decision-making, reduce risk, and better align land assets with operational and asset management objectives.

As modern geospatial capabilities take hold, water utilities gain the technical foundation needed to connect data, systems, and workflows across the enterprise. These capabilities extend beyond network modeling and analytics into how utilities understand and manage the land that supports their infrastructure. Property and land assets are critical to system reliability, regulatory compliance, and long-term planning, yet they are often managed separately from core asset systems. By applying the same geospatial principles of integration, visibility, and analysis, utilities can bring property and land management into a unified GIS environment, enabling more informed decisions, reducing risk, and ensuring that all land interests are fully aligned with infrastructure operations and asset management strategies. ■



The Management of Property and Land Assets

Property and land assets form the physical and legal foundation that enables water infrastructure to exist, operate, and expand. From treatment plants and pipelines to access routes and environmental protection areas, these assets define where and how utilities deliver service. These assets are often managed separately from core infrastructure systems, limiting visibility into ownership, rights, constraints, costs, and risk. As utilities advance asset management practices, bringing property and land assets into a unified strategy becomes essential.

GIS provides the means to integrate these assets into a single, authoritative view, connecting land interests with infrastructure, operations, and regulatory requirements. By managing property and land alongside network and facility assets, utilities can reduce risk, improve coordination, and ensure that land decisions support long-term system performance, compliance, and resilience.

What Should Be Considered an Asset

For utilities, property and land assets include all land interests required to support infrastructure, operations, and regulatory compliance. This includes owned parcels and rights-of-way that accommodate

pipelines, treatment plants, pump stations, fences, gates, and access routes to those assets. Utility access and environmental easements are equally important, as they grant the legal authority to install, operate, and maintain infrastructure on land not owned by the utility. These land interests are often critical to maintaining system connectivity and ensuring reliable service delivery.

Utilities must also account for lands that support system protection and long-term planning objectives. Buffer lands and watershed protection areas play a key role in preserving water quality and environmental resilience. Surplus or lease-eligible properties represent potential financial or strategic value, while contaminated sites or lands with use restrictions introduce regulatory obligations and operational risk. The consideration of all these land interests as managed assets ensures they are incorporated into planning, risk management, and decision-making processes.

Challenge

Water utilities often manage land records across multiple systems and formats, including paper documents, scanned files, and digital databases. Ownership records, easements, and legal agreements are frequently disconnected from spatial data, making ▶



The Management of Property and Land Assets (continued)

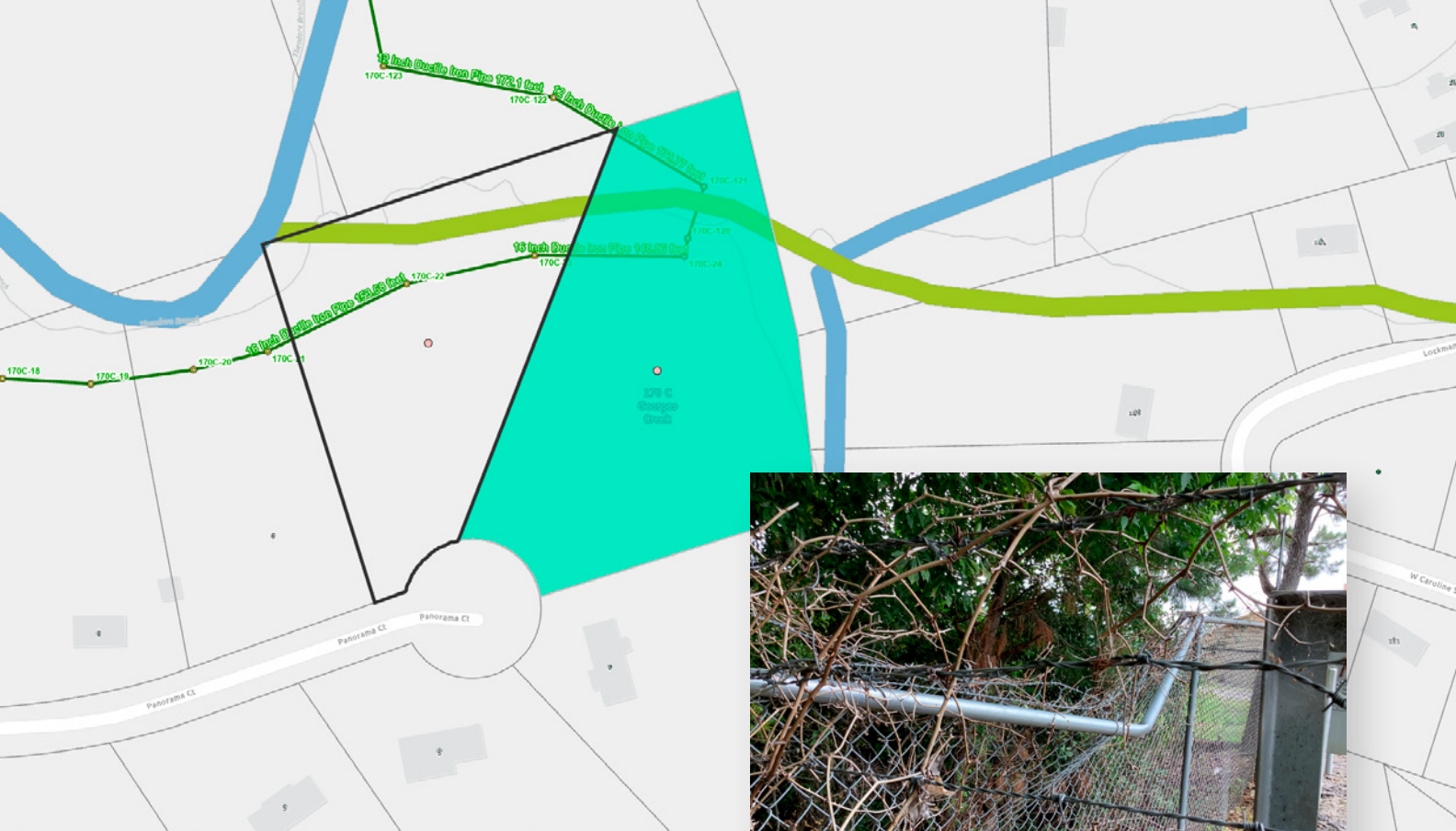
it difficult to maintain an accurate view of land interests and access rights.

These challenges can create delays during capital projects and emergency response. Limited visibility into property boundaries, access points, and legal constraints increases the risk of project delays, cost overruns, and compliance issues. In addition, poor coordination across legal, planning, engineering, and operations teams can hinder efforts to align land management with infrastructure planning and investment.

GIS Solution

GIS provides a centralized system for managing property and land assets alongside utility infrastructure. Parcel boundaries, ownership records, easements, access points, and legal restrictions can be linked to pipelines, facilities, and other assets, giving utilities a clear view of land interests and operational impacts. This is especially valuable for small and rural utilities that manage assets across large service areas with limited staff and resources.

GIS also integrates environmental risk data, including flood zones, sea level rise projections, wildfire hazards, and other authoritative layers from ArcGIS Living Atlas. By bringing land, infrastructure, and risk information together on a single platform utilities can improve capital planning, support legal and regulatory requirements, reduce risk, and make more informed asset management decisions. ►



Case Study

Renewable Water Resources

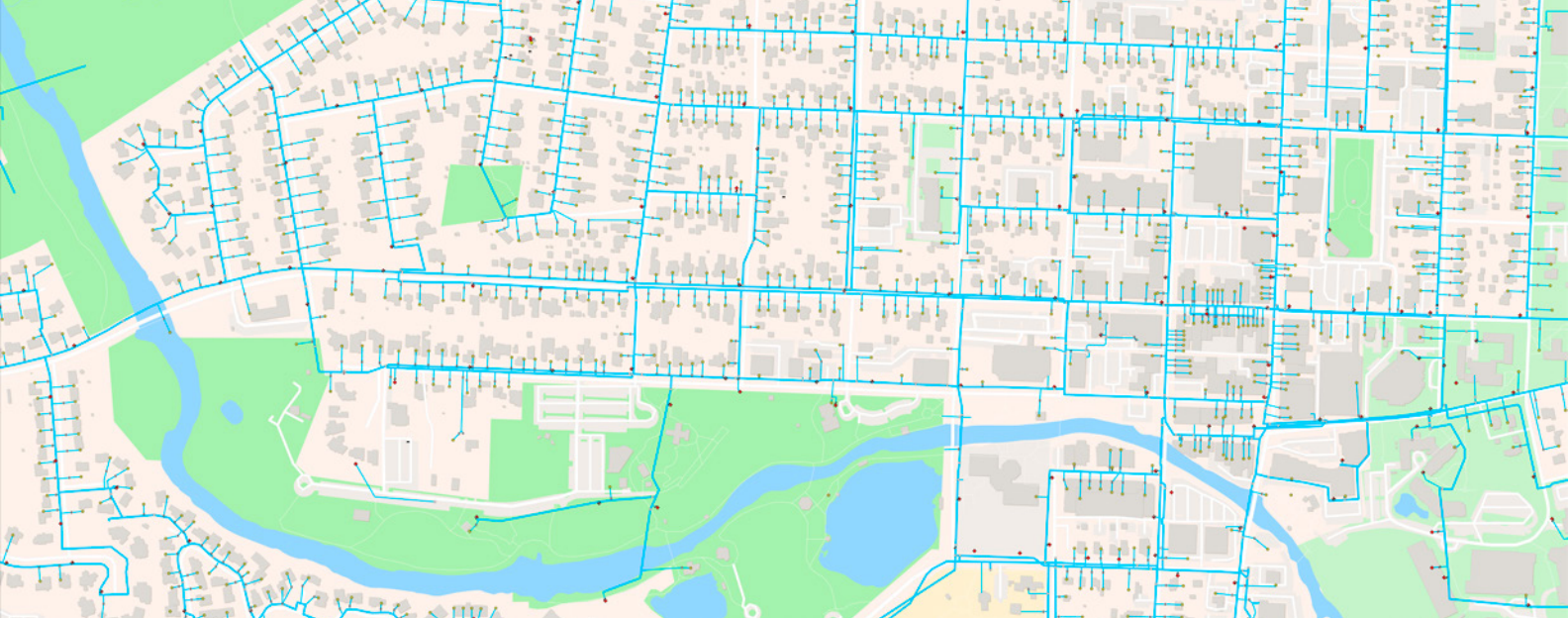
A GIS-Driven Approach to Property Management and Environmental Stewardship

Renewable Water Resources (ReWa), a regional wastewater utility in South Carolina, used GIS to centralize parcel boundaries, ownership records, legal documents, and environmental data into a single property management system. By integrating land records with asset management workflows, ReWa improved visibility into property conditions, supported environmental stewardship initiatives, and streamlined coordination across departments. The result was a more proactive approach to land management that reduced risk, improved decision-making, and treated land as a strategic asset supporting operations, compliance, and long-term planning.

As utilities mature in managing property and land as strategic assets, the focus naturally expands from where infrastructure is located and governed to how it functions as an interconnected system. While land assets provide the legal, environmental, and spatial context that enables infrastructure to exist and operate, linear and network assets represent the dynamic systems that deliver services. Advancing from land management to network infrastructure requires utilities to shift from managing static boundaries and rights to understanding connectivity, flow, and system performance. GIS serves as the bridge between these domains, linking land context with network behavior to support more holistic, system-wide asset management. ■



[Read the full story](#)



The Management of Linear and Network Infrastructure

Linear and network assets form the foundation of water, wastewater, and stormwater systems. Pipes, valves, hydrants, maintenance holes, and service connections must be managed as an interconnected network, where asset performance and service impacts depend on connectivity, flow, and system dependencies.

GIS enables utilities to model and manage these assets as a connected system by linking infrastructure, operational data, and spatial context. This supports better risk management, maintenance planning, and investment decisions, helping utilities improve reliability and deliver consistent service across the network.

What Should Be Considered an Asset

For water utilities, linear and network infrastructure assets form the backbone of service delivery and must be managed as an interconnected system. This includes water distribution, wastewater collection, and stormwater conveyance pipes, along with essential components such as valves, hydrants, manholes, and cleanouts that enable system operation and maintenance. These assets work together to move water and wastewater reliably, making both the individual components and their relationships critical to understand and manage.

Utilities must also account for system-level elements such as pressure zones, gravity basins, and force mains that define flow behavior and system performance. Outfalls and discharge points represent key interfaces with the environment and are often tied to regulatory compliance for effective watershed management. Connections and service laterals extend service to customers and are essential for maintaining service continuity. Managing all these elements as part of a connected asset system enables better performance, risk management, and long-term planning.

Challenge

Linear infrastructure is challenging to manage because most assets are buried, widely distributed, and difficult to inspect. Aging systems and incomplete records often leave utilities relying on asset age and failure history to assess condition, limiting visibility into system health and risk.

These challenges are especially significant for small and rural utilities, where limited funding, staffing, and large service areas can make inspection and maintenance difficult. As a result, many utilities remain dependent on reactive maintenance, leading to deferred repairs and inefficient use of limited resources.

Utilities also need to understand how asset failures affect the broader network. ►

The Management of Linear and Network Infrastructure (continued)

Without visibility into connectivity and flow relationships, it is difficult to assess service impacts, prioritize investments, and align capital planning with long-term reliability and resilience goals.

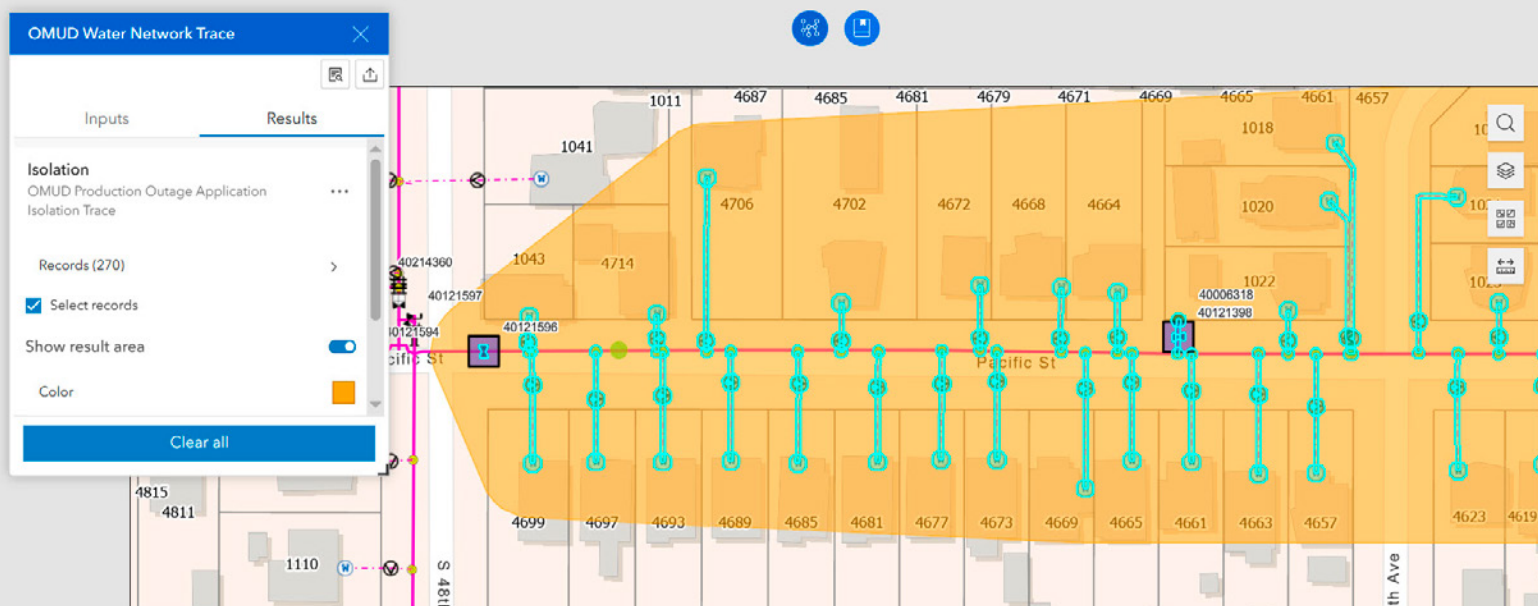
GIS Solution

GIS enables water utilities to manage linear infrastructure as a connected network, capturing asset relationships and flow direction. Advanced tracing helps identify service impacts, isolate outages, and understand how failures affect the broader system. For small and rural utilities, GIS improves visibility into buried assets and reduces reliance on institutional knowledge.

GIS also centralizes asset information such as material, age, condition, and failure history, creating a reliable system of record. When paired with mobile data collection and inspections, utilities can continuously improve data quality and support more informed maintenance and rehabilitation decisions.

By supporting hydraulic modeling, spatial analysis, and capital planning, GIS helps utilities evaluate system performance, assess risk, prioritize limited resources, and move toward proactive, risk-based asset management. ►





Case Study

Geospatial Solutions Support Metropolitan Utilities District's Vision for the Future

Metropolitan Utilities District (M.U.D.) faced growing challenges with legacy GIS technology, including disconnected workflows, slow performance, and limited support for outage management, modeling, and regulatory compliance. As infrastructure complexity increased and new requirements such as the Lead and Copper Rule Revisions emerged, the utility needed a more reliable and scalable approach. M.U.D. responded by implementing ArcGIS Enterprise and ArcGIS Utility Network, supported by a comprehensive data cleanup effort that created a connected, accurate, and authoritative system of record.

The modernization effort strengthened data quality, improved hydraulic modeling, and enabled enterprise-wide access to network information. By integrating GIS with systems such as SAP and Aquanuity, M.U.D. streamlined engineering, planning, and asset management workflows. ArcGIS Utility Network traces now help mobile crews quickly identify isolation valves and affected customers during outages, while GIS applications

support lead service line inventory, replacement tracking, and regulatory reporting. The result is a more proactive, data-driven approach to asset management that improves operational efficiency, emergency response, capital planning, and regulatory compliance.

As utilities strengthen their understanding of linear and network infrastructure, the focus on system connectivity and flow naturally extends to the facilities that support and control these networks. While pipes and conveyance assets move water across the system, facilities and vertical assets serve as the operational hubs where water is treated, stored, and managed. Effectively transitioning from managing distributed networks to complex facility environments requires a shift from system-level visibility to detailed insight into equipment, processes, and asset dependencies. GIS provides the common thread, linking network performance to facility operations and enabling a unified view that supports more coordinated, efficient, and resilient asset management across the entire system. ■

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The Management of Facilities and Vertical Assets

Facilities and vertical assets are the operational center of water, wastewater, and reuse systems, where treatment, storage, and critical processes occur. Treatment plants, pump and lift stations, reservoirs, and related equipment must be managed in detail to ensure reliability, safety, and regulatory compliance.

GIS provides a framework for connecting facility layouts, equipment, and operational data within a single environment. By improving visibility into asset conditions, dependencies, and performance, GIS supports better decision-making, faster response, and more proactive management of critical facility assets.

What Should Be Considered an Asset

Facilities and vertical assets are the operational hubs of water, wastewater, and reuse systems. Treatment plants, pump and lift stations, reservoirs, storage tanks, and associated process components support treatment, storage, flow management, and system resilience. These assets require comprehensive life cycle management to ensure reliability, safety, and regulatory compliance.

Water utilities must also manage the systems that support facility operations, including electrical infrastructure, HVAC, backup generators, control systems, and security technologies. Treating these components as integrated assets helps maintain operational continuity, reduce risk, and support reliable service delivery.

Challenge

Water utilities often lack a complete view of facility condition, performance, and risk because maintenance records, engineering drawings, inspections, and operational data are stored in separate systems. This makes it difficult to prioritize maintenance, plan capital improvements, and understand how facility issues affect broader operations.

These challenges are compounded by inconsistent asset criticality definitions and limited visibility during outages or emergencies. Without timely access to asset information, utilities may struggle to prioritize resources, respond to failures, and maintain reliable, compliant operations. ►





The Management of Facilities and Vertical Assets (continued)

GIS Solution

GIS provides a spatially enabled framework to unify facility data and connect vertical assets with enterprise systems such as CMMS and EAM platforms. Facility footprints can be mapped and linked to asset records, enabling utilities to visualize maintenance history, inspections, and performance metrics in a geographic and operational context. With tools such as ArcGIS Indoors™, utilities can extend these capabilities to facilities, mapping floors, rooms, and individual equipment locations to create a comprehensive, navigable view of complex environments.

By organizing assets into a clear hierarchy from facility to system to component, GIS supports better understanding of dependencies and criticality within each site. Utilities can visualize condition, risk, and maintenance backlog in both 2D and 3D, allowing stakeholders to quickly assess facility health and prioritize actions. This foundation also enables digital twin capabilities, where real-time data, sensors, and analytics are integrated with spatial models to simulate performance, monitor operations, and guide decision-making. The result is improved situational awareness, faster response times, and more proactive management of critical vertical assets.

Pennichuck Water Works Expands Its Digital Transformation with 3D Digital Twins

Pennichuck Water Works advanced its digital transformation by extending GIS-enabled asset management into facilities by establishing a digital twin. While the utility had modernized its distribution systems with ArcGIS Utility Network and map-based workflows, facility assets remained limited in detail and visibility, relying heavily on manual processes and institutional knowledge. Partnering with LandTech, Pennichuck developed a scalable workflow using laser scanning, 3D modeling, and GIS integration to create interactive, data-rich facility environments.

The result is a unified system where staff can visualize assets in context, access maintenance data instantly, and streamline workflows.

This approach improves visibility, accelerates operations, and establishes GIS as the central platform connecting facility data, systems, and decision-making. ■



[Read the full story](#)



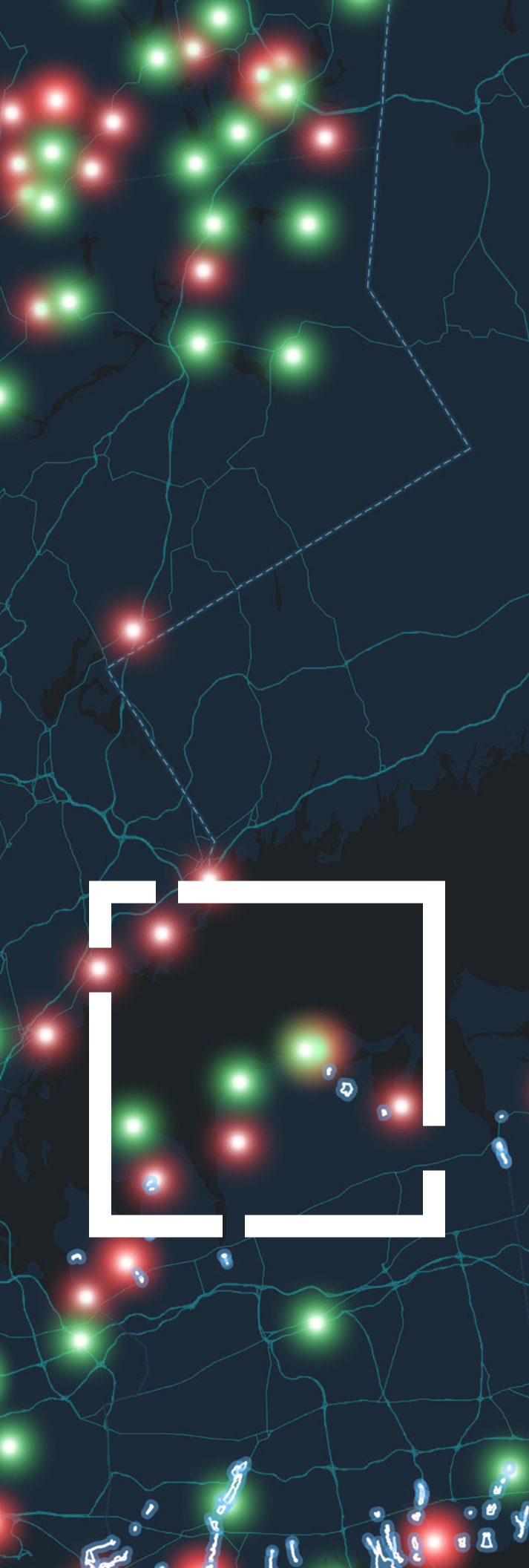
GIS as the Foundation of Modern Asset Management

Modern asset management for water utilities is no longer achievable without GIS at its core. As utilities progress from basic inventory to advanced, predictive operations, GIS evolves into the system that connects assets, data, and decisions across the enterprise. It transforms fragmented information into a unified, authoritative view of infrastructure, enabling utilities to align planning, engineering, operations, and leadership around a shared understanding of system performance and risk.

Through capabilities such as ArcGIS Utility Network, BIM and 3D GIS integration, and geospatial AI, GIS delivers the connectivity, context, and intelligence required to manage assets as complete, interdependent systems. It enables utilities to move beyond static records and reactive maintenance toward proactive, risk-based strategies supported by real-time data, advanced analytics, and life cycle insight. This shift improves reliability, optimizes capital investment, and strengthens resilience in the face of aging infrastructure, regulatory pressure, and limited resources.

Across land, linear networks, and facilities, GIS provides the common framework that integrates all asset classes into a single operational environment. It also operationalizes industry standards such as ISO 55000 and CMOM by translating policy into measurable, location-based workflows that are auditable, repeatable, and defensible.

Ultimately, GIS is not just a technology that supports asset management. It is the platform that enables it. By providing visibility, integration, and actionable intelligence at every level of the organization, GIS empowers water utilities to manage their systems more efficiently, make better decisions, and build a more sustainable and resilient future. ■



About Esri

Esri, the global market leader in geographic information system (GIS) software, location intelligence, and mapping, helps customers unlock the full potential of data to improve operational and business results. Founded in 1969 in Redlands, California, USA, Esri software is deployed in hundreds of thousands of organizations globally, including Fortune 500 companies, government agencies, nonprofit institutions, and universities. Esri has regional offices, international distributors, and partners providing local support in over 100 countries on six continents. With its pioneering commitment to geospatial technology and analytics, Esri engineers the most innovative solutions that leverage a geographic approach to solving some of the world's most complex problems by placing them in the crucial context of location.

For more information, visit our [**Water Asset Management page.**](#)



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