

SELECTING SEWER MAINS FOR AN ANNUAL CCTV INSPECTION PROGRAM



Paper Presented by:

Alan Tonks

Author:

Alan Tonks, Technical Officer,

Goulburn Valley Water



*73rd Annual Water Industry Engineers and Operators' Conference
Bendigo Exhibition Centre
31 August to 2 September, 2010*

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Alan Tonks, Technical Officer, Goulburn Valley Water

ABSTRACT

Goulburn Valley Water (GVW) has an annual program to investigate and where necessary rehabilitate gravity sewers. A list is prepared annually for the CCTV inspection of sewer mains from towns within the Corporations districts. The inspections incorporate cleaning, root cutting if applicable and closed circuit camera and video survey (CCTV). Based on the results of the CCTV inspections, sewer mains are then selected for renewal or rehabilitation.

GVW historically concentrated on large diameter deep concrete sewer mains as these were regarded as being those with the largest likelihood of failure and greatest consequence of failure.

Involvement in the WSAA/CSIRO sewer blockages project and adoption of the proposed water industry best practice for managing sewer blockages has resulted in GVW broadening the section criteria.

GVW now uses the CCTV inspection program to identify sewer mains for rehabilitation, but also to clean sewer mains and reduce the reoccurrence of sewer blockages, and is targeting sections of the sewer network with high sewer blockage rates. This is identifying a higher percentage of sewer mains that require rehabilitation than the previous program criteria.

KEY WORDS

Sewer, CCTV Inspection, Program, Sewer Blockages

1.0 INTRODUCTION

GVW provides water and wastewater services to 54 towns and cities in north east Victoria with 1,100 kilometres of pressure and gravity sewers. GVW has an annual Capital Expenditure budget item for the Relining/Replacement of sewers which includes a CCTV program which totalled \$685,000 for 2010/2011.

The aim of this program is to identify sewers for rehabilitation before failure. This paper discusses the methodology for selecting the correct asset for review.

2.0 ORIGINAL PROGRAM

GVW commenced an annual sewer rehabilitation program in 1996/1997 with program objectives to:

- Prevent service interruptions resulting from structural failure of sewers of 300mm or greater; and
- Prevent service interruptions resulting from the structural failure of sewers laid at depths greater than 6 metres.

The sewer inspection program targeted sewers that met the above criteria and included CCTV inspection of selected sewer mains.

Initially, all the footage of each sewer main inspected was reviewed by GVW to select mains that required further works, such as relining, replacement or patch lining. The footage was also used to identify property branches that were blocked, with property owners notified to clear their lines.

With time, the subsequent programs were expanded to include specifically concrete sewers. This was influenced by a sewer collapse in a large diameter concrete sewer main. The focus was shifted to include:

- concrete sewers 225mm diameter and above that are greater than 30 years old; and
- 150mm diameter concrete sewer pipes that are greater than 50 years old and laid at a depth of more than four metres.

The programs also included requests from the Operations District Managers, who were aware of problem sewer mains which had developed blockages in the past.

The CCTV programs identified problems in the sewer reticulation mains, including mains for relining, pipes for patching and sewer collapses that required urgent attention and excavation. However the investigations were scattered across the sewer network within serviced towns across the Corporation's region.

As such, individual lines were being sampled providing no broad assessment of pipes in the similar cohorts to the sampled selection. Often, the CCTV contractor would inspect a single line in one area of town and then relocate to other areas, even though adjacent pipes were not inspected which were the same material, age, proximity to large trees, etc. Table 1 shows the total length of sewer main CCTV inspected since 2002.

Table 1: *Length of CCTV Inspection*

CCTV Stage	Inspection Year	Total Inspection Length
4	2002/2003	15,000m
5	2004/2005	24,000m
6	2004/2005	21,000m
7	2005/2006	12,640m
8	2006/2007	16,100m
9	2007/2008	
10	2008/2009	29,300m
11	2009/2010	36,000m

3.0 CHANGE OF THINKING

GVW has participated in the WSAA/CSIRO Sewer Blockages Project which was part of the suite of WSAA Asset Management Programs since 2009. Involvement in this project including the attendance at the project workshops has improved our understanding of:

- the causes of sewer blockages,
- benefits of cleaning sewer mains with jetting
- impacts of root foaming, on the sewer main and environment,
- best management practices of other water agencies

The main aspects from the WSAA/CSIRO Sewer Blockage program that have been

adopted by GVW in formulating the selection criteria moving forward are:

- At the heart of most blockages or series of blockages is a structural issue; and
- Research has shown that once cleaned properly a pipe with root intrusion could stay blockage free for five years and possibly beyond.

Condition scores, consequence of failure scores and estimated remaining service life have also been allocated for each main in the sewer network based on the GVW 'Asset, Priority and Decision Manual'. This is providing another tool for assessing asset performance and selecting mains for future CCTV inspection, root foaming or jetting.

This new way of thinking has the possibility to improve the overall service level of the entire system while still ensuring the Corporation is covering their obligation to view pipes with a high consequence of failure. The CCTV inspection program can then provide a two part benefit in that it enables the identification of sewer mains that require further work and also cleans sewer mains which reduces the risk of repeat blockages.

Other changes to the process that have occurred include:

- All CCTV inspections are to be provided in Wincan 8 format by a trained operator
- All newly constructed sewer reticulation mains are to be CCTV inspected prior to acceptance by GVW
- All CCTV inspections of sewer mains, even outside of the program, are to be completed to the same standard
- All jetting is to be completed using a root cutter
- GVW only considers and reviews sewer mains with a structural code of 4 or 5 for further rehabilitation
- Jetting of blocked connections by GVW.

4.0 2010/2011 CCTV INSPECTION PROGRAM CRITERIA

A review of the GVW sewer network identified that particular serviced towns had a higher sewer blockage rate than others and that some pipe cohorts were also more prevalent to sewer blockages. Sewer blockage rates for GVW serviced towns for 2010 is presented in Figure 1.

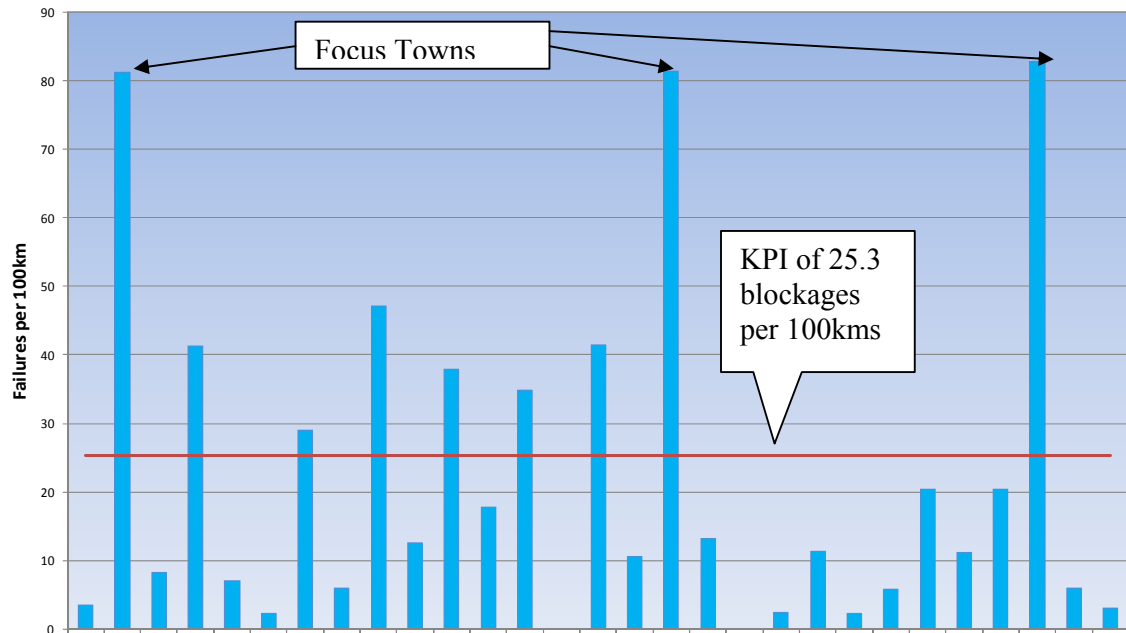


Figure 1: Sewer Blockage Rates for GVW Towns 2010

The current program uses the following criteria for selecting the CCTV inspection program:

Deep Concrete Sewers

Concrete sewers that are over four metres deep and that have not been inspected in the last five years. This criteria has remained from the initial program.

Requests from Districts

Each District Manager was requested to submit lines for investigation. These lines were then assessed for their suitability and in most cases expanded to cover two to three lines up and down stream of the original request.

Root Foaming and Preventative Jetting

A cross section of mains from recent programs to assess the effectiveness of these applications. These mains are CCTV inspected only with no jetting.

High Blockage Rates

Areas or towns of the sewer network with high sewer blockage rates have been selected. The aim is to monitor the rate of repeat blockages.

Environmental Risk

A selection of sewers located within 20 metres of a waterway. Based on size, age and consequence of failure

Consequence of Failure

Sewers that have the highest ranking for consequence of failure, particularly those that have not been inspected to date.

The current program is a layer on our GIS system so operations staff can view what lines are to be inspected. Also previous years structural and service scoring is stored as a layer allowing operators to view CCTV assessment.

5.0 BENEFITS IDENTIFIED

The current selection criteria were adopted for the selection of the 2009/2010 CCTV program and the 2010/2011 program. Data collected to date has shown that this structured program has achieved the following objectives:

- All mains that have had CCTV survey have also been thoroughly cleaned.
- Blockage rates in focus towns are down.
- Percentage of structural condition 5 pipes identified has increased.
- The total number of pipes for rehabilitation has increased.

The failures per 100km shown in Figure 2 are of a town within the Corporation that received focused CCTV treatment due the high sewer blockage rate. The figure shows that since the CCTV program started in October 2009 there has been a 16 point decrease in the blockages per 100km.

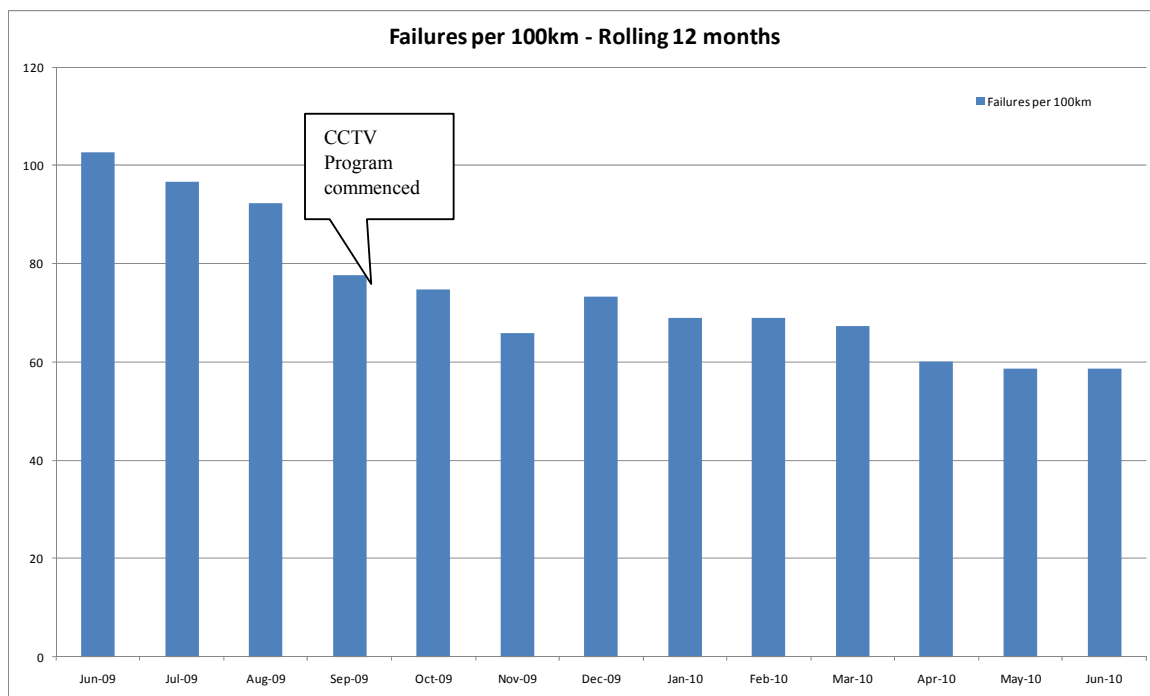


Figure 2: Sewer Blockage Rates for CCTV Focus Town

The next step in monitoring the success of the CCTV program in reducing blockages is gathering data that shows how many days between the CCTV cleaning and the next failure. Our hope is for this to extend to approximately 5 years providing structural failure is not an issue.

6.0 CONCLUSION

The aim of this program was to set out a more structured approach to the Corporation's annual CCTV program. This approach incorporates the need to focus on historically known pipes at risk such as deep concrete mains with new failure thinking such as blockages = structural failure and environmental and consequence of failure risks. Also focusing on CCTV of whole catchments to give sound findings on the structural and service condition of cohorts of sewer mains.

GVW will continue to develop the CCTV program and monitor the benefits of this new approach.

7.0 REFERENCES

Beale, B; Marlow,S, De Silva, D,. *“Blockage Management Report 1: A Review of Sewer Blockage Management”*; *Water for a Healthy Country Flagship Report*, WSAA/CSIRO, June 2009