Integrated Approach to Design, Modelling and Asset Management of StormWater Infrastructure

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Agenda

• BIM for Stormwater Infrastructure
• Hydraulic modeling as a reliable decision-support tool for Sustainable Urban Drainage Systems
  – Design and rehabilitation
  – Engineering support of operation
  – Improved emergency response
• Some project examples from the *Be Inspired* Awards
• Conclusion and additional resources
• Q&As
Bentley’s mission is to provide "innovative software and services" for the enterprises and professionals who "design, build, and operate" the world’s infrastructure – sustaining the global economy and environment for "improved quality of life."
Bentley provides applications across the entire lifecycle
Why BIM (building information modelling) for StormWater Infrastructure

- Better Asset Performance through Depth of Information Modeling
- Better Project Delivery through Breadth of Information Mobility
- CAPEX
- OPEX
It is All about the - Whole Life Cycle of the Assets

- Project and Information Integration
- Business Requirements
- Design
- Construct
- Use
- Maintenance
- Business Operations
- Asset Performance and Asset Management
- Work upstream and downstream to make value flow
- Profitability of Infrastructure

- Value
- Cost
- Time
- $ $ $ $ $
BIM Aligns with Asset Management Standards (ISO 55000, PAS55)

• Ensures delivery of both: **Physical Infrastructure & Digital Information Model**

• Drives asset performance throughout operable life

• Uses disciplined asset lifecycle information management
BIM Level 1
2D: Storm Drainage Networks
3D: Intelligent Storm Drainage Models
BIM Level 2

4D: Time
5D: Cost

Design Modeling

Construction Modeling

Simulation

Visualization

Analytical Modeling

Design

Construction

Information Mobility
“Context Capture”…
Example: Paris 500 km of sewers mains

**Requirement**
- Model and refresh a sewer infrastructure (500km long) including pipes, cables and other equipment

**Solution**
- Multi-directional camera system (like Trimble v10) + specific lighting system + Smart3DCapture Ultimate

**Result**
- Photorealistic 3D model, helping users to detect and extract structure components from the mesh and point cloud
Why Use Storm Water and Sewer System Models?

**Bentley Playbook:** StormCAD, CivilStorm, SewerGEMS, Open Utilities, Mohid 2d/3d, PowerCivil, ContextCapture, LumenRT

- Master planning
- Subdivision design
- Capacity evaluation
- Pump station design
- Force mains
- Pump selection
- Pressure sewer design
- Flood risk analysis

- Overflows
- I&I studies
- Pump operation
- System extensions
- Energy efficiency
- Rehabilitation
- Hydraulic flows in WWTP
- Delivery of BIM-ready models
Bentley OpenUtilities: Multi-utility GIS for mapping, design and analysis of storm / sewer and other utilities infrastructure
New in CivilStorm & SewerGEMS: Low Impact Development (LID)
Flexible LID Modeling

a. Before LID Controls

b. With two LID controls in series
Storage Tanks

• Manufactured tanks
• Usually underground
• New pond volume type
• Library available
Cost-Effective Design and Rehabilitation

Objectives

Deliver designs that meet regulatory requirements
Reduce modeling time, in order to focus on engineering decisions

Outcomes

Optimal design - Minimized capital investment
High quality projects
Design

New Infrastructure

Automated constraint-based design

Minimize design costs and capital investments
Maximize performance
Rehabilitation

Existing Infrastructure

- Evaluation of capacity
- Assessing the risk of flooding
- Find/fix bottlenecks
- Improve overall system
- Reduce capital investments
Full Integration with SUE - 3D Storm Drainage Design

SUE = Subsurface Utility Engineering + StormCAD or CivilStorm or SewerGEMS
Flood Risk Analysis of Storm Drainage Systems

Flood risk = probability (flood hazard) x consequences (damage)

Flood hazard map (flood probability) based on capacity assessment / modelling using hydrologic inputs and hydrodynamic simulation models SwerGEMS / CivilStorm / HEC – Pack, Mohid 2D/3D

Flood damage map showing the exposure and damage potential (consequences of flooding), based on available GIS data

Flood risk map representing the direct damage (monetary value). Derived with GIS spatial analysis (Bentley Map)
LumenRT flood visualization (results from flood simulation and Map)
Take Away Message

• Bentley’s integrated solution cover the complete life-cycle of the Stormwater, Sewer and any other Infrastructure

• Haestad modelling products are the back-bone of this solution to improve the Asset Performance of the infrastructure

• Delivery of BIM-ready digital information models is the way forward to ensure Sustainable Stormwater Infrastructure
Thank you for your attention!

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