

Site Visit Report

Under the European Union (Drinking Water) Regulations 2014 as amended, the Environmental Protection Agency is the supervisory authority in relation to Irish Water and its role in the provision of public water supplies. This Audit was carried out to assess the performance of Irish Water in providing clean and wholesome water to the visited public supply.

The audit process is a sample on a given date of the facility's operation. Where a finding against a particular issue has been reported this should not be construed to mean that this issue is fully addressed.

Water Supply Zone	
Name of Installation	Foynes/Shannon Estuary PWS
Organisation	Irish Water
Scheme Code	1900PUB1027
County	Limerick
Site Visit Reference No.	SV25556

Report Detail	
Issue Date	25/05/2022
Prepared By	Orla Harrington

Site Visit Detail			
Date Of Inspection	10/05/2022	Announced	Yes
Time In	10:30	Time Out	13:10
EPA Inspector(s)	Orla Harrington Cormac MacGearailt		
Additional Visitors			
Company Personnel	Limerick City and County Council (acting under service level agreement to Irish Water): Seamus Martin, Neal Boyle, Anne Peters, Kieran Crowley Irish Water: Duane O'Brien, Tommy Roche, Deirdre O'Loughlin		

> Summary of Key Findings

1. The audit found that the *Cryptosporidium* failures detected in the final water sample on 23/02/2022 (0.03 oocysts/10L) and 13/04/2022 (0.017 oocysts/10L) were most likely due to a deterioration in raw water quality combined with significant deficiencies and pressures on the treatment processes at Foynes/Shannon Estuary Water Treatment Plant. The audit found that the incident was suitably escalated and managed to protect human health. A third *Cryptosporidium* failure was detected in the final water sample on 12/05/22 (0.01 oocysts/10L) and notified to the EPA on 18/05/2022, subsequent to the audit. The EPA are very concerned about the ongoing detections and may consider enforcement action.
2. Remedial works are required on the rapid gravity filters at Foynes/Shannon Estuary Water Treatment Plant to ensure adequate depth of filter media is provided and that the *Cryptosporidium* barrier is not compromised. At the audit, Irish Water advised that refurbishment of filter no 4 would be completed by Quarter 2 2022 and the remaining filters (1-3) would be complete by Quarter 1 2023. Irish Water has indicated that the Foynes/Shannon Estuary Public Water Supply source has a protozoal log credit requirement of 3.5 log. Currently treatment at the plant provides 3 log credit if operated in accordance with the log credit performance approach. This gives a -0.5 log treatment deficit. Irish Water's intention is to determine if an additional 0.5 log credit can be achieved once the filter refurbishment works are complete. Irish Water should continue weekly monitoring of *Cryptosporidium* until the refurbishment of the filters is complete and the log deficit is addressed.
3. The current chemical dosing regime is insufficient to cater for the considerable variation in raw water quality. Irish Water should progress further operational improvements to the coagulation process without delay to ensure that the plant is optimised to respond to changes in raw water quality.

> Introduction

Foynes/Shannon Estuary Public Water Supply (PWS) supplies approximately 7,242 people from the Foynes/Shannon Estuary Water Treatment Plant (WTP). Water is abstracted from the River Deel and treated through coagulation, flocculation, clarification and rapid gravity filtration. Disinfection is achieved through chlorination. It is staffed on a 24 hour basis.

The audit was carried out in response to the notification by Irish Water of the detection of *Cryptosporidium* from samples taken on 23/02/2022 and 13/04/2022 and to assess Irish Water's progress in implementing the recommendations of the previous EPA audit on 20/10/2021.

> Supply Zones Areas Inspected

The audit was carried out on-site at Foynes/Shannon Estuary WTP. The audit consisted of a meeting with staff and an inspection of the filtration process.



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?	Yes
<p>Comment</p> <p>1. On the 28/02/2022 the EPA was notified of the detection of <i>Cryptosporidium</i> (0.03 oocysts/10L) in a sample taken of the final treated water at the Foynes/Shannon Estuary WTP on 23/02/2022. On 19/04/2022 the EPA received a notification from Irish Water confirming a second <i>Cryptosporidium</i> detection (0.017 oocysts/10L) in the final treated water in a sample taken on 13/04/2022. Following immediate consultation with the HSE on both occasions, it was determined that the exceedance did not constitute a risk to public health, as there had been no community notified cases of <i>Cryptosporidium</i> in the community linked to the Foynes/Shannon Estuary PWS. A third <i>Cryptosporidium</i> detection was notified to the EPA on 18/05/2022, subsequent to the audit. The HSE were notified by Irish Water on 17/05/2022. The EPA were informed by Irish Water that there is no change to the HSE advice.</p> <p>2. Following the previous EPA audit (20/10/2021) Irish Water commenced weekly monitoring of <i>Cryptosporidium</i> at the plant in accordance with Irish Water's 'Rationale for Determining the Frequency of Cryptosporidium Monitoring in Public Water Supplies'.</p> <p>3. Irish Water investigations determined that the cause of the <i>Cryptosporidium</i> break-through was associated with poor raw water quality influenced by storm events combined with a number of deficiencies in the coagulation and filtration stages.</p> <p>4. The barrier to <i>Cryptosporidium</i> entering the Foynes/Shannon PWS is provided by 4 no. rapid gravity filters (RGF). At the time of the first two detections, neither filter had a run to waste installed, therefore when there is a rise in turbidity following a filter backwash there is a risk of <i>Cryptosporidium</i> break-through in the filters and entering the distribution network. The filter media depth was less than the 1000mm depth recommended in the EPA Water Treatment Manual: Filtration (2020). The EPA had recommended in the previous audit (20/10/2021) that Irish Water investigate the feasibility of installing run to waste option after backwashing and refurbish the sand media in the RGFs in accordance with EPA guidance. At the audit, Irish Water advised that run to waste pipework was installed and commissioned on 25/04/2022. Limerick City and County Council confirmed that filter media refurbishment of filter no.4 had commenced with an estimated completed date of 13/06/2022. The remaining filters (1-3) will then be refurbished and Irish Water provided an estimated completion date of Quarter 1 2023 for this work. The EPA instructed Irish Water to continue weekly monitoring for <i>Cryptosporidium</i> until the process optimisation works for the filtration stage have been completed and verified.</p> <p>5. A review of the coagulation process is currently being undertaken by Irish Water following the recent <i>Cryptosporidium</i> detections and Irish Water advised that a streaming current monitor will be installed at the plant in the next 9 to 12 months to provide better monitoring and control of coagulation at the plant. As the raw water is variable, Limerick City and County Council are currently collecting raw water data to determine the required target value for the streaming current. Irish Water plan to undertake the coagulation optimisation works following the completion of the remedial works on the filters.</p> <p>6. In response to the <i>Cryptosporidium</i> detections Irish Water also cleaned all 4 settlement tanks, the balance tank and turbidity monitors at the plant.</p>	



2. Source Protection

2.1

	Answer
Is the abstraction source(s) adequately protected against contamination?	No
Comment	
<p>1. The supply is fed by the River Deel. Landuse in the vicinity of the abstraction point is agriculture and the Newcastlewest Wastewater Treatment Plant (WWTP) is situated upstream of the intake. Limerick City and County Council advised that it takes a discharge from the WWTP approximately 8 - 12 hours to reach the abstraction point to the plant.</p> <p>2. Irish Water submitted the raw water monitoring data for the period 01/11/2021 to 03/05/2022. The data indicated considerable variation in turbidity with levels of 65.8 NTU and 26 NTU recorded on 01/11/2021 and 07/02/2022 respectively.</p> <p>3. There is an online alarmed monitor on the raw water intake for ammonia. Abstraction ceases in the event the ammonia concentration reaches the high alarm level of 0.3mg/l. There is an online turbidity monitor on the raw water. There is no alarm or shut down linked to elevated turbidity in the raw water. Limerick City and County Council manually monitor at the balance tank for turbidity 4 times per day. It takes raw water approximately 4 hours to travel from the abstraction intake point to the balance tank and according to plant operators the balance tank provides a more realistic and representative location for turbidity monitoring. Turbidity was 1.95 NTU at the intake on the day of the audit.</p>	



3. Coagulation Clarification Flocculation (CFC) Stage

3.1

	Answer
Is the CFC process optimised to respond to changes in raw water quality?	No
Comment	
<p>1. The coagulation process is manually controlled, and the alum and poly dosing rates do not adjust automatically in responses to changes in raw water quality. The coagulant dose is manually adjusted by the operator based on raw water colour, turbidity and operator experience. The coagulant dose is delivered by duty and standby dosing pumps however there is no automatic switchover between the pumps. There is no routine jar testing programme in place at the plant, instead jar testing is carried out in response to a change in raw water quality as required. All dose rates are recorded in the daily log book, which was inspected on the day of the audit.</p> <p>2. A review of the coagulation process is currently being undertaken by Irish Water following the <i>Cryptosporidium</i> detections. Limerick City and County Council stated that a streaming current monitor has been ordered and is to be installed at the plant within the next 6 to 9 months to control coagulant dosing. Irish Water plan to undertake the remedial works on optimisation of the coagulation process following the completion of the filter works. The raw water is currently being monitored to determine requirements for optimum coagulation.</p> <p>3. There is an injection point for pH correction upstream of the static mixer, however it is not used or maintained for coagulation. The pH of the raw water on the day of the audit was 8.49 and this can vary significantly due to the flashy nature of the river.</p>	



4. Filtration

	Answer
4.1	Are the filters designed and managed in accordance with EPA guidance? No
Comment	
<p>1. There are 4 no. rapid gravity filters at the WTP. At the previous EPA audit (20/10/2021) Irish Water were unaware when the filter media was installed or topped up. Following the audit, a process of procuring a contractor for filter refurbishment was undertaken by Irish Water. The filter media replacement commenced on 09/05/2022, starting with filter no. 4 as only 1 filter can be taken out of service at any one time in order to meet demand in the network. Irish Water said the work to refurbish all filters is expected to be complete by Quarter 1 2023.</p> <p>2. There is a turbidity alarm set point at 0.28 NTU on each of the individual filter turbidity monitors. The plant is manned 24 hours a day and in the event of a triggering of the turbidity alarm setpoint operators respond to the alarm and investigate. Backwashing is linked to turbidity and there is a run to waste facility installed since 26/04/2022 until turbidities of 0.28 NTU is observed at the filter. All wastewater is disposed of to the sludge holding tank.</p> <p>3. The combined final water turbidity shuts down at 0.2 NTU (10 minutes delay).</p> <p>4. On the date of the audit the following turbidity levels were observed: Filter No. 1: 0.02 NTU; Filter No. 2: 0.03 NTU and Filter No. 3: 0.03 NTU, which is satisfactory.</p>	



5. Disinfection

5.1

Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?

Answer

No

Comment

1. The disinfection system at Foynes/Shannon Estuary WTP is verified using monitors and alarms, and the chlorine residuals are recorded and accessible.

2. The low chlorine alarm setting at the outlet of the clear water tank, remains at 0.4 mg/l at this audit. The chlorine shut down setpoint figure is 0.3mg/l. The low chlorine alarms and shutdown are below the target of 0.8mg/l chlorine residual concentration in the final water. There are no high chlorine alarm setpoints or shutdowns at this location. Recommendations have been raised in relation to these points in the report of the EPA audit on 20/10/2021.

3. The Irish Water Q1 2022 update on the National Disinfection Programme said that the Foynes/Shannon Estuary WTP was commissioned and available on telemetry on November 2021, however operational monitoring is not complete. This consists of 30 days of data monitoring of the live upgrade disinfection system, followed by assessment and approval of the data. During the audit, Irish Water stated that operator training on the disinfection upgrades had been completed in January 2022, however contractors had a list of snag works to complete before fully handing over the process.



6. Management and Control

6.1

	Answer
Have the recommendations from the previous EPA audit been satisfactorily addressed?	No
<p>Comment</p> <p>The following recommendations from the previous audit on 20/10/2021 have not been fully completed to date. These being:</p> <p><i>No. 2 Irish Water should replace and refurbish the sand media in the rapid gravity filters to a minimum of 1000m in accordance with the EPA Water Treatment Manual: Filtration. Irish Water outlined at the audit that refurbishment of filter no. 4 commenced on 09/05/2022 and will be complete by 13/06/2022. All remaining filters will be refurbished by Quarter 1 2023 as only one filter can be taken out of service at any one time due to demand on the network.</i></p> <p><i>No. 3 Irish Water should (i) ensure low and low low chlorine setpoints are set at an appropriate level to ensure that the target residual chlorine concentration in the final water is met and (ii) notify the EPA when the Disinfection Programme is complete and provide an outline of works completed. The data provided at the audit indicated that chlorine setpoints have not been revised to ensure the target residual chlorine concentration is met in the final water. The Disinfection programme is generally complete, however contractors are still working on a final snag list. Once this work is done, Irish Water must provide an outline of the works completed under the Programme.</i></p> <p><i>No. 6 Irish Water should explain how any log deficits will be addressed. Irish Water advised that the protozoal log credit requirement for the source water is 3.5 log. The treatment processes at the plant provide 3 log credits if operated in accordance with the log credit performance approach and this indicates that there is a -0.5 log deficit at the plant. Regarding the log deficit at Foynes, Irish Water advised that the intention is to determine whether an additional 0.5 log credit can be achieved once the works on the first filter is completed.</i></p> <p><i>No. 7 Irish Water should investigate the feasibility of introducing pH correction prior to coagulation to reduce the need for excessive levels of coagulant. Irish Water will carry out a suite of tests as part of their investigation into pH correction by end Quarter 2 2022.</i></p> <p><i>No. 9 Irish Water should submit the Drinking Water Safety Plan high and very high risks identified for the plant and the plans to address these risks. Irish Water advised that the plan will be submitted to the EPA once finalised. There was no date for completion provided.</i></p> <p><i>No. 10 Irish Water should review the chemical arrangements in place at the WTP. Chemicals must be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein. Irish Water will carry out a review of the existing chemical storage facilities in Quarter 1 2023.</i></p> <p><i>No. 12 Irish Water should ensure that the Foynes treated water storage reservoir is inspected and cleaned as a matter of priority. Irish Water is currently in the process of procuring contractors to carry out an inspection of the Foynes reservoir in Q1 - Q2 2023.</i></p> <p>These outstanding recommendations have been included in this audit report.</p>	

Recommendations

Subject	Foynes Audit Recommendations [10/05/2022]	Due Date	21/06/2022
Action Text	<p>Recommendations</p> <p>Irish Water is responsible for ensuring a safe and secure supply of drinking water. To address these issues, Irish Water should implement the following recommendations without delay:</p> <ol style="list-style-type: none"> 1. Irish Water should replace and refurbish the filter media in the rapid gravity filters to a minimum of 1000m in accordance with the EPA Water Treatment Manual: Filtration. 2. Irish Water should identify measures to address the - 0.5 log deficit and provide a timeframe for completion. 3. Irish Water should monitor for <i>Cryptosporidium</i> in the final water on a weekly basis, until the filter refurbishments are complete and the log deficit addressed. 4. Irish Water should a) submit an Action Plan with timeframe for the completion of the works associated with the switch over to automatic coagulant dosing via a streaming current monitor b) install automatic switchover on the duty and standby coagulant dosing pumps. 5. Irish Water should install a turbidity monitor at the balance tank and undertake a review to determine a suitable turbidity alarm setting and time delay to ensure appropriate alarm levels and response procedures are in place in the event that the raw water quality is compromised. 6. Irish Water should (i) install a high-level chlorine alarm and shutdown (ii) ensure low and low low chlorine setpoints are set at an appropriate level to ensure that the target residual chlorine concentration in the final water is met (iii) notify the EPA when the Disinfection Programme Works are complete and provide a brief outline of works completed. 7. Irish Water should investigate the feasibility of introducing pH correction prior to coagulation to reduce the need for excessive levels of coagulant. 8. Irish Water should submit the Drinking Water Safety Plan high and very high risks identified for the plant and the plans to address these risks 9. Irish Water should review the chemical storage arrangements in place at the WTP. Chemicals must be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein. 10. Irish Water should ensure that the Foynes treated water storage reservoir is inspected and cleaned as a matter of priority. <p>Follow-Up Actions required by Irish Water</p> <p>During the audit, Irish Water representatives were advised of the audit findings and that action must be taken as a priority by Irish Water to address the issues raised.</p> <p>This report has been reviewed and approved by Regina Campbell, Drinking Water Team Leader.</p> <p>Irish Water should submit a report to the Agency on or before 21/06/2022 detailing how it has dealt with the issues of concern identified during this audit.</p> <p>The report should include details on the action taken and planned to address the various recommendations, including time frame for commencement and completion of any planned work.</p> <p>The EPA also advises that the findings and recommendations from this audit report should, where relevant, be addressed at all other treatment plants operated and managed by Irish Water.</p> <p>Please quote the Action Reference Number DW20210167 in any future correspondence in relation to this Report.</p>		