Drinking Water Audit Report

County:	Cork County Council	**Date of Audit:**	12/07/19
Plant(s) visited:	Inniscarra Water Treatment Plant Cork Harbour and City Public Water Supply Scheme Code 0500PUB3401	**Date of issue of Audit Report:**	18/07/19
		File Reference:	DW2019/130
		Auditors:	Criona Doyle Cliona Ni Eidhin
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended*. • *The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)* • The recommendations specified in the EPA *Drinking Water Report*. • EPA Drinking Water Advice Notes No.s 1 to 15.		

MAIN FINDINGS

i. **The audit found that Irish Water had promptly commenced investigations following the receipt of a complaint of worms being observed in water from a consumer's tap.**
ii. **The investigations into the cause of the presence of worms at the complainant's property and in filter no. 3 at the water treatment plant is ongoing. Irish Water should continue to keep the EPA informed on progress with the investigations and the results of the findings.**
iii. **It was found that the current filter backwashing sequence is not adequately removing material which has built up in the sand layer and Irish Water should adjust the backwashing sequence to ensure it is effectively operating.**

1. INTRODUCTION

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.

On the 11/07/19 Irish Water informed the EPA that they were investigating a complaint from a member of the public that worms had been found in water from a kitchen tap. As part of the follow up investigations in response to the complaint, sampling had identified worms in filter no. 3 of the Inniscarra Water Treatment Plant. The species of worms were identified as *Nais elinguis* which are not parasitic and are harmless to humans. This audit was undertaken by the EPA to investigate the issue.

The raw water for the Cork Harbour and City Water supply is abstracted from the River Lee at Inniscarra Lake and is treated at the Inniscarra Water Treatment Plant (WTP). The design capacity of the plant is 120,000 m^3/d and EDEN figures indicate currently 60,918 m^3/d of water is produced serving a population of 131,567. The water undergoes several treatment stages including coagulation, flocculation, clarification, filtration, disinfection and fluoridation.

The opening meeting commenced at 12:30pm at the Inniscarra Water Treatment Plant. The scope and purpose of the audit were outlined at the opening meeting. The audit process consisted of interviews

with staff, review of records and observations made during an inspection of the treatment plant. The audits observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water:
Deirdre O'Loughlin, Compliance Specialist.
Neil Smyth, Operations Lead.

Representing Cork County Council:
Pat Murphy, Acting Senior Engineer.
Jerry Creedon, Acting Senior Executive Engineer.
Mary Hickey, Scientist.
James Thompson, Caretaker.

Representing the Environmental Protection Agency:
Criona Doyle, Inspector.
Cliona Ni Eidhin, Inspector.

2. AUDIT OBSERVATIONS

The audit process is a random sample on a particular day of a facility's operation. Where an observation or recommendation against a particular issue has not been reported, this should not be construed to mean that this issue is fully addressed.

1.	**Incident Investigations** a. On 02/07/2019 Cork County Council received a complaint from a domestic dwelling in Carrigaline, Co. Cork stating that white worms had been found in water coming from a kitchen tap. On the same day, the local water curator called to the house and checked the chlorine level which was found to be satisfactory (0.5mg/l) and flushed the line in the vicinity as the property is located close to the end of the line. No further worms had been observed by the complainant who has been undertaking daily checks. b. On 04/07/19 Cork County Council took a sample for analysis from the kitchen tap. No worms were observed in the sample from the tap which was tested for total chlorine, free chlorine, total coliform, E. coli, conductivity, turbidity, manganese, iron, ammonium and colour. The sample was compliant for all of the parameters tested. The complainant was informed of the results. As the complainant had outlined that the worms had been observed when filling a fish tank, a sample of a worm was taken from the fish tank. The sample was transported back to the lab but disintegrated before it could be identified. On 08/07/19 Cork County Council revisited the complainant and took a second sample which was tested for total chlorine, free chlorine, total coliform, E. coli, colony counts, TOC, pH, conductivity, turbidity and colour. No worms were observed in the sample and the results were compliant for the tested parameters. c. On 08/07/19 an investigation was undertaken at the WTP. Grab samples were taken of the water in each of the 8 no. rapid gravity filters at the site. Two worms were observed in the grab sample from filter no. 3 and two worms were found in a bowl under the turbidity monitor in filter no. 3. Filter no. 3 was removed from service on 08/07/19 and a sample was sent to UCC for identification of the species of worm. UCC confirmed that the sample from filter no. 3 contained oligochaete worms (family Naididae). d. On 08/07/19 a crypto sampling rig was set up to take samples of the raw water into the plant and the treated water at the outlet of the reservoir over a 24-hour period and no worms were observed during this period. e. Daily samples continue to be taken at the outlet from the treated water reservoir using the crypto rig and no worms have been observed at this location. f. Samples have been taken from the raw water tanks and the lake and no worms were observed

	at these locations. g. Samples were taken from 2 additional domestic dwellings, close to the complainant's, on 11/07/19. No worms were observed, and the samples were compliant for total chlorine, free chlorine, total coliform and E.coli. h. Cork County Council and Irish Water were also in consultation with the HSE with respect to the risk to public health. i. Prior to the audit a number of remedial actions had been undertaken: (i) Crypto filters had been set up to check the water from filter no. 3 and the treated water from the reservoir outlet at Inniscarra for the presence of worms; (ii) Core testing had been undertaken in filter no. 3 and the residue observed in the filter has been sent for analysis to determine if it is a build-up of sludge as a result of an inadequate backwashing process or dust which has accumulated from the manganese dioxide filter media; (iii) A biofilm was observed in the sample tubing between the filters and turbidity monitors and the tubing had been replaced. j. It was outlined at the audit that the following additional remedial actions were planned: (i) backwashing flow rates are being increased to provide more effective backwashing. It was proposed to undertake 6 no. backwash cycles on filter no. 3 over the weekend of the 13/07/19 and 14/07/19. This was to be followed by core sampling on 15/07/19 to confirm that the increased backwashing has been effective in removing any build up material within the filter media; (ii) filter no. 3 will then be chlorinated to achieve a chlorine level of 3 to 5mg/l which is the concentration required to kill any remaining worms; (iii) a filtered sample using a crypto rig is also being taken at the Strawhall reservoir which serves the area of the complainant's house; (iv) carbon dosing is to commence on 12/07/19 which assists with coagulation and is normally undertaken during the algae season; (v) follow up sampling is to be undertaken at complainant's property; (vi) end of the line samples to be taken in the vicinty of the complaintant's house. k. Subsequent to the audit Irish Water informed the EPA that flushing in the distribution system will commence on 16/07/19 on the dead legs closest to the complainant's house and will continue over the next few weeks until all adjacent houses are flushed. A plan for the flushing of the remainder of the network is being prepared and will commence in the next few weeks also.
2.	**Filtration** a. 8 no. rapid gravity filters are provided on site. Manganese dioxide has been added to the silica sand filter to aid manganese removal. b. There is continuous monitoring of the turbidity of the filtered water from each individual filter and on the combined filtered water. c. 4 no. core samples have been taken from filter no. 3. There was a build -up of material in the bottom half of the sand layer. Samples of the material have been sent for analysis to determine if it a build-up of sludge material or dust from the manganese dioxide layer. d. Backwashing of each filter is automated and takes placed on a timed basis every 72 hours. Backwashing can also be triggered by head loss. All filter backwashes are observed by the caretaker. The backwashing sequence involves 8 to 10 minutes air scour, followed by low rate water for 6 minutes and then high rate water for a minimum of 6 minutes or until the filter is clean. Treated water is used for backwashing. Settled solids from the backwash water are combined with the sludge for disposal and the supernatant is discharged to the lake. e. Following backwashing there is a delayed start to allow the filter to remain offline for 30 minutes. This allows the filter material to resettle before it is brought into service again. f. The filter media has not been topped up since 2013/2014 when the manganese dioxide layer was added. The sand layer was confirmed to be within specification. The sand media was last replaced in 2009/2010. g. It was outlined that filter no. 3 would be backwashed 6 times over the weekend of 13/07/19 and 14/07/19 at the increased backwashing rates. Cores will then be taken to confirm that the increased backwash rates have effectively cleaned the sand layer in filter no. 3. Any changes to the backwash rates will then be applied to all filters. h. The filters are cleaned every 4 months. Cores of the filters are not routinely taken as part of plant operations.

3. AUDITORS COMMENTS

The audit found that Irish Water had promptly commenced investigations following the receipt of a complaint of worms being observed in water from a consumer's tap including a programme of sampling at the complainant's property and at the Inniscarra WTP.

The investigations into the cause of the presence of worms at the complainant's property and in filter no. 3 are ongoing. Irish Water continue to keep the EPA informed on progress with the investigations and the results of the findings.

The core sample from filter no. 3 indicates a build-up of material in the bottom half of the sand layer. The current filter backwashing sequence is not removing material which has built up in the sand layer and is being adjusted to ensure it is effectively operating. The undertaking of regular core sampling is recommended for all rapid gravity filters at all drinking water treatment plants to ensure the backwashing sequence is effectively operating.

4. RECOMMENDATIONS

General

1) Irish Water should forward the results of the additional sampling undertaken at the original complainant's house, the two neighbouring properties and the dead end in the network.

2) Irish Water should consider repeating the chlorination of filter no. 3 after a time period of 100 hours to tie in with the lifecycle of the worm.

3) Irish Water should forward the details of the findings of the investigation being undertaken on filter no. 3 and the optimisation of the backwashing sequence together with the results of the core sampling following the optimisation works.

4) Irish Water should consider undertaking cores of all filters at the WTP following the optimisation of the backwashing sequence to confirm the revised backwash sequence has been effective in cleaning all of the filters.

5) Irish Water should ensure that core sampling is undertaken of all filters as part of regular maintenance operations.

6) Irish Water should inform the EPA of any changes to the HSE advice.

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 Regina Campbell, Drinking Water Team Leader.

Irish Water is recommended to put such measures in place as are necessary to implement the recommendations listed in this report. The actions by Irish Water to address the recommendations taken will be verified by the Agency during any future audits.

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 File Reference Number in any future correspondence in relation to this Report.

Report prepared by: Fiona Doyle **Date:** 18/07/19

Inspector