

PROTECTING THE LAST BARRIER: MIDCOAST COUNCIL'S COMMITMENT TO COMMUNITY SAFETY

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ABSTRACT

MidCoast Council's (Council) water hygiene project aims to manage the risk of contamination associated with main breaks and construction of new mains. Water utilities have a strong focus on water treatment processes including critical control points (CCPs) to ensure water is treated to a high standard before it enters the reticulation system.

System pressure, system integrity, maintaining residual chlorine and preventing recontamination within the reticulation system are the final barriers which protect drinking water quality before it reaches customers' taps. These barriers are equally important as the treatment barriers as main breaks become more prevalent, resulting from aging distribution systems and shifting soils in response to drought and floods.

KEYWORDS

Change management, public health, water hygiene

1.0 INTRODUCTION

MidCoast Council has continued to develop and implement workplace changes aimed at providing a safe drinking water supply to the public. This approach has been strongly focussed upon the "Framework for Management of Drinking Water Quality provided in the Australian Drinking Water Guidelines (2011).

In terms of the development of workplace knowledge and culture, Council commenced a staff (outdoor & indoor employees) training program in May 2015. This training program was based upon the National Water Package (NWP) unit of competency (NWP279A) which focussed on the Australian Drinking Water Guidelines.

The development and implementation of a Drinking Water Quality Management System (DWQMS) by Council had already seen the establishment of CCPs, which were initially targeting water treatment process outcomes. However, even in these early days the importance of water quality outcomes in the distribution system had been identified as a longer term aim of the DWQMS.

By May 2016 a total of 190 staff and elected members at Council had successfully completed this unit of competency. This represented over 95% of the staff, with many commenting that they had a much better understanding of the drinking water supply systems and appreciation of the critical importance of protecting water quality to ensure the public health of the local community.

The training program continued on an annual basis to cater for both new staff and also to incorporate updates for particular work groups. This was based upon changes to the DWQMS and also water quality incident reviews, which had identified opportunities for improvement to existing work practices and procedures for both outdoor and indoor staff.

In 2018, under NSW Health's DWQMS implementation support, funding was provided for Council's water hygiene project.

A project manager from Hunter H2O assisted Council in the development of standard operating procedures for new and repaired water mains, facilitated workshops and provided training to key staff.

2.0 DISCUSSION

Council expanded this water hygiene project to include training for all response and construction crews including supply of in-field water quality monitoring equipment. An ozone trailer was purchased to disinfect new mains and high risk main breaks.

Key to the success of the project is the level of stakeholder engagement including NSW Health, NSW Department of Planning and Environment (DPE) as well as Council staff including the director, managers, operators, laboratory technicians, engineers and water quality specialists.

A risk assessment review of Council's DWQMS focusing on public health, ranked the former water main repair procedure as high risk. While a safe work method statement was previously used to instruct the repair process, there was no focus on hygiene, no guidance on water quality targets or disinfection options. The procedure of laying new mains also required review and improvement.

The ADKAR principles of change management were used to guide decisions and actions throughout the project, as follows:

A = Awareness. The initial step was to agree on the problem using the 'catchment to tap' approach from the Australian Drinking Water Guidelines. Catchment studies and investigations had provided some solutions to improving water quality in drinking water catchments. Process improvements at water treatment plants including CCPs ensures that the water quality leaving the plant is high. Network integrity was the next step to examine opportunities for recontamination in the reticulation system. Reservoir integrity and backflow prevention programs have been implemented. The next area identified as high risk to public health was the potential for contamination during laying and repairing water mains.

D = Desire. How do we create the desire to change practices so there is a focus on hygiene and protection of public health? There are many cases of illness relating to main break repairs documented in literature across the world. To create desire at a local level for staff who are involved in this work on the ground, we needed to answer the question 'What's in it for me?'. To do this we developed a scenario to appeal to field staff, to create a real sense of personal responsibility to protect public health in their local community. This was a strong lever for change as they all live and work within the community.

K = Knowledge. Developing knowledge through workshops and training with key stakeholders helped to create a sense of ownership of the new workplace procedures. The trainer was knowledgeable and trusted, with practical, hands on training to ensure success in the field.

A = Ability. Developing the ability to participate in the new procedures was achieved by continued involvement of coordinators, access to subject matter experts and hands on exercises in training. Change management drivers were critical to ensure uptake of the new procedures.

R = Reinforcement. Ongoing support for staff was critical to ensure successful implementation and to sustain the changes long term. This included refresher training, highlighting and celebrating successes and embedding water hygiene principles into everyday language.

Project activities included; stakeholder engagement at each step, workshops to identify what we were trying to achieve and to create ownership of any changes to procedures, introduction of additional skill-sets for onsite water sampling and testing, hands on training exercises, purchase of an ozone disinfection trailer and ongoing reporting to Council and regulators. These activities were implemented over a 12 month period collaboratively by Council, Hunter H2O and NSW Health.

Workshops and training activities emphasised the importance of using hygienic work practices during main repairs and laying of new mains especially when staff work with water and sewer. These included using clean tools, clean boots and disinfecting pipes, tools, clamps with sodium hypochlorite spray before they come into contact with water, maintaining air gaps in trench, maintaining positive pressure in the system where possible, capping pipes, clean storage areas and personal hygiene. An awareness to prioritise water quality over outage times was also emphasised during workshops.

Outcomes of the project have been largely successful. This has been measured by feedback from staff, commitment and uptake of new procedures, and improvement of water quality data compared to baseline data (refer to Figure 1, Water quality after main breaks). All samples collected and tested for *E.coli* following main repairs have had no *E.coli* detected. The majority of samples collected and tested for *E. coli* following laying of new mains have had no *E.coli* detected. New mains where *E.coli* was detected were disinfected again to comply with guidelines before being commissioned. Storage facilities and cleaning procedures have been improved and an ozone disinfection trailer has been purchased.

Increased awareness and change in procedures have been sustainable as they were implemented progressively. Water quality monitoring equipment, reinforcement and support has been provided by coordinators and the project manager. While full uptake of the new procedures has not been achieved with every individual staff member, reinforcement and ongoing support is resulting in continuous improvement.

Some funding was made available from NSW Health, and Council funded the remainder of the project including water quality monitoring equipment and ozone disinfection trailer. The extra time taken to repair a water main under the new work procedure is estimated at approximately 25% of a typical job. Considering the initial and ongoing costs, outcomes have been achieved in a cost effective manner.

Critical to the success of the project was the support and leadership of change management

drivers and all levels of management. Involving staff at each step helped to create ownership of the procedures. Listening to concerns, implementing practical solutions and utilising a trusted and knowledgeable trainer were also important.

Ongoing reinforcement will determine success and sustainability of the change in procedures in the longer term.

Figure 1 below demonstrates improvements to water quality after main breaks since water hygiene training began.

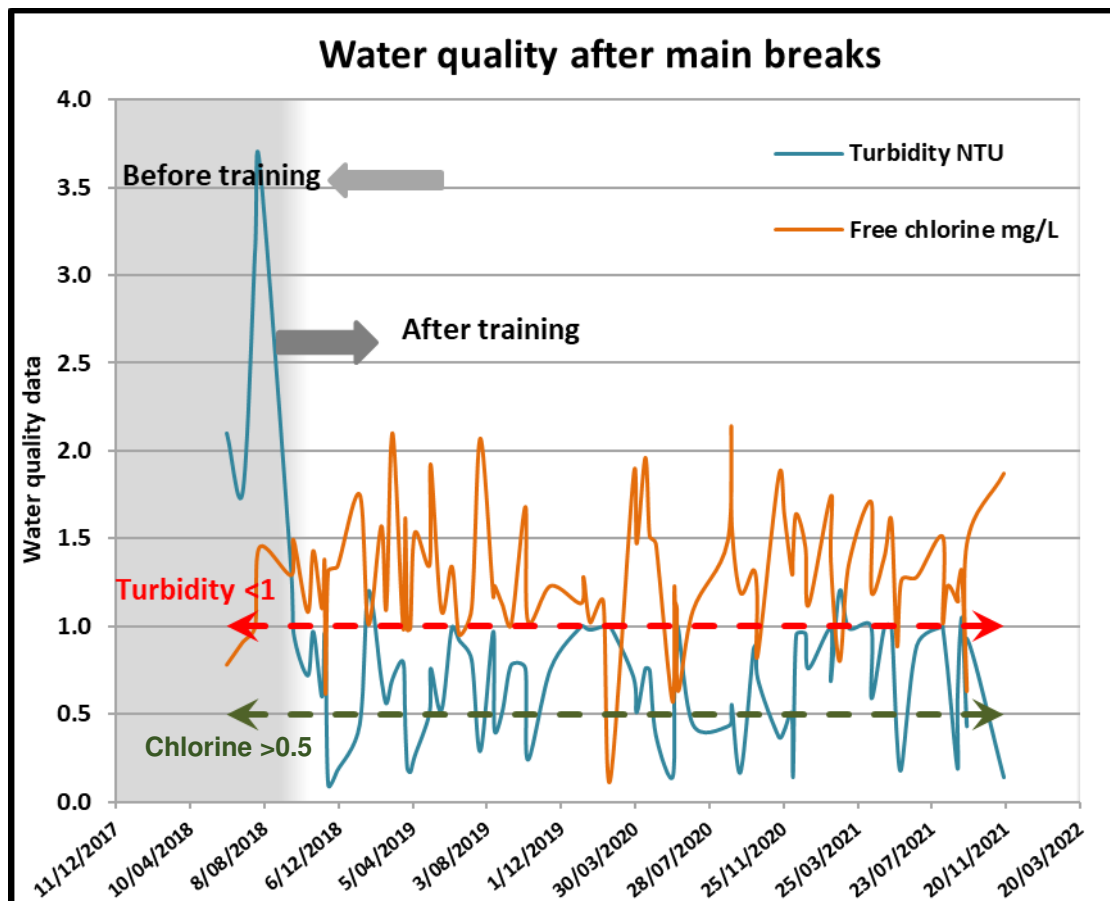


Figure 1: Water quality data of main breaks before and after implementation of the water hygiene program

As the figure indicates, turbidity and chlorine levels have been maintained within the recommended levels: 1 NTU and >0.5 mg/L except for a few instances since beginning of the program. Total coliform and *E.coli* counts have also been less <1 orgs/100 mL for main breaks.

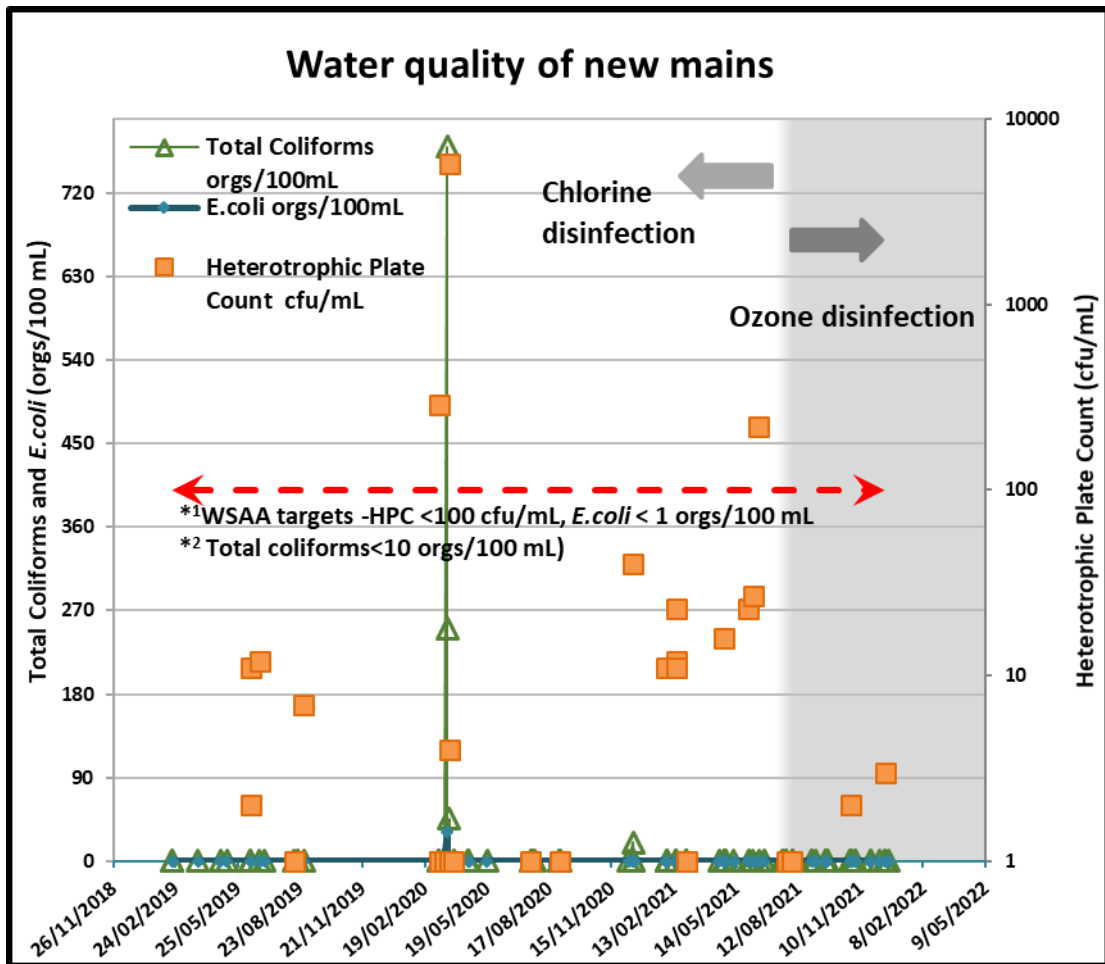


Figure 2: Water quality data of new mains before and after the implementation of ozone disinfection program

*1 Water Services Association of Australia

*2 Council's target for total coliforms

Disinfection of new mains using the ozone trailer was implemented in July 2021. Since the implementation of the process there has been an improvement in the water quality of the new mains after disinfection. Figure 2: indicates that the Heterotrophic Plate Count (HPC) at 35°C, Total coliforms and *E. coli* counts of disinfected mains before and after implementation of the ozone trailer disinfection program. As noted, there have been a few instances where HPC and *E. coli* counts were above the levels recommended by WSAA (WSAA 03-2011-3.1) guide for new mains. This was during the period when mains were disinfected using chlorine. However, every instance where the counts did not meet guidelines, mains were disinfected again and commissioned only after the test results complied with the guidelines.

Ozone has also increased efficiency of the disinfection process. Unlike the 24 hours required to super chlorinate, ozone disinfection of mains can be completed within hours. The operators from the construction team at Council prefer the process of ozonation. This is partly due to the reduced work health and safety risk of working with ozone compared to high strength chlorine. Additionally, the water does not need to be dechlorinated before being released to the environment, therefore saving water.

Implementation of the program also had its challenges. The main challenges were managed through change management processes where key stakeholders were brought together to participate in decision making using workshops. Training and support from the water quality team in water testing field equipment provided the operators with confidence in testing procedures.

Training using the ozone trailer during COVID restrictions was also a challenge. Other challenges included servicing the trailer and developing standards and procedures for handing over mains constructed by contractors. These challenges are being resolved through standard operating procedures and training has been provided to the necessary staff. Overall, the response from staff and management has been positive with good outcomes for water quality.

3.0 CONCLUSION

This project has been achieved by; building Awareness of the problem, highlighting the risk to public health of previous work procedures; creating Desire to participate in the change by answering the question ‘What’s in it for me?’; developing Knowledge and fostering Ability to implement the change through training; and offering Reinforcement and ongoing support to ensure the change is effective and sustainable.

4.0 ACKNOWLEDGEMENTS

The project was supported by funding from NSW Health under the Drinking Water Quality Management System implementation program.

5.0 REFERENCES

1. *NHMRC (National Health and Medical Research Council), National Resource Management Ministerial Council Australian Drinking Water Guidelines (2011) 6th Edition*
2. *WSAA (Water Services Association of Australia) 2011 Disinfection of water mains water quality compliance specification.*