

## Canterbury Flood Prevention Scheme

by Robert McTaggart

### 4Delivery

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### **Brief description**

Case study, evaluating a challenging flooding and urban growth project. Canterbury is a historic city with significant projected new growth. To accommodate this growth and address existing flooding problems a new trunk sewerage system was proposed. An alternative option incorporating pumping and a new CSO avoids having to build new trunk sewers and thus delivers significant cost savings and reduced carbon. The paper will describe the process that enabled this novel approach to be realised and will show how construction is progressing on site.

### **Introduction**

The historic city of Canterbury consists of approximately 20,000 households. Continuous growth within the city has exhausted spare capacity of the sewerage network. Extra sewerage capacity was required to service new development and reduce risk of flooding and pollution.

4Delivery developed an innovative solution which provides additional capacity whilst saving in excess of 2800 tons of carbon (approximately 75% saving over the original client brief scheme), reduced disruption to the public, achieved "no deterioration" to the quality of the River Stour and made financial savings of £16m. The 4Delivery methodology was not only accepted by the Environment Agency but has been put forward to Water UK as the "process for permitting new CSOs to resolve sewer flooding" with the intention of becoming official EA policy.

### **Project description**

The city of Canterbury is located in South-East Kent. The catchment comprises Canterbury and the outlying areas of Sturry, Blean, Tyler Hill and Harbledown. The catchment is located either side of the River Stour which drains from the South West to the North East. All wastewater flows from the catchment drain directly to Canterbury Waste Water Treatment Works (WTW) situated to the North East of the city centre. The drainage area covers 1,673 ha and has a residential population of approximately 49,000.

Approximately 4500 new properties and 13 hectares of commercial developments are planned in the Canterbury sewerage catchment during the period 2006 to 2015. Developments are planned at more than 100 discrete sites within the catchment, with a predicted increase in population of approximately 9400 (an increase of 20%). Hydraulic analysis demonstrated that the existing sewerage system was not achieving Southern Water's level of service protection against flooding due to hydraulic overload. The increase in population would aggravate the level of service afforded to Southern Water's customers and the environment.

Infrastructure improvements were therefore funded to provide additional network capacity to service new development.

## Client brief scheme

The client brief scheme was to construct 4.4 km of trunk sewer to Canterbury WTW and provide an increased inlet works capacity of 2000l/s. No additional improvement work or increased capacity was proposed for the WTW. Assessment of this option highlighted it would cause significant detriment to the operation of the WTW and storm overflow spills. This would result in deterioration to the quality of the River Stour.

## Development of an Alternative Scheme

During the initial stages of the project 4Delivery adopted the following solution strategy

- Provide extra sewerage capacity to service new development and reduce the risk of future flooding and pollution.
- Achieve 'no deterioration'
- Minimise environmental impact / Carbon Footprint.
- Minimise disruption to the public / SW customers
- Provide best network resilience.
- Minimise impact on fluvial flooding.

## Alternative Scheme

As an alternative, the following scheme was proposed and delivered, which met the above criteria:

- A new offline pumping station, passing flows to storm tanks at Canterbury WTW.
- Additional 2500m<sup>3</sup> of storm tank storage to supplement the existing tanks, providing a total of 8100m<sup>3</sup> of storm tank storage at Canterbury WTW.
- 900m<sup>3</sup> offline storage and screened CSO located in-catchment. The new CSO is Formula A compliant and hydraulic analysis demonstrated that the spill frequency is limited to once every two years. Discharges have been determined to comply with both percentile and fundamental intermittent standards for UPM studies.

## Construction of in-catchment storage



One of the key elements of the alternative scheme was the inclusion of a new CSO.

## EA submission to support the case for a new CSO consent.

Normally The EA refuse to permit such discharges. The Water Industry Act 1995 requires water companies to 'effectually drain' the catchment.

The water company must demonstrate the following to enable the agency to grant an intermittent discharge consent:

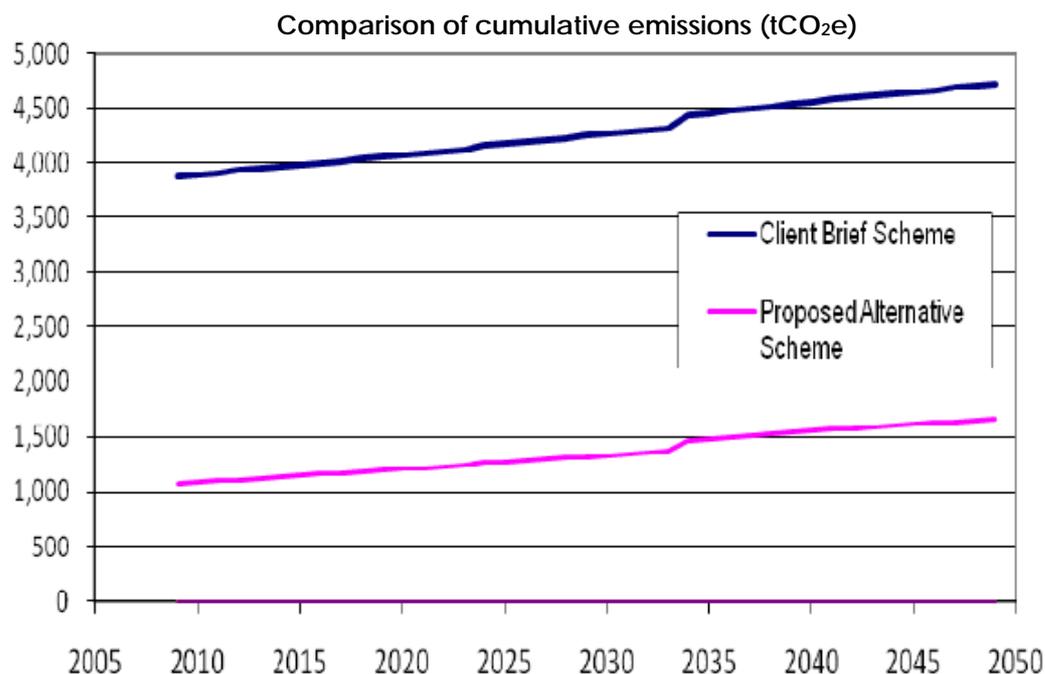
- i) That there is existing sewer flooding that needs resolution;
- ii) The potential change in environmental conditions that are predicted to occur as a result of introducing the new discharge, related to the sensitivity of the watercourse;
- iii) The rigorous exploration that has taken place for other alternative solutions to the introduction of a new CSO (e.g. Isolation, flow transfer, system optimisation, do nothing, storage or upsizing);
- iv) That any other viable solution entails excessive cost when compared with the CSO option.

150+ pages of supporting information was submitted as part of the consent application including.

- Rainfall report 12 pages
- Model Build Verification report 78 pages
- Urban Pollution Management report 14 pages
- BATNEEC report 13 pages
- Flood Risk Assessment report 36 pages
- Consent application

## Carbon Assessment

A carbon emissions assessment has been undertaken to compare the two schemes. The carbon emissions assessment included consideration of the embodied carbon and operational carbon emissions associated with the proposals. The figure below shows the difference in carbon emissions between the client brief scheme and the alternative scheme.



Using the carbon auditing methodology, the total embodied carbon for the alternative scheme was determined to be 1076 tCO<sub>2</sub> compared to the original scheme emissions of 3885 tCO<sub>2</sub>.

It is clear that in terms of carbon emissions, the alternative scheme offers a very substantial advantage over the client brief scheme. Over a 40-year period the alternative scheme is estimated to generate approximately 3000 fewer tonnes of carbon dioxide (tCO<sub>2</sub>).

In terms of Defra's Shadow Price of Carbon, the net present value of the alternative scheme's carbon impacts was assessed to be approximately £40k whilst that of the client brief scheme was £120k.

### **Conclusion**

4Delivery has developed an innovative solution to provide additional hydraulic capacity for the City of Canterbury. This has been achieved whilst saving in excess of 2800 tons of carbon (approximately 75% saving over the original brief), reduced disruption to the public, achieved "no deterioration" to the quality of the River Stour and made financial savings.