

Whitehillocks WTW Coagulation Failures 30 May & 27 July 2014

DWQR Inspector:
William Byers

Event Nos. 6007 & 6126

Event Category: Two significant events

Summary of Incident

Whitehillocks experienced two significant events in May and July of 2014, where the coagulation process failed in similar circumstance causing exceedences of the aluminium standard in the final drinking water supply to consumers. In both situations, the flocculation blankets rose within the clarifier tanks and overflowed into the outlet channel and subsequently carried aluminium floc through onto the filters.

Over the course of May, the operators were experiencing difficulty in controlling the flocculation blanket in the clarifiers and as part of the process optimisation trials, a decision was taken to remove the flocculation tank from the process. The concern at the time was that the hot weather was affecting the flocculation process within the elevated steel tank. The tank was bypassed on 29 May and initial indications were that an improvement to process had taken place. At 18:15 hrs the next day, however, the operator was called to the site to attend an alarm of high turbidity on the filtered water. It was immediately apparent that the cause was the blanket carry over and a number of remedial actions were carried out. Treatment processes were substantially restored by 01:00 on 31 May. Instrument records show that the Aluminium standard on the final water was breached for a short time but samples taken within the distribution system following the event did not show any adverse effect.

In event 6126, the operator was called to site in the early evening of 25 July to again deal with the situation where the flocculation blanket had carried over onto the filters. The process at this time continued to operate with the flocculation tank bypassed. Adjustments were made to the flocculation chemical dosing to restore the blanket and stabilise the clarifier process. Continuing instability of the process and the consequent adjustments to achieve optimum dose rates on 26 July however, meant normal production was not restored until 19:00 hrs. A total period of some 24 hours. Monitoring of water quality at a key storage tank in the distribution system showed samples to be failing the aluminium standard through to 27 July with clear samples being recorded from 29 July onwards.

DWQR Assessment of Cause of Incident

Scottish Water has carried out an investigation of the problems experienced with the coagulation process, identifying a number of factors which contributed to the instability of the clarifier blankets. Although there are compounding issues related to the control of flows through the works, control of polyelectrolyte dosing, clarifier desludging and pH control, DWQR is satisfied that the root cause lay with arrangements for creating an adequate coagulant floc within the flocculation process.

DWQR Assessment of Actions Taken by Scottish Water

DWQR considers Scottish Water to have attached insufficient importance to investigating and understanding the root cause of the event in May. Whilst the trial bypassing of the flocculation tank was expedient in resolving that event, this should have stimulated an urgent need to understand why a key process element was not operating as it should. Their ultimate determination that there were inconsistencies in the batching process which gave rise to a varying strength of Aluminium sulphate used for flocculation and the location of the polyelectrolyte dosing was detrimental to the creation of a stable floc, are conclusions that could have been reached earlier. Similarly, Scottish Water found that elements of process control which should have an automatic response to changing flow and quality, were being operated on a manual or timer setting. This prevented automatic desludging of the clarifier cones when the blanket rose in the tanks and optimal dosing of polyelectrolyte. The identified remedial measures could then have been put in place earlier to resolve the issues with the clarifiers and the flocculation tank and avoid the second event, a full 2 months later.

Early warning of the progressive floc blanket instability may have provided sufficient time for remedial actions to have been taken in both instances. There is however no means of providing continuous monitoring of this at this works. DWQR acknowledges Scottish Water has identified actions to consider provision of monitoring of the clarifier performance and setting of appropriate alarms and considers it imperative that these are put in place at the earliest opportunity to facilitate the arrest of future impending failures of process.

In terms of recognising the risk to public health, DWQR has significant concerns on the timeous liaison with the Consultant in Public Health Medicine (CPHM). It is essential that there is a clear understanding between Scottish Water and health authorities around unfolding events and there must be an effective framework in place for formal reporting and informal notification where there may be a risk to health. This requires effective internal escalation to scientific and public health teams and for a shared understanding of the health risk assessment carried out for the developing situation in all areas of the supply system.

It is clear from records of chlorine dosing that the coagulation problems led to a significant impact on disinfection in both events. Whilst samples were taken within the distribution system to monitor the level of aluminium in the supply, DWQR finds it unacceptable that there were no samples taken from individual consumer taps across the system to monitor the impact of the event and extent of any microbiological and chemical contamination of drinking water supplied to consumers.

With regard to the need to monitor for breakthrough of *Cryptosporidium* in such events, SW did not install a filter until some 4 hours after arrival on site on 30 May and being aware of the high turbidity off the process filters. DWQR considers it important that any failure of process is fully monitored to determine the effect on water quality and *Cryptosporidium* filters must be fitted as soon as possible. The sample taken from the *Cryptosporidium* filter in this instance did not show any detection of Oocysts and subsequent samples were also clear. In the 25 July event, there were no spare filters on site to allow monitoring to take place and DWQR finds this to be a significant failure of responsibility. The first sample was removed on 30 July and whilst it showed there to be no detection of Oocysts, DWQR finds it unacceptable that the final water during the critical period of the event was not monitored for *Cryptosporidium* and Scottish Water was unable to demonstrate this aspect of water quality.

Both events have been categorised as Significant. Scottish Water has identified a number of actions and DWQR accepts that these are appropriate. Additionally, DWQR has made two recommendations and will be monitoring to ensure all are completed prior to signing off the incident.

