


Flow surveys in sewer networks and at WwTW


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Introduction

- Determining flow splits at wastewater treatment works
 - Canwick STW, Lincoln
- Infiltration studies in a sewer network
 - Fritwell STW, Oxfordshire


2




Canwick STW: Background

- Significant growth planned for Lincoln
- EA require Canwick WwTW to pass 1029 l/s by March 09
- Works has sufficient process capacity to biologically treat the maximum flow, but only the hydraulic capacity to pass 650 l/s
- Not possible to identify the hydraulic restrictions by increasing the flow at the works
- Hydraulic models developed
 - Many unknowns
 - New pipework required in the areas where there is limited data available


3



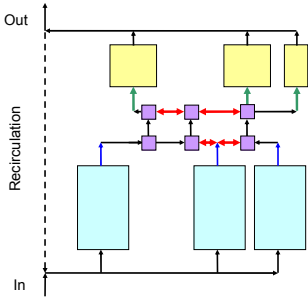
Canwick STW: Site layout




4



Canwick STW: Unknown information



5



Canwick STW: Options for data collection

CCTV



- Cannot be used when the pipes are flowing full

Conventional in-situ flow meter


- Very difficult to install
 - Pipes 2.5 m below coping level
 - Cannot isolate

Portable flowmeter

- Installation problems
- Are the measurements of velocity representative
 - Sediment deposits



6



Canwick STW: Options for data collection

Tracer study

- Determination of flow rates via dilution gauging provides an accurate data set
- Determination of flow rates at any access point
- Can be used to determine if the flow splits change with flow rate
- Assumptions
 - Cross-sectional fully mixed
 - No loss in the system

7

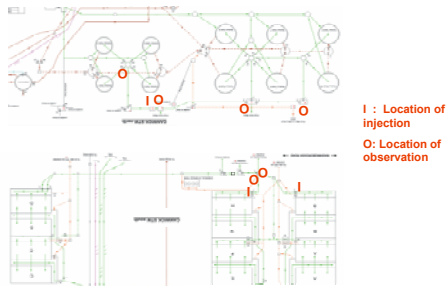
Canwick STW: Tracer study set-up

- Constant dye injection system
- Spot samples collected at 15m intervals
- Samples filtered before analysing to remove turbidity and its effects and give more accurate readings



8

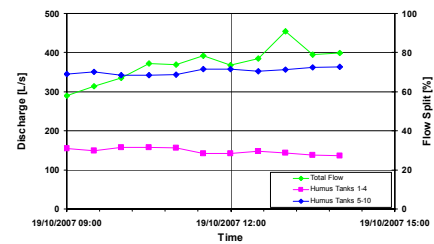
Canwick STW: Tracer study set-up



9

Canwick STW: Survey results

- What is the flow split?
- Did it change with flow to treatment?



10

Canwick STW: Conclusion

- Survey results have been incorporated into the hydraulic model
- By removing uncertainty in the system, 88 m of pipework is not required, saving Anglian Water in excess of £50k.

11

Fritwell STW: Background

- Infiltration in the network causes the storm tank to operate for prolonged periods during the winter
 - Works running at FFT
 - Discharges from the storm tank
- EA obligation – stop discharges from the storm tank in dry weather
 - Obligation date March 09
- The number and location of the infiltration points unknown

12

Fritwell STW: Catchment



13

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Fritwell STW: Options for data collection

CCTV

- May highlight faults with the pipe
- but not necessarily key infiltrations points

In-situ flowmeter

- May provide a good data set over a range of flow conditions
- Flow meter likely to get ragged up – risk of flooding
- Limited number of locations

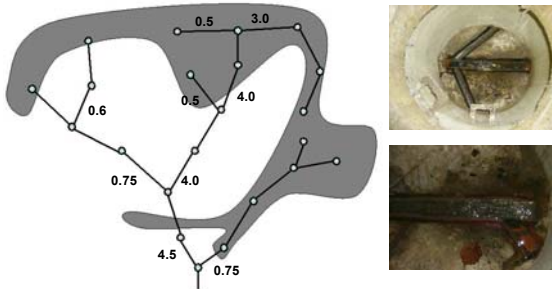
Portable flowmeters

Tracer study

14

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Fritwell STW: Flowmeter results



15

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Fritwell STW: Conclusion

- Both approaches have advantages and disadvantages

Tracer studies

- Potential for an accurate data set even at low flows
- On-line measurements affected by turbidity
 - toilet flushes, washing machine, school kitchen
- Grab samples will only give a snap-shot in time
- Time consuming to set-up

Flowmeters

- Quick and easy to set-up
- Will not give accurate readings when the depth of flow is low

- CCTV survey conducted in areas highlighted by the study – defects identified



16

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Conclusion

- Tracer studies perceived by Anglian Water as a very useful data collection tool
 - Non intrusive - do not require isolation
 - Provide an accurate data set
 - Cost effective

17

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