

Mannofield WTW Cryptosporidium Detections 8 October 2013

DWQR Inspector:
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Event No. 5647

Event Category: Serious

Summary of Incident

Cryptosporidium Oocysts were detected in a sample taken from the final water produced at Mannofield Water Treatment Works on 8 October 2013. Sampling over the following days also showed *Cryptosporidium* to be present on dates up to 16 October. Whilst individually these were of low level, the repeating nature of the detections gave DWQR concerns over the robustness of processes at the works and their ability to respond to changing raw water conditions.

The Mannofield Works has coagulation, clarifier and rapid gravity filter stages in the process and these, operated to best practice standard, should provide a good barrier to *Cryptosporidium*. There had been significant change to the coagulation process earlier in the year when the coagulant used changed from Ferric Sulphate to Poly Aluminium Chloride (PACl). Optimisation of the process had been carried out over the summer where raw water conditions had been stable but with the heavy and persistent rainfall in the catchment in early autumn, a very different quality of water was being presented for treatment. Compounding matters, the sister plant providing the water supply to Aberdeen, Invercarnie WTW, was similarly having to adjust to a heavily discoloured raw water supply and production between the two plants had to be varied and re-balanced to ensure consumers continued to receive a supply.

The situation required the flow into the Mannofield works to be significantly increased, in stages, over the days 5th to 7th October but the clarification stage did not adjust to the increased flow causing the flocculation blanket to become unstable and pass forward onto the filters. To aid recovery of the blanket the operators reduced the inlet flow and the overall process started to show signs of recovery by midday on 8th October.

DWQR Assessment of Cause of Incident

Scottish Water has investigated the performance of the treatment works and has identified elements where deficiencies could permit *Cryptosporidium* to pass. Investigation of the failure of the coagulation process found that the automatic inlet flow control was inactive which allowed the flow to increase too quickly. In addition, the poly dosing pump was on manual control and not on the flow proportional setting resulting in the wrong and inadequate dose being applied. DWQR considers the failure to ensure adequate flocculation and clarifier performance to be the key factor in the detections of *Cryptosporidium*. DWQR however also considers the condition of the rapid gravity filters to be a significant contributory element.

At the time of conversion of the works to a PACI based process, Scottish Water commissioned an investigation of the filter beds to determine the impact from many years of direct lime dosing for manganese removal. The report, obtained at the end of July, had identified a number of concerns covering the integrity of the structure of the beds, the binding of filter materials, dirt and evidence of mudballing and inefficient washing. Scottish Water had not yet actioned the necessary remedial works at the time of this incident and the deficiencies identified would certainly reduce the effectiveness of the filters to providing a barrier to *Cryptosporidium*.

DWQR Assessment of Actions Taken by Scottish Water

DWQR is concerned that there is a perception within the organisation of a degree of inevitability at low levels of *Cryptosporidium* being present in final water under certain conditions. There is a lack of importance attached to a sequence of low level *Cryptosporidium* detections and DWQR considers there to be a need for a wider appreciation through the organisation of the importance of maintaining treatment elements and processes in an optimum state to address *Cryptosporidium* risk.

DWQR considers Scottish Water to have failed to maintain the works in a position where it could respond to changing raw water conditions. When it became necessary to increase the production from the plant, there was no control over the rate of increase in the inlet flow, which is one of the key recommendations of the Badenoch and Boucher industry reports into the prevention of *Cryptosporidium* breakthrough, nor an ability to automatically adjust the flocculant dose rate.

Early warning of the progressive floc blanket instability may have provided sufficient time for the inlet flow and flocculant dosing issues to have been corrected. There is however no means of providing continuous monitoring of this at this works. Once the clarifier breakthrough had occurred however, Scottish Water took appropriate steps to recover the process. DWQR considers it essential that work to restore the filter beds to efficiency is carried out. Currently Scottish Water is engaged with contractors to make the necessary arrangement for two of the six filters but it is essential that works to remediate the structure, integrity and the efficiency of backwashing of the remaining four, or verify their improved performance, is also progressed.

The event has been categorised as serious. Scottish Water has identified a number of actions and DWQR accepts that these are appropriate. Additionally, DWQR has made five recommendations following this incident and will be monitoring to ensure all are completed prior to signing off the incident.

