

## **CAMBOURNE TERMINAL PUMPING STATION SURCHARGE - ACTION PLAN**

### **Executive Summary**

This action plan has been prepared to report on previous work undertaken, and identify future work needed to remedy surcharging within the foul water Terminal Pumping Station at Cambourne.

This problem currently remains the primary reason why Anglian Water will not adopt the foul sewer network. On completion of the works identified within this action plan a programme of remedial works will be implemented which will enable Anglian Water to progress towards adoption.

The report identifies the likely causes of increased flows within the TPS as being ingress of water during and after periods of heavy rainfall and goes on to identify likely causes of this ingress.

This report also shows the progress that has been made to date on repairing manholes and drain runs and reports on how this improvement has been measured.

The action plan has been developed as a result of visual inspection during and after a recent intense rainfall event. WSP staff witnessed ingress of water to the foul network from a variety of sources including, surface water drainage runs laid by house builders within their respective development plots and leaking manholes.

The report includes a summary of observations made during recent heavy rain that indicate an ingress of surface water into a limited number of 'Developer' laid mains. A comprehensive method of testing the possibility of surface water entering the foul system by incorrectly connected surface water drainage is included in the Action Plan.

The report concludes with clear recommendations of how with 4 teams, using bowsers of water and coloured dye cross connections to the foul network will be identified.

### **Introduction**

This action plan has been developed following a meeting between MCA Development Ltd and WSP in response to the surcharging incident at the Anglian Water Terminal Pumping Station (TPS) on 26/27 August 2010.

The event followed a period of heavy and prolonged rainfall during week commencing 22 August 2010.

The rainfall over this period was recorded at local observation weather stations at Royston and Cambridge University as 88mm and 89mm respectively. This was higher than that recorded during previous rainfall events which caused flooding to properties at Damson Way in August 2009 (60mm) and February 2010 (35mm) although this later event was contributed to by other problems at the TPS. No flooding to property was caused by the recent August 2010 event.

During 26/27 August 2010 a large number of the manholes within the foul sewer system were inspected for leaks or high flows. These observations identified 'hot spots' and areas requiring further investigation some of which indicated the strong possibility of cross connections from garage areas and courtyards etc. within development sites. Further investigation of these areas will require access onto private property.

This Action Plan provides an update on the ongoing remedial works and develops the strategy for carrying out further investigative work to locate remaining sources of infiltration during and after rainfall.

### **Current Status Of Strategy Plan**

The strategy developed after previous surcharging / flooding at the Terminal Pump Station had ensured that all of the Primary (MCA) Infrastructure and Secondary (Developer) Infrastructure foul drainage networks had been CCTV surveyed by the end of July. Almost all the identified defects were addressed on the Primary network with a significant proportion of the Secondary. There were unfortunate delays with the completion of some of the remedial works contracts which are now progressing.

It had been anticipated that during the investigative period a process of monitoring the effectiveness of the study and the repairs undertaken would be achieved after rainfall. However the long dry spell between April and July meant little checking was possible, so although much work had been undertaken there had been no way of ensuring this was complete and the problem solved.

The week-end rainfall on 21/22 August caused no surcharging but the additional rain on 25/26 August did although the non-return valve and other works carried out at the Terminal Pump Station prevented any flooding of property.

The satellite pump station monitoring and tankering strategy also worked to reduce tankers at the TPS although some disturbance was caused overnight.

Anglian Water have undertaken some analysis of the all the Pump Station's records and conclude that improvements have been in evidence from reduced pump run times and the telemetry readings.

### **Summary Of The Results From Site Observations**

The observations on site during and immediately after the rainfall overnight on 25/26 August and during 26 August were undertaken by two teams led by WSP staff.

The attached plan of Cambourne (Drg. No 138A) shows the extent of the inspection area and identifies the approximate location of the 'hot spots' ie leaks in manholes or observed high flows. A written record of manholes inspected and findings was maintained.

The 'high flows' observed were considered higher than might normally be expected during normal dry weather conditions in a foul sewer. The observations were carried out

between 9.00am and 4.00pm on both days, which is largely outside the diurnal peaks usually associated with foul sewer flows.

The types of leaks observed in the manholes included leaks through joints in the precast rings or locating 'eyes', through the concrete benching at the base, at joints between ring and base, joints in the pipework, from fixing bolts for the access ladders or from beneath the cover slab. There was also leakage between cover and frame particularly where the manholes were constructed in carriageways, footways or other hard surfaced areas eg car parks and yards and where they occur in low areas of open ground.

The reasons for the unusually high flows in the pipework as witnessed in the manholes at this time are considered to be due to:

- i) open or damaged pipework,
- ii) leaking manholes and redundant laterals not capped or sealed
- iii) land drainage connections
- iv) cross connections to the surface water pipework,

#### **i). Pipework**

Numerous geotechnical investigations undertaken at Cambourne have confirmed that the sub-soil is predominantly impervious clay. Almost all the sewer trenches beneath carriageways and footways are backfilled with granular material in accordance with highway and drainage adoption policies. These trenches together with a network of service company trenches with sand backfill can impound surface water run-off that has percolated below the paved level. Any open pipework or joint in such a location would allow a leak into the system, as would any weakness in the manhole construction. Water pressure would build up after heavy rainfall to expose these defects resulting in prolonged infiltration after the rain had ceased. In addition any remaining sections of the land drainage system or naturally occurring lenses of sand and gravel within the clay could also convey water towards the drainage trenches and manholes.

Open or damaged pipework issues have already been identified from the complete CCTV survey undertaken for all the adoptable foul sewers ie the Primary (MCA) Infrastructure network and Secondary (Developer) Infrastructure network. The whole of these networks have already been CCTV surveyed and defects identified. There is some confidence that the problems of infiltration within the major network's pipework has been addressed. Most of the remedial works required have been completed or are scheduled for completion soon.

#### **ii) Manholes**

A number of leaking manholes on the Primary Infrastructure and leaking redundant laterals from development sites had been identified from the original CCTV and visual inspections and these have been dealt with already. The inspections prompted by the recent rainfall have revealed some further work is required to these manholes and fresh leaks were found in other manholes. The remedial works to these manholes will be undertaken as part of this Action Plan.

#### **iii) Land Drains**

A study of old farm and site records to establish potential Land Drainage connections has been made and confirms that most have been severed by the construction work for

the development. However these records will be rechecked to see whether these may still be contributing to the piped drainage system.

#### **iv) Cross (rogue) connections**

The possibility of cross connections from Surface Water pipework based on the identified 'hot spots' will form the core of the investigative work contained in this Action Plan. The likelihood of cross connections is greatest on pipework and manholes or inspection chambers on the smaller upstream drainage networks. These tend to be on private property or in communal areas and are not adoptable. Investigation of these networks will involve initial contact with the property owners and the use of teams equipped with bowsers and coloured tracing dye.

### **Action Plan**

Four phases of work are identified below.

**Phase A** which is in two distinct parts involves site work to test the connectivity of drains in development site areas identified in the investigations described above where High Flows were observed after rainfall.

Part 1 of Phase A would tackle the known 'Hot Spots' whereas Part 2 would rely on further observations after rainfall to identify other specific target areas from the remainder of the site. If no rainfall observations were possible during part 1 of the Phase A work, then the connectivity tests would be extended to all remaining areas.

These remaining areas would be prioritised according to the potential risk of finding a cross connection. Ultimately all areas would be assessed for site testing.

Part 3 of this phase would cover Upper Cambourne which although it is of more recent construction some high flows observed recently need to be further investigated.

The testing procedure involving bowsers of water and coloured dye would be undertaken by 4 teams with two operatives and an engineer to identify manholes etc to be checked and to maintain comprehensive records. Water and dye would be used to check the flow pattern through the drainage system and to confirm or otherwise whether water from surface water run-off areas eg roads footways, garage areas and courtyards or roof drainage pipework is connected correctly. Multi linked systems would use several colours of dye to identify these routes.

A letter or leaflet drop would need to be carried out in advance to advise residents of the need to enter communal areas and if necessary their property to carry out these water tests.

Phase A1 Test sites are: Lower Cambourne- LC01, LC02, LC05, LC08, LC11, LC12,  
LC13, LC15.  
Great Cambourne- GC12, GC14, GC17, GC23, CR01.

A2 Test sites are (if not eliminated following a rainfall observation survey)

Lower Cambourne- LC03, LC04, LC06, LC07, LC09, LC10,  
LC14, LC16.

GC16, Great Cambourne – GC06, GC08, GC13, GC14, GC15,  
GC25, GC19, GC20, GC21, GC22, GC24,  
CR03 GC27, GC28, GC29, GC30, GC31,

A3 Test sites in Upper Cambourne (if other causes of 'High Flows' not discovered)  
- UC01, UC02, UC03, UC04b, UC07,  
UC08.

Plus also (if not eliminated after a rain event) - UC05, UC06, UC10, UC12.

- Note :
1. Detailed as-built record drawings would be obtained from developers to identify the routes of drain runs and manholes
  2. Sites GC01, GC02, GC03 and CR05 are all connected to an adopted sewer system and not included in this testing programme.

**Phase B** This will involve agreeing appropriate remedial works with Anglian Water and instructing and monitoring the repairs to the defects. This work has already begun and would be extended to incorporate the results of the testing regime outline in phase A.

The areas of initial work include sewers in: Western Valley, Hub Car Park, Brace Dein, Sterling Way and Lancaster Gate, plus those in the Eastern Valley alongside the SE boundary of Cambourne.

**Phase C** Contact would be made with non- MCA developers where results of the tests or observations show the need for remedial work. Progress would be monitored to ensure cooperation.

**Phase D** Inspections of the Primary and Secondary Infrastructure would continue after rainfall to complete the observation work begun during August 26/27 2010. Further 'Hot Spots' would be added to the testing regime if required. A nil result could reduce the work load as noted for phase A2 and A3 above.

**Phase E** All repair work instructed above to be further inspected during a rainfall event.

**Phase F** Continued liaison would be maintained with Anglian Water to regularly review the impact of these remedial works on the performance of the Terminal Pump Station.

Note: Phases of work would in some cases be concurrent.

## **Programme:**

A programmed start date of 5 October 2010 is proposed. However, although enquiries have been made to mobilise the plant and labour this date will be subject to the confirmation of approval to proceed, the assessment of the as-built records, instructions being prepared and issued and finally the distribution of leaflets/letters to residents.

The timescale is estimated as follows based on a large site taking 3 days per team to complete and the small social housing areas 1 day. There are some very large sites for which 4 days have been allowed.

Phase A1 8.5 days (assuming 4 crews)

Phase A2 12.5 days (if all sites are required to be tested – assuming 4 crews)

Phase A3 4 days (if all sites are required to be tested – assuming 4 crews)

A total of 25 days site work is estimated, the overall duration for testing and production of results would therefore be say, 7-8 weeks.

Phases B, C, D, E, and F would run concurrently but extend beyond Phase A depending on the extent of the repair works required.

## **Reporting**

The results of all testing and observations would be collated and fed back to MCA developers as appropriate, for remedial action by their own contractors.

Similarly for Non-MCA developers with addition monitoring to check progress.

The MCA Project Director would be kept up to date on a regular basis and periodic reports presented to the Surcharge Strategy Committee which has met regularly since September 2009. Representatives include the Project Director, Anglian Water, MCA Developers, WSP, SCDC (Environmental Health and Planning Departments, Environment Agency, Granta Homes (Damson Way).

In addition the SCDC, Parish Council and the Action Group 'RAFT' would be kept advised of progress and involved as required.

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