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	Barrow Supply
Organisation	Irish Water
Scheme Code	1400PUB1060
County	Kildare
Site Visit Reference No.	SV22836

Report Detail

Issue Date	05/11/2021
Prepared By	Aoife Loughnane

Site Visit Detail

Date Of Inspection	12/10/2021	**Announced**	Yes
Time In	10:30	**Time Out**	13:30
EPA Inspector(s) **Additional Visitors**	Aoife Loughnane Eimear O' Keeffe		
Company Personnel	Irish Water: Andrew Boylan, Edward Haythornthwaite, Peter Thornton, Ger Brady Veolia (operating under DBO contract to Irish Water): Mark Robinson, Catherine Furey		

Summary of Key Findings

1. The audit found that Srowland water treatment plant was performing well and producing safe drinking water on the basis of primary disinfection being achieved by chlorination at the plant. Disinfection is also provided by UV treatment. However, the audit found some deficiencies with the controls on the UV system, which need to be addressed in order to demonstrate and verify that it is operating within its validated range at all times.

2. The plant is well managed by Veolia, operating under DBO contract to Irish Water. There is a documented incident response procedure in place at the plant. There are suitable alarms in place to alert operators to deteriorating water quality or the failure of a critical treatment process.

3. The water conditioning (i.e. softening) plant at Srowland WTP was switched off in May 2020 following a decision by Irish Water to cease water softening due to operational expenditure considerations. The subsequent changes in water chemistry may have contributed to the THM exceedances in the distribution network in September/October 2020 and August 2021. Veolia has recently carried out process improvement works to the coagulation process at Srowland WTP to minimise THM formation. However the results of Irish Water's investigative THM monitoring programme since June 2021 show elevated levels of THMs in the distribution network which are very close to the 100 ug/l parametric value. On this basis, Irish Water needs to take further action to reduce the risk of THM formation in the Barrow public water supply.

Introduction

Srowland water treatment plant began production in 2013. Raw water is abstracted from the River Barrow and stored in two raw water storage reservoirs which have up to 3 days storage (120,000 m3 capacity). Treatment consists of raw water pH correction, coagulation, flocculation & clarification in an Actiflo clarifier followed by rapid gravity filtration through dual media (anthracite and sand), pH correction (CO2 towers), disinfection by UV treatment and chlorination, and fluoridation. The plant is designed to treat 38.4 ML/d and is currently operating at 20 ML/d.

Srowland WTP supplies water to the following public water supplies:

- Barrow supply;
- Barrow/Poulaphouca Blend supply;
- Rathangan (via Redhills Reservoir); and
- Monasterevin (via Hillwood Reservoir).

This audit was carried out to verify if the water supply from Srowland water treatment plant is safe and secure.

Supply Zones Areas Inspected

This audit comprised of a site visit to Srowland water treatment plant, which involved an inspection of the water treatment processes, equipment and water quality data.

1. Coagulation Clarification Flocculation (CFC) Stage

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

Comment

1. The raw water is a very hard water, with hardness levels up to 350 mg/l CaC03. The water conditioning plant at Srowland WTP was switched off in May 2020 following a decision by Irish Water to cease water softening due to operational expenditure considerations. Veolia confirmed that chemical adjustments needed to be made to the treatment processes due to changes in the water chemistry following the cessation of the water conditioning plant.

2. Sulphuric acid is dosed first, to achieve an optimum coagulation pH of 6.3, followed by the coagulant (aluminium sulphate) dose. The dose rates are flow proportional.

3. The coagulant dosing system has been manually controlled since the plant began production in 2013. Veolia are currently commissioning a streaming current monitor for automated control of the coagulant dosing system.

4. Veolia has recently carried out the following process improvement works at Srowland WTP:

- a programme of jar testing in a pilot plant;
- relocation of the coagulant dosing points to a point 30 m upstream of the original location;
- introduction of a second coagulant dose pre-filtration.
- upgrades to the polymer dosing system; and
- addition of a submersible mixer in the coagulant tank.

These changes have resulted in improved water quality by reducing the post-clarification turbidity levels from 0.8 NTU to 0.6 NTU, and reducing the aluminium residuals in final water from 190 ug/l to below 100 ug/l.

2. Filtration

		Answer
2.1	Are the filters designed and managed in accordance with EPA guidance?	Yes

Comment

1. There are 4 rapid gravity filters at the plant, containing dual filter media of 0.5m silica sand and 1.5m anthracite.

2. There are 3 triggers for an automatic filter backwash; pressure differential, turbidity (0.25 NTU) or time (24 hours). The filters run to waste for 10 minutes after a backwash.

3. The filter turbidity alarm and shutdown set-points are:

- High alarm = 0.25 NTU
- High High alarm = 0.3 NTU
- High High shutdown = 0.3 NTU for 15 minutes or 0.5 NTU for 3 minutes

4. The auditors review of the filtered water turbidity trends from 20/08/21 to 30/09/21 found satisfactory filter performance overall. There were two large spikes in filter turbidity levels which Veolia explained as follows:

- 23/09/21: the combined filter turbidity monitor was replaced.
- 30/09/21: the plant was shutdown for emergency works on the high lift pump pipework.

3. Disinfection

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

Comment

1. The water is disinfected by chlorination and UV treatment. Irish Water and Veolia stated that either disinfection system can be considered the primary disinfection at the plant. However, the audit found some deficiencies with the controls on the UV system, which need to addressed in order to verify that it is operating within its validated range at all times. The auditors were satisfied that primary disinfection is being achieved by chlorination.

Chlorination

2. The water is disinfected with sodium hypochlorite (14%). There are duty and standby dosing pumps with automatic switchover. The dose is flow proportional.

3. The target specified in Veolia's contract is 0.75 mg/l free residual chlorine in final water leaving the plant. The auditors review of final water chlorine levels from 20/08/21 to 30/09/21 found adequate levels above the 0.75 mg/l target value.

4. The following chlorine alarms and shutdowns are in place on the treated water:

- Free chlorine residual low alarm at 0.7 mg/l, shutdown at 0.6 mg/l.
- Total chlorine residual low alarm at 0.8 mg/l, shutdown at 0.7 mg/l.
- Free chlorine residual high alarm at 1.6 mg/l, shutdown at 1.7 mg/l.
- Total chlorine residual high alarm at 1.9 mg/l, shutdown at 2.0 mg/l.

5. A review of data from the continuous monitors showed that the total chlorine analyser failed to display correctly for two weeks from 20/08/21 to 03/09/21. Veolia stated that during that time they were communicating with the manufacturer regarding the fault. The analyser was returned to normal operation on 03/09/21. The free chlorine residual analyser was displaying correctly during the two week period from 20/08/21 to 03/09/21. In addition, total and free chlorine residuals are tested and recorded by manual daily testing at the plant.

UV Disinfection

6. UV Disinfection is carried out in a Wedeco BX3200 system, where two UV reactors operate in parallel on a duty/duty basis. There is no standby UV reactor.

7. The UV validation certificate was inspected during the audit. It confirmed that the system is validated in accordance with the USEPA Ultraviolet Disinfection Guidance Manual (UVDGM). The minimum validated dose is 40mJ/cm2. Following the audit, Irish Water provided a table which sets out the range of operating criteria (UVT, UVI and flow) at which this dose is achieved. During the audit the UVI levels were 53.3 W/m2 in reactor 1 and 42.8 W/m2 in reactor 2.

8. Veolia confirmed that the following controls are in place on the UV system:

- High priority alarm (i.e. plant shutdown) on bulb or ballast failure.
- Low priority alarm (i.e. signal sent to the HMI and alarm generated) if UVI < 42 W/m2.

9. There is no continuous UVT monitor on the UV system. Irish Water and Veolia plan to install a UVT monitor as a matter of urgency.

10. There is no automatic shutdown of the UV system if the operating conditions deviate outside the validated range.

		Answer
3.2	Does the trend in chlorine residual at the treatment plant indicate adequate and stable levels of disinfection?	Yes

Comment

The auditors review of final water chlorine levels from 20/08/21 to 30/09/21 found adequate levels above the 0.75 mg/l target set by Irish Water in Veolia's contract, however the chlorine trend is unstable with large fluctuations. Veolia explained that the fluctuations are caused by the need to shut down the plant when the water levels in the service reservoirs reach the required level. The plant then idles until the reservoir levels drop and the plant is called into production once again.

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

Comment

1. The network residual chlorine readings from 20/08/21 to 30/09/21 show that network chlorine levels were checked sporadically on 11 occasions, but there were some weeks when chlorine levels were not checked.

2. Irish Water's investigations into drinking water quality exceedances in the Barrow supply and Barrow Poulaphouca Blend supply during 2021 found inadequate residual chlorine levels at several locations in the distribution networks, with some results being persistently low. Where the issue was found to be property-specific, Irish Water issued advisory notices under Regulation 6 to advise the owners of commercial premises of their responsibilities under the Drinking Water Regulations. In other cases, Irish Water identified the cause of the low chlorine levels as old cast iron mains where water usage was low.

		Answer
3.3	Is there adequate chlorine contact time before the first connection?	Yes

Comment

1. Irish Water and Veolia provided chlorine contact time calculations in advance of the audit. Contact time is achieved in the clear water tanks at the plant. There are two tanks with a capacity of 3,300 m3 each, however only one tank is in use based on current production levels.

2. The target chlorine concentration used in the calculation is 1.0 mg/l at the end of the clear water tanks. During the audit the free chlorine residual level was 1.16 mg/l at this location.

3. The calculated contact time is 49.5 mg.min/l which is well above the WHO recommendation of 15 mg.min/l.

4. Management and Control

		Answer
4.1	Is the plant suitably managed and controlled to maintain the designed log credit on each treatment stage?	No

Comment

Irish Water has calculated the log removal requirement for Srowland WTP as 3.5 (rounded up from 3.15). The log treatment credit from the clarification & filtration processes is 3. UV treatment is also in operation at the site, and delivers a 40 mJ/cm2 dose (3 log credit). However, as there is no continuous UVT monitor, the UV treatment cannot be assigned the full 3 log credit. Irish Water and Veolia plan to install a UVT monitor as a matter of urgency.

		Answer
4.2	Is there a documented alarm response procedure?	Yes

Comment

During the audit, Veolia confirmed that there is a documented incident response procedure in place, and the operators are aware of what to do in terms of escalating incidents affecting drinking water quality.

		Answer
4.3	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	Yes

Comment

With the exception of UV treatment, there are suitable plant shutdowns in place to prevent the entry of inadequately treated water entering the distribution network.

		Answer
4.4	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	Yes

Comment

1. There are suitable alarms in place to alert operators to deteriorating water quality or the failure of a critical treatment process. Srowland WTP is manned by Veolia from 08:30 to 17:00 Monday to Friday with four operators on-site, including the plant manager. The plant is also visited on Saturday and Sundays for routine checks.

2. Outside of normal hours there is an operator on-call, with others available to assist if necessary. If an alarm activates out of hours, it dials out to the operator on call. If the alarm is not responded to after 20 minutes, it dials out to the plant manager. Veolia plans to put the alarms on a cascade loop, to ensure a timely response in the event that either the operator on call or the plant manager is unavailable.

5. Drinking Water Quality

		Answer
5.1	Have relevant failures to comply with the requirements of the European Union (Drinking Water) Regulations 2014, as amended, been notified to the EPA?	Yes

Comment

Barrow Supply

1. Irish Water notified the EPA of four THM exceedances in the Barrow Supply distribution network since September 2020: 120.5 ug/l on 09/09/20; 108.6 ug/l and 108.4 ug/l on 14/10/20; and 118.2 ug/l on 26/08/21.

2. In light of these THM exceedances, Irish Water has implemented an investigative THM monitoring programme in the distribution network, and Veolia has undertaken process improvement works to the coagulation process at the plant. The monitoring results show that since June 2021:

- THM levels in final water leaving Srowland WTP range from 41.07 to 56.1 ug/l;
- Monthly monitoring of THMs in the distribution network were compliant for July (89.4 ug/l), September (89.4 ug/l and 91.6 ug/l) and October (96.9 ug/l). However, an exceedance of 118.2 ug/l was detected in August, and while the other monthly results were compliant, they still show elevated levels of THMs close to the parametric value of 100 ug/l.
- On 22/10/21 Irish Water provided an update which stated that their investigations into the August THM failure are ongoing and further investigative sampling was arranged for the week commencing 11/10/21. Results were not yet available.

4. The investigative THM monitoring programme shows that further actions are necessary in order to address the risk of THM formation in the Barrow public water supply.

Barrow/Poulaphouca Blend Supply

5. Irish Water notified the EPA of 41 exceedances of the parametric values for aluminium, manganese, iron and turbidity in the Barrow Poulaphouca Blend Supply between 13/04/21 and 16/07/21. The cause of the exceedances was not attributed to final water quality from either Srowland or Ballymore Eustace water treatment plants, but was believed to be associated with disturbance of sediment in the network following changes in network configuration.

6. Two property specific “Do Not Consume” notices were issued due to elevated manganese levels detected during the sampling programme on 07/07/21 and 09/07/21. Both “Do Not Consume” notices were lifted after 9 days and 12 days respectively following compliant resample results after flushing.

7. Irish Water notified the EPA of 2 exceedances of the coliform bacteria parametric value in the Barrow Poulaphouca Blend supply on 17/08/21 and 21/09/21. In both cases, Irish Water’s investigations determined that the cause of the coliforms exceedances were property specific issues and not representative of overall water quality in the supply.

		Answer
5.2	Is Cryptosporidium monitoring being carried out in accordance with Irish Water’s ‘Rationale for Determining the Frequency of Cryptosporidium Monitoring in Public Water Supplies’?	Yes

Comment

There is a fortnightly monitoring programme for *Cryptosporidium/Giardia* in raw and final water at Srowland WTP. There has been no detections of *Cryptosporidium/Giardia* in raw or final water.

6. Site Specific Issues

		Answer
6.1	Is there automatic switchover between the duty and standby dosing pumps for all water treatment chemicals used at Srowland water treatment plant?	Yes

Comment

There is automatic switchover between the duty and standby dosing pumps for all chemicals used at Srowland WTP.

		Answer
6.2	Having regard to the Drinking Water Safety Plan for Srowland water treatment plant, has Irish Water provided details of the “very high” and “high” risks for the supply?	No

Comment

Prior to the audit, the EPA asked Irish Water for the Drinking Water Safety Plan (DWSP) “very high” and “high” risks identified for the supply and plans in place to address these, where available. Irish Water stated that the risk assessment stage of the DWSP is not yet complete for Srowland WTP. The DWSP site survey is complete and the next steps will include a review of the site survey, risk assessment and identification of plans to address those risks.

		Answer
6.3	Are all continuous monitors operating at all times?	No

Comment

The continuous fluoride analyser on the final water is currently out of operation and awaiting a service. Veolia placed the service order with the manufacturer on 30/07/21. Due to supply chain issues, the repair won’t take place until 18/10/21. Daily testing of fluoride levels in final water is being carried out in the meantime.

Recommendations

Subject	Srowland WTP Audit Recommendations	Due Date	03/12/2021
Action Text	**Recommendations** **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.** 1. Irish Water should install a continuous UVT monitor on the UV Disinfection system at Srowland water treatment plant, in order to demonstrate and verify that the UV system is operating within its validated range at all times. 2. Irish Water should ensure there is automatic shutdown of the UV disinfection system if the operating conditions deviate outside the validated range. 3. Irish Water should assess the feasibility of installing a back-up UV reactor to enable the UV disinfection system operate in duty and standby arrangement. 4. Irish Water should identify and implement further measures to reduce the risk of THM formation in the Barrow public water supply, in light of the results of the investigative THM monitoring programme since June 2021. 5. Irish Water should ensure that the protozoal log treatment requirement of 3.5 can be demonstrated and verified by the treatment processes at Srowland water treatment plant. 6. Irish Water should provide details of the Drinking Water Safety Plan “very high” and “high” risks identified for the supply, and the plans in place to address these risks. 7. Irish Water should ensure that the continuous monitoring equipment is operating at all times and being maintained in accordance with the manufacturer’s instructions. 8. Irish Water should ensure that a minimum free chlorine residual of 0.1 mg/l is present at all locations in the distribution network, to ensure adequate disinfection of the water supply. 9. Irish Water should ensure there is a regular programme of monitoring residual chlorine levels in the distribution network, ideally 2 to 3 times per week, to verify adequate disinfection of the water supply across the distribution network. The results should be recorded and available for inspection when requested. **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 03/12/21 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.		