SMART Flood Management
Flood reduction on the A548 Coast Road

Greenfield, Holywell

Client

Flintshire County Council

Services Provided

- Design & Analysis
- Hydraulic Modelling
- Smart Technology
- Project management
- Tender Process
- Construction support

Scheme Details

This pilot scheme involved an in-depth hydraulic investigation and the design and mathematical modelling of a SMART Flood Management scheme to effect a flood reduction on the A548 North Wales Coast Road at Greenfield, HOLYWELL North Wales.

The primary cause of the flooding is the limited capacity of a culvert under the A548 this despite upstream capacity in the Greenfield Valley particularly at Battery Pool Reservoir.

Hydraulic Modelling

A hydraulic model was built in order to verify the effects of different events within the catchment and to quantify the influence of proposed intervention. A 1D-only model of the valley stream was built with the hydraulic software MIKE11. This was then coupled into a 1D/2D model, linking to a DTM of the Coast Road area with the software MIKE FLOOD. The model results showed that in its current configuration Battery Pool provides some limited flood attenuation; which can be improved by appropriate control applied on the outfall gate. Volumes spilled from Greenfield Centre pond are considerable (due to the inadequate maximum capacity of the culvert, estimated equal to 1.05 m3/s in surcharged conditions) and capable of flooding the A548 Road also for low return period events shows the large scale flood obtained for a Q100 + Climate Change Allowance (CCA) event. The volume available at Battery Pool (~5000 m3) has the potential to completely store a Q30 event and to reduce of one third the peak flow during a Q100 + CCA event.
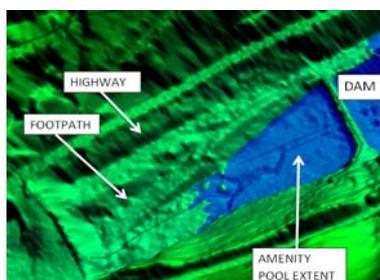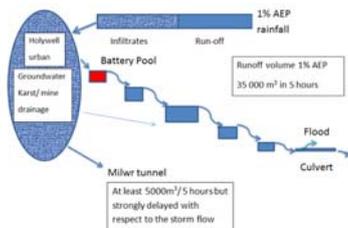
Application of Smart Technology

Active **Smart storage** uses information from flow, level and rain gauge sensors to predict the best time to intervene by moving the active gate and throttling down the outflow increasing the storage rate. Therefore, active storage is more efficient in reducing peak flow levels, per cubic metre of storage available. At Battery Pool, the 1% AEP event volume is 10 times the available passive storage. Active storage is a significant attenuator of peak flows (i.e. top 3rd of the hydrograph) and allows the capture of significant rainfall volumes, because using active gate controlled storage only the upper part of the hydrograph is targeted for capture, reducing volumes by a factor of up to 7. Control of the system is achieved by the use of 3 rain gauges, 2 flow devices and a PLC with an intelligent cloud-based 'Control and Command' autonomous system. All the devices have default off-grid settings providing fail-safe routines in the event of power or communication failures.
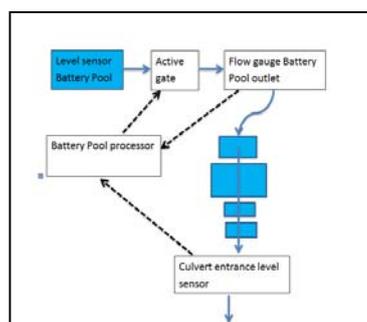
Outcomes

Waterco was engaged to work as part of a client led multi-disciplinary team to develop the design, obtain tenders and provide construction support; the project is on-going.

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