

Incident Assessment

Bradan WTW
Coagulation Failure
22nd September 2014

DWQR Inspector:
Sue Petch

Event No. 6364

Event Category: Significant

Summary of Incident

At 16:15 on 22nd September the coagulation chemical dosing at Bradan WTW failed. The coagulation failure generated an alarm but it was not received by the Intelligent Control Centre (ICC). The site is unmanned between the hours of 16:00 and 08:00, so this failure went undetected until 08:10 on 23rd September. From 16:15 untreated water passed forward to the clarifiers and filters, resulting in water with elevated colour and aluminium presented for disinfection. The filtered water had a higher chlorine demand than normal and the result of this was a significant reduction in the residual chlorine of the water entering supply, from its normal target value of 0.4 mg/l to 0.12 mg/l. When the duty operator arrived on site at 08:10 on 23rd September he was immediately alerted to the situation through the SCADA alarms. The coagulation dosing was re-established and the issue was escalated.

An Incident Control Team was established to monitor and manage the incident. As a precautionary measure the chlorine dosing was increased and the clear water tank was manually dosed with sodium hypochlorite. One compartment of the clear water tank was isolated to reduce the volume of partially treated water entering supply, though this action caused an increase in the turbidity of the water entering supply (1.2 NTU) at 13:30. Network service operators were despatched to monitor the quality of water at service reservoirs and carry out sampling, flushing and to boost chlorine residuals as necessary. Bradan WTW supply was restored to an acceptable quality by 14:30 on 23 September.

The treatment failure at Bradan resulted in water which did not meet the standards for wholesomeness entering supply, as evidenced by consumer contacts and water quality sampling. Scottish Water received 60 water quality contacts from consumers over 23rd and 24th September, of which 54 related to discolouration of their supply. 36 water quality samples were taken during the incident of which four failed to meet the standards. One exceeded the PCV for colour and iron and a further three exceeded the PCV for manganese. Two scheduled samples also exceeded the PCV for total trihalomethane on 25th September and this is most likely to be due to the failure of the treatment process to effectively remove organic carbon from the raw water. A scheduled *Cryptosporidium* sample had been set up on 22nd September and was removed at 08:20 on 23rd, effectively capturing the period of time that coagulation had failed and no oocysts were present in this sample.

DWQR Assessment of Cause of Incident

Scottish Water has carried out a detailed investigation into the reasons for the failure of the coagulant dosing and the loss of communication from Bradan WTW to the ICC. Operational data is transferred from Bradan WTW's remote telemetry unity (RTU) via a satellite communication system (TSAT) on a direct point to point basis. A TSAT communication failure with a treatment works should generate a priority response alarm for ICC staff. The investigation verified that the RTU was functioning, but the satellite communication modem had not returned or transmitted data between 11:44 on 22nd September and 14:22 on 23rd September when the modem was reset. Two telemetry system alarms had been generated during the period of modem outage, but they had been given the incorrect default priority setting at P4 so were not visible to ICC staff. The investigation did not determine a specific reason for failure of transmission from the modem, but as the modem required a manual reset to commence normal operation, this was concluded to be the primary root cause of the failure of data transfer between Bradan WTW and the ICC.

The coagulation process failed at 16:15 on 23 September and a priority 2 alarm was generated. This occurred during the period that the satellite communication modem was not functioning and as a result the ICC were not alerted to the failure. Scottish Water has concluded that a power dip in the electrical supply caused either the alum or the lime pump to stop. If either of these pumps fails, a fail-safe mode operates which stops the other pump generating a "No Alum dosing, No Lime dosing" alarm.

DWQR is satisfied that the root cause of the incident was a failure of the coagulation process which coincided with a failure of the remote monitoring system.

DWQR Assessment of Actions Taken by Scottish Water

Once Scottish Water became alerted to the failure of the treatment process, the operator acted promptly to restore coagulation and immediately escalate the situation. An ICT was convened and a number of actions, which DWQR consider to be appropriate to the incident, were initiated to increase the speed of recovery and to mitigate the impact on consumers.

Extensive monitoring of chlorine residuals and assessment of the appearance of the water was undertaken. Estimates of time of travel were utilised to focus interventions. Water quality samples were taken from properties in the areas directly fed from Bradan WTW and from the supply zones fed by service reservoirs. Scottish Water expended significant resource on sampling and visual monitoring, however DWQR has some concerns in relation to the sampling in this incident:

- Sampling from properties directly supplied by Bradan did not occur until 24th September
- No follow up sampling was undertaken on 25th September despite some samples taken on 24th September exhibiting visible colour and a small number of consumers reporting discolouration on 25th September
- No follow up resampling was undertaken from those properties where samples had failed a PCV

External communication commenced at 11:15. Ayrshire and Arran Health Board convened a Problem Assessment Group with key stakeholders to assess public health risk. Based on information given at the time, public health risk was assessed as low and it was agreed that there was no requirement to implement any active interventions such as boil water advice. The Health Board has provided feedback to DWQR on this incident and suggested that for future events it would be useful to have a standard suite of information readily available which could be issued in advance of the initial PAG meeting. DWQR agrees and is surprised that such information did not already exist.



The event has been categorised as Significant. Scottish Water has identified several actions and DWQR accepts that these are appropriate and will be monitoring to ensure they are completed prior to signing off the incident.

