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	Breanlee PWS 088A
Organisation	Irish Water
Scheme Code	1300PUB1094
County	Kerry
Site Visit Reference No.	SV22486

Report Detail

Issue Date	05/07/2021
Prepared By	Regina Campbell

Site Visit Detail

Date Of Inspection	24/06/2021	**Announced**	Yes
Time In	10:30	**Time Out**	13:30
EPA Inspector(s) **Additional Visitors**	Regina Campbell		
Company Personnel	Irish Water: Kian Guihen, Oliver Harney, Tommy Roche*, Ian O' Mahony* Kerry County Council: Seamus O' Mahony, Brian Lennon, Kathleen Casey, Paul Neary*, Dan Heffernan** * Attended videoconference call only ** Attended site visit only		

Summary of Key Findings

1. There is a duty UV treatment unit only at the Breanlee Water Treatment Plant (WTP). There is no automatic shutoff in the event of failure of the UV unit or if the duty UV unit operates outside its validated range. Irish water should ensure that there are duty and standby UV disinfection arrangements with automatic changeover in the event of failure of one of the UV disinfection units.

2. The plant operates as a single stream process. In the event of mechanical or operational issues with the coagulation/flocculation/clarification (CFC) unit lasting more than a few hours, the CFC and filtration treatment processes are bypassed and the raw water is treated by UV and chlorination only. During bypass periods, there is a risk of the water being inadequately treated by the UV and chlorination treatment systems particularly if the raw water is of poor quality and if the turbidity of the water is > 1NTU. Currently there is no shutdown of the plant when turbidity of the water is > 1 NTU (parametric value).

3. There is a concern about the resilience of the Breanlee WTP which has approximately 3 hours treated water storage capacity. There are no reservoirs on the supply and there are no automatic shutdowns linked to turbidity, chlorine or UV setpoints. In the event of very poor raw water conditions or operational issues with the treatment processes there is a risk of inadequately disinfected water entering the supply.

4. On the basis of the findings outlined in this audit report, the EPA will consider adding the Breanlee PWS to the Remedial Action List.

Introduction

The Breanlee Public Water Supply (PWS) serves a population of 1,243 and produces 651 m3/day. The source of the supply is a mountain stream from the Coomloughra lakes. The plant operates 24 hours/day and treatment comprises of coagulation, flocculation, clarification, filtration and disinfection by UV and chlorination.

The audit was undertaken following 6 no. aluminium exceedances and 1 no. turbidity exceedances notified to the Agency between 19/01/21 and 20/05/21.

Supply Zones Areas Inspected

The audit consisted of a videoconference call with Irish Water and Kerry County Council staff on the 23/06/21 following by an on-site inspection of the water treatment plant on the 24/06/21. The source and all treatment processes were inspected.

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

There were a number of exceedances of parametric values and incidents notified to the Agency between January and May 2021 as detailed below.

Incident 1 - The EPA was notified of an exceedance of the aluminium parametric value (400 ug/l versus 200 ug/l limit) in a sample taken at the WTP on the 19/01/21. Irish Water submitted results that showed that the aluminium results at the plant were in compliance and that the plant was operating normally at the time of the exceedance. Irish Water concluded that the exceeedance was as a result of the sample being taken from an inappropriate tap at the WTP. Kerry County Council (KCC) advised that laboratory staff had been informed of the correct sampling tap location and a 'Sampling Tap' sign would be placed at the correct tap. The audit confirmed that the sign was in place.

Incident 2 - The EPA was notified of an exceedance of the aluminium parametric value (7,646 ug/l versus 200 ug/l limit) in a sample taken at the WTP on the 01/02/21. There were also two aluminium exceedances in the network recorded for the same day. Records submitted to the EPA showed that the aluminium results at the plant were in compliance on the same date and turbidity was <0.3 NTU with chlorine and UV trends normal. As a precaution, network flushing was put in place. KCC confirmed that the sample had been taken at the correct location at the plant. The result on 01/02/21 is viewed by KCC and Irish Water as an erroneous result and possibly due to contamination by the contracted laboratory.

Incident 3 - On 07/04/21 Irish Water notified the EPA of an incident with high aluminium in the final water due to a blockage with the PAC (coagulant) dosing pumps. Coagulation resumed on 08/04/21 after the repairs to the dosing pump. On the 12/04/21 coagulation was again suspended due to an issue with the coagulation pH probe. Coagulation was restored with a temporary pH probe on 16/04/21. On the 23/04/21 there was an issue with the hydrocylone in the Actiflo unit. The hydrocyclone separates the microsand from the sludge and a part needed to the replaced. Four aluminium exceedances (ranging from 233 ug/l to 350 ug/l) were notified to the EPA for samples taken between 04/04/21 and 21/04/21 at the plant. At the audit, KCC explained that the CFC unit is a single stream process and that it has to be shutdown if an issue occurs. When the Actiflo unit is shutdown, this may result in the CFC and filtration being manually bypassed to the UV and chlorination treatment processes. Records viewed showed that that the turbidity remained <1NTU in the final water and that the UV unit was operating within its validated range during this time. The audit confirmed that a second pH probe was now in place at the plant. KCC said that there is no procedure in place for when the CFC/filtration processes are bypassed.

Incident 4 - Irish Water notified the EPA of a turbidity exceedance of 1.4 NTU in sample taken of the final water on 20/05/21. The elevated turbidity was due an airlock in the SAC (Spectral Adsorption Coefficient) monitor which lead to underdosing of coagulant for approximately 90 minutes. Normal dosing resumed once the airlock was released. Corrective actions are that the sensor will be wiped when its immersed in the water bath after cleaning. Records reviewed showed a dip in the UVT trend to 63.21 % and the flow spiked to 54.7 m3/hr around the same time which shows that the UV operated outside its validated range at this time.

Incident 5 - On 28/05/21 the CFC unit was switched off due to coagulation problems due to a blockage with the soda ash dosing pumps. Following repairs, the coagulation system was switched on again on 29/05/21. While the coagulation system was turned off the water was treated by UV and chlorination only. The UV remained within its validated operating range during this time.

All off the above incidents were suitably alerted, escalated and managed by staff and consultation with the HSE took place on each incident in relation to any possible risk to public health.

2. Source Protection

		Answer
2.1	Is the abstraction source(s) adequately protected against contamination?	Yes

Comment

The source of the supply is a mountain stream which flows from the Coomloughra Lakes. The water passes through a fine screen and is gravity fed to the plant. The river is flashy in nature and is prone to high colour and turbidity during heavy rainfall. There are no houses or septic tanks upstream of the intake and the main activity is sheep grazing. There is raw water monitoring for turbidity and UV 254 SAC (spectral adsorption coefficient). The SAC is alarmed at 40% and this is the critical parameter for control of coagulant dosing. On the day of the audit, the raw water SAC monitor displayed a reading of 2%. Kerry County Council said that the quality of the water was very good at the moment due to the settled weather conditions.

3. Coagulation Clarification Flocculation (CFC) Stage

		Answer
3.1	Is the CFC process optimised to respond to changes in raw water quality?	Yes

Comment

Raw water is dosed with soda ash for pH correction followed by coagulant 10% PAC (polyaluminmium chloride). There is a duty soda ash pump only and a duty/standby PAC pump in place. Dosing is controlled by an algorithm based on the % SAC of the raw water.

		Answer
3.2	Are the CFC processes appropriately controlled?	Yes

Comment

Following soda ash and PAC dosing the water goes to the Actiflo mixing tank which contains a pH probe with optimal pH for coagulation being 7.1-7.2. There are high & low alarms on the floc pH monitor of 7.6 and 6.3. The water then goes to the Actiflo turbomix tank at which point a mix of microsand and 0.1% polyeletrolyte is added to aid flocculation. The turbomix tank leads to a hopper bottomed settling tank. The micosand/sludge mix settles to the bottom and is scraped off and the settled water is collected in channels. The Actiflo hydrocyclone separates the microsand sand from the sludge. The microsand is reused in the process and the sludge is sent to the sludge settling tank.

The Actiflo coagulation/flocculation/clarifier is a single stream process and is highly automated. KCC said that the unit is prone to wear and tear and has to be shutdown for planned maintenance or for remedial works in the event of a mechanical or operational issue. KCC said they try to plan any maintenance of the unit during periods of fine weather when the raw water conditions are stable. Because of the limited treated water storage capacity at the plant of 3 hours, the CFC process may have to be bypassed manually and the raw water sent straight to the UV and chlorination disinfection processes. This bypass process is done by the plant operator following consultation with supervisors. However there is no documented procedure setting out the conditions under which the plant may operate with UV and chlorination only.

		Answer
3.3	Were the CFC tanks, channels and weirs observed to be clean, level and well maintained during the audit?	Yes

Comment

The clarifier is covered over and there is an inspection hatch to view it. The channels were clean on observation.

4. Filtration

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

Comment

There is 1 rapid gravity filter at the plant. The main purpose of the filter is to reduce turbidity prior to disinfection by UV and chlorination. KCC said that the media is comprised of sand with depth of about 800 -900mm which is less than the 1m depth recommended in the EPA Water Treatment Manual: Filtration (2020). Kerry County Council said that the depth is measured regularly and the sand was topped up in the last month. Backwashing takes place on a timed basis every 16 hours. The backwash cycle is 90 seconds air, 8 minutes slow wash with air & water, 60 seconds settling and 5 minutes fast wash with water only. There is run to waste for 15 minutes afterwards.

Scum was observed on the filter which KCC said may be coagulant carryover. Some green algae was also observed growing on the sides of the filter wall.

Information submitted prior to the audit stated that the post filter turbidity alarm (pre UV unit) and final water turbidity alarm were 0.4 NTU. On the day of the audit KCC said that it had lowered the turbidity alarms to 0.2 NTU in the last few days to provide an earlier warning of any issues but that usually the turbidity alarms are set at 0.4 NTU. There is no shutdown based on high turbidity after the filter or in the final water.

Backwash water goes to a settlement tank and then is discharged to a drain. Kerry County Council said that they were unsure of the final destination of the discharge from the site.

		Answer
4.2	Does monitoring indicate that the filters are operating effectively?	Yes

Comment

On the day of the audit the turbidity post the filter was 0.032 NTU. Records reviewed for April & May 2021 showed that generally turbidity is <0.3 NTU post the filter.

5. Disinfection

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

Comment

Primary disinfection is achieved by UV disinfection followed by chlorination to maintain a residual disinfectant in the network. The Best UV unit was installed on the site in 2017/2018 to ensure that a *Cryptosporidium* barrier was provided during periods when the CFC processes were bypassed due to operational issues or planned maintenance.

Both the UV and chlorination systems are monitored with alarms in place and with trended data recorded and accessible. Monitors and alarms are operational via dial out and there is a suitable cascade system in place which is documented in the Alarm Response Procedure.

The Best UV unit is certified under the Austrian standard and operates within the following validation envelope: 33 m3/hr at 70% UVT, 42.9 m3/hr at 75% UVT, 53 m3/hr at 80% UVT. There is a low UVI alarm of 80 W/m2 and a low UVT alarm of 75 %.

On the day of the audit the UV unit was operating within its validated range with a flow rate of 29.6 m3/hr and a UVT of 95.67 % with a UVI reading of 152 W/m2. There are no shutdowns in place and the UV unit will continue to operate if it goes outside its validated operating range or if the turbidity is > 1 NTU. The complete validation certificate for the unit was not available for viewing at the audit.

High and low chlorine alarms are 1.95 mg/l and 0.5 mg/l respectively.

		Answer
5.2	Are duty and standby chlorine pumps/ UV units in operation?	No

Comment

UV

There is a duty UV unit only which does not meet the mininum EPA Disinfection Criteria for a plant of this size (pop served 1,243) and with only 3 hours treated water storage.

Chlorination

10% sodium hypochlorite is dosed flow proportionally with residual trim. There are duty and standby chlorine dosing pumps with automatic changeover. Drums of sodium hypochlorite were within the expiry date and the PCS number was displayed.

		Answer
5.3	Does the trend in chlorine residual at the treatment plant indicate adequate and stable levels of disinfection?	No

Comment

The target residual chlorine level for the treated water is 0.9 mg/l and is measured after Contact tank no. 1 (36 m3). The water is then split between a further 2 contact tanks of 22m3 capacity each. There were a lot of dips and spikes in the chlorine trend submitted for May 2021 which were not adequately explained on the day of the audit. KCC said they will investigate if the monitor can be reconfigured to give a more accurate representation of the chlorine level at the monitoring location.

Even though primary disinfection is by UV, Irish Water submitted the chlorine contact time calculation which shows the plant providing 20.6 mg.min/l which is adequate chlorine contact time.

		Answer
5.4	Is there a suitable monitoring frequency for residual chlorine in the network with records available?	No

Comment

Records for May 2021 were reviewed and there were gaps of up to 10 days between monitoring for residual chlorine in network. All chlorine residual results viewed for the network were >0.1 mg/l.

6. Management and Control

		Answer
6.1	Is the water treatment plant resilient enough to cope with significant variations in raw water quality or demand?	No

Comment

The Breanlee WTP has approximately 3 hours treated water storage. The plant operates as a single stream process and in the event that the CFC unit goes offline as a result of a mechanical failure or for maintenance for any significant length of time, then the CFC and filtration processes may have to be bypassed to the UV and chlorination processes. There is a single UV unit only which provides primary disinfection and there is no automatic shutoff in place in the event that the UV unit fails or operates outside its validated range.

On the day of the audit, the raw water was of very high quality but the source is a very flashy stream and prone to high turbidity and colour during flood conditions. There are no shutdowns at the plant based on turbidity, UV or chlorine residual. This lack of shutdowns combined with 3 hours treated water storage could lead to inadequately disinfected water entering the supply on occasions.

KCC said that shutting off the supply could lead to bursts in the network pipeline.

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

Comment

Irish Water provided contradictory information in relation to the log treatment requirement for the plant. Information submitted prior to the audit said that the supply has a log requirement of 4 but on the day of the audit Irish Water said that the supply had a log requirement of 3 which included a penalty of +1 for having no sanitary survey completed.

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

Comment

There are no shutdowns in place based on turbidity, on the UV alarms (flow, UVT or UVI) or on the chlorine dosing system at the plant. The lack of shutdowns combined with the single stream nature of the CFC/filter and duty only UV unit and the lack of adequate treated water storage make this plant very vulnerable to inadequately treated water entering the distribution network.

		Answer
6.4	Are relevant alarms dialled out via a cascade system to allow a timely response by plant operators?	Yes

Comment

Monitors and alarms are operational via dial out and there is a suitable cascade system in place which is documented in the Alarm Response Procedure.

		Answer
6.5	Are instrument calibrations within date?	Yes

Comment

Instruments checked were within calibration date.

7. Sludge Management

		Answer
7.1	Is sludge arising from the treatment processes adequately managed?	Yes

Comment

There are two settling tanks at the site, one for sludge and the other for supernatant from the sludge tank and also backwash water.

Sludge is collected from both tanks about every 3 months and sent to Killorglin WWTP.

Supernatant is discharged to a drain. Kerry County Council were unsure of when the supernatant was last tested and what is the route of the drain and if it discharges into surface water.

Recommendations

Subject	Breanlee PWS Audit Recommendations	Due Date	05/08/2021
Action Text	**Recommendations** 1. The following recommendations are made in relation to the UV disinfection system: a) Irish Water should ensure that there are duty and standby UV disinfection arrangements with automatic changeover in the event of failure of one of the UV disinfection units. b) Irish Water should ensure that the UV disinfection system operates within its validated range at all times. c) Irish Water should submit the complete UV unit validation certificate. 2. Irish Water should document a procedure outlining the circumstances under which the CFC and filtration treatment processes are bypassed and the water is treated by UV and chlorination only. 3. Irish Water should take action to improve the resilience of the Breanlee supply by ensuring that there is sufficient adequately treated water in the event of poor raw water conditions or in the event of operational issues at the plant. 4. Irish Water should install a standby soda ash dosing pump at the plant. 5. Irish Water should confirm the protozoal log treatment requirement for the plant and address how any treatment log deficit will be addressed. 6. Irish Water should review and implement turbidity alarms and shutdown on the filter and on the final water in accordance with the EPA Water Treatment Manual: Filtration (2020). 7. Irish Water should a) install shutdown at the plant based on high and low residual chlorine in the final water b) install shutdown at the plant in the event that turbidity is > 1NTU in the final water. 8. The following recommendations are made in relation to the chlorination system: a) Irish Water should ensure that monitoring of residual chlorine is undertaken in the network, including the extremities, several times a week. b) Irish Water should provide an explanation for the spikes & dips in the residual chlorine trend submitted for May 2021 and outline actions to address any issues identified. 9. The following recommendation are made in relation the filtration system: a) Irish Water should increase the sand depth in the filter to the minimum recommended depth of 1m as per the EPA Water Treatment Manual: Filtration (2020). b) Irish Water should investigate the cause of the scum observed in the filter at the audit and take action to ensure that it does not have an effect on the quality of the filtered water. c) Irish Water should ensure that the filter is cleaned on a regular basis to prevent the build up of algae and any subsequent impacts on treatment processes. 10. Irish Water should undertake regular sampling of the surface water discharge from the site, confirm the disposal route for the discharge and ensure that it is not having an impact on the environment. **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 Dr. Michelle Minihan, Senior Inspector, Drinking Water Team. Irish Water should submit a report to the Agency on or before 05/08/21 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 DW20210003 in any future correspondence in relation to this Report.		