Drinking Water Audit Report

County:	Fingal	**Date of Audit:**	22nd March 2019
Plant visited:	Leixlip Water Treatment Plant	**Date of issue of Audit Report:**	3rd April 2019
		File Reference:	DW2016/206 & DW2019/63
		Auditors:	Aoife Loughnane Michelle Minihan Tom Ryan
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 poly dosing pump failure which occurred at Leixlip water treatment plant at 23:30 on 13/03/19 resulted in operational difficulties with the clarification and filtration processes and gave rise to elevated aluminium and turbidity levels in the final treated water, which resulted in a temporary loss of the Cryptosporidium/Giardia barrier at the plant.**

ii. **There is no automatic switchover between duty and standby poly dosing pumps, and the plant operator on duty at the time of the incident failed to respond to the alarm. The dosing pump failure was detected upon shift changeover at 07:00 on 14/03/19.**

iii. **When the HSE were consulted regarding the risk to public health associated with the incident, their advice was only sought on the high aluminium levels in the final treated water, and not on the more significant issue of the temporary loss of the Cryptosporidium/Giardia barrier as a result of elevated turbidity levels.**

iv. **Irish Water failed to ensure that reactive sampling of the final treated water for Cryptosporidium/Giardia was undertaken in the critical period following the incident. When samples were eventually taken on 17/03/19 & 18/03/19, low levels of Giardia were detected.**

v. **There was an increase in raw water ammonia levels, which was noticed by Leixlip WTP operators on 17/03/19 and coincided with the uncontrolled releases of raw sewage from Newhall waste water pumping station into the River Liffey 31.8 km upstream on 14/03/19, 15/03/19 & 16/03/19. Leixlip WTP operators were not alerted to the potential risk to the drinking water abstraction from the waste water discharges. This matter is the subject of a separate investigation by the EPA.**

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. This audit was carried out in response to the notification by Irish Water of an incident involving the failure of a poly dosing pump at the plant on 13/03/19, and the subsequent failure to meet the aluminium parametric value in the final treated water leaving the plant.

Leixlip water treatment plant abstracts raw water from the River Liffey and supplies approx. 195,000 m^3/day to approx. 600,000 consumers. Treatment at the plant consists of screening, coagulation, flocculation, clarification, rapid gravity filtration, chlorination and fluoridation. The treatment plant consists of Leixlip 'old plant' and 'new plant'. In total there are 26 clarifiers and 21 rapid gravity filters.

The opening meeting commenced at 10:00 at Leixlip 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:

Aodhnait Ni Chathasaigh – Compliance Analyst
Andrew Boylan – Compliance Specialist
Tselo Tlou – SLA Water Lead
Ivan Corcoran – Capital Programmes Regional Lead

Representing Fingal County Council:

Paul Graham – Senior Executive Engineer
Derek Judge – Executive Engineer

Representing the Health Service Executive:

Helena Murray – Specialist in Public Health Medicine & Medical Officer of Health
Ruth McDermott – Specialist in Public Health Medicine
Coilín Ó'hAiseadha – Senior Medical Officer, Dept. of Public Health
Bernice Martin – Acting Principal Environmental Health Officer

Representing the Environmental Protection Agency:

Aoife Loughnane – Inspector
Michelle Minihan – Senior Inspector
Tom Ryan - Director

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.	**Polyelectrolyte dosing pump failure incident** a. On 14/03/19 Irish Water notified the EPA of an incident involving the failure of a poly dosing pump at Leixlip 'new plant' at 23:30 on 13/03/19. The pump was restored to action at 07:30 on 14/03/19. b. The cause was later identified as the failure of the pump diaphragm, which meant that only 10 – 15% of the required poly dose was being delivered to aid the coagulation process. c. The failed pump was one of six poly dosing pumps at the new plant. There are 4 duty dosing pumps and 2 standby pumps. There is no automatic switchover between the duty & standby dosing pumps in the event of a pump malfunction. The switchover requires manual intervention.

	d. Approximately 50 minutes after the poly dosing pump failed, the settled water turbidity levels began to rise. There was a complete loss of the sludge blanket in Sedimentation Tank No. 2, with floc carryover into two filters and into the final treated water. e. At approx. 01:10 on 14/03/19, the settled water turbidity alarm of 1 NTU was activated. The plant operator on duty at the time of the incident failed to respond to the alarm, as set out in standard operating procedures for operators of the WTP. There is no cascade system for alarm response because the plant is manned 24/7, and therefore the operator on duty is expected to respond to all alarms. f. The residence time in the clear water tank is approx. 4 hours. By 05:00 on 14/03/19, the final water turbidity and aluminium values began to increase (see Figure 1 of this report). g. The problem was addressed by the next operator who started shift at 07:00 on 14/03/19, noticed the alarms activated earlier the night before, and restored the poly dosing pump to action by 07:30. By 09:00 the final water turbidity and aluminium levels began to decrease. h. An examination of the SCADA system during the audit showed that the final water turbidity was above 0.2 NTU from 07:20 to 14:23 on 14/03/19, which meant the plant's Crypto/Giardia barrier was compromised during that 7 hour period. i. On 14/03/19 Fingal County Council, acting on behalf of Irish Water, consulted with the HSE regarding the risk to public health associated with the incident. However, the HSE's advice was only sought on the high aluminium results, and the high turbidity levels were not identified, nor was the loss of Crypto/Giardia barrier made clear to the HSE. j. Following this incident, the WTP managers conducted a thorough investigation and have put corrective actions in place to prevent a reoccurrence, including: • Automatic plant shut-down will be initiated if a turbidity alarm is not cleared within 15 minutes of activation; • Plant alarms should be set to recognise a drop in poly and alum dosing rates; • Aluminium monitor in clear water tank will be moved from the outlet to the inlet, to provide earlier warning. Monitor should be alarmed and shutdown automated.
2.	**Source Protection** a. Leixlip WTP abstracts raw water from the River Liffey 29 km downstream of Osberstown waste water treatment plant (Upper Liffey Valley Sewerage Scheme). The waste water discharge is authorised by the EPA under Licence Register No. D0002-01. b. During the audit, the WTP operators stated that they noticed a rise in raw water ammonia levels on the morning of 17/03/19, and they contacted Osberstown WWTP to see if there had been a waste water incident upstream. It was subsequently confirmed that there were uncontrolled releases of raw sewage from Newhall pumping station into the River Liffey 31.8 km upstream on 14/03/19, 15/03/19 & 16/03/19. Leixlip WTP operators were not alerted to the potential risk to the drinking water abstraction. Elevated ammonia levels in raw water would increase the chlorine demand at Leixlip WTP and could compromise the effectiveness of the disinfection process. This matter is now the subject of a separate investigation by the EPA.
3.	**Cryptosporidium and Giardia Monitoring Programme** a. Irish Water has a weekly Cryptosporidium and Giardia monitoring programme at Leixlip WTP. There is a sampling rig at the plant and samples are taken over an approx. 24 hour period from Saturday night to Monday morning, when they are sent to Dublin City Council's Central Laboratory for analysis. b. Irish Water failed to take a Crypto/Giardia sample in the critical period following the poly pump incident. By the time the significance of the incident became apparent on 15/03/19, both the EPA and HSE requested Irish Water to arrange for immediate Crypto/Giardia sampling. However, Irish Water stated this was not possible due to the timing of receipt of sample by the laboratory, because the holding time for Crypto samples is 48 hours and due to the Bank Holiday weekend, the earliest the sample could be taken was 17/03/19. c. During the audit, Irish Water confirmed that the samples taken on 17/03/19 & 18/03/19 tested positive for Giardia (1 cyst in approx. 1000 litres). Irish Water undertook an assessment of filter performance and confirmed that all filters were operating satisfactorily in the week prior to the detections. Irish Water believes that the Giardia detections are unlikely to be linked to the poly pump incident or the ongoing filter upgrade works at the old plant. The cause of the Giardia detections is unknown.

	d. Following the Giardia detections, the HSE has commenced an 8 week programme of enhanced surveillance for Cryptosporidiosis and Giardiasis in the areas supplied by Leixlip WTP, starting from 18/03/19.
4.	**Coagulation, Flocculation and Clarification** a. At the time of the incident, the raw water pH was 8.25 and 238 mg/l alkalinity, which makes the water difficult to treat in the absence of pH control facilities at the plant. b. There is currently no pH adjustment before coagulation. This means that excess coagulant (aluminium sulphate) must be dosed in order to depress the pH levels to achieve the optimum coagulation pH. c. Irish Water confirmed that this problem has been recognised and they plan to retro-fit pH control facilities (sulphuric acid dosing) at the new plant and to reinstate pH control facilities at the old plant.
5.	**Filtration** a. The rapid gravity filters at the old plant are currently being upgraded, by replacement of the sand media & laterals. The filter upgrade works commenced in Q2 2018 and are expected to be complete by Q4 2019, with works being carried out on a phased basis to avoid impacting on production capacity at the plant.
6.	**Management and Control** a. Using the protozoal compliance log credit approach, there is currently a 2-log deficit at Leixlip WTP because the River Liffey is a S3 source which has a 5-log credit requirement, and the current CFC and filtration processes provide 3-log credits. Once the filter upgrade works are complete, this will provide an additional log credit for enhanced individual filtration. However, there will still be a 1-log deficit. During the audit, Irish Water stated that there is a weekly monitoring programme in place for Crypto/Giardia in the final treated water, and they are in discussions about how to address the log deficit.

3. AUDITORS COMMENTS

The audit found that Leixlip water treatment plant is generally very well run and operated, however the series of events which occurred from 13/03/19 to 15/03/19 presented a significant risk to the safety of the water supply. Irish Water must ensure that the lessons learned from this incident are acted upon to prevent a reoccurrence, and to ensure the ongoing safety and security of the water supplied by Leixlip water treatment plant, and to protect public health for the significant population served by the plant.

4. RECOMMENDATIONS

1. Irish Water should ensure there is automatic switchover between the duty and standby polyelectrolyte dosing pumps at Leixlip water treatment plant.

2. Irish Water should ensure that plant operators respond immediately to any alarms generated at Leixlip water treatment plant. If an operator fails to respond to an alarm, Irish Water should ensure that the plant automatically shuts down, to prevent inadequately treated water being supplied to consumers. If the plant automatically shuts down outside of normal working hours, Irish Water should assess the feasibility of alerting another operator via an alarm response cascade system.

3. Irish Water should ensure there is a documented communications protocol between the operators of Osberstown waste water treatment plant and Leixlip water treatment plant, so that the water treatment plant operators are alerted in the event of a waste water incident which could potentially impact on the raw water quality at Leixlip water treatment plant. Irish Water should ensure that staff at both plants are trained in the protocol and understand the instances in which the protocol is to be used.

4. During consultation with the HSE following an incident or exceedance of a parametric value, Irish Water should ensure that all relevant information is provided to allow the HSE to determine if the water supply presents a risk to public health, and if consumers need to be informed promptly thereof and given the necessary advice.

5. Irish Water should continue the monitoring programme for Cryptosporidium and Giardia in the final treated water at Leixlip water treatment plant. Irish Water should also ensure that reactive sampling can be undertaken in a timely manner in response to an incident at the plant.

6. Irish Water should install pH correction prior to coagulation at Leixlip water treatment plant, to reduce the need to add excessive levels of coagulant to achieve the optimum coagulation pH.

7. Irish Water should ensure the filter upgrade works at Leixlip water treatment plant are completed by Q4 2019.

8. Irish Water should identify how the protozoal compliance log deficit is to be addressed at Leixlip water treatment plant.

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 within **one month** of the date of this audit report 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 timeframe 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.

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

Report prepared by: Aoife Laghnare **Date:** 3nd April 2019

Inspector

Figure 1: SCADA graph showing the impact on final treated water aluminium levels (red line) and turbidity levels (green line) following the failure of the poly dosing pump.