Integrated Catchment Modelling

Modelling the whole water cycle in one package

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Integrated Water Planning

• Historically water, wastewater and stormwater modelling occurred in “silos” with little integration - we need to think more holistically about 3 waters modelling
• We need to incorporate climate change predictions
• Planners, engineers and modellers working together
• Bring 3 waters considerations into the urban design process earlier and acknowledge the importance of:
  • Whole of Water Cycle Management
  • Sustainable Urban Design e.g. stormwater harvesting & sewer mining
  • Greenspace, landscaping, streetscapes and recreational value e.g. daylighting of stormwater channels etc.
• Modelling is a tool that supports decision making
Integrated Water Modelling?

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- Flooding - 2D models & rivers, channels
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  (long time series)
- Potable water Supply
- Climate Change
- Water Quality
  > Treatment processes (WSUD)
  > Quantity and effect on receiving environment
Disciplines are Siloed

- **Catchment**
  - Quantity
  - Quality
  - Receiving Water Condition
  - Stream flow

- **Stormwater**
  - Quantity
  - Damage
  - Quality
  - Potable Water Supply

- **Quality**
  - Quantity
  - Levels of Service

- **Sewage**
  - Containment
  - Transport
  - Quality
Assumptions are also Siloed

The “big” assumptions
- Boundary
- Outcomes
- Climate change
- $, politics etc.

Rainfall generated water
- Resource
- Nuisance
- Surface Water
- Groundwater

Water fit for a purpose
- Consumption
- Industry
- Environment

Used water containing pollutants
- Recovery
- Treatment
- Reuse
MODELLING of Water, Wastewater, Stormwater and Land drainage

Example linkages

- Metering/Billing
- Asset Management
- GIS
- SCADA & Field Observations

Inputs

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The Melbourne example

• Integrated Water Management is not new

• What is new is having all the components and assumptions in the one dynamic model.

• Start with household water balance

• Engage experts to build sections
  • BECA – Project Manage and Peer Review
  • Urban Water Solutions – Potable Water & Sewerage
  • Water Technology – Drainage & 2D
Whole of Water Cycle Modelling

- Modelling of water, wastewater and stormwater in a single package
- Looking at the whole water cycle in an area
- Supporting integrated catchment management and sustainable design principles
Household water cycle

- Rainwater Tank
- Runoff from roof
- External Use
- Property drain
- Tank overflow
- Storm Water network
- Pervious Surface Runoff
- Potable Water
- Potable for external use
- Internal Use
- External Use

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Control logic required to “operate” the houses

- Generic profiles were used to replicate demand
- Individual rainwater tanks for each property
Potable Water = 600 l/household/day
Potable Supply

Rainwater Tank

600 litres

100 litres

Household

50%

Garden

50%

200 litres

Sewer
Pilot Study

- Feasibility and practicality of WOWC modelling for
  - 100 properties
  - 5,000 properties
  - 27,000 properties
5000 Property Integrated Water Cycle: Model Stats

- 5,800 Buildings
- 5,301 Buildings with Water & Sewer connections
- 4,923 Buildings with rainwater tanks (res only)
- 23,197 Nodes
- 8,160 Pipes
- 15,147 Pumps
- 15,147 Weirs
- 4,921 Orifices
- 54,903 lines of RTC code
1D – 2D linkages

- 2218 individual manholes linked to mesh
- Surface flow paths identified
- Building outlines ignored
Results: Stormwater
5000 households
At peak flow – 100 yr 2 hr storm with rainwater tanks
Rainwater tanks – empty, fill and spill

Overflow to Stormwater Network
Dynamic connection between Water Supply and Sewerage Systems

Simplified representation of a house – does not include losses from individual fittings

Potable Water

Sewerage
Questions?