

Tomnavoulin WTW *Cryptosporidium* Detection 4 June 2013

DWQR Inspector:
William Byers

Event No. 5360

Event Category: Significant

Summary of Incident

Cryptosporidium Oocysts were detected in the final water sample taken from the Tomnavoulin water treatment works on 4 June 2013. Regular monitoring of the integrity of the membrane plant is carried out and sampling of the combined permeate had shown there to be high levels of Coliform and E.Coli on 24 May. Although there was no obvious reason for the failure, a *Cryptosporidium* filter had been set up in response to the concerns over performance of the membrane plant and 25 Oocysts were detected in the resulting sample equating to a level of 0.265/10 litres. Further investigation and sampling of each of the membrane modules in the plant indicated potential issues in six of the 20 modules. Damaged tube seals were discovered on examination of the modules and these were replaced. Further failures of bacteriological samples and detections of *Cryptosporidium* were recorded over the following days during which time more tube seals were replaced. On 11 June, a boil water notice was issued to consumers supplied from the works and bottled water was also issued.

Further inspection of the membrane stack failed to identify any cause for the failure of the tube seals and a decision was taken to remove the treatment works from service until the problem could be identified and rectified. The clear water storage tank at the site was emptied and cleaned before being filled with tankered water from the Aviemore system. The boil water notice remained in place until sampling verified that the water being supplied to consumers was compliant with regulations and the boil notice was ultimately lifted on 14 June.

Investigations of the plant by the manufacturer and the plant fabricator were unable to reach a conclusion as to the root cause and a decision was taken to replace all membranes and seals. The timescale to carry this out was dependent upon manufacture of the specialist membranes and the new filters could not be fitted until August. A period of testing was then commenced during which time extensive monitoring equipment was fitted to the membranes and different points in the works to gain a thorough understanding of the treatment conditions being experienced at the site. Following a period of operation and demonstration of final water consistently meeting regulatory standards and being free of any *Cryptosporidium* detections, the refurbished plant was returned to service on 22 October.

DWQR Assessment of Cause of Incident

DWQR declared this event an incident due to the detection of *Cryptosporidium* Oocysts in the final water. The reason for this is clearly the failure of seals within the membrane modules. This however is the third instance in as many years where the integrity of membrane modules has been found to be compromised at this site.



DWQR is concerned that the underlying cause of the failure of seals within the modules is not understood and required Scottish Water to undertake the necessary steps to establish any raw water quality issues arising from the catchment or operational factors within the treatment plant configuration that would result in this mode of failure. Despite extensive monitoring, Scottish Water remains unable to state a clear root cause.

DWQR is of the view that it is likely the membrane modules experience some cycling or fluctuation in pressure, which may be attributable to pump operation or fouling of the membrane through poor raw water quality or a combination of both, which stresses the membrane tubes and seals. Given that these problems will only manifest themselves after a period of extended use, it is incumbent upon Scottish Water to continue gathering performance data to provide the evidence to substantiate the view or identify another cause.

DWQR Assessment of Actions Taken by Scottish Water

There was a delay in providing sample result information to Public Health and Operations teams, which prevented awareness being raised of a possible problem with the treatment works. Had the information been passed through, the necessary action could have been implemented some seven days earlier and DWQR considers this unacceptable. This reporting deficiency has since been addressed. Once known however, Scottish Water took appropriate action to investigate the membrane integrity failure and to implement safeguard for consumers from the possible contamination of the supply.

Scottish Water quickly engaged with the Engineering contractor who fabricated the plant to carry out investigations of the membrane modules and the sample failures. Ultimately, with an inability to gain confidence that replacing the seals would provide on-going resilience in the plant, a decision to remove the plant from service was taken and DWQR considers this to be a justifiable measure. Whilst the works was restored to service in October 2013, after new membranes and seals had been fitted, DWQR is disappointed that, to date, Scottish Water through its contractors and suppliers, has been unable to reach satisfactory conclusion from their investigation of the cause of the seal failures.

With the exception of the detection of a single Oocyst in a sample taken on 6 December 2013, there has been no further instance of *Cryptosporidium* in monitoring or regulatory samples to date. Again, investigation of the detection has been unable to determine a root cause.

DWQR considers implementation of the identified actions are key to minimising the *Cryptosporidium* loading on the plant from both the raw water drawn from the catchment and also from the work within the pumping regime in the plant. Until these are completed, DWQR considers the treatment works to be at considerable risk of a similar event occurring. Scottish Water must do their utmost to ensure a focus is retained on understanding and responding to monitoring data and sample information and that vigorous investigation is carried out if failures occur.

DWQR expects Scottish Water to continue to engage with their supplier and plant fabricator to ensure an understanding is reached on the failure mode of the membrane seals as soon as possible. It must also reach an understanding of any features of this catchment or treatment works which has resulted in the particular vulnerability of this site to these conditions.

The event has been categorised as serious. Scottish Water identified 21 actions from the incident. DWQR accepts these are appropriate and will be monitoring to ensure they are completed prior to signing off the incident.

