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	Enniscorthy
Organisation	Irish Water
Scheme Code	3300PUB1491
County	Wexford
Site Visit Reference No.	SV22328

Report Detail

Issue Date	21/04/2021
Prepared By	Daryl Gunning

Site Visit Detail

Date Of Inspection	25/03/2021	**Announced**	Yes
Time In	11:00	**Time Out**	12:45
EPA Inspector(s) **Additional Visitors**	Daryl Gunning Michelle Roche		
Company Personnel	Irish Water: Colin Cunningham, Samantha Keane Wexford County Council: Paul Delahunty, Fionnuala Callery, Tadhg O'Corcoran		

Summary of Key Findings

1. *Cryptosporidium* was detected in the final water at the Vinegar Hill water treatment plant (WTP) in samples taken on 23/02/21 and 04/03/21.

2. The audit identified two potential causes of the *Cryptosporidium* detections: (i) The Kilagoley Borehole, which has been identified by Irish Water as a G3 groundwater source (high risk of microbiological and protozoal contamination), does not have *Cryptosporidium* treatment installed, and is not monitored for *Cryptosporidium* or *E. Coli*; and (ii) The sand filter media in the rapid gravity filters at the Vinegar Hill WTP, which is below the minimum required depth outlined in the EPA Filtration Manual.

3. Irish Water and Wexford County Council intend to review the coagulation, flocculation and clarification, and filtration (including filter media) treatment processes at the Vinegar Hill water treatment plant.

Introduction

The Vinegar Hill WTP produces approximately 150 m3/hour of water serving a population of 11,402 on the Enniscorthy PWS. Raw water is abstracted from the Slaney river (intake at Clonhasten). Treatment consists of coagulation, flocculation, and clarification (CFC); rapid gravity filtration (RGF); chlorination with sodium hypochlorite; pH correction; and fluoridation. The treated water from the Slaney river source enters the low level reservoir. From there it feeds the low level network or is pumped to the high level reservoir (approximately 65-75% of the volume). An additional supply (25 m3/hour) is sourced from the Kilagoley Borehole (BH). Treatment of this additional BH source water consists of pH correction and chlorination with sodium hypochlorite. Treated water from the BH source is pumped up to the higher level reservoir. An additional supply (Edermine BH; treatment - UV) supplies the Enniscorthy PWS, however, it does not feed into the Vinegar Hill WTP and was not assessed during this virtual audit.

The audit was carried out in response to the detection of *Cryptosporidium* in the final water at the Vinegar Hill WTP on 23/02/21 and 04/03/21.

Supply Zones Areas Inspected

The audit comprised of a video conference meeting on 25/03/21. A site visit was not undertaken due to Covid-19 restrictions.

1. Incident Management

		Answer
1.1	Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	Yes

Comment

The EPA were notified of a *Cryptosporidium* detection (0.007 per 10L) in the final water at the outlet of the high level reservoir, in a sample taken on 23/02/21. This detection was notified to the EPA on 02/03/21. Irish Water and Wexford County Council consulted with the HSE in a timely manner and it was agreed that further *Cryptosporidium* sampling would be carried out. The *Cryptosporidium* resample taken on 02/03/21 was clear, however, a further resample taken on 04/03/21 detected *Cryptosporidium* (1 per 10L) at the outlet of the high level reservoir. The consultation and risk assessment undertaken by Irish Water, Wexford County Council and the HSE determined that consumers did not need to be informed of a risk to public health. It was agreed that further *Cryptosporidium* sampling would be undertaken. Resamples conducted on the 9th, 10th, and 16th of March did not detect *Cryptosporidium*.

Prior to the virtual audit taking place, Irish Water and Wexford County Council undertook investigations at the Vinegar Hill WTP and no issues with treatment processes were identified.

Turbidity and chlorine trended data from the Vinegar Hill WTP were examined during this audit and indicated that all treatment processes were working correctly at the time of the *Cryptosporidium* detections. The cause of the *Cryptosporidium* detections has not been determined, however, a number of potential causes were identified:

1. An *E.Coli* or *Cryptosporidium* monitoring programme has not been carried out on the Kilagoley borehole (BH). As this BH has been classified as a G3 source, it is at high risk of microbiological and protozoal contamination. The treated water from this BH is pumped up to the high level reservoir. As the *Cryptosporidium* samples were taken after the high level reservoir the Kilagoley BH is a potential source of the *Cryptosporidium* detections.
2. The sand filter media in the rapid gravity filters (RGFs) is not at the recommended depth of 1000-1200mm, as per the requirements of the EPA filtration manual, and has not been changed in 9 years. Subsequently, this may be another potential cause of *Cryptosporidium*.

The EPA were notified at the audit that Irish Water and Wexford County Council have scheduled a treatment process investigation of the coagulation, flocculation, and clarification (CFC) stage and rapid gravity filters (RGFs) to take place 6 weeks from the date of this audit.

2. Coagulation Clarification Flocculation (CFC) Stage

		Answer
2.1	Are the CFC processes appropriately controlled?	Yes

Comment

Raw water monitoring

Irish Water has not yet undertaken the assessment of the Kilagoley borehole (BH) or River Slaney using the *Cryptosporidium* source risk assessment methodology and have therefore classified the BH as G3 and the Slaney as S3 (high risk of microbiological and protozoal contamination).

Kilagoley BH:

1. An *E.Coli* or *Cryptosporidium* monitoring programme has not been carried out on the Kilagoley BH.
2. The Kilagoley BH source is monitored for turbidity. Raw water turbidity is generally <0.1 NTU.
3. Treatment of Kilagoley BH raw water consists of pH correction and chlorination with 14-15% sodium hypochlorite. Treated water from the BH is pumped up to the higher level reservoir and does not undergo Coagulation, flocculation, clarification (CFC) or Rapid Gravity Filtration (RGF) treatment.

River Slaney:

1. The river Slaney source is monitored for pH, turbidity, ammonia, and UVT.

CFC stage

1. Raw water pH from the Slaney river source ranges between 6.6 - 7.1. Currently there is no pH correction prior to CFC treatment, however, this will be evaluated in conjunction with the planned treatment process assessments.
2. Aluminium sulphate (alum) is added to the contact tank through the bottom of the tank. Alum has 8-9 minutes of contact time. Polyelectrolyte (coagulation aid) is also added to the contact tank through the bottom of the tank.
3. Automatic dosing was installed at the Vinegar Hill WTP 12 months ago and is controlled by an automatic dose streaming current meter. However, during periods of poor weather conditions, dosing is changed over to manual control.
4. Automatic switchover of the alum duty and standby dosing pumps occurs once per week.
5. There are two flat bottomed clarifiers at the Vinegar Hill WTP.
6. The sludge bleeds operate for 2 minutes every 30 minutes. Sludge goes to 2 sludge holding tanks, where sludge is removed as required. The water is allowed to settle prior to being released directly to the sewer.
7. The clarifiers are monitored for turbidity and the alarm setpoint is 2.5 NTU. For approximately 18 hours (from approximately 9pm on 22/03/21), turbidity post clarifiers was >2.5 NTU, peaking at 4.8 NTU. The alarm was triggered during these high turbidities. These elevated turbidity levels, post clarifier, were as a result of elevated raw water turbidity resulting from peak flood waters following poor weather conditions. However, individual filter turbidities were not adversely impacted, peaking at (i) filter 1: 0.11 NTU; (ii) filter 2: 0.16 NTU; and (iii) filter 3: 0.03 NTU during this 18 hour period.
8. A cascade system is in place to alert staff in the event of an alarm being triggered.

3. Filtration

		Answer
3.1	Are the filters designed and managed in accordance with EPA guidance?	No

Comment

1. There are three rapid gravity filters (RGFs) at the Enniscorthy WTP.
2. Filter media (gravel and sand) depth in each filter is approximately 600mm.The minimum depth recommended by the EPA is 1000 to 1200mm media depth above the support gravel. The filter media in each RGF is approximately 9 years old.
3. The RGFs are backwashed on a daily basis (1 filter per day). The backwash procedure lasts 13 minutes (5 minutes of air scour and 8 minutes of water scour). There is no run-to-waste after the backwash, however, the filter is left to settle for approximately 1 hour prior to the filter being refilled with water (approximately 1 hour duration), after which the filter is brought back into service.
4. There is a turbidity monitor on each of the RGFs.
5. Individual filter turbidities are alarmed as follows: (i) warning: 0.3 NTU for 15 minutes; (ii) control: 0.5 NTU for 15 minutes; and (iii) trigger: 1 NTU for 3 minutes. Individual filter turbidity is consistently <0.2 NTU.
6. Final water turbidity is alarmed as follows: (i) High: 0.5 NTU for 20 minutes and (ii) High High: 0.9 NTU for 20 minutes.
7. There is currently no automatic shutdown enabled on the turbidity alarms. The feasibility of enabling automatic shutdown and run-to-waste is currently being investigated.
8. A cascade system is in place to alert staff in the event of an alarm being triggered.
9. The final water turbidity monitor is currently located at the low level reservoir. The feasibility of relocating the final water turbidity monitor from the low level reservoir to upstream of the reservoirs will be investigated.
10. Irish Water and Wexford County Council have scheduled an assessment of filter performance / operation to take place 6 weeks from the date of this audit.

4. Disinfection

		Answer
4.1	Is the chlorine dosed appropriately?	Yes

Comment

1. Raw water from the Kilagoley BH is disinfected with 14-15% sodium hypochlorite prior to entering the higher level reservoir. Dosing is flow proportional. There is a duty and standby dosing pump, which is manually switched over. Automatic switchover occurs in the case of a pump failure.
2. Filtered water from the Slaney river is disinfected with 14-15% Sodium hypochlorite. Dosing is flow proportional. There is a duty and standby dosing pump, which is manually switched over. Automatic switchover occurs in the case of a pump failure.
3. A chlorine residual of 0.8 mg/l is aimed for leaving the Vinegar Hill WTP.
4. Chlorine contact time at the Vinegar Hill WTP is 48.1mg.min/l. Contact time is satisfactory to the first customers at maximum flow and minimum water level in the reservoir.
5. Chlorine residuals of >0.1 mg/l are consistently achieved in the Enniscorthy PWS network which demonstrates the water in the distribution network is adequately disinfected.
6. The following chlorine alarms are present at the Vinegar Hill WTP:

- CL001 (located prior to the reservoirs): (i) low: 0.8 mg/l; (ii) low low: 0.7 mg/l; (iii) high: 2.5 mg/l; and (iv) high high: 2.7 mg/l.
- CL002 (located post high level reservoir): (i) low: 0.5 mg/l; (ii) low low: 0.5 mg/l; (iii) high: 1.6 mg/l and (iv) high high: 2 mg/l.
- CL003 (located post low level reservoir): same as CL002 set-points.
- A cascade system is in place to alert staff in the event of an alarm being triggered.

5. Reservoirs and Distribution Networks

		Answer
5.1	Are reservoirs adequately inspected and maintained?	Yes

Comment

1. pH correction with caustic soda takes place prior to the treated water entering the low level reservoir. The pH aimed for is 6.8 - 7. Fluoride is also dosed prior to the treated water entering the low level reservoir.
2. There are two reservoirs at the Vinegar Hill WTP, a low level reservoir (capacity: 2,272m3) and a high level reservoir (capacity: 3,408m3).
3. Both reservoirs were last inspected in 2020 and were found to be in good condition, with minimal sediment present.
4. Both reservoirs are scheduled to be cleaned in 2021.

Recommendations

Subject	Enniscorthy Audit Recommendations	Due Date	21/05/2021

Action Text

Recommendations

1. Irish Water should carry out a risk-based source characterisation assessment on all sources for the Enniscorthy PWS and identify the protozoal compliance log requirement for the Vinegar Hill water treatment plant, providing a timeframe and report to the EPA, without delay.

2. Irish Water should provide the outcome of the investigation into the Coagulation, flocculation, and clarification, and rapid gravity filtration treatment processes at Vinegar Hill WTP.

3. Irish Water should investigate the feasibility of implementing automatic shutdowns and run-to-waste procedures to ensure inadequately disinfected water does not enter the network in the event of any failure of the disinfection system or failure of the *Cryptosporidium* barrier.

4. Irish Water should relocate the final water turbidity monitor to before the reservoirs and review the final water alarm setpoints to ensure staff are alerted to any failure of the disinfection system or failure of the *Cryptosporidium* barrier, in the most efficient and effective manner possible.

5. Irish Water should clarify what the delay times are for each of the chlorine alarm setpoints and, regarding alarms CL002 and CL003, why the low and low low level alarm setpoints are the same (0.5 mg/l).

6. Irish Water should ensure that all filters at the Vinegar Hill water treatment plant have the minimum sand media depth of 1000-1200 mm as per the requirements of the EPA filtration manual.

7. Irish Water should continue to undertake *Cryptosporidium* monitoring in Enniscorthy public water supply (at both Vinegar Hill WTP and the Kilagoley BH) in accordance with Irish Water's *Rationale for Determining the Frequency of Cryptosporidium in Public Water Supplies.*

8. Irish Water should undertake *E.Coli* monitoring at the Kilagoley borehole.

9. Irish Water should ensure that the high and low level reservoirs are cleaned in 2021.

Follow-Up Actions required by Irish Water

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.

This report has been reviewed and approved by Michelle Minihan, Drinking Water Team Leader.

Irish Water should submit a report to the Agency one month from the date of this audit report detailing how it has dealt with the issues of concern identified during this audit.

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.

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.

Please quote the Action Reference Number in any future correspondence in relation to this Report.