Site Visit Report

Under the *European Union (Drinking Water) Regulations 2023*, the Environmental Protection Agency (EPA) is the supervisory authority in relation to Uisce Éireann and its role in the provision of public drinking water supplies. This audit was carried out to assess the performance of Uisce Éireann in providing clean and wholesome water to the public water supply named below.

The audit process is a sample of the performance of a water treatment plant and public water supply on a given date.

Water Supply Zone

Name of Installation	Redcross Conary Public Supply
Organisation	Uisce Éireann
Scheme Code	3400PUB1032
County	Wicklow
Site Visit Reference No.	SV29624

Report Detail

Issue Date	02/05/2024
Prepared By	Derval Devaney

Site Visit Detail

Date Of Inspection	12/04/2024	**Announced**	Yes
Time In	10:30	**Time Out**	13:15
EPA Inspector(s)	Derval Devaney Chris Fennell		
Additional Visitors			
Company Personnel	Uisce Éireann (UÉ): Linda Doran, Jessica Evans Wicklow County Council (working in partnership with Uisce Éireann): Mark Redmond, Shane Kinsella, Noel Doody.		

Summary of Key Findings

1. There are no automatic plant inhibits in place to prevent inadequately treated water being supplied to consumers. There is no automatic switchover of pH correction pumps.
2. The chlorine monitor post dose displayed lower concentrations than the chlorine monitor recording levels after disinfection was complete. This unusual trend was ongoing for almost 6 weeks and was not escalated for further investigation. There was no procedure in place for responding to and escalating alarms generated at the plant or reporting incidents when they occurred.
3. The low alarm set points on the chlorine dose (monitor CL001) were too low and did not protect the site specific target level. The treated water pH alarm set points were not available during the audit to verify they protected the site specific target level and statutory limits.
4. UÉ has yet to fully implement the findings of its Alarm and Inhibits Review which was completed in 2022.

Introduction

The Redcross Conary public water supply serves 300 m3/day to a population of approximately 780 from two boreholes at Redcross Village. Water is pumped to the Intermediate Reservoir where it is disinfected and pH corrected. Treated water is pumped to Ballydonnell Reservoir where it serves Conary area. Water is also gravity fed from the Intermediate Reservoir to serve Redcross Village and the Oghill area. The Barndarrig PWS, which was subject to nitrite failures in 2020 and 2021, was replaced with treated water from Redcross Conary PWS in 2022. The Intermediate Reservoir now gravity feeds the Barndarrig Reservoir.

The audit was undertaken to assess Uisce Éireann's performance in producing clean and wholesome water with a focus on the alarms and inhibits in place at the treatment plant and the procedures in place to ensure appropriate oversight of treatment processes

Supply Zones Areas Inspected

The Intermediate Reservoir and associated treatment processes were inspected during the audit and monitoring and control systems including alarm set-points were reviewed.

1. Management and Control

		Answer
1.1	Has the protozoal compliance log treatment requirement been identified for the water treatment plant?	No

Comment

1. UÉ could not confirm if a source and sanitary survey had been completed for the groundwater sources serving the Redcross Conary PWS.
2. UÉ could not confirm if the protozoal compliance log treatment requirement been identified for the water treatment plant.
3. UÉ stated monthly raw water monitoring had commenced at the start of 2024. A final water sample is also taken at a monthly frequency.

2. Alarms, Inhibits & Oversight Audits 2024

		Answer
2.1	Were online monitors operational?	No

Comment

1. There was an issue with chlorine monitor, CL001, which samples after water is disinfected with sodium hypochlorite. The monitor was continuously displaying chlorine residual levels which were at a lower concentration than chlorine monitor CL002, located after the contact time (Ct) had elapsed. It would be expected that CL001 would read higher concentrations than CL002. From a review of chlorine residual trends during the audit this issue appeared to be occurring for almost 6 weeks; since 03/03/2024.
2. On 08/04/2024 chlorine residual concentrations at CL002 dropped to 0.33 mg/l and then increased to 0.9 mg/l. Readings averaged at 0.6 mg/l on the day of the audit. It was explained that at times the chlorine dose pumps can freeze on a certain dose rate and it is thought that at times the dose may not respond to the chlorine monitor element of the dosing arrangements.
3. It is thought the chlorine issues outlined in Points 1 and 2 above relate to a signal issue between the PLC and the dosing pumps. There are plans in place to change the HMI/PLC system to address the chlorine overdose issue (experienced at CL002) and the lower readings (from CL001), with new software to better signal a ramping up and down of the chlorine dose pump as required.
4. The plant operator documents the chlorine residual reading from CL002 and takes a handheld chlorine residual reading from this sample point to ensure the readings tally. Both results are recorded in the daily log book. The operator also documents the chlorine reading from CL001, but does not carry out handheld readings to verify the accuracy of this monitor. There was no action taken when the CL001 monitor was reading a lower chlorine residual concentration than those taken post contact time (at CL002), for example to commence handheld monitoring at CL001 sample point to verify the CL001 readings and escalation of the matter for further investigation.

		Answer
2.2	Are suitable alarm settings in place to alert operators to deteriorating water quality or the failure of a critical treatment process?	No

Comment

1. Sodium hypochlorite is dosed into the inlet pipe of the Intermediate Reservoir to disinfect the water supply. A chlorine monitor, CL001, monitors chlorine residual levels post the dose. The CL001 low alarm, set at 0.2 mg/l, does not protect the site specific target concentration of 0.55 mg/l at this point and the time delay of 1800 seconds (30 minutes) does not allow for a timely response should an inadequate chlorine dose occur. The EPA's Water Treatment Manual: Disinfection states "*Low level alarms are critical ... and a maximum of 0.1 mg/l below the target concentration for a maximum of 5 minutes would be recommended.*"
2. Chlorine monitor CL002 monitors the chlorine residual on the outlet of the Intermediate Reservoir when contact time (Ct) has elapsed. The Ct calculation illustrates a minimum free chlorine residual of 0.26 mg/l is required post Ct to achieve adequate disinfection. The alarm set points for CL002 protect this target value. CL002 read 0.658 mg/l during the audit.
3. pH correction is achieved by dosing sodium hydroxide into the intermediate reservoir post disinfection. The duty and standby dose pumps do not switchover automatically. It was unclear on the day of the audit what the pH alarm settings were post pH dosing to ensure the site specific target pH of 7 was met and the treated water statutory limit of between 6.5 and 9.5 pH units was being protected. The raw water pH monitor was reading 5.83 and the the pH monitor in the Intermediate Reservoir was reading 6.82 on the day of the audit.
4. There is a turbidity monitor in place post the chlorine dose on the inlet to the Intermediate Reservoir. The time delay of 300 seconds (5 minutes) on the 1 NTU HiHi set point is not in line with the specified three consecutive minutes time delay (at a turbidity in excess of 1NTU) as per UÉ's Disinfection Strategy.

		Answer

2.3	Has UÉ carried out an alarm and inhibit review at the water treatment plant?	Yes

Comment

1. An alarm and inhibit review of the water treatment plant was carried out in October 2022.

		Answer
2.4	Were all findings of the UÉ alarm and inhibit review implemented?	No

Comment

1. Not all of the recommendations of the Alarm and Inhibit Review have been implemented.

		Answer
2.5	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	No

Comment

1. There are no plant shutdowns/inhibits in place at the water treatment plant to prevent inadequately treated water entering supply.

		Answer
2.6	Is there appropriate oversight of plant performance trends?	No

Comment

1. Every morning the supervisor reviews SCADA trends and alarms. However the issue with the CL001 monitor's low chlorine readings was not appropriately managed by UÉ.

		Answer
2.7	Is there a documented alarm response procedure?	No

Comment

1. There is no documented site specific procedure setting out how alarms are responded to in order to protect water quality and public health.
2. Following on from Point 2.1 and 2.6 above, such procedure should also cover what actions the operator should take in the event of a breakdown or malfunction of a critical piece of equipment (such as the chlorine monitors).

		Answer
2.8	Are there appropriate procedures covering verification of alarms and inhibits status following maintenance or other work on site?	No

Comment

1. There is no procedure in place covering the verification of alarms and inhibits following maintenance or other work on-site. The current alarm settings are not displayed at the site to allow a contractor or operator to amend them. There are no plant inhibits in place.
2. A procedure should be put in place when alarms and inhibits (when in place) are displayed at the water treatment plant.

3. Site Specific Issues

		Answer
3.1	Was supply information submitted to the EPA accurate?	No

Comment

1. The water treatment plant schematic submitted in advance of the audit was not entirely accurate. For example acid pumps were incorrectly referenced on the schematic when sodium carbonate was used for pH correction. The post dose pH monitor was illustrated as being located on the outlet pipe of the Intermediate Reservoir when in fact the monitor was reading from within the reservoir.
2. The volume documented on EDEN for this supply is incorrect (192 m3/day in EDEN versus 300 m3/day provided at the audit). EDEN documents that the supply serves a population of 780 persons. This should be reviewed to ensure the population figure is accurate.

Recommendations

Subject	Redcross Conary PWS Audit Recommendations	Due Date	12/06/2024

Action Text

Uisce Éireann is responsible for ensuring a clean and wholesome supply of drinking water and should implement the following recommendations without delay.

1. Provide:
    i. the protozoal log treatment requirement following completion of a sanitary survey;
    ii. details on how a protozoal log deficit, if identified, will be addressed;
    iii. ensure Cryptosporidium monitoring is undertaken as per Irish Water Rationale for Determining the Frequency of Cryptosporidium Monitoring in Public Supplies until a protozoal barrier at the plant can be verified.
2.
    i. investigate the cause for residual chlorine concentrations post dosing (CL001) reading lower than those post contact time (CL002);
    ii. carry out handheld monitoring at CL001 sample point to verify adequate dose levels and record the results until such time as the issue is rectified;
    iii. submit plans to upgrade the HMI/PLC system to improve signalling and ensure all alarm setpoints and time delay details are displayed on the system.
3.
    i. Review alarm and time delay settings at the plant for pH, turbidity and chlorine to protect target levels and ensure critical treatment processes and statutory limits are protected;
    ii. Implement the findings of the Alarm and Inhibit Review.
4. Install automatic plant inhibits/shutdowns for high turbidity, high/low chlorine residual and high/low pH setpoints to prevent inadequately treated water being supplied to consumers.
5.
    i. install automatic switchover between duty and standby sodium hydroxide dosing pumps;
    ii. examine the feasibility of installing an alarm in the event of pH or chlorine dose pump failure.
6. Put a documented procedure in place for responding to and escalating all alarms generated and incidents occurring at the WTP. The procedure should clearly document the corrective actions and set out delegation of responsibilities for operational and relief staff. Ensure all staff are trained on the procedure.
7. Ensure there is a procedure in place for operators and contractors to check and sign-off that all alarms have been correctly re-set on completion of any maintenance work.
8. Update EDEN with the correct supply volume and population for Redcross Conary PWS.
9. Update the water supply's schematic to accurately reflect the critical equipment in place.

Actions required by Uisce Éireann

During the audit, Uisce Éireann representatives were advised of the audit findings and that action must be taken by Uisce Éireann to address the issues raised.

Uisce Éireann should submit a report to the EPA on or before the above due date detailing the actions taken and planned, with timescales, to close out the above recommendations.

The EPA advises that the findings and recommendations from this audit report should, where relevant, be addressed at other public water supplies.