

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	Killadysert PWS
Organisation	Uisce Éireann
Scheme Code	0300PUB1008
County	Clare
Site Visit Reference No.	SV29950

Report Detail	
Issue Date	10/04/2024
Prepared By	Orla Harrington

Site Visit Detail			
Date Of Inspection	11/03/2024	Announced	Yes
Time In	10:30	Time Out	12:40
EPA Inspector(s)	Orla Harrington		
Additional Visitors			
Company Personnel	Uisce Éireann: Tommy Roche, Regina Scarry, Darragh McCormack Clare County Council (working in partnership with Uisce Éireann): Martin Corry, Paul Cusack.		

> Summary of Key Findings

1. The aluminium exceedances in Killadysert public water supply on 11/12/2023, 09/01/2024, 31/01/2024 and 27/02/2024 were caused by rapid changes in raw water quality following intense rainfall events, which caused problems with the clarification process at the treatment plant. This resulted in destabilisation of the sludge blanket and carryover of aluminium into the final treated water.
2. There is poor management and an absence of operational control of the treatment processes at Killadysert water treatment plant. The issues include: a) aluminium analyser is out of specification and requires re-calibration; b) no routine jar testing to determine the optimum coagulant dose; c) no automatic shutdowns of the water treatment plant linked to the residual chlorine alarm setpoints; d) no automatic switchover of coagulant dosing pumps and e) no residual chlorine and turbidity trend data available to the operator at the plant. Underlying the above failures, the treatment processes on-site are unable to cope responsively to raw water changes including the presence of algae in Gortglass lake, variations in temperature and intense rain events.
3. The protozoal barrier on the rapid gravity filters at Killadysert water treatment plant is not fully protected by suitable alarms and inhibits as set out in the EPA Water Treatment Manual: Filtration in order to verify the protozoal barrier and to prevent the entry of inadequately treated water into the supply.

> Introduction

The Killadysert public water supply (PWS) serves a population of 705 and supplies on average 1,524 m³/day of water to the Killadysert area and the Coolmeen - Killadysert group water scheme. Water is abstracted from Gortglass lake. Treatment consists of pH correction using soda ash, coagulation, flocculation, clarification, sodium hypochlorite dosing prior to rapid gravity filtration to oxidise out manganese and fluoridation. Treated water is then pumped to a reservoir before distribution.

This audit was carried out in response to the notifications by Uisce Éireann of the failures to meet the aluminium parametric value in the Killadysert PWS on 11/12/2023, 09/01/2024, 31/01/2024 and 27/02/2024.

> Supply Zones Areas Inspected

The treatment processes at Killadysert water treatment plant were inspected as part of the audit.



1. Incident Management

1.1

	Answer
Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No
Comment	
<p>1. Uisce Éireann notified the EPA of the following aluminium exceedances in the distribution network:</p> <ul style="list-style-type: none"> • On 7/02/24 of an exceedance of 201 ug/l from a sample taken on 11/12/2023; • On 25/01/2024 of an exceedance of 350 ug/l from a sample taken on 09/01/2024; • On 9/02/2024 of three exceedances ranging from 350 - 386 ug/l from samples taken on 31/01/2024; • On 7/03/2024 of an exceedance of 501 ug/l from a sample taken on 27/02/2024. <p>The aluminium failure recorded in network testing on 11/12/2023 was not reported to the EPA until 07/02/2024 when Uisce Éireann were investigating other aluminium exceedances on the network, which meant risk to public health was not assessed in a timely manner. The cause of the plant performance issues has been attributed to variations in raw water quality following an intense rainfall event, which caused problems with the clarification process at the treatment plant. This resulted in destabilisation of the sludge blanket and potential carryover of aluminium into the final water.</p> <p>2. The HSE were consulted relating to the aluminium failures and advised Uisce Éireann to resample, investigate cause and take appropriate corrective action.</p> <p>3. Clare County Council dispute the contract laboratory aluminium failures in the network. The daily log book of manual testing showed that there were no aluminium failures recorded in January and February 2024. The auditor noted that the aluminium analyser used to test the final water for aluminium was out of specification and required re-calibration.</p> <p>4. Uisce Éireann advised that trend data shows unstable final water turbidity levels spiking >0.3 NTU which coincided with the aluminium exceedances on 31/01/2024, meaning that Uisce Éireann could not verify that on the 31/01/2024 that the barrier (rapid gravity filtration) to <i>Cryptosporidium</i> was being maintained. Follow up sampling in the network following the most recent aluminium exceedance on 27/02/2024 has yet to be submitted to the EPA. <i>Cryptosporidium</i> samples were taken at the plant on 22/02/2024 and 29/02/2024 in response to the potential loss of the <i>Cryptosporidium</i> barrier. There were no detections in the samples.</p> <p>5. Uisce Éireann stated that the water treatment plant will be upgraded, however a timeframe for completion was not provided on the day of the audit.</p>	



2. Source Protection

	Answer
2.1 Is the abstraction source(s) adequately protected against contamination?	No
Comment	
<p>1. Clare County Council stated that the raw water abstraction point in the lake has issues with algal blooms, with algae now prevalent in the lake nearly all year round. At the audit, it could not be confirmed when landowners within the zone of contribution were written to, to inform them of their obligations under the <i>European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022 as amended</i>.</p> <p>2. There are no alarms or shutdowns based on raw water quality.</p>	



3. Coagulation Flocculation and Clarification (CFC) Stage

3.1

	Answer
Are the CFC processes appropriately controlled?	No
Comment <p>1. Clare County Council stated that the Killadysert water treatment plant undergoes a stop/start every morning for approximately 2 hours to allow caretakers to carry out a backwash of the filters and make up the coagulant day tanks. This may present operational challenges to the water quality produced at the plant.</p> <p>2. Chemicals added to the raw water during the coagulation process include soda ash (increase alkalinity), aluminium sulphate 10% (coagulant), polyelectrolyte (coagulant aid) and carbon dosing (algae removal). The chemical dose is fixed, with manual adjustments possible. The dosing pumps operate on a duty / standby basis. There is no automatic switchover in place in the event of a pump malfunction. There is no alarm to signal to the caretaker when a change in pumps is required. Jar testing is not carried out to determine the optimum coagulant dose and pH when the raw water quality changes. Manual adjustments are made based on visual observations of the sludge blanket in the clarifier. There is no turbidity monitor after the clarifier to alert the caretaker in the event of sludge carry over to the rapid gravity filters. Automation of the coagulant dosing system would allow for greater control over the process in response to sudden blooms of algae and/or rainfall events.</p> <p>3. There is no online monitoring of the treated water for aluminium. Daily aluminium bench testing is carried out by the caretaker and the results are recorded in the daily log book. An examination of the monitoring records showed compliant results. However it was noted that the aluminium analyser is out of specification since 14/07/2021 and requires re-calibration.</p> <p>4. There is an online pH monitor at the clarifier but there are no high or low pH alarms in place.</p> <p>5. Clare County Council stated that the plant is designed to treat 75 m³/hour and that the plant is now operating at full capacity.</p>	



4.1

	Answer
Are the filters designed and managed in accordance with EPA guidance?	No
Comment	
<p>1. The clarified water is filtered via 2 no. rapid gravity filters. Uisce Éireann estimated that the filter media was last replenished 10 years ago and could not confirm the media depth in the filters. There are no marker posts installed to allow visual observation of the depth of the filter media.</p> <p>2. An online continuous turbidity monitor is in place on each individual filter and a combined turbidity monitor on the final water. At the audit the following turbidity levels were observed Filter No. 1 0.08 NTU; Filter No. 2 0.07 NTU and combined filtered water 0.13 NTU. The turbidity monitors are not linked to SCADA which prevents remote access to the system and trend analysis of turbidity readings. Prior to the audit, Uisce Éireann provided final water turbidity trend data for the period 28/01/2024 to 02/02/2024 and stated <i>'some of the spikes can be attributed to back washes however the trend does show prolonged period of elevated turbidity around the period exceedances were detected in the supply'</i>, resulting in drinking water that was inadequately treated for <i>Cryptosporidium</i> entering the distribution network. There is automatic shutdown of the plant set at 0.3 NTU (delay of 30 minutes) on the individual filters, however it appeared from the trend data that the automatic shutdown did not activate in that particular instance. There are no turbidity alarm set points in place on the individual filters. There were no turbidity trends available to view onsite at the audit and the caretakers stated that they did not have access to trend data.</p> <p>3. Backwashing of the filters takes place on a timed basis (every morning while the plant is switched off) and initiated by the caretakers. There is no automatic backwashing linked to head loss or turbidity. A backwash of filter No. 1 was observed. An uneven air scour was observed.</p>	



5. Disinfection

		Answer
5.1	Is the disinfection system verified using monitors and alarms?	No
Comment		
<p>1. Disinfection is achieved using sodium hypochlorite, which is dosed using duty/standby pumps with automatic switchover prior to filtration. Uisce Éireann stated that it was relocated to pre filtration a number of years ago to address a manganese issue at the plant. At the audit, it was not confirmed whether there is operational verification of the effectiveness of manganese removal at the treatment plant. Chlorine dosing is flow proportional but is not linked to the residual chlorine monitor, such that any changes in the chlorine demand can be responded to automatically by the dosing pumps. Chlorine dosing is adjusted manually by the operator and is typically 1.7 litres/hour to achieve a residual chlorine target level of 1 mg/l. There is no continuous online chlorine residual monitor located at the chlorine dosing point.</p> <p>2. There is a chlorine monitor (CL001) at the inlet to the reservoir and contact time (Ct) is achieved at the on-site reservoir with dual validation chlorine monitors (CL002/CL003) after the reservoir. These monitors were reading 1.09 mg/l and 1.11 mg/l respectively. The low-level chlorine alarm is set at 0.8mg/l. There is no automatic shutdown of the supply linked to the low chlorine alarm. There is no high level chlorine alarm or shutdown.</p> <p>3. Chlorination is switched off each day during the filter back-wash. The chlorine monitor CL001 was found to not provide a reliable reading of chlorine levels in the treated water as it was reading a high result of 2.24 mg/l during the audit while the target chlorine level in final water is 1 mg/l.</p> <p>4. There was no trend data available for chlorine residual at CL002/CL003 during the audit.</p> <p>5. There is no turbidity monitor in place prior to chlorination to verify the quality of the water.</p>		

		Answer
5.2	Is there a suitable monitoring frequency for residual chlorine in the network with records available?	No
Comment		
<p>1. Chlorine residuals are undertaken on the network twice a month at four locations.</p> <p>2. On the day of the audit, there was one chlorine residual monitoring result of 0.703 mg/l from a sample taken on 23/02/2024.</p>		



6. Reservoirs and Distribution Networks

		Answer
6.1	Are reservoirs adequately inspected and maintained?	No
Comment		
1. The reservoir supplied by the WTP was not inspected as part of the audit. Uisce Éireann were unable to confirm when the reservoir was last cleaned.		



7. Treatment Process Chemicals

	Answer
7.1 Are treatment process chemicals appropriately managed and stored?	No
Comment	
1. There was no bunding observed around the day tanks.	



8. Management and Control

		Answer
8.1	Has the protozoal compliance log treatment requirement been identified for the water treatment plant?	Yes
Comment		
1. Uisce Éireann confirmed that Killadysert PWS has a protozoal compliance log treatment requirement of 3 log, and a log 3 treatment is provided by the water treatment plant if operated in accordance with EPA guidance.		

		Answer
8.2	Is the plant suitably managed and controlled to maintain the designed log credit on each treatment stage?	No
Comment		
1. The individual filters have an automatic shutdown at 0.3 NTU (30 minute time delay). There are no high and low warning alarms on the individual filters.		
2. There are no automatic backwashing facilities in place at the plant. Filter backwashing is triggered manually every morning by the caretaker.		

		Answer
8.3	Is there appropriate oversight of plant performance?	No
Comment		
1. Uisce Éireann advised that they do not have remote access to performance trend data from the plant.		

Recommendations

Subject	Killadysert PWS - Audit Report	Due Date	10/05/2024
Action Text	<p>Uisce Éireann is responsible for ensuring a clean and wholesome supply of drinking water and should implement the following recommendation(s) without delay.</p> <ol style="list-style-type: none"> 1. a) Develop and implement upgrades at the Killadysert WTP associated with better control of coagulation in response to rapidly changing raw water quality. This should include installation of automatic switchover of chemical dosing pumps and regular jar testing; b) submit details of the scope of works and timeframe for completion. 2. Aluminium: a) submit one month of daily aluminium monitoring from the final water; b) review the accuracy of manual testing at the plant and testing done from network samples by the contract laboratory; c) assess the feasibility of installing an online aluminium monitor on the final treated water, to allow for better operational control of the coagulation, flocculation, and clarification processes and d) ensure procedures in place for reporting aluminium failures promptly to the EPA and HSE. 3. Disinfection: a) investigate the high chlorine residual reading on CL001 and put appropriate corrective actions in place; b) install automatic shutdown based on low and high levels for residual chlorine in the final water to ensure adequate disinfection; c) verify the water presented for chlorination meets the requirements of the Water Treatment Manual: Disinfection and c) ensure that monitoring of residual chlorine is undertaken several times a week at different points of network to include network extremities, and that records of the monitoring results are maintained, ensuring chlorine is >0.1 mg/l in the network. 4. Filtration: a) review and implement turbidity alarms and shutdown on each filter, combined and final water to ensure the plant operates in accordance with the log performance criteria as outlined in the EPA Water Treatment Manual: Filtration; b) assess the feasibility of the filter media meeting the minimum 1m operating depth; c) install a filter media depth gauge on the filters; d) assess the feasibility of linking automatic backwashing to turbidity alarm setpoint and e) ensure the filters slow start or run to waste for an appropriate period of time after backwashing. 5. Examine the feasibility of installing a raw water turbidity monitor with appropriate warning alarms/plant shutdowns at the plant to reduce the risk from turbid waters which destabilise the coagulation and clarification processes at the plant. 6. Ensure that a) the treatment plant is connected to the county SCADA system; b) that plant process information and trended performance data are available to operational and supervisory staff via SCADA and c) that there are robust systems of review and checks on water treatment plant performance data which should include regular review of SCADA trends by operational and supervisory staff. 7. Ensure all instruments have been calibrated as per the manufacturer's requirements. 8. Ensure that the reservoir is on the Uisce Éireann reservoir cleaning programme. 9. Review chemical storage arrangements at the treatment plant. Chemicals should be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein. 10. Liaise with Clare County Council to ensure that local landowners are written to in relation to their obligations under the European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022, as amended. <p>Actions required by Uisce Éireann</p> <p>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.</p> <p>Uisce Éireann should submit a report to the EPA on or before 10/05/2024 detailing the actions taken and planned, with timescales, to close out the above recommendations.</p> <p>The EPA advises that the findings and recommendations from this audit report should, where relevant, be addressed at other public water supplies.</p>		

