Sewer Blockage Cause Diagnosis – A Model to Reduce Incidents

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stream

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Project Background

Sewer blockages now account for the majority of all sewer flooding incidents, (OFWAT, 2009; WICS, 2009; NIUR, 2009)

Over 160,000 blockages occur annually at a direct cost of £70 million to the UK water industry

The objective of this project is to create a blockage diagnosis tool to allow a practical diagnosis of the cause of sewer blockages

Use of the model will allow proactive intervention to be implemented improving the performance of small bore sewers and lateral drains

Model Inception

Literature Review

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Field Work

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Data Mining

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Blockage Formation Factors

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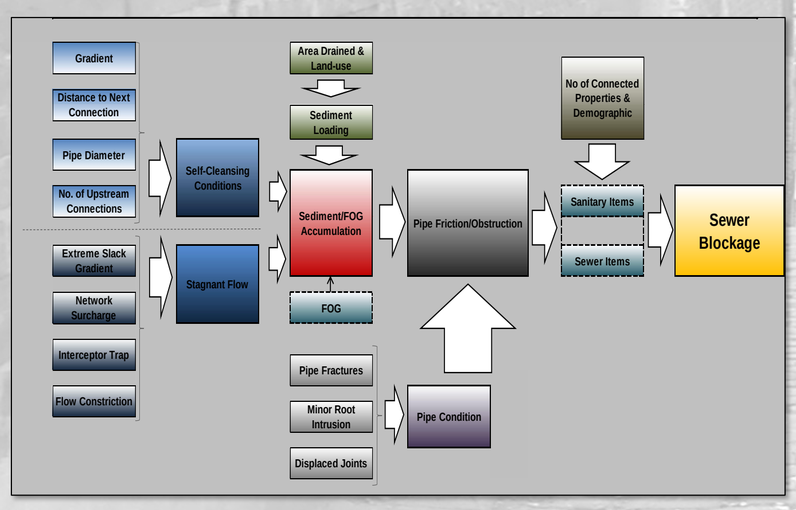
Blockage Formation Mechanisms

Model Development

Conceptual Model Development



The initial conceptual model was developed based on the blockage formation mechanisms

Development of Scoring Matrix

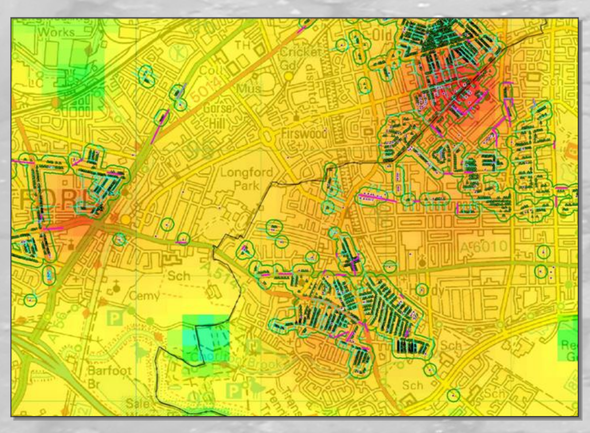
1. Are self-cleansing conditions achieved?						
A. Housing Density		High Density 50-74 1.9	Medium Density 25-49 1.2	Low Density <25 1.1		per hectare
B. Up-Stream Connections		0 *1.7*	1 *1.5*	2 *1.4*	3 *1.3*	>3 *1.1*
C. *Gradient vs. Diameter*	+	<=2.5:DN *2.1*	>1:2.5DN and < 1:DN *1.6*	>=1:DN *0.7*		Gradient= value specified from input Diameter = value from input sheet
2. Is a sediment bed likely?						
A. *Function*	+	Foul *1*	Surface *1.2*	Combined *2.1*		Entered manually on data entry shee
B. *Expected impervious area* N/A If Foul Sewer	+	<5m² High Density *1*	<12m² Medium Density *1.2*	<20m² Low Density *1.4*		Extrapolated from housing density Just use Housing Density categories
C. *Land-use* N/A If Foul Sewer	+	Suburban *1*	Urban *1.2*	Peri-Urban *1.4*		Entered manually on data entry shee
3. What is the pipe friction likely to be?						
A. *Sediment Bed*		>=3 and <=3.5 1	>3.5 and <=4.5 2	>4.5 and <=5.5 3	>5.5 and <=6.5 4	>6.5 5
**CCTV record*	+	<5% 0	5%-19% 1	20%-49% 2	50%-75% 3	>75% 4
INTERVENTION Cleansing Use Sediment Bed Category: Score (linked to cells above)		1 0				
C. Direction Changes		0 *1*	1 1.3	2 *1.5*	3 1.7	>3 *2*
	+					

Each sewer parameter in the model was then assigned a score and developed into a scoring matrix

Model Calibration

The scoring was then calibrated using water company data

Output & Application



Model Output

- Effective diagnosis of blockage occurrence on a pipe by pipe basis
- Guidance on the most appropriate remediation for a catchment specific situation
- A simple economic evaluation of potential interventions

Model Application

The model can be used by WaSC as a decision support tool to guide the implementation of proactive maintenance

The model can also be used to improve understanding of the processes and mechanisms by which sewers become blocked

Project Collaborators

Project collaborators include:

United Utilities · Scottish Water (Always serving Scotland) · northern ireland water · SEVERN TRENT WATER · Southern Water · anglian water

References

NIUR 2009. Annual Information Return 2009. http://www.uregni.gov.uk/uploads/publications/3_AIR09_Public_Domain_Version.pdf (last accessed 22/08/2011)

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