Drinking Water Quality Regulator for Scotland

Incident Assessment

Bayhead WTW North Uist
Process Failure
September 2011 onwards

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Summary
Throughout Autumn 2011, Bayhead Water Treatment Works (WTW) encountered a series of problems, resulting in a prolonged exceedence of the regulatory standard for aluminium in water supplied to consumers. These culminated in a "Do Not Drink, Do Not Use for Cooking" notice being placed on the supply at the request of the Health Board. Scottish Water has undertaken a large number of actions at the site in order to improve performance. These have had some effect, however the treatment process continues to show some instability that are only likely to be resolved when the works is upgraded in Spring 2012.

Details of Incident
North Uist is a small treatment works serving the Western side of North Uist. The treatment process consists of coagulation followed by filtration by two Dynasand fluidised bed filters and disinfection.

On 18 September 2011, a high filtered water aluminium alarm alerted operational staff to problems at Bayhead WTW. The operator made process adjustments and for the next few days, water was run to waste at times when water quality had deteriorated. By reducing flows through the works it was possible to supply water that met the aluminium standard, however this was insufficient to meet demand and it was necessary to increase flows again, resulting in a corresponding reduction in quality and culminating in concentrations of aluminium reaching 1000 µg/l on 20 September against a regulatory standard of 200 µg/l. Throughout this period, Scottish Water consulted with NHS Western Isles and Western Isles Council, who monitored developments closely.

Over the next 14 days, concentrations of aluminium continued to fluctuate. Scottish Water maintained supplies by reducing flows from Bayhead and tankering water from other supplies on North Uist and Benbecula. Throughout this time, Scottish Water tried various measures to improve the performance of the treatment process and reduce demand, including backwashing filters and reducing leakage in the distribution system.

By 5 October, the plant was still extremely unstable and an Incident Management Team meeting was called by NHS Western Isles / Highland. Due to the lack of certainty of an immediate resolution to the issues and to reduce any risk to consumers, it was decided to place a "do not drink, do not use for cooking" notice on the supply until such time as aluminium concentrations were consistently lower. Scottish Water reports that notification of consumers was completed by 23:30 on 5 October, although local representatives have reported issues around notification of all consumers in the supply area. Bottled water was made available and delivered to vulnerable consumers.

Scottish Water continued to act to stabilise the treatment process, including consulting the manufacturers of the Dynasand process on operation and maintenance aspects. Scottish Water held three customer consultation sessions in the area, with the assistance of NHS Western Isles and the council. Filters at the plant were given an enhanced clean, and this seemed to improve performance. Various other actions were taken,

including cleaning and bringing into service an additional settlement tank. Preparations were also made to install a package plant to pre-treat the water and further enhance quality and stability.

On 12 October it was agreed with the NHS that the criteria to lift the usage restrictions on the supply had been met. Criteria were also agreed for re-imposing the restriction, should this become necessary due to deteriorating circumstances.

For the remainder of October, Scottish Water continued to monitor the plant closely and make modifications throughout the process, although the situation remained fragile. The quality of water supplied by the plant was, for the most part, compliant and tankering was used as necessary to reduce loading on the plant. It is apparent that this tankering from other works was having a detrimental effect on the other supplies, notably Lochmaddy and Benbecula, by causing sudden changes in water pressure and increasing the load on these plants.

In late October a package Actiflo plant was commissioned upstream of the main treatment process. It was anticipated that this would act as a pre-treatment stage that would reduce the loading on the Dynasand filters. Scottish Water and the contractor attempted to integrate the Actiflo unit into the main treatment process over a period of 20 days, but several issues were encountered and it became clear that this was never going to offer a stable treatment process in combination with the rest of the plant. The Actiflo unit was subsequently removed from supply in early November.

The situation at Bayhead remains unstable, although the works is producing compliant water, albeit at a reduced flow. Tankering is continuing to be used to maintain supplies. On 18/19 January 2012, two further low level exceedences of the aluminium standard were reported. These were due to problems with the sodium carbonate dosing pumps.

DWQR Assessment of Cause of Incident

The quality of the raw water entering Bayhead WTW undoubtedly changed in September, triggering the instabilities with the treatment process and increased aluminium concentrations. Raw watercolour measurements more than doubled, and longer term trends show that colour and turbidity are significantly higher than they were prior to 2009.

DWQR is of the opinion that the Bayhead Works was already being operated in circumstances close to or beyond its design specification, and consequently the seasonal change in raw water that was encountered in September was more than it could cope with. DWQR undertook a full inspection of the treatment works on 20 December 2011 and concluded that the works was in need of significant process improvements and increased capacity. The efforts of operational and technical staff have kept the works supplying water of an acceptable quality, however this has been highly time consuming for the staff involved, especially given the limited numbers of staff available on the island.

It is likely that a significant change in raw and final water quality has occurred each year at this time, although it has perhaps not previously been as significant and enhanced monitoring at the treatment works has given the issue greater visibility.

The capacity and capability issues surrounding the works had been highlighted by Scottish Water in its Water Safety Plan for the site, and it is unfortunate that the incident occurred before the necessary work to upgrade the plant had commenced. DWQR expects Scottish Water to proactively and continually assess quality and performance at all its treatment plants in order that the necessary maintenance and investment work can be undertaken in a timely fashion.

DWQR Assessment of Actions Taken by Scottish Water

Actions to Protect Consumers

Scottish Water worked closely with NHS professionals to ensure that consumers were protected from prolonged exposure to elevated aluminium concentrations. The implementation of the "Do not drink, do not use for cooking" notice was undertaken with reasonable effectiveness and in a reasonable timescale, although it has been suggested that there is scope for Scottish Water to improve its sensibilities towards the particular needs of this community, around issues such as spelling of local names and use of the Gaelic language.

Scottish Water has continued to regularly report the situation to health professionals and liaise with the local community. The prolonged nature of the incident has caused a considerable amount of concern among the local population and there is undoubtedly scope for additional communication and liaision between Scottish Water and the local community.

As a result of the slightly increased risk to water quality presented by regular tankering between supplies, Scottish Water has temporarily increased chlorine residuals in the supply. DWQR accepts the wisdom of doing this, but acknowledges that consumers notice the changes in taste and smell and expects Scottish Water to keep chlorine levels under constant review.

Actions to Confirm the Quality of Water Supplied

Scottish Water has taken a very large number of water samples from the affected area over a prolonged period, and DWQR is content that these are sufficient to demonstrate the extent and nature of the water quality issues. In the early stages of the incident there were delays in transporting and analysing the aluminium samples collected from the works and supply area. This undoubtedly hindered medical professionals in trying to establish the nature of any risk to public health. Scottish Water acknowledges this and has committed to an action to review the process for fast– tracking samples from island communities during incidents.

Actions to Restore Water Quality

Over the duration of the incident, which DWQR considers still to be ongoing, Scottish Water has undertaken many actions. These focussed on the following areas:

- Cleaning of raw water tank;
- Improvements to chemical dosing and monitoring;
- Improvements to the design and operation of the flocculation tank;
- Investigation of the operation of the pre-settlement tank;
- Enhanced maintenance and checking of the Dynasand filters;
- Regular optimisation of process chemistry;
- Trial of additional pre-treatment process (discontinued)
- Reduction of flow through filters (necessitating tankering from other supplies)

DWQR considers that these measures were, and continue to be, appropriate. Many are partly symptomatic of a need to address an historic lack of maintenance at the plant. It is DWQR's belief that these issues could in part have been anticipated and prevented had the situation not been allowed to develop whereby the plant was running so close to its design capacity and was therefore highly susceptible to any change. Scottish Water has produced a comprehensive Water Safety Plan for the plant that identified many of the issues, but they had not been addressed sufficiently quickly to prevent the incident.

It is recommended that Scottish Water actively review all its treatment assets to establish whether other sites exist that are similarly vulnerable to overload and changes in incoming water quality.

Scottish Water has committed to installation of a third Dynasand unit at Bayhead. This will increase the capacity of the plant and make it more resilient. The installation of this unit, next to the operational filters and

in such an exposed location will be a difficult task and Scottish Water will have to manage the risks arising from this. It is currently anticipated that the new unit will be in place by May 2012, however this date is vulnerable to changes due to poor weather. In the meantime, DWQR expects Scottish Water to continue to manage the quality of water produced by the works and work closely with the local community to keep them informed of developments.

Scottish Water has committed to undertake 15 actions at the plant and more generally across Scotland in light of the incident. DWQR will be tracking progress on delivery of these. In addition, DWQR has made 10 recommendations following its inspection of the site and two further recommendations following this assessment of the incident.

DWQR will revisit this incident once it considers it to be completely over and may revise or make additions to this assessment as required.