Incident Summary

Finlas WTW
Loss of control of treatment
August 2020

DWQR Inspector:
Colette Robertson-Kellie

Event No. 11151

Event Category: Serious

On 4 August 2020, torrential rainfall at Loch Finlas triggered a landslide, causing colour in the raw water supplying Finlas Water Treatment Works (WTW) to increase from around 40°H to more than 100°H, and turbidity to increase from around 0.7 NTU (nephelometric turbidity units) to more than 20 NTU. The treatment works is designed to treat water of up to 50°H, so the aluminium sulphate coagulant pumps and the sodium hydroxide pumps used for coagulation pH correction were switched from automatic to manual, to allow the duty and standby pumps to run simultaneously. The site auto to manual board was used to record this change; the treatment works coped well with the changes and there was no escalation of the situation to the Team Leader or the wider operational team.

Severe electrical storms in the early hours of 12 August 2020 caused widespread disruption across central and western Scotland, causing around half of the treatment works in the West operational region of Scottish Water to experience some form of power interruption. The standby Operator was advised by the ICC that there were alarms from Blairlinnans, Overton Alexandria, Belmore and Finlas WTW; this was impossible for one Operator to respond to, so the standby Operator called other Operators in the team who were not on call to request support

Finlas WTW had experienced a power outage, causing all chemical dosing to fail. This triggered a low coagulation pH alarm at the ICC at 03:22. The standby Operator ran the site to waste on arrival by allowing the plant to overflow at the chlorine contact tank (CCT) while stored water in the clear water tank (CWT) was fed to the network to maintain supplies to consumers. However, the standby Operator was unaware that the plant had been running with both duty and standby aluminium sulphate and sodium hydroxide pumps on manual settings, and the coagulation pH pump defaulted to its automatic setting when restarted. This caused a significant under dosing of sodium hydroxide, and pH dropped from 5.85 to 4.60. Although the plant was running to waste, this low pH water ran through the coagulation, clarification and filtration processes. The ICC received a further low coagulation pH but did not notify the Operator, as the Operator was known to be working on site; the Operator did not check the coagulation pH before leaving to attend to other sites. Over three hours later, the Operator returned to Finlas WTW, and online instrumentation showed that the combined filtrate aluminium levels were out of range as they were so high - manual bench tests showed aluminium levels of 1.60 mg/l (the standard is 0.200 mg/l). Interrogation of the SCADA (computer display) system showed that the coagulation pH was 4.62, so the sodium hydroxide set point was increased – this was not an adequate dose, and it was not until other staff arrived at the site an hour later that the sodium hydroxide pumps were switched to manual, both pumps were switched on, and the coagulation pH began to recover. The treatment processes were adjusted and managed until they were back under control, and the site was put back into supply at 15:30. However, aluminium levels again began to rise, so again the site was

run to waste while supplying the network from storage. The Operators continued to manage a number of issues at the site while repeatedly being called out to other sites through the night. Concerns over storage meant that Finlas WTW had to be returned to service at 10:00 on 13 August, and the Process Scientist and Process Science Team Leader arrived to optimise coagulation conditions and stabilise the treatment works. At 13:14, an airlock in the aluminium sulphate dosing pumps caused pH to rise sharply – this was corrected but caused turbidity to rise dramatically in the primary and secondary filters along with the combined DAF (dissolved air flotation) aluminium and turbidity levels. The works was again shut down. Since stored water supplies were now critically low, significant rezoning of the networks, around 88% of the supplied area, was carried out to feed the area from another treatment works and preserve stored water supplies at the site.

The treatment works was completely shut down to allow the DAF units to be drained and cleaned, with the assistance of staff from other sites, and filters were washed repeatedly. The backwash tank was drained, and then refilled three times with tankered water to allow thorough cleaning of filters before the works was restarted. Again Process Scientists assisted in optimising treatment processes and the works was again run to waste to allow the processes to stabilise. In the early hours of 14 August, tank levels were again becoming cause for concern, so the site was returned to service at 02:06 and Operators remained onsite throughout the night to wash filters and manage the site until 04:00. At 06:00 the standby Operator was called out to investigate high DAF turbidities – filters were washed, and further support was received to again optimise coagulation, clarification and filtration processes. Water quality improved throughout the afternoon, and Operators were able to leave the site at 20:30 on 14 August.

Sampling at the treatment works and in the network, from outside taps or fire hydrants due to COVID-19 restrictions, showed that aluminium exceeded the aluminium standard in three samples from the outlet of the treatment works and two samples from the distribution system. There was one exceedance of the manganese standard at the treatment works and one in the network.

The root cause of the incident was a power outage and a failure by Scottish Water to return the sodium hydroxide coagulation pH dosing pumps to their manual setting to achieve the necessary coagulation pH.

The event has been categorised as Serious. Scottish Water has identified nine actions which DWQR accepts are appropriate and will monitor to ensure they are completed prior to signing off the incident. DWQR made no additional recommendations.