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	Fingal Zone 1
Organisation	Irish Water
Scheme Code	0900PUB1001
County	Dublin
Site Visit Reference No.	SV22535

Report Detail

Issue Date	30/07/2021
Prepared By	Aoife Loughnane

Site Visit Detail

Date Of Inspection	13/07/2021	**Announced**	Yes
Time In	14:00	**Time Out**	15:30
EPA Inspector(s) **Additional Visitors**	Aoife Loughnane Michelle Minihan		
Company Personnel	Irish Water: John Leamy, Tselo Tlou, Eamonn Connolly, Hugh Kennedy Fingal County Council: Derek Judge, Tom Brennan		

Summary of Key Findings

1. Irish Water has installed a new ultraviolet (UV) disinfection system at the ‘old plant’ at Leixlip water treatment plant. Primary disinfection is achieved by chlorination, and the UV system provides secondary disinfection. The use of both disinfection methods is a multi-barrier approach which provides full-spectrum pathogen control, to help safeguard drinking water quality.

2. The audit found that the new UV disinfection system was operating within its validated range, and there were appropriate alarms and controls in place to ensure adequate disinfection of the water supply from Leixlip water treatment plant.

3. Based on the audit findings, the EPA is satisfied to remove Leixlip water treatment plant from the Remedial Action List. However, further upgrade works remain to be completed in order to optimise the coagulation, flocculation and clarification (CFC) processes at both the old plant and new plant. The remaining works are the subject of an EPA Direction which Irish Water is required to comply with by 30th June 2023.

Introduction

Leixlip water treatment plant is the second largest water treatment plant in the country, which supplies water to 622,070 people in the Greater Dublin Area. Raw water is abstracted from the River Liffey impoundment adjacent to the plant.

Treatment consists of screening, coagulation, flocculation, clarification, rapid gravity filtration, disinfection and fluoridation. Approximately 60% of water is treated in the ‘old plant’ (the Paterson Candy International and Mahon & McPhillips plants) and 40% is treated in the ‘new plant’. A new UV disinfection system has been installed at the old plant to provide multi-barrier disinfection control. The new plant has a chlorine disinfection system only, however the treatment processes at the new plant consistently provide a validated protozoal barrier so Irish Water does not plan to install UV disinfection at the new plant.

Leixlip water treatment plant was added to the EPA’s Remedial Action List (RAL) in November 2019 following two Boil Water Notice incidents which highlighted treatment deficiencies at the old plant. Irish Water’s RAL action programme involved the completion of filter upgrade works and the installation of UV disinfection at the old plant.

The purpose of the audit was to verify if Leixlip water treatment plant can be removed from the EPA’s Remedial Action List.

Supply Zones Areas Inspected

The audit comprised of a site visit to the new UV disinfection system at Leixlip old plant.

1. Disinfection

		Answer
1.1	Is the UV system suitably validated?	Yes

Comment

1. The new UV disinfection system comprises two Trojan UV Flex 200 units in a duty-standby arrangement. Each unit has 72 lamps, arranged in 3 banks of 24 lamps. The units are configured and alarmed to operate within their validated range.

2. A 12 mJ/cm2 UV dose is required to achieve 3 log protozoan inactivation. There is an added UV validation factor which adjusts the minimum actual dose to approximately 13.5 mJ/cm2.

3. The UV system is validated to the USEPA UV Disinfection Guidance Manual (2006) protocol. During the audit, the auditor examined the UV system validation report, including the test envelope and the third party validation documentation. Following the audit, Irish Water provided a written statement from the UV manufacturer to confirm that the UV system is validated to operate within the specified range.

4. The validated operating range of the UV system is as follows:

- Minimum UVT of 81% for a maximum design flow of 7,250 m3/hr; and
- Minimum UVT of 70% for a maximum design flow of 6,500 m3/hr.

5. There is an uninterruptible power supply (UPS) to the UV system, which provides protection from any input power disruptions.

6. If the duty UV unit fails for any reason, the standby unit switches on automatically. During changeover there is a very short period (in the order of minutes) where the UV disinfection is outside of its validated range (i.e. < 3 log inactivation). Scheduled changeover occurs 2 times every 3 months (8 times per year), which means > 99.98% validated treatment. Irish Water stated that double the available power requirement would be needed to configure the UV units to only changeover when the other UV unit is fully warmed-up and operating within its validated range.

7. In the unlikely event that both the duty and standby UV units fail, the water treatment plant will not automatically shutdown, and treated water will continue to the chlorination stage and into distribution. This decision has been taken by Irish Water to ensure continuity of the water supply, and on the basis that the existing treatment processes upstream of the UV units provides adequate treatment (a 3 log protozoal barrier) for the River Liffey source.

8. The new UV disinfection system is verified using monitors and alarms, with trended data recorded and accessible on the SCADA system at the plant, and linked to Irish Water's control centre via the national telemetry system.

9. During the audit the pre-UV readings from the continuous sampling instruments were 0.093 NTU turbidity, 89.7% UVT and 5,282 m3/hr flow. UV unit No. 1 was operating during the audit, and delivering a UV dose of 13.8 mJ/cm2.

10. The UV process set points and alarms levels are as follows:

- **UV dose:** Warning alarm sent at 3.3 log (10% above validated dose), automatic changeover triggered at 13.2mJ/cm2.
- **UVT:** Warning alarm sent at 82%, automatic switchover triggered at 80%. Note: minimum UVT can go below 80% and remain in validation (depending on the flow rate).
- **Turbidity:** Warning alarm sent at 0.5 NTU, automatic switchover triggered at 0.6 NTU. Note: It is unlikely that the UV turbidity alarm level will ever be reached, as automatic shutdowns are triggered by much lower turbidity levels measured upstream of the UV units in filtered water.
- **Flow:** Warning alarm sent at 6,800 m3/hour, critical alarm at 7,225 m3/hour.
- **Full shutdown** of both UV units is also alarmed, and will be immediately reviewed on site for assessment and for a decision on the appropriate course of action.

2. Management and Control

		Answer
2.1	Has the protozoal compliance log treatment requirement been identified for the water treatment plant?	Yes

Comment

1. Irish Water has submitted their *Cryptosporidium* source risk assessment methodology calculations which demonstrate that the River Liffey source water has a 3 log protozoal treatment requirement. Irish Water's methodology predicted a *Cryptosporidium* oocyst loading of 409/m3 compared to a maximum observed oocyst concentration in the raw water of 143 oocysts/m3. The calculated log inactivation/removal requirement for Leixlip water treatment plant has been conservatively rated at 3 log, rounded up from 2.61.

2. Protozoal treatment at the Old Plant:

Irish Water has stated that the recently installed UV disinfection system at the old plant is an emergency UV system. It will provide additional resilience to the water from the old plant until such time as the full coagulation, flocculation & clarification (CFC) upgrade is complete by 30th June 2023.

3. Protozoal treatment at the New Plant:

Irish Water has stated that the new plant treatment processes consistently provide a validated barrier of greater than 3 log removal, and will be further enhanced by the planned CFC upgrade due to be completed by 30th June 2023. The average filter performance at the new plant is consistently below 0.2 NTU (typically closer to 0.1 NTU) and is monitored with appropriate alarms and shutdowns. On this basis, Irish Water has confirmed there is no log deficit at the new plant and therefore no public health driver to install UV disinfection at the new plant.

4. Irish Water is undertaking monitoring of *Cryptosporidium/Giardia* in the combined final water twice weekly at Leixlip water treatment plant. There has been no detections since the last *Giardia* detection on 08/02/20.

3. Supply on the Remedial Action List

		Answer
3.1	Do the audit findings support progress made with the Remedial Action List upgrades?	Yes

Comment

Irish Water's action programme to address the Remedial Action List (RAL) risks at Leixlip water treatment plant was to:

(a) upgrade the rapid gravity filters at the old plant by September 2020; and

(b) install UV disinfection at the old plant by March 2021.

The EPA audit carried out on 13/10/20 found that Irish Water had completed the filter upgrade works at the old plant.

The EPA audit carried out on 13/07/21 found that Irish Water has installed a new UV disinfection system at the old plant.

Based on the audit findings, the EPA is satisfied to remove Leixlip water treatment plant from the Remedial Action List. However, further upgrade works remain to be completed in order to optimise the coagulation, flocculation and clarification (CFC) processes at both the old plant and new plant. The remaining works are the subject of an EPA Direction which Irish Water is required to comply with by 30th June 2023.

		Answer
3.2	Is further information needed to assess completion of the Remedial Action List upgrade?	No

Comment

Prior to the audit, Irish Water submitted the details of the new UV disinfection system and UV operational data for the month of April. During the audit, the EPA requested Irish Water to submit the following information in order for the supply to be considered for RAL removal:

1. Evidence of Irish Water's *Cryptosporidium* source risk assessment methodology calculations to demonstrate the River Liffey source water has a 3 log credit requirement.
2. Confirm if there was any *Cryptosporidium* or *Giardia* detections in final treated water in March 2021.
3. UV operational data from 01/05/21 to 31/05/21 to include flow, UVT, and UV dose.
4. Cover letter from the UV manufacturer (or third party validator) to verify that the Leixlip UV Disinfection system is validated to operate within its specified validated range.

On 26/07/21, Irish Water submitted the requested information to the satisfaction of the EPA.

4. Site Specific Issues

		Answer
4.1	Is the plant operator fully trained on the operation and control of the UV disinfection system?	No

Comment

Glan Agua Limited were contracted by Irish Water to deliver the new UV disinfection system. At the time of the audit, the UV system had not yet been handed over to the operators of Leixlip water treatment plant (Fingal County Council on behalf of Irish Water). Glan Agua currently carry out any UV system maintenance work, e.g. changing lamps. Irish Water confirmed that full training will be provided to the plant operators prior to formal handover from Glan Agua Limited.

Recommendations

Subject	Leixlip UV Disinfection Audit	**Due Date**	27/08/2021
Action Text	**Recommendations** 1. Irish Water should ensure that the UV disinfection system operates within its validated range at all times, to ensure adequate disinfection of the water supply from Leixlip water treatment plant. 2. Irish Water should ensure that the operators of Leixlip water treatment plant are fully trained in the operation and control of the UV disinfection system, before it is formally handed over from the contractor. 3. Irish Water should evaluate the effectiveness of continuing the *Cryptosporidium/Giardia* monitoring programme in the combined final water at Leixlip water treatment plant, considering that UV disinfection is now in place at the old plant. **Follow-Up Actions required by Irish Water** During the audit, Irish Water representatives were advised of the audit findings. 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 27/08/21 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.		