Bentley®
Advancing Infrastructure

CONNECT Edition

OpenFlows™ WaterGEMS®
Water Distribution Modeling and Management

OpenFlows WaterGEMS is a hydraulic modeling application for water distribution systems with advanced interoperability, geospatial model building, optimization, and asset management capabilities. From fire flow and water quality analyses to energy consumption and capital cost management, OpenFlows WaterGEMS provides an easy-to-use environment for engineers to analyze, design, and optimize water distribution systems. WaterGEMS takes advantage of Bentley CONNECT*services* by associating a hydraulic model with a CONNECT project.

Superior Interoperability

With OpenFlows WaterGEMS, you can work across CAD, GIS, and stand-alone platforms while accessing a single, shared project data source. The application gives you the choice of modeling from within three interoperable platforms:

- Windows for ease of use, accessibility, and performance.
- ArcGIS for GIS integration, thematic mapping, and publishing.
- AutoCAD for CAD layout and drafting.

Streamlined Model Building

You can leverage geospatial data, CAD drawings, databases, and spreadsheets to jumpstart the model building process. OpenFlows WaterGEMS provides synchronized database connections, geospatial links, and advanced model-building modules that connect with virtually any digital data format. The included LoadBuilder and TRex modules can help you allocate water demands and node elevations based on geospatial data found in shapefiles, geodatabases, various types of DEMs, and even CAD drawings. These modules help you avoid mistakes caused by manual input. OpenFlows WaterGEMS also provides drawing and connectivity review tools to guarantee a hydraulically coherent model. Skelebrator® automatically removes network complexity while maintaining hydraulic equivalence to efficiently tackle a wider range of modeling applications.

Optimized Model Calibration, Design, and Operations

OpenFlows WaterGEMS includes state-of-the-art genetic algorithm optimization engines for automated calibration, leak detection, design, rehabilitation, and pump operations. Darwin® Calibrator evaluates millions of possible solutions to let you quickly find a calibration hypothesis that best matches measured flows, pressures, and on/off status, empowering you to make reliable decisions based on accurate
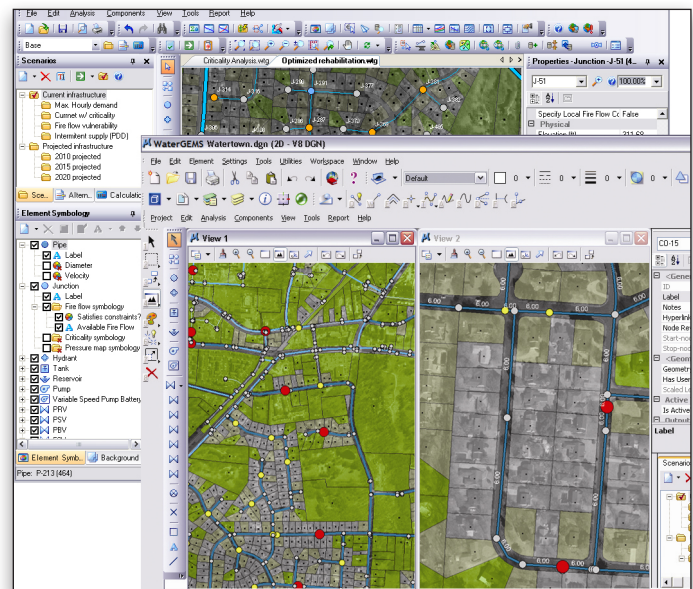
OpenFlows WaterGEMS runs in its stand-alone platform, and can also integrate with ArcGIS and AutoCAD.

hydraulic simulations of the real world. Additionally, Darwin Calibrator supports active leak detection activities by identifying the most likely locations of leakage in the network.

OpenFlows WaterGEMS' SCADAConnect® module lets modelers automatically acquire supervisory control and data acquisition (SCADA) data, creating a real-time system simulator that accurately represents current system conditions. The module also enables model results to be published to a utility's existing SCADA control room screens, helping to forecast operating conditions and potential issues. Darwin Designer automatically finds maximum benefit or minimum cost designs and rehabilitation strategies based on available budget, construction cost, and pressure and velocity constraints.

OpenFlows WaterGEMS analyzes energy consumption to identify the most energy-efficient pump scheduling strategy. Darwin Scheduler optimizes the operations of fixed- and variable-speed pumps and tank storage to minimize energy usage or energy cost based on pressure, velocity, pump start, and tank level constraints. Energy costs can be aggregated across pumping stations and can factor in complex tariffs as well as nonmodel-related energy costs to perform net present value analyses of their operating scenarios.

OpenFlows WaterGEMS At-A-Glance

Interoperability, Interface, and Graphical Editing

- Runs from within three compatible platforms:
  - » Windows
  - » ArcGIS (ArcMap license required)
  - » AutoCAD (AutoCAD license required)
- Unlimited undo and redo
- Element morphing, splitting, and reconnection
- Merge nodes in close proximity tool
- Automatic element labeling
- Scaled, schematic, and hybrid environments
- Element prototypes
- Aerial view and dynamic zooming
- Named views library
- Multiple background-layer support
- Seamless compatibility with OpenFlows WaterCAD® and OpenFlows HAMMER®

Hydraulics, Operations, and Water Quality

- Steady-state and extended-period simulations
- Constituent concentration analysis
- Multispecies water quality analysis
- Tank mixing analysis
- Water age analysis
- Water quality batch run
- Criticality analysis
- Fireflow analysis
- Rule-based or logical controls
- Variable-speed pumping with option to use APEX (Automatic Parameter Estimation eXtension)
- NPSH analysis
- System head curves
- Leakage and sprinkler modeling
- Water loss analysis
- Pressure-dependent demands
- Conventional and unidirectional flushing simulations
- Source tracing
- Valve modeling
- Air release valve element
- Top fill tank element
- Combination pump curves
- Carbon emission calculation
- Optimization of pipe renewal with Pipe Renewal Planner
- Override of pump and valve controls using historical SCADA data
- Real-time modeling
- Emergency response simulations for pipe breaks, power outages, fires, and pipe shutdowns
- Pressure zone management
- Support Districted Metered Areas (DMA) design

Model Building and Data Connection

- DGN, DXF, spreadsheet, database, and ODBC connections
- Shapefile, geodatabase,* Geometric Network,* and SDE* connections (*when running from within ArcMap)
- Oracle Spatial support
- GIS-ID property to maintain associations between records in the data source / GIS and elements in the model
- SCADAConnect unlimited signal pack for live data connections (to and from SCADA systems)
- Graphical SCADA element

- Customer meter element
- Lateral link (no need to split pipes)
- Automatic demand allocation from geospatial data
- Geospatial demand allocation from customer meters
- Demand allocation from lump-sum geospatial data
- Geospatial-based water consumption projection
- Daily, weekly, monthly, and superimposed patterns
- Unaccounted for water and leakage estimation
- Composite demands global edition
- Area, count, discharge, and population-based loading
- Pipe length-based demand loading
- Elevation extraction from DEM, TIN, and shapefiles
- Elevation extraction from CAD drawings and surfaces
- Series, parallel, branch-trimming, and multicriteria automated skeletonization of pipes
- Skeletonization support for isolation valves
- User data extension, including formula-based
- Bing Maps support
- Model sync in/out, update a model or sync out to an external file

Model Management

- Unlimited scenarios and alternatives
- Comprehensive scenario management
- Global attribute tabular edition
- Automated model skeletonization
- Personalizable engineering libraries
- Sorting and persistent filtering on tabular reports
- Statistical analysis from tabular reports
- Dynamic and static selection sets
- Local and global engineering units management
- Sub-model management
- Drawing review tools for connectivity consistency
- Automatic topology review
- Orphaned nodes and dead-end pipes queries
- Change tracking

Results Presentation

- Thematic mapping with property-based color-coding, symbology, and annotations
- Dynamic, multiparameter, and multiscenario graphing
- Scenario and element comparison
- Shapefile contouring
- Advance profiling
- Advanced tabular reporting with FlexTables
- Creation of Google Earth (KML) files
- Publishing of iModels in 2D or 3D, including to Bentley Map® Mobile
- Video recording of result animation
- Customizable reports

Optimization (using Genetic Algorithm)

- Automated model calibration with Darwin Calibrator
- Identify leaks locations with Darwin Calibrator
- Optimized design and rehabilitation with Darwin Designer
- Optimized pump scheduling with Darwin Scheduler

Energy and Capital-cost Management

- Energy cost analysis
- Capital cost analysis
- Pump and turbine energy analysis

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