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	Knockanarrigan Davidstown Public Supply
Organisation	Uisce Éireann
Scheme Code	3400PUB1047
County	Wicklow
Site Visit Reference No.	SV28313

Report Detail

Issue Date	21/11/2023
Prepared By	Derval Devaney

Site Visit Detail

Date Of Inspection	20/10/2023	**Announced**	Yes
Time In	11:00	**Time Out**	02:00
EPA Inspector(s)	Derval Devaney David O'Malley		
Additional Visitors			
Company Personnel	Uisce Éireann: Edward Haythornthwaite, Jessica Evans, Eoghan Forristal Wicklow County Council (working in partnership with Uisce Éireann): Tom Griffin,Tom O'Leary, Damien Byrne, Noel Doody EPS Group: David logue, Tom Hickey		

Summary of Key Findings

1. The detection of microbiological parameters in the water supply on 27/09/2023 and 30/09/2023 resulted in the imposition of a Boil Water Notice (BWN) on 02/10/2023. Due to the absence of a turbidity monitor at the water treatment plant, it could not be verified if disinfection treatment was adequate during the incident.

2. The Water Supplier attributes the likely cause of the contamination of the water supply to three properties which were served by both the public water supply and its own private water supply. It is thought that the private water supply contaminated the public water supply. The three properties were disconnected from the public water supply on 10/10/2023. Water quality results on 11/10/2023 and 14/10/2023 were satisfactory. The BWN was lifted on 19/10/2023.

3. There is no automatic shutdown of the water treatment plant to prevent inadequately treated water from entering the distribution network.

Introduction

Knockanarrigan Davidstown Public Water Supply (PWS) produces approximately 7 m3/hour serving a population of 219. Raw water is abstracted from one borehole. Treatment consists of disinfection by chlorination and is managed by a contractor under a design, build and operate (DBO) contract.

Supply Zones Areas Inspected

The treatment processes at the water treatment plant and the on-site reservoir were inspected in addition to the borehole located approximately 1.5 km away from the boundary of the water treatment plant.

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?	No
	Comment	

1. On Monday 02/10/2023 the EPA was notified of a Boil Water Notice (BWN), which was imposed on the Knockanarrigan Davidstown PWS that day following the detection of microbiological failures in the network as follows:

Wednesday 27/09/2023:

Knockanarrigan Donard Crossroad (a private dwelling): Enterococci (33 no. per 100ml); Coliform Bacteria (64 no. per 100ml); Chlorine residual 0.07 mg/l (Group B Compliance Sample)

Saturday 30/09/2023:

The Old Post Office, Knockanarrigan: Enterococci (3 no. per 100ml); E coli (8 no. per 100ml); Coliform Bacteria (8 no. per 100ml); Chlorine residual 0.02 mg/l (Investigative Sample)

The Old Barracks, Knockanarrigan: Enterococci (100 no. per 100ml); E coli (100 no. per 100ml); Coliform Bacteria (100 no. per 100ml); Chlorine residual 0.02 mg/l (Investigative Sample)

The Old School House, Knockanarrigan: Enterococci (100 no. per 100ml); E coli (1 no. per 100ml) and Coliform Bacteria (1 no. per 100ml); Chlorine residual 0.08 mg/l (Investigative Sample)

2. On the afternoon of Friday 29/09/2023, when Uisce Éireann (UÉ) was notified of the initial failures on 27/09/2023 it consulted with the HSE to determine risk to public health. UÉ communicated to the HSE that there was no issue with the water treatment plant as the DBO operator confirmed there was no issue with plant operations and instrumentation. Further sampling was arranged to be carried out on an emergency basis and it was determined that a BWN was not required at that point in time.

3.During the audit it was evident that there is no turbidity monitor at the water treatment plant to determine if turbidity was < 1 NTU, ensuring adequate disinfection was being achieved at the plant. Due to the absence of this critical instrumentation, it could not be confirmed that the water treatment plant was operating effectively and delivering safe water during the incident. The lack of a turbidity monitor at the plant did not appear to be communicated to the HSE on 29/10/2023 in order for it to make an informed risk assessment in its determination of measures to be taken to protect human health.

4. Further emergency sampling was carried out at various locations in the network which included microbiological and residual chlorine sampling on 04/10/2023, 11/10/2023 and 14/10/2023. On the 04/10/2023 the Army Seskin Information Centre (the Old National School House) had a failure of E coli (3 no. per 100ml) and Coliform Bacteria (3 no. per 100ml) with free chlorine residual < 0.02 mg/l. Unsatisfactory chlorine residuals, at < 0.1 mg/l, were also detected on 04/10/2023 at two other locations in the network. Results of sampling on 11/10/2023 and 14/10/2023 were satisfactory with the exception of the chlorine residual concentration remaining < 0.1 mg/l at the Army Seskin Information Centre (the Old National School House) in its 14/10/2023 sample.

5. Chlorine residual monitoring was also undertaken at various locations in the network on 03/10/2023, 04/10/2023, 10/10/2023, 11/10/2023 and 16/10/2023. Chlorine residuals remained < 0.1 mg/l throughout the monitoring period at two locations; the Hydrant below the Army information Centre and the Hydrant at the end of Line Ballinedin. Chlorine results returned to satisfactory levels on 16/10/2023 after flushing those network locations.

6. UÉ's investigations into the cause of the detection Enterococci, E coli and Coliform Bacteria in the water supply found that the likely cause was due to three properties having a private supply, while also being served by the Knockanarrigan Davidstown PWS. The water supplier's review of network flow data indicated that flow from the private water supply entered the public network during periods of low demand, typically at night. In order to prevent cross contamination and isolate these properties, meter boxes with integrated non-return valves were installed at the properties on 10/10/2023 . These three properties are no longer served by the PWS and are now fully supplied by their private surface water source.

7. On Friday 13/10/2023 UÉ consulted with the HSE to update it on the outcome of its investigations and further compliant monitoring results. The Boil Water Notice was rescinded on 19/10/2023.

2. Source Protection

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

Comment

1. The supply is served by one borehole located approximately 1.5km from the WTP. Details on the borehole's construction (such as its depth, when the borehole was drilled and a borehole log) were unavailable during the audit.

2. The borehole is located in a grass field which is used for agricultural purposes. The borehole is secured with a fence and it is adequately capped. However, landowners were not advised in writing of the setback distances set out in the Good Agricultural Practice (GAP) Regulations 2022 to prevent water pollution from fertilisers and certain agricultural activities.

3. There is no turbidity monitor on the borehole to alert the operator to any changes in raw water quality. The source is monitored annually so it is not possible to assess if there are rapid variations in raw water quality. It was not possible to assess historical raw water data, as results were unavailable on the day of the audit. The source is not monitored for *Cryptosporidium.* UÉ has not yet identified the log credit requirement of the source water, therefore it is unknown if protozoal treatment is needed to achieve protozoa compliance.

3. Disinfection

		Answer
3.1	Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?	No

Comment

1. Primary disinfection is achieved by chlorination using 14% sodium hypochlorite dosing at a fixed rate based on the borehole fixed pump rate. Chlorine is not stored on site, instead the operator tops up the chlorine day tank when needed. However the operator does not attend the WTP on a daily basis and there is no chlorine level sensor monitor on the day tank to alert the operator when chlorine drops below a critical level in the day tank.

2. There is a duty and standby chlorine dose pump but it was not known how frequently the switchover occurs and if it is an automated process or requires manual intervention via SCADA.

3. Chlorine is dosed prior to entering an underground baffled 4.75 m3 on-site contact tank. This tank was installed around 2009 and was not integrity tested or cleaned since its installation**.**

4. Water then enters the on-site reservoir which was cleaned in 2017. The water supply has a required target contact time (Ct) of 23.40 mg.min/l to achieve adequate disinfection. The contact tank and reservoir collectively provide an effective Ct of 29.78 mg.min/l with a minimum free chlorine concentration of 0.2 mg/l required exiting the reservoir. The operator stated the chlorine residual target leaving the reservoir is 0.38 mg/l. On the day of the audit the chlorine monitor had a chlorine residual reading of 0.37 mg/l exiting the reservoir.

5.UÉ was unable to confirm if it had undertaken an alarm and inhibits review of this WTP. The chlorine monitor had a low alarm of 0.2 mg/l and a high alarm of 0.5 mg/l. There is no continuous online turbidity monitor installed on the raw or final water at the plant. There was no treatment plant shutdown in place to prevent inadequately treated water entering the network (for example to prevent high or low chlorine concentrations or turbidity in excess of the 1 NTU limit from entering the distribution network).

		Answer
3.2	Are monitors and alarms operational via dial out and being responded to with a suitable cascade system in place?	Yes

Comment

1. The low and high level chlorine alarms are sent by text to four persons which includes the plant operator. There is no written procedure on alarm response to ensure alarms are acted upon without delay and appropriately. EPS Group stated that it is in the process of upgrading its SCADA which will allow operators to acknowledge its response to an alarm by text rather than having to acknowledge response to an alarm via entry to SCADA as is the current situation.

		Answer
3.3	Is there a chlorine residual ≥0.1 mg/l throughout the network?	No

Comment

1. During the microbiological failure incident from 27/09/2023 - 16/10/2023, chlorine residuals in the network dropped to < 0.1 mg/l. With the identification and removal of the source of the microbiological failures in the network and regular flushing of dead ends, chlorine residuals increased to > 0.1 mg/l.

2. However certain parts of the network (the Hydrant below Army Information Centre and the Hydrant at end of the line Ballinedin) are prone to low chlorine residual concentration due to their low water usage. It was proposed during the audit that automatic flushing valves would be installed in these areas to ensure chlorine residuals are adequate.

Recommendations

Subject	Knockanarrigan - Davidstown PWS Audit Recommendations	Due Date	18/12/2023

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. Source:

(a) Investigate if there is a borehole log or particulars relating to the construction and depth of the borehole and maintain such records for this water supply source**;**

(b) Put in place a raw water monitoring programme for the Knockanarrigan - Davidstown PWS source (to include but not be limited to iron, manganese and microbiological parameters);

(c) Provide (i) the protozoal log treatment requirement for the groundwater source following completion of a sanitary survey; (ii) details on how a protozoal log deficit, if identified, will be addressed and (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.

(d) Liaise with Wicklow County Council to ensure that local landowners are written to in relation to their obligations under the *European Union (Good Agricultural Practice for Protection of Waters) Regulations 2022, as amended*.

2. Treatment:

(a) Install turbidity monitor(s) with appropriate alarm settings and plant inhibits;

(b) Install plant shutdowns linked to the high and low chlorine alarm setpoints;

(c) Install a level sensor on the chlorine chemical tank with suitable low level alarm settings;

(d) Ensure automatic switchover of the duty and standby chlorine pumps occurs at least every 24 hours;

(e) Undertake and implement any recommendations arising from Uisce Éireann's Alarm and Inhibit Review;

(f) Carry out an inspection of the on-site underground contact tank, in accordance with the manufacturer's instructions or a professional engineer's guidelines, to determine if it needs to be cleaned and/or integrity tested.

3. Management:

(a) Put a documented procedure in place for responding to site specific alarms generated at the water treatment plant and include the provision of training to staff on the procedure. The procedure should document the corrective actions required and set out delegation of responsibilities for operational, relief staff and management in the acknowledgement and oversight of alarm response;

(b) Ensure when consulting with the HSE on incidents that an absence of critial monitoring equipment used to verify the adequateness of treatment is communicated, to warrant an informed assessement of the risk to human health.

4. Network:

Install automatic flushing valves in the network as planned to ensure residual free chlorine concentrations are at least 0.1 mg/l at all times to maintain adequate disinfection.

Uisce Éireann should submit a report to the EPA on or before 18th December 2023 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.