Water and Wastewater
An Integrated Software Solution for Potable Water, Wastewater, and Stormwater Systems
The Bentley Advantage

An integrated solution — Bentley’s fully integrated water and wastewater solution addresses the needs of owner-operators and engineers who contribute to the water infrastructure lifecycle. Its powerful capabilities enhance mapping and data management, information sharing and collaboration, hydraulic simulation and analysis, design and construction documentation, field engineering and inspection, and operations and maintenance.

A commitment to interoperability — The Bentley solution allows water professionals to work with an entire suite of interoperable Bentley products that access Oracle Spatial, Esri ArcGIS data, and DGNs stored in a relational database management system (RDBMS), or leverage AutoCAD or ArcGIS data directly from the modeling products. The interoperability of Bentley products with users’ existing technologies (including ArcGIS, AutoCAD, and MicroStation) extends the value of their current technologies and training investments.

More time engineering for increased productivity — Bentley water products use modern technology that maximizes return on investment. Bentley water technology allows users to spend more time solving engineering problems and less time on the modeling process.

Support for the entire water lifecycle — The Bentley solution meets the needs of water infrastructure professionals by covering the entire design, build, and operate lifecycle, and providing a comprehensive mapping, modeling, and engineering design environment.

Sustaining Water Infrastructure — Sustaining Society

Satisfying the world’s demand for clean water is a growing challenge, one that can only be met with optimally designed infrastructure. The world needs treatment and distribution systems that deliver potable water and sanitation systems that manage sewerage and storm runoff. In developing countries, where fast-growing populations and inadequate infrastructure are pressing issues, the priority is broader access to safe drinking water and sanitation in accordance with the Millennium Development Goals – an initiative of the United Nations to fight poverty. In developed countries, water and wastewater utilities face the difficult task of maintaining or upgrading aging infrastructure while reducing operating costs.

By delivering sustainable water infrastructure to meet these needs, engineers help sustain our society. Bentley helps architectural, engineering, construction, and operations (AECO), and geospatial professionals successfully complete this critical mission by providing a comprehensive set of software tools to design, build, and operate water infrastructure for the 21st century.
For more than two decades, utilities, municipalities, and civil engineering firms around the world have trusted Bentley’s easy-to-use and multiplatform hydraulic and hydrology products to generate master plans, support land development projects, design and optimize system expansions, and streamline the operation of water distribution, wastewater conveyance, and stormwater drainage infrastructure.

**Water Distribution**

WaterGEMS® and WaterCAD® are the most widely used software products for the analysis and design of water distribution systems, from automated fire flow, water quality, criticality and flushing studies to energy cost analysis, pipe renewal optimization, and genetic algorithm optimization modules for automating pipe design, calibration, water loss detection, and pump scheduling.

HAMMER® helps engineers determine appropriate surge control strategies and reduce transients. It uses the Method of Characteristics, the benchmark standard for hydraulic transient analyses. Engineers can run both transient and steady-state (for initial condition calculation) analyses in HAMMER, and choose to use it as a stand-alone product or use it along with WaterCAD or WaterGEMS.

**Wastewater Collection**

From overflow remediation and water quality analysis to urban sewer planning and detailed network design, SewerGEMS® and SewerCAD® are designed to grant more engineering time. They also allow engineers to detect system bottlenecks easily, improve capacity, and limit sewer overflow, enabling utilities to comply with sewer regulations set by regulatory agencies and thereby minimize customer complaints. Engineers can analyze sanitary or combined conveyance systems accurately with built-in hydrology tools, a variety of wet-weather calibration methods, and sewer loading allocation tools.

**Stormwater Systems**

Bentley’s stormwater modeling products provide a solution for many stormwater projects:

- Site design – for projects involving site development or detention and retention facility design;
- Urban stormwater – for pursuing and completing municipal projects for cities, counties, or departments of transportation;
- Master planning – for completing master plans and prioritizing future improvements.

StormCAD® helps commercial and industrial site designers, land developers, and roadway and transportation designers analyze and design site drainage systems, from rainfall to outlet.

With PondPack®, site and detention pond designers, regional drainage planners, and Best Management Practices (BMP) designers and reviewers can perform design and analysis for simple or complex detention and retention facilities, outlet structures, and channels.

With CivilStorm®, for the analysis of complex stormwater systems, engineers can model inlets, storm sewers, open channels, streams, culverts, pump stations, control structures, detention ponds, and overflows. It can be used to analyze drainage and detention facilities for systems with hydraulically connected elements, develop stormwater master plans, perform water quality studies, prioritize the rehabilitation of an existing system, and evaluate systems with stormwater pumping.

For quick element calculations, water engineers can use CulvertMaster® to solve culvert hydraulics and FlowMaster® for the design and analysis of pipes, ditches, open channels, weirs, orifices, and inlets. The results are obtained quickly and easily and are report ready.

**Project Example**

**Salt Lake City Improves Fire Flow Planning**

 Pipelines in some areas of the city had fallen behind current fire flow service requirements, and customers complained about low pressure during periods of peak demand. WaterGEMS was used to determine which pipes were the best candidates for replacement to satisfy fire flow constraints.

Higher pressure was achieved, increasing customer satisfaction, and all hydrants now meet the fire department’s flow requirements of 1500 gpm (8.17 MLD). Some areas are even able to meet the 3000 gpm (16.35 MLD) required by the presence of larger homes.
Conserve Water, Control Water Loss With Bentley’s Water Software

Bentley’s integrated water software helps engineers improve customer service, reduce nonrevenue water, and generate a comprehensive and proactive plan to manage water loss strategically. Bentley’s water products cover the International Water Association Best Practices, which combine 4 strategies to address water leakage: Active Leakage Control, Pressure Management, Speed and Quality of Repairs, and Infrastructure Management.

Superior Hydraulic and Hydrology Technology

- **Advanced scenario management**: Prioritize system improvements by comparing alternative designs or a variety of system conditions – for use in master plans, drainage studies, and BMP submittals;
- **Detailed design**: Conduct automated constraint-based design of water distribution systems, sanitary and storm sewers, and pond and outlet – for new designs or system improvements;
- **Operating cost and energy usage minimization**, to help:
  - Identify old pumps that no longer perform at their pump curves;
  - Decide when to use variable speed vs. constant speed pumping;
  - Determine energy costs for different operating rules to find the best operational strategy;
  - Find optimal pump operation schedules;
- **Criticality analysis**: Identify critical assets in water distribution infrastructure, and evaluate the risk associated with their failure;
- **Renewal of pipes**: Effectively prioritize network upgrades, based on the optimization of replacement and rehabilitation of water mains;
- **Interconnected pond modeling**: Simulate tidal and tailwater effects in interconnected ponds – for an accurate understanding of real-world situations;
- **Water safety and security**: Prevent, detect, and respond to emergencies and customer complaints, by modeling emergency planning scenarios, real-time operations, and forensic analyses;
- **SCADA integration**: Automatically acquire supervisory control and data acquisition (SCADA) data in water distribution and sewer models, to enable continuous model calibration or respond to emergencies. Or publish hydraulic results to the utility’s existing SCADA system control screen, allowing operators to visualize model results in an interface that they are familiar with;
- **Superior interoperability**: Run hydraulic and hydrology products stand alone or from within up to four platforms: MicroStation, AutoCAD, ArcGIS, and PowerCivil.

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Runs from within this platform.

Option to run from within this platform is available for an additional fee.
Streamlined Network Design and Management
Bentley Utilities Designer is a comprehensive design and GIS-based management application for water and wastewater networks that enables utility owner-operators to increase productivity, accelerate projects, and reduce software costs. Utilities can increase the productivity of both brownfield and greenfield network design with engineering-grade design tools that integrate with a variety of enterprise GIS systems. Intelligent CAD-based modeling tools let designers rapidly achieve the precision and quality they require by avoiding the drawing inefficiency of GIS-based applications. On-the-fly cost estimation provides immediate feedback on every design decision, allowing designs to be quickly refined. A configurable workflow engine integrates with a variety of WMS and ERP systems to streamline work management. A built-in, configurable, utility-specific GIS provides owner-operators the option to consolidate design and GIS-based management into a single license and application for simplified training, deployment, maintenance, and enterprise system integration. Bentley Utilities Designer is also tightly integrated with WaterGEMS and SewerGEMS to support hydraulic modeling and analysis.

Web, Enterprise, and Mobile GIS
Bentley extends the value of spatial information to support web GIS projects with Bentley Geo Web Publisher. Bentley Geo Web Publisher provides the ability to share maps and non-spatial information dynamically to user communities who do not require editing privileges. This means that spatial information is easily accessible via an Internet browser to groups such as customer service representatives, maintenance crews, sales and marketing, and senior management.

Bentley® Geospatial Server supports enterprise GIS deployments with enterprise printing, plotting, engineering content management, and n-tier access to spatial data stores such as Esri ArcGIS and Oracle Spatial.

And finally, Bentley Map® Mobile supports the publishing of spatial information, even with very large data sets, to mobile devices.

Improved Team Collaboration and Engineering Content Management
Bentley’s ProjectWise® is an engineering content management software product that allows utility owner-operators to improve the accuracy, reuse, and auditing of design and construction documents. With ProjectWise, utilities increase productivity, accelerate projects, and reduce risk. ProjectWise supports the fast and accurate reuse of engineering content, efficient outsourcing through managed interactions with engineering companies working on outsourced projects, and agile compliance with the reporting requirements of utility regulators.

Who Uses Bentley’s Water and Wastewater Solution?
• Owner-operators (including municipalities, other publicly owned utilities, and investor-owned utilities)
• Engineering procurement and construction (EPC) firms
• Engineering consulting organizations
• Transportation departments
• Regulatory agencies
• Research institutions and universities
Multi-discipline Plant Design, Construction, and Operations

Treatment plant design and construction is a multidisciplinary problem, often spread across many offices. Bentley solutions provide all the necessary tools to design and build a treatment plant from the initial site grading to 3D visualization of the final design and efficient construction management, and helps EPCs do so in record time under budget, in a fully managed, collaborative team environment. Bentley’s plant, structural, and building applications are used together with ProjectWise around the world on projects ranging from small retrofits to existing facilities to the creation of large greenfield facilities.

Today’s best-in-class treatment facility is at the forefront of environmental impact design, delivering minimal (to zero) energy footprint, zero emissions, 100 percent water recycling (zero water usage) as well as minimizing visual impact. Bentley’s users are delivering such best in class plants using a wide range of integrated applications for centralized data management, 2D functional design, multidisciplinary 3D plant modeling, design analysis and simulation, and visualization and reporting.

Bentley’s AssetWise APM and enterprise asset management solution uniquely offers treatment plant operators a PAS 55 (ISO 55000) compliant solution to effectively implement predictive maintenance methodologies such as reliability-centered maintenance (RCM). RCM can provide reliable process equipment by having the ability to proactively plan maintenance and repair activities thereby reducing treatment process interruptions and overall maintenance costs.

Benefits
This solution models and manages not only graphics, but also information – information that allows the automatic generation of drawings and reports, design analysis, schedule simulation, facilities management, and more – ultimately enabling the construction team to make better-informed decisions.

Collaborative information and visualization workflows are central to realizing innovation within successful alternative delivery projects such as design-build and Construction Management (CM) At-Risk. Bentley’s 3D visualization and design review applications allow the entire project team to undertake design reviews directly from the multidisciplinary digital plant models.

Design files can also easily be shared with owners, consultants, fabricators, and contractors using 3D PDFs.

Importantly, Bentley’s leadership in BIM (building information management) ensures that plant and building information serves design-build teams through all phases, from design into construction and beyond facility hand-over into plant operations.

Project Example

Wigan Q: Wastewater Treatment Plant Project – Atkins Water and Environment, United Kingdom

“As part of a five-year, GBP 3 billion asset management plan, joint venture partners Galliford Try, Costain, and Atkins, teamed with United Utilities to develop the GBP 13.6 million Wigan wastewater treatment plant. The biological aerated flooded filter improved process flexibility and compliance with tighter standards.

Using MicroStation, Bentley Navigator, and AutoPLANT®, Atkins modelers created each element in various configurations to enable designers to refine the layout for cost-effective operation and sustainability. The software allowed designers to quickly and easily review equipment layouts, analyze possible pipe work clashes, and assess lifting and maintenance issues. As a result of constructability reviews, costs were forecasted to be 15 percent below budget.”
Reference Books
Bentley Institute Press reference books are an essential component of any water-resource professional’s library, and are recognized as a leading source for explaining complex concepts in clear, easy-to-read language.

These are not how-to guides for using software. They teach the concepts of applying hydraulic models and provide practical guidance based on the experiences of industry experts.

> www.bentley.com/Books

Bentley Institute Press Water and Wastewater Network Analysis and Design books include:

- Advanced Water Distribution Modeling and Management
- Computer Applications in Hydraulic Engineering
- Floodplain Modeling Using HEC-RAS
- Security and Emergency Management for Water Systems
- Stormwater Conveyance Modeling and Design
- Wastewater Collection System Modeling and Design
- Water Loss Reduction
- Water Supply and Wastewater Removal

Training and Learning
The Bentley Institute develops and delivers accredited professional training programs that help busy infrastructure professionals stay competitive and increase productivity. Through a unique blend of theory, software instruction, and practical know-how, our industry-expert instructors teach water professionals to confidently apply models in their day-to-day decision making.

> www.bentley.com/Training

Be Communities
The Water and Wastewater community focuses on developing trends in asset and facilities management, environmental compliance modeling, 2D and 3D design, GIS, network modeling, and enterprise integration. Participants include individuals from global consulting engineering firms, major municipalities, and leading utilities, and their discussions center on the application of technology to achieve savings and efficiencies in engineering processes, minimize environmental consequence, preserve public capital investment, and enhance the level of service of costly but necessary water infrastructure.

> http://communities.bentley.com/Water

Support, Maintenance, and Subscriptions
Bentley’s portfolio of subscriptions encompasses a range of subscriptions to meet the needs of users in any size of organization—from individual infrastructure professionals in small firms to large project teams in global organizations.

A Bentley SELECT® subscription helps organizations lower the total cost of ownership for Bentley software by providing flexible licensing options, 24/7/365 assisted support, and anytime software upgrades all for a fixed annual fee per license.

> www.bentley.com/SELECT

The Enterprise License Subscription helps large, multi-office, and global organizations gain significant operational and competitive advantage, reduce annual software costs, and enjoy unrestricted access to a comprehensive software and learning portfolio—all for a single annual fee.

> www.bentley.com/ELS

The Enterprise License Subscription for Municipalities helps local governments maximize budgets and resources, and improve taxpayer services. Subscribers access a comprehensive software portfolio and the Bentley LEARN® training subscription for an annual fee based on population size.

> www.bentley.com/ELSM
Bentley Water and Wastewater Offerings:

Water Distribution
- HAMMER
- WaterCAD
- WaterGEMS
  - Darwin Calibrator
  - Darwin Designer
  - Darwin Scheduler
  - Pipe Renewal Planner
  - SCADAConnect*
  - Skelebrator®

Wastewater Collection
- SewerCAD
- SewerGEMS

Stormwater Systems
- CivilStorm
- CulvertMaster
- FlowMaster
- PondPack
- StormCAD

GIS-based Water and Wastewater Network Design and Management
- Bentley Geo Web Publisher
- Bentley Geospatial Server
- Bentley Map
- Bentley Map Mobile
- Bentley Utilities Designer

Treatment Plant
- AssetWise APM
- AutoPLANT Piping
- AutoPLANT Equipment
- AutoPLANT P&ID
- Bentley PlantWise®
- ConstructSim
- OpenPlant Modeler
- OpenPlant P&ID
- promis•e®

*In addition to being included in WaterGEMS, this module is available for WaterCAD for an additional fee.