Drinking Water Audit Report

County:	Carlow	**Date of Audit:**	14th May 2015
Plant(s) visited:	Borris Water Treatment Plant 0100PUB1162	**Date of issue of Audit Report:**	3rd June 2015
		File Reference:	DW2013/109
		Auditors:	Ms. Michelle Roche Ms. Yvonne Doris
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014).* • *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*. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **The UV disinfection system at the Borris Water Treatment Plant should be further optimised in accordance with the minimum criteria set out in the '*EPA Advice Note No. 3: E.coli in Drinking Water*' and the '*EPA Water treatment Manual: Disinfection*'.**
ii. **The efficiency of both filters should be addressed and the potential to control the backwash process based on Turbidity readings should be investigated.**
iii. **Works to replace cast iron mains in the distribution network should progress as planned.**
iv. **Works to replace Reservoir 1, which is showing signs of structural integrity failures, should progress without delay.**

1. INTRODUCTION

Under the *European Union (Drinking Water) Regulations 2014* 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 drinking water.

The Borris Water Treatment Plant serves approximately 1200 customers and is operational between 16 and 18 hours per day, with a throughput of approximately 200m^3 per day. The supply is sourced from the Mountain River and the abstraction point is located directly adjacent to the water treatment plant. The Mountain River is a designated Natura 2000 Special Area of Conservation (SAC) for pearl mussels. The Borris Water Treatment Plant was constructed in the 1930's and while the plant has been continuously upgraded since its construction, a significant upgrade programme was implemented in 2010. The following water treatment processes are currently in place at the plant:

- pH correction of the raw water with Soda Ash
- Coagulation with Ferric Aluminium Sulphate
- Clarification with Multiflo clarifier (covered)

- Filtration by two gravity fed sand filters (indoors)
- UV disinfection
- Fluoridation
- Chlorine disinfection (to provide a disinfection residual that can be detected in the network)

Photographs taken by Michelle Roche during the audit are attached to this report and are referred to in the text where relevant.

The opening meeting commenced at 10.15am at Borris 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: (* indicates that person was also present for the closing meeting)

Ms. Deirdre O'Loughlin – Water Compliance Analyst, Irish Water*

Mr. Brian O'Donovan – Senior Executive Engineer, Carlow County Council*

Ms. Catherine Buggy – Environmental Technician, Carlow County Council*

Mr. Patrick Hynes – Caretaker and Supervisor, Carlow County Council*

Mr. Adrian Cotes – Caretaker, Carlow County Council*

Representing the Environmental Protection Agency:

Ms. Yvonne Doris – Inspector*

Ms. Michelle Roche – Inspector*

Mr. Darragh O'Connor - Observer*

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.	**Source Protection** a. The Mountain River Catchment is used predominantly for cattle and sheep grazing. The area around the abstraction point has been fenced off to prevent animal access to the river and local landowners have been verbally informed of location of the abstraction point and their obligations under the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014).* b. A C*ryptosporidium* risk score of 11 (low risk) has been derived for the supply and *Cryptosporidium* is monitored once a year. c. The abstraction point on the Mountain River is double screened with a coarse and fine screen (Photograph 1). The screens are cleaned every 3 months. d. The raw water intake is fitted with duty and standby pumps. e. Raw water is continuously monitored for pH, turbidity, colour and temperature and daily grab samples are taken for the same parameters. f. The plant has a raw water turbidity shut-off point of 100 NTU and raw water colour shut-off of 550 Hazen.

2.	**Coagulation, Flocculation and Clarification** a. pH adjustment (5% Soda Ash) and coagulant (Ferric Aluminium Sulphate) dosing are automated and dosing points are located at the intake to assist with mixing. b. Coagulant dosing is controlled by a stream and current meter. c. Flocculation and clarification occur in a single hopper bottomed Multiflo clarifier tank (Photograph 2). One half of the tank is commissioned as a mixing tank and the other half of the tank is a 2 clarifier. The mixing tank and clarification tanks are covered. d. The clarifier channels are cleaned once every two weeks and the clarifier is cleaned once a month. The flow in the clarifier channels appeared to be uneven during the audit. e. Sludge bleeds from the clarifier are automatically set to last for 10 seconds every hour. An effective sludge bleed was observed during the audit. f. Sludge supernatant from the sludge tank is not currently tested for aluminium or chloride before discharging to the river. Remaining sludge is collected weekly and tankered to Bagnelstown or Carlow WWTPs.
3.	**Filtration** a. Two circular rapid gravity sand filters are in place inside the Borris Water Treatment Plant. The filter media was replaced in Filter 1 in 2012 and Filter 2 in 2013. No core sampling has taken place on either filter since the media was replaced. b. Turbidity monitors were installed on both filters and were reading 0.027 NTU (Filter 1) and 0.019 NTU (Filter 2) at the time of the audit. The settled water turbidity monitor was reading 1.95 NTU and the combined treated water turbidity monitor was reading 0.078 NTU. Settled water turbidity was observed to be reading slightly high and was thought to be related to one of the alum dosing pumps being offline at the time of the audit. c. A filter backwash is run on both filters every 24 hours. Filters are put back into service following 4 minutes run to waste, 6 minutes settlement and a manual assessment of turbidity readings. No target turbidity levels are set to automatically control the backwash sequence. d. A filter backwash was observed in Filter 2. The filter backwash appeared uneven as air scour was less vigorous at the edges of the tank.
4.	**Chlorination and Disinfection** **UV Disinfection** a. Ultraviolet (UV) disinfection was installed at the Borris Water Treatment Plant in 2010. UV was installed as a proactive measure to provide additional protection against the potential microbiological incidences such as *Cryptosporidium*, rather than a reactionary measure to a *Cryptosporidium* detection. *Cryptosporidium* has never been detected in the treated water leaving the plant. b. The UV system is an Aquafadis 3 AF 300T and consists of two UV reactors, a duty and standby, with three Low Pressure High Output UV lamps in each reactor. Both UV reactors are validated to an incoming UVT of >77% based on the validation certificates viewed during the audit. The validation is to the German standard, DVGW as well as the OeVGW, SVGW and NIPH standards. The UV system is set-up to achieve a UV dose of 40mJ/m^2. c. A UVT monitor was installed at the plant 2 weeks prior to the audit; however no UVT alarm or links to SCADA had been established for this monitor at the time of the audit. d. Instantaneous UVT readings on the UVT monitor were 85.8% at the time of the audit and UVT readings are currently being manually recorded on a daily basis. e. There is automatic switchover between the UV reactors in the event that one reactor fails and automatic plant shut down in the event that both reactors fail. f. Each reactor is installed with one UVI sensor linked to a monitor. The UVI sensors are calibrated every 6 months by Veolia. g. The UV lamps have a life-span of 10,000 hours and are replaced by Veolia before that time has elapsed. Lamp sleeves are not self-cleaning but are cleaned by the plant Caretaker every 6-8 weeks. h. No water can flow through either reactor until the UV lamps reach operating temperature.

	Chlorine Disinfection i. To provide further and residual disinfection, chlorination is in place using neat 10/12% Sodium Hypochlorite. Chlorine is dosed flow proportionately from a day tank with duty and standby dosing pumps in place, with automatic switchover. Pumps automatically switchover every 24 hours in addition to the pump failure switchover. j. A high alarm of 2.0 mg/l and a low alarm of 0.5 mg/l are in place. The low alarm of 0.5 mg/l will shut down the plant. k. No effective chlorine contact time has been calculated for the supply; however it is assumed that the minimum effective contact time is afforded by a contact tank with a volume of 19.2L, a pipework of 1km distance and 2 reservoirs. l. Chlorine residuals at the end of the distribution network are measured every second day. The most recent chlorine residual measurement at the end of the network was 0.18mg/l.
5.	**Treated Water Storage and Distribution Network** a. Treated water is stored in 2 reservoirs located approximately 1km from the Borris Water Treatment Plant. b. Reservoir 1 was in built in the 1930's and cracking in the side walls was observed during the audit (Photograph 3). The top of the reservoir could not be inspected as no ladder was present. Irish Water has received quotations to replace Reservoir 1. c. Reservoir 2 was built in 1999 and was inspected from the top. The reservoir has no guard rail at the top. The reservoir has two locked access hatches and vents; however the vents are not fitted with fine mesh to prevent the access of small animals or birds. Reservoir 2 has never been cleaned or inspected. d. The distribution network is predominantly a 4 inch cast iron main. 600m of the 4km network has currently been replaced with a HDPE pipeline and the remaining network is scheduled to be replaced by April 2016.
6.	**Chemical storage and bunds** a. All bulk and day storage areas are well bunded and bund integrity appears good. b. The location of the hydrofluosilic acid fill point juts out slightly over the bund wall.
7.	**Hygiene and Housekeeping** a. Housekeeping at the Borris Water Treatment Plant was very good and the plant was fitted with good and clear signage.

3. AUDITORS COMMENTS

The Borris treatment plant is a well managed and operated plant. Further refinements to the treatment process that should be considered by Irish Water include the control of filter backwashing based on turbidity readings and UVT monitoring for the validation of the UV disinfection system. Planned network improvements including replacement of reservoir 1 and replacement of an old cast iron main should be progressed without delay.

4. RECOMMENDATIONS

Clarification

1. Irish Water should ensure that settled water outlet channels are level, free from blockage and flow into these channels is even.

Filtration (General)

2. Irish Water should investigate the possibility linking the initiation and control of the filter backwash process to turbidity levels.

3. Irish Water should ensure that the air scour during the backwash is even across the filter and should ensure that air nozzles are fully functional and not blocked or damaged.

4. Irish Water should schedule a programme of filter media coring for both filters.

Disinfection

5. Irish Water should undertake works to fully optimise the UV disinfection system. These works should include the following:

    i. Link the UVT monitor to SCADA and establish UVT set points and alarms to ensure that the UV disinfection system operates within its validated range at all times.
    ii. Introduce a schedule of checks on the UVT monitor using a hand held UVT meter.
    iii. Review the calibration schedule of the UVI and UVT monitors and sensors.
    iv. Ensure Veolia have sufficient bulbs and sensors readily available for replacement in the event of failure.
    v. Ensure Veolia have a procedure in place for dealing with a mercury spill should a bulb break. A copy of this procedure should be kept at the treatment plant.
    vi. Investigate the correct cleaning procedure for the UV bulb sleeves.

Treated Water Storage

6. Irish Water should ensure that Reservoir 1 is replaced as planned.

7. Irish Water should ensure that all vents on the reservoirs are secured against ingress of animals or deliberate introduction of any contaminant or acts of vandalism.

Distribution System

8. Irish Water should ensure that the cast iron distribution mains are replaced as planned.

Chemical Storage and Bunds

9. Irish Water should examine the location of the hydrofluosilic acid fill point within the bunded area and ensure all that the point is well within the bund.

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 Ms Yvonne Doris, Drinking Water Team Leader.

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:  **Date:** 3rd June 2015

Inspector

Photograph 1: Abstraction point with Intake Screen

Photograph 2: Multiflo Clarifier Tank


Photograph 3: Cracking visible on the side walls of Reservoir 1