Site Visit Report

Under the *European Union (Drinking Water) Regulations 2023*, the Environmental Protection Agency (EPA) is the supervisory authority in relation to Uisce Éireann and its role in the provision of public drinking water supplies. This audit was carried out to assess the performance of Uisce Éireann in providing clean and wholesome water to the public water supply named below.

The audit process is a sample of the performance of a water treatment plant and public water supply on a given date.

Water Supply Zone

Name of Installation	Killavaney Public Supply (Tinahely)
Organisation	Uisce Éireann
Scheme Code	3400PUB1072
County	Wicklow
Site Visit Reference No.	SV29625

Report Detail

Issue Date	26/02/2024
Prepared By	Derval Devaney

Site Visit Detail

Date Of Inspection	01/02/2024	**Announced**	Yes
Time In	11:00	**Time Out**	13:00
EPA Inspector(s)	Derval Devaney		
Additional Visitors	Health Service Executive (HSE): Eugene Monahan.		
Company Personnel	Uisce Éireann (UÉ): Jessica Evans, Linda Doran. Wicklow County Council (working in partnership with UÉ): Damien Byrne, Shane Kinsella.		

Summary of Key Findings

1. The Killavaney (Tinahely) Water Treatment Plant cannot respond to variations in raw water quality leading to turbidity and iron failures in the supply.

2. The borehole was not adequately protected to prevent contamination of the groundwater source.

3. The UV Unit is not operating to the Owner's Manual specifications, as it does not have pre-treatment for certain water quality parameters (such as iron and turbidity) to ensure optimum performance.

4. The turbidity monitor at the treatment plant was disabled and is currently not operational.

5. Some parametric failures in the network, arising from compliance monitoring, were not notified to the EPA.

Introduction

The Killavaney (Tinahely) Public Water Supply (PWS) serves 7 properties. Raw water is abstracted from a borehole which undergoes ultraviolet (UV) treatment prior to passing through a pH contactor and iron filter. There is no reservoir or secondary chlorination on the supply. The water supply is delivered in response to demand for water.

The audit was conducted in response to a UV failure incident on 29/11/2023 and microbiological and iron parametric failures on 30/11/2023 which was notified to the EPA on 04/12/2023. A Boil Water Notice (BWN) was imposed on the supply on 04/12/2023 and remains in place. The HSE was also in attendance at the audit, upon an EPA invitation, for observation purposes.

Supply Zones Areas Inspected

The borehole, treatment plant and associated equipment and monitors situated next to the borehole were inspected during the audit.

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

On Monday 04/12/2023 the EPA was notified of a Boil Water Notice (BWN), which was imposed on the Killavaney (Tinahely) PWS that day following the detection of failures in the network in a sample taken on 30/11/2023 as follows: Enterococci (1 no. per 100ml); E. coli (1 no. per 100ml), Coliform Bacteria (3 no. per 100ml) and Iron (501 ug/l).

Prior to sample on 30/11/2023, the water supplier received a UV alarm on the afternoon of 29/11/2023. The sleeve around the bulb required cleaning which was carried out the same afternoon (on 29/11/2023).This UV incident caused the UV unit to automatically shutdown, ceasing entry of water from the plant to the network for a time on 29/11/2023. There was also a report of no water submitted by a resident to the water supplier on 29/11/2023. UÉ stated the UV unit was operating normally at the time of the failure on 30/11/2023 and unit was checked again with emergency samples collected on 05/12/2023.

UÉ stated in writing on 13/12/2023 in response to the incident, that the cause is not believed to have been high turbidity in the raw water as inspection of the UV unit filter showed no visual indication of high turbidity in the raw water. It also stated the cause is not believed to have been due to the treatment at the WTP, noting that the UV unit had been cleaned the day before and was working correctly. It stated there is currently no evidence to suggest that there is ingress into this relatively small network. The cause it stated was suspected to be due to a private side issue. The tap that the sample was taken from had a shower like flow disperser which could not be removed.

However on 24/01/2024, in response to the EPA's pre-audit information request, UÉ stated an inspection of the borehole was carried out on 15/12/2023. Observations included that the borehole is old and not constructed to a modern specification, and that there is a risk of ingress of extraneous water into the well. During the audit UÉ stated it was in the process of reviewing what actions can be taken to address this risk as it is now deemed possible that the contamination could have been due to ingress into the borehole.

Emergency sampling carried out on 05/12/2023 for final water, the original property, and the property at the end of the line were fully compliant for parameters including microbiological, turbidity, iron and pH parameters.

The BWN remains on the supply until further upgrade works are in place, which include actions to address source protection and elevated water quality parameters such as iron and turbidity.

2. Source Protection

		Answer
2.1	Is the abstraction source(s) adequately protected against contamination?	No

Comment

1. There is no groundwater borehole log available for the Killavaney (Tinahely) PWS, the sole water source for the supply. A CCTV survey was carried out on the borehole in 2018 and determined that its depth is 46m. There is metal casing visible at the top of the borehole but its cap was not secure with a significant gap evident allowing for the risk of contamination of the source.

2. There was no raw water monitoring programme in place for the source prior to 2023. UÉ stated raw water monitoring will form part of the operational monitoring for the supply, which has commenced in 2024. Raw water monitoring should include, but not be limited to, parameters such as iron, manganese, nitrate, nitrite, turbidity, pH and microbiological parameters to determine if current treatment is adequate and if the source is under the influence of surface water.

3. A protozoal log treatment requirement has not yet been calculated as the source and sanitary survey has yet to be completed. This will inform the log requirement for the plant.

4. A raw water turbidity monitor is in place at the plant but is not operating currently as UÉ stated it had no outlet to discharge the discarded sample water.

3. Disinfection

		Answer
3.1	Is there an automatic cleaning unit in place to regularly clean the UV lamp sleeves?	No

Comment

1. There is no automatic cleaning unit to regularly clean the UV Lamp Sleeves. The UV Unit failure on 29/11/2023 was due to fouling of the quartz sleeve. The sleeve had to be manually cleaned in order to re-start the UV Unit.

2. UÉ stated during the audit that the operator now visits the plant on a weekly basis, rather than on a reactionary basis which was the case prior to the incidents on 29/11/2023 and 30/11/2023, and the quartz sleeve is cleaned on a monthly basis.

3. The *EPA's Water Treatment Manual: Disinfection* states where iron levels are above 500 ug/l, sleeve chemical cleaning may be required every few days. The recommended operators checklist should take account of EPA guidelines to ensure the quartz sleeve is frequently checked and the UV Unit is operating optimally.

4. Management and Control

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

Comment

1. Persistent failures of Iron and Turbidity detected in final water samples indicate that the water treatment plant cannot deal with the variation in raw water quality as follows:

- Iron exceeded the parametric value in compliance monitoring in the network during 2022 and 2023 (487 ug/l on 18/05/2022; 744 ug/l on 15/08/2022 and 501 ug/l on 30/11/2023). To address iron failures in the network, UÉ installed an Pyrolox iron treatment filter with support gravel media on 22/11/2022. The media is maintained with a programmed backwash every 24 hours. The failure on 30/11/2023 indicates that this filter failed to treat elevated iron in the raw water.
- Turbidity was also significantly elevated in compliance monitoring samples: 16.4 NTU on 18/05/2023; 18.6 NTU on 15/08/2023; 27.3 NTU on 30/11/2023 and 1.2 NTU on 19/12/2023.

2. The UV Unit's Owners Manual specifies iron concentrations of < 300 ug/l and turbidity concentrations of < 1 NTU is required for optimum performance of the UV unit. The iron treatment system is installed post the UV treatment unit. Therefore, there is no treatment in place to prevent elevated turbidity concentrations and fouling of the UV Unit's quartz sleeve due to elevated iron levels in the raw water.

		Answer
4.2	Is there a documented alarm response procedure?	No

Comment

1. There was no documented site specific alarm response procedure made available for inspection during the audit.

		Answer
4.3	Is a suitable cascade system in place for alarm dial outs?	No

Comment

1. An alarm is dialled out by text to two persons; a supervisor and an operator who has since retired. The cascade needs to be updated to dial out to the plant operator and other relevant staff.

		Answer
4.4	Are instrument calibrations within date?	Yes

Comment

1. There was no sticker indicating when the the UV sensor was last calibrated. During the audit the Water Supplier provided a Pro UV Check Sheet, completed by EPS Contractors on 05/12/2023 following the UV incident. This sheet indicated that the UV sensor was calibrated on 05/12/2023.

2. UÉ could not confirm during the audit the required calibration frequency for the sensor. Following the audit UÉ confirmed the manufacturer recommends that the UV sensor is calibrated every six months.

		Answer
4.5	Is there appropriate oversight of plant performance?	No

Comment

1. Up to the incident the plant was only checked as a reactionary measure, e.g. when an incident occurred. Since the incident of 30/11/2023, UÉ put measures in place to ensure an operator checks the plant on a weekly basis as a minimum.

2. There was no list of checks and actions that the operator must carry out when visiting the plant to ensure the source is protected and the plant is operating optimally.

5. Drinking Water Quality

		Answer
5.1	Have relevant failures to comply with the requirements of the European Union (Drinking Water) Regulations 2023 been notified to the EPA?	No

Comment

The following parametric failures were not notified to the EPA:

Iron 487 ug/l, Aluminium 520 ug/l and Turbidity 16.4 NTU on 18/05/2023.

Turbidity 18.6 NTU on 15/08/2023; 27.3 NTU on 30/11/2023 and 1.2 NTU on 19/12/2023.

6. Site Specific Issues

		Answer
6.1	Is compliance monitoring being carried out at the point of compliance and evenly spread throughout the year as required by Regulation 7 and 13 of S.I No. 99 of 2023?	No

Comment

1. A Group A compliance sample on 19/12/2023 was taken at the pump house of the water treatment plant. This is not a point of compliance as defined by Regulation 7 of the 2023 Drinking Water Regulations.

2. Three compliance samples are required to be taken on this supply (i.e. two Group A and one Group B sample). The three compliance samples taken on this supply during 2023 were taken in October, November and December 2023 which shows they were not evenly spread throughout the year as required by Regulation 13(8) of the 2023 Drinking Water Regulations.

		Answer
6.2	Is the UV Unit operating optimally in accordance with manufacturers instructions?	No

Comment

1. The Viqua Trojan UVmax Pro 20 Ultraviolet Microbiological Treatment System in place is validated to NSF/ANSI Standard 55 Disinfection Performance Class A (as listed in “VIQUA NSF 55 Official Listing - Mar 2021 (1)”) to deliver minimum 40mj/cm2 at maximum flow of 20 gpm (76 lpm). Once the dose drops below 40mj/cm2, the UV unit shuts down and the supply is prevented from entering supply.

2. It is unclear whether the UV unit is operating as intended, due to the levels of certain water quality parameters in the raw water. The Owner's Manual for the Viqua Trojan UVmax Pro 20 states water quality is extremely important for optimum performance of the UV system. It references certain water quality and mineral concentration limits and specifications (such as iron < 300 ug/l, turbidity < 1 NTU and UVT > 75%) stating if water chemistry contains levels in excess of those mentioned, pre-treatment is recommended to correct these water problems prior to the installation of the UV system. It states "proper pre-treatment is essential for the UV system to operate as intended".

3. Iron has exceeded the parametric value in compliance monitoring in the network since 2022. All iron failures were above the 300 ug/l level as outlined in Point 2 above for optimum performance of the UV unit (487 ug/l on 18/05/2022, 744 ug/l on 15/08/2022 and 501 ug/l on 30/11/2023). To address iron failures in the network, UÉ installed an Pyrolox iron treatment filter with support gravel media on 22/11/2022. The media is maintained with a programmed backwash every 24 hours. However this was installed post the UV treatment unit, so it does not provide pre-treatment essential for the UV system to prevent fouling of the quartz sleeve due to elevated iron levels in the raw water.

4. Turbidity was also above 1 NTU in compliance monitoring samples taken during 2022 and 2023; ranging from 1.2 NTU to 27.3 NTU.

5. There was no UVT monitor on the raw water to determine if UVT was > 75% in advance of UV treatment.

Recommendations

Subject	Killavaney (Tinahely) PWS Audit Recommendations [01/02/2024]	Due Date	26/03/2024
Action Text	**Uisce Éireann is responsible for ensuring a clean and wholesome supply of drinking water and should implement the following recommendations without delay.** 1. Ensure there is prompt and timely notification to the EPA of parametric failures in the water supply. 2. Put in place a raw water monitoring programme for the Killavaney (Tinahely) PWS source. 3. i. Complete a sanitary survey and provide the protozoal log treatment requirement for the groundwater source; ii. Provide details on how a protozoal log deficit, if identified, will be addressed; iii. Ensure *Cryptosporidium* monitoring is undertaken as per Irish Water Rationale for Determining the Frequency of *Cryptosporidium* Monitoring in Public Supplies where a protozoal log deficit is identified, until such time as it is addressed; iv. Ensure the borehole is capped and adequately sealed and protected in accordance with *EPA Advice Note No. 14: Wellhead Protection and Borehole Construction;* v. Install a raw water turbidity monitor with appropriate warning alarms/plant shutdowns at the treatment plant. 4. Put in place an inspection checklist for operators including actions to take if an issue is found. The checklist should be displayed at the water treatment plant. 5. Submit an action programme with timelines, to address treatment plant deficiencies, to ensure the plant can respond to raw water quality variations in advance of the UV system. Ensure the UV system operates in accordance with the VIQUA Owner's Manual. 6. Review the iron treatment process effectiveness and submit the criteria to be used to inform media replacement and prevention of iron failures. 7. Ensure that (i) there is an appropriate cascade system for responding to alarms generated at the plant which allows for verification that an alarm has been responded to, (ii) there are documented site specific alarm response procedures and (iii) training is provided to all relevant staff on the procedures. 8. Ensure plant equipment (for example the UV sensor) is included in a maintenance programme, calibrated in accordance with manufacturers instructions, and clearly labelled to show the date of calibration and the next 'calibration due by' date. 9. Ensure that the Incident Communication Response Guidance Form is updated to include relevant trigger levels relating to the operation and validity of the UV system. 10. Ensure sampling locations used for compliance monitoring purposes are at the point of compliance and equally distributed throughout the sampling year. **Actions required by Uisce Éireann** During the audit, Uisce Éireann representatives were advised of the audit findings and that action must be taken by Uisce Éireann to address the issues raised. Uisce Éireann should submit a report to the EPA on or before the above due date detailing the actions taken and planned, with timescales, to close out the above recommendations. The EPA advises that the findings and recommendations from this audit report should, where relevant, be addressed at other public water supplies.		