INNOVATIVE USE OF AIR SCOURING – ODOUR CONTROL AND CLEANING RISING MAINS

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ABSTRACT

A long standing odour issue in the township of Johnsonville in East Gippsland, and the unsuccessful trial of chemical methods to control this odour, led to unrest amongst our customers and damage to our assets.

Monitoring levels of hydrogen sulphide (H_2S) from the rising main leading to Johnsonville had shown unacceptable levels of the offensive (and dangerous) gas before, during and after a number of trials of 'odour control' systems. Using Odaloggers, average daily levels in selected manholes varied between 100 ppm and 200 ppm H_2S. After the unsuccessful odour control trials East Gippsland Water (EGW) adopted an approach of cleaning the rising main as a method of controlling the H_2S and subsequent odours. Using Air Scouring Technology and Sodium Hypochlorite disinfection this has been successful at this site reducing odour levels to well below 3 ppm H_2S

At a second site, and in response to a very expensive (~$100,000) unblocking of the Bruthen to Johnsonville rising main, EGW investigations revealed the cause of the blockage to be a residual compound most likely resulting from the chemical dosing to this main. In response to this issue EGW utilised its Air Scouring Technology to clean this main where more traditional methods such as flushing, pumping and high pressure cleaning had failed. Following on from this success EGW has now implemented a proactive cleaning campaign for this asset involving air scouring specific sections once a pre-set discharge pressure trigger point has been breached at the Bruthen Pump Station.

1.0 INTRODUCTION

East Gippsland Water (EGW) serves an area of 21,000 square kilometres in the east of Victoria. The service area extends east from Lindenow, through to the region's capital Bairnsdale, the holiday centres of Paynesville and Lakes Entrance, and on to the wilderness coast and Mallacoota near the New South Wales border. The Corporation also serves as far north as Dinner Plain in the High Country of the Victorian Alps. Johnsonville is a town in the East Gippsland region. It is a small town considered part of the 'twin rivers' of the Tambo and Nicholson rivers. For a number of years, there had been an odour issue in Johnsonville. Although there were not many formal complaints registered, anecdotally it was known that our customers were not happy as a number of staff living locally were getting ear-bashed on many occasions!

The extent of the problem was magnified when, in 2009, EGW repaired a major infiltration problem in the Swan Reach Sewer reticulation system that reduced the flow in the rising main from Swan Reach by ~60%. This reduction in flow increased detention time in the rising main from Swan Reach to Johnsonville and increased the levels of H_2S at the discharge manhole. This led to an increase in odour issues as well as further deterioration of manholes on the discharge side.

Figure 1: ***Badly corroded manhole at Johnsonville***

2.0 DISCUSSION

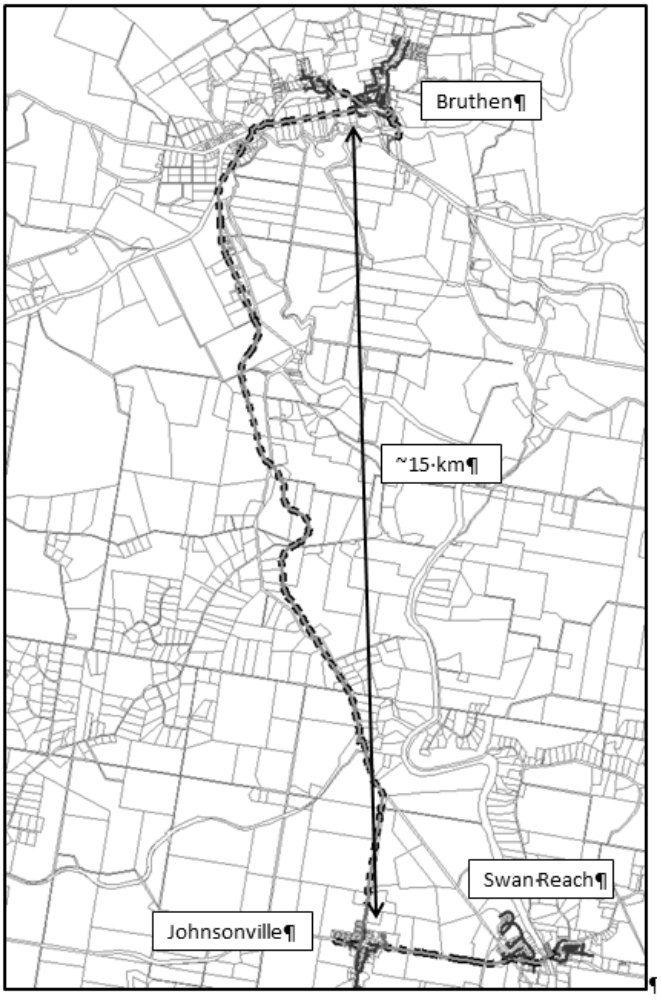


Figure 2: ***Schematic of the Great Alpine Road rising main***

There are two rising mains that meet at Johnsonville. The Great Alpine Road rising main, which runs ~15 km from Bruthen to Johnsonville and the Swan Reach rising main, which runs ~2.4 km from Swan Reach to Johnsonville. Air scouring of the Great Alpine Road rising main to move sediment blockage was the subject of a Poster Presentation by Terry Watt in 2011 at the WIOA Bendigo Conference. The rising main from Bruthen to Johnsonville has a Ferrox Chemical dosing plant at Bruthen and generally does not deliver any measurable H_2S to Johnsonville.

The Swan Reach rising main was installed in 1998 and consists of ~2.4 km of 100 mm PVC with 110 PE pipe installed under the Tambo River to cross into Swan Reach. This rising main had no chemical treatment and was the source of the significant H_2S issues in Johnsonville.

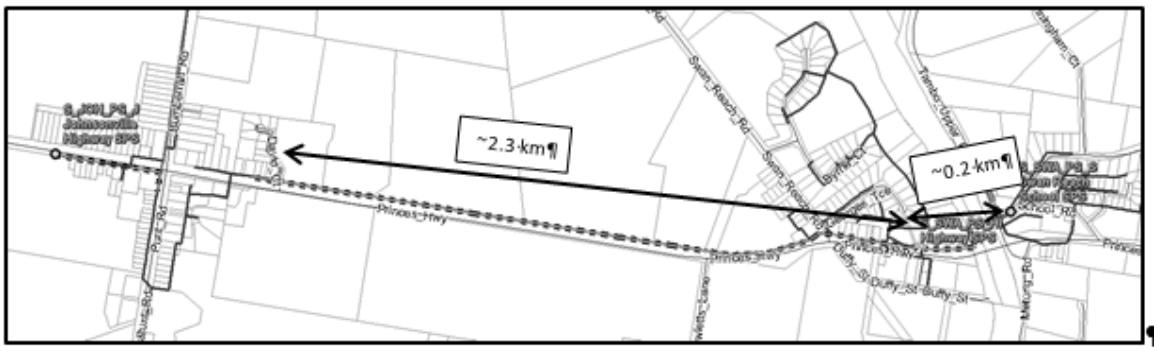


Figure 3: ***Schematic of the Swan Reach rising main***

2.1 Trialling Methods of Odour Control

In terms of the odour and corrosion issues in Johnsonville, there was no immediate response or quick fix to the issues. EGW had allocated $250,000 in Water Plan 2 for the installation of a chemical dosing system at Swan Reach to deal with the issue and the potential was there to fast track these works.

Interim measures such as adjustment of pumping levels and pump stop starts made no impact to the H_2S levels. After studying literature on various alternative odour control practices, EGW implemented some trials using compressed air injection to the rising main which had no measurable impact on the H_2S levels. We also trialled 2 biological agents to control odours in this main and again these trials did not produce any measurable improvements.

One issue that developed throughout the various trials was the cost of paying an external party to monitor and report on H_2S levels . It was found that EGW could purchase and maintain its own odour monitoring device (the OdaLogger) for the cost of about 2 weeks data collection from a consultant.

Following the lack of success with air injection and other biological trials it was decided to trial cleaning the rising main via air scouring and then dosing at the Swan Reach Pump Station with 10ppm of sodium hypochlorite to help control the future development of H_2S. Sodium hypochlorite was chosen as it was readily available, economic and staff were familiar with its use and handling procedures.

2.2 The Air Scouring / Cleaning Process

To undertake the intial air scouring, EGW needed to install fittings to feed the air into the main and deal with the expulsion of the air and particles at the discharge manhole. As you can imagine in the first few air scouring operations there was a significant amount of sludge and slime that was removed from the rising main.

To deal with this a manhole lid was removed to reduce pressure and stop gases entering house drains. An open grated, fall-from-heights cover was installed over the manhole. The air scouring process is very effective in this particular instance .

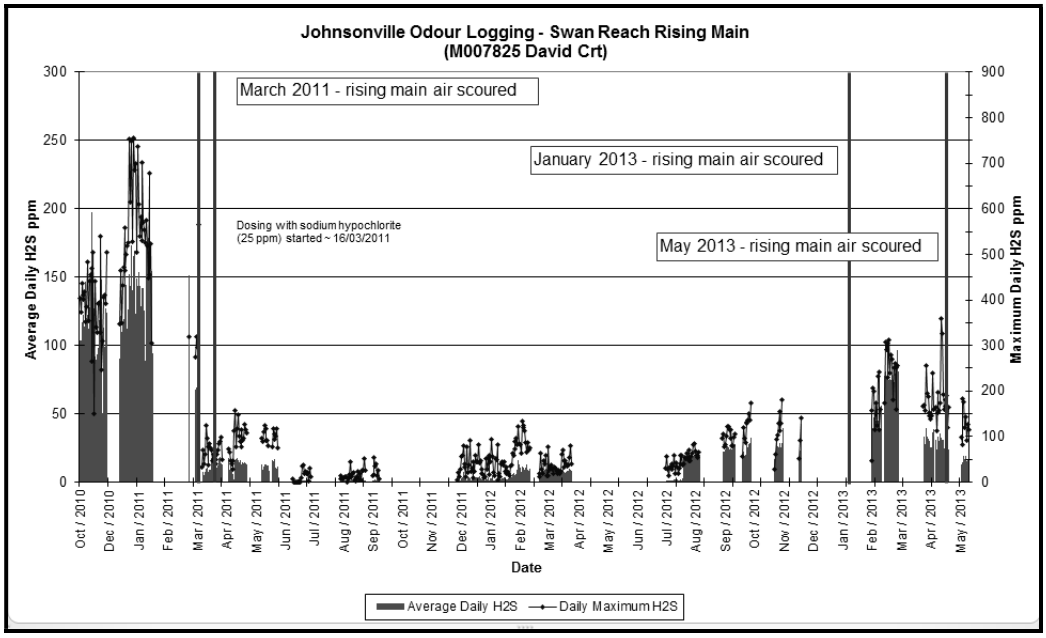
There is no interruption to any customer or business practice, it involves 2 staff members for 4 hours and each occurrence costs EGW approximately $320 in total.

Figure 4: ***Manhole with fall-from-heights cover***

Figure 5: ***Air scouring trailer hooked up to the Swan Reach sewer pump station***

2.3 Results

The air scouring process had immediate success!. H_2S levels were immediately reduced from a daily average of 100 - 150 ppm to <20 ppm in the discharge manhole for the Swan Reach rising main. EGW continued to monitor H_2S levels in the discharge manhole to assess the ongoing effectiveness of the process. What was determined is that initially we had to repeat the air scour process about every 3 months. As the main became cleaner we were able to extend future air scour cycles out to a six monthly interval.



3.0 ISSUES AND BENEFITS

Some of the issues identified during this process were:

- Sludge buildup in the Great Alpine Rising Main due to chemical use. The sludge buildup was extremely difficult to locate and remove using traditional methods. Air Scouring was the ideal solution for this.
- Design changes need to be incorporated into future sewerage systems to allow for air scouring works (injection points, scour points etc) on rising mains that can be Air Scoured i.e. main size and distance is suitable for Air Scouring
- The need for pro-active inspection / maintenance programs – for example, air valves on rising mains are now inspected and maintained on a regular basis through pro-active programmed works
- Design of the Great Alpine Road rising main has resulted in a 'low spot' (Dirty Hollow) where sludge (by product of chemical dosing) tends to accumulate, especially near bends where the offtake is for the airvalves. There is not much that can be done retrospectively, however, now that this issue is known, an eye can be kept on it. This is done by monitoring the back pressure at the Great Alpine Road sewer pump station – the trigger for air scouring is 190 kPa. The normal running pressure is ~ 150 kPa.

Amongst the many benefits of using air scouring to help control odours (and reduce corrosion) are:

- Financial – low operation cost, no contractor / consultant fees, reduced chemical costs
- Assets – reduced corrosion (as H2S does not build up or stay in contact with pipe material for long), reduced damage to infrastructure –a significant amount of money was spent refurbishing corroded manholes and we wouldn't want to do that again in a hurry!
- Resources – use of existing resources justifies the expense of purchasing; upskilling of staff
- Customer satisfaction – less odour complaints (official and informal)
- Deferral of Capex spending on chemical dosing plant . In this instance a saving of $250,000
- Reduction in operational costs due to no chemical dosing plant

- Ability of EGW to respond immediately to an issue . ie not have to wait for external resources to deal with the issue
- Benefits associated with carbon foot print and green house gas emissions

4.0 CONCLUSION

In order to efficiently monitor H_2S gas over a long term period it is significantly cheaper to buy and maintain OdaLoggers internally than to have these works carried out by external parties.

Routine monitoring of H_2S enables efficient and effective use of resources to provide pro-active maintenance instead of reactive maintenance (e.g. in response to increased customer complaints or failure of sewer systems).

In this instance Air Scouring and associated disinfection with Sodium Hypochlorite at about 10ppm has proven a cost effective method of odour control . It would not be effective in all circumstances and will be influenced by aspects such as the length of the rising main and the ability to air scour it, i.e pipe diameter and material, effective injection points and points for disposal of air and sludge.

5.0 ACKNOWLEDGEMENTS

- ✓ Russell Bates (Manager Service Delivery) – for thinking outside the square and taking a chance

- ✓ Mitchell Depot Operations Staff – for patiently installing and retrieving odour loggers from various manholes (and cleaning them before giving them to Kris Hunter)

- ✓ Kristine Hunter (Coordinator Network Performance) – for downloading and analysing data from the odour loggers

- ✓ Tim Froud (Mitchell System Team Leader) and Keith Bone (Maintenance & Projects Officer) – Johnsonville locals who were our 'canaries in the coal mine' for odour issues and customer satisfaction!

- ✓ Ian Christie and the Maintenance Crew for looking after the sewer pump stations and modifying chemical dose rates etc.