



Drinking Water Audit Report

County:	Roscommon	Date of Audit:	18 th September 2015
Plant(s) visited:	Ballyfarnon, Arigna Drinking Water Treatment Plant (serving Ballyfarnon, Arigna, Keadue and Rover areas)	Date of issue of Audit Report:	14 th October 2015
		File Reference:	DW2008/163
		Auditors:	Ms Yvonne Doris
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)</i>. • The <i>EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)</i> • The recommendations specified in the <i>EPA Drinking Water Report</i>. • The recommendations in any previous audit reports. 		

MAIN FINDINGS

- i. A new treatment plant comprising aeration, pressure filtration and ultraviolet treatment has been constructed and has been operating since 1st July 2015. This is an appropriate barrier to *Cryptosporidium* as required by the EPA's 2014 Direction to Irish Water.
- ii. As a result of the installation of an appropriate *Cryptosporidium* barrier, the Ballyfarnon PWS has been removed from the EPA's Remedial Action List.

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 compliance with EPA direction issued to Irish Water on 30th October 2014 to review the risk from *Cryptosporidium* on the Ballyfarnon public supply. The deadline in the direction was the 30th October 2015. The new treatment plant was operating from 1st July 2015, four months in advance of the deadline in the direction.

The new Ballyfarnon drinking water treatment plant source water is abstracted from two boreholes acting as duty and standby. 67.5m³/hr is abstracted for 20 hours a day. The treatment plant design capacity is 75m³/hr over 20 hours (1,485 m³/day). Treatment consists of a multi-barrier approach comprising aeration to remove manganese, filtration in pressure filters, UV treatment, chlorination and fluoridation. There is equipment to add coagulant to the water but this process is not operating as the source water is currently of high quality. There is one reservoir in the network. It serves 788 people in the Ballyfarnon, Arigna, Keadue and Rover areas of north county Roscommon. The Ballyfarnon supply was on the EPA Remedial Action List between 2009 and 2012 for bromate and since Q3 2014 for inadequate treatment for *Cryptosporidium*.

Photographs taken by Yvonne Doris during the audit are attached to this report and are referred to in the text where relevant. The opening meeting commenced at 09.30am at Ballyfarnon Drinking 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)

Name – Job Title

Anne Bonner, Compliance Specialist, Irish Water.

Justin Doran, DBO Engineer, Irish Water.

Vincent Walsh, Acting Senior Executive Engineer, Roscommon County Council.

Anne McHugh, Senior Resident Engineer, Roscommon County Council.

Tommy Shivanan, Networks Team, Roscommon County Council.

Michael Kelly, Networks Team, Roscommon County Council.

Andrew Young, Project Manager 4-Regional Schemes, Glan Agua.

John Fox, Operations Manager 4-Regional Schemes, Glan Agua.

Aine Healy, Glan Agua.

Dessie Gardiner, Plant Operator, Glan Agua.

Anthony Mulvey, Plant Operator, Glan Agua.

Representing the Health Service Executive:

Name – Job Title

Dr Melissa Canny, Public Health Specialist.

John Keenihan, Environmental Health Officer, South Roscommon.

Representing the Environmental Protection Agency:

Name – Job Title

Ms Yvonne Doris, 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.	<p>Management and Control</p> <ul style="list-style-type: none">a. According to Irish Water, commissioning and process-proving is complete for the Ballyfarnan plant. It is in the operational phase of the Design-Build-Operate contract. The plant is managed by Glan Agua. The operator attends 7 days per week and this will move to every second or third day in the longer term. Responsibilities and attendance is managed by the Plant Manager.b. The plant has good process controls in place: continuous raw water monitoring; pH monitoring of raw water; turbidity monitoring of raw, individual filters and treated water; UVT monitoring of raw, pre-UV and treated water. Duty-standby is in place on all key process equipment and there is storage capacity to allow for UV and other plant maintenance and repairs. All monitors are linked to SCADA and monitoring information is easily available to the plant operator to facilitate management and operation of the plant. All monitors are calibrated monthly.c. There is a mobile generator available in the event of loss of power. All signals are fused to protect from electrical surges. Loss of power or phase loss results in an alarm to the operator.d. Two Glan Agua staff completed a 4-day certified UV training course with Wedeco and are Certified Wedeco Technicians available to carry out UV maintenance. The plant operator has completed the FETAC Certified Water Training Course run by the Water Services Training Group and received in-house training from Glan Agua Certified Wedeco Technicians.
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<p>2.</p>	<p>Source Protection</p> <ul style="list-style-type: none"> a. A Groundwater Protection Scheme for County Roscommon has been prepared. Source Protection Reports have not been prepared for the Ballyfarnan source. b. Agricultural activities in the catchment are predominantly low intensive grazing. The vulnerability of the groundwater has been deemed low risk by RCC based on the agricultural activities in the catchment. According to Roscommon County Council (RCC) no farms in the catchment have been inspected by RCC, under the Good Agricultural Practice Regulations. No inspections of septic tanks were identified in the National Inspection Plan and RCC have not inspected any septic tanks in the catchment. c. No farmers in the catchment have been written to by RCC making them aware of the presence of the drinking water abstraction and highlighting farmers' responsibilities under the Good Agricultural Practice Regulations. d. The two boreholes, labelled 3 and 3a, at Ballyfarnan treatment plant were inspected during the audit. Both were located in a secure area at the treatment plant. The boreholes are 35m deep fully cased with a slotted screen at 20m depth for abstraction. The duty and standby boreholes are switched over every few days. 67.5m³/hr is abstracted for 20 hours per day. Borehole 3a had roughly 1cm standing water in the borehole chamber. Raw water quality does not appear to be impacted by heavy rainfall. There is continuous online raw water monitoring for pH, UVT, turbidity and colour.
<p>3.</p>	<p>Manganese removal and Aeration</p> <ul style="list-style-type: none"> a. Water enters an aeration vessel to precipitate out Manganese in the raw water. The retention time in the aeration vessel is 5 minutes. Sodium hydroxide 25% was not being dosed at the time of the audit but it can be introduced to reduce the pH for manganese removal if required. b. There is the facility (equipment and procedures) to dose coagulant but this process was not operating at the time of the audit as the raw water was of such a high quality (94-96% UVT).
<p>4.</p>	<p>Filtration</p> <ul style="list-style-type: none"> a. The water is filtered in two pressure filters with a 1m of a filter bed (100mm base layer, 900mm sand layer). A core test of the filter bed is done each year. b. Backwashing of the pressure filters is based on time (24 hours), turbidity (0.8NTU) or headloss (1 bar) and can be initiated manually. The filter backwash sequence is an air scour at 75m³/m²/hr and a water wash at 40m³/m²/hr. c. After the pressure filters the water goes through a GAC filter (1700mm). The design GAC filtration rate is 75m³/m²/hr. The GAC layer is tested for dissipation once a year. The use of GAC will be monitored on an ongoing basis. If the GAC layer is not required it will not be used. There is an automated bypass and alarm trigger setpoint to stop and start the GAC treatment.
<p>5.</p>	<p>Chlorination and Disinfection</p> <p>UV disinfection</p> <ul style="list-style-type: none"> a. A single Xylem/Wedeco Spectrum 250e UV reactor validated to UVDGM (USEPA) standard is in place to provide a barrier to <i>Cryptosporidium</i>. b. The UV reactor is validated to achieve 3-log reduction of <i>Cryptosporidium</i>, if operated at an incoming UVT of >69% based on the validation certificate document provided by the manufacturer and documentation stating same provided by Irish Water. Below 69% UVT the reactor shuts down and no undisinfecting water can enter supply. An alarm is sent to the plant operator who attends the site on a 24 hour/7 day basis. A cascade system of alarms is in place. c. Incoming UVT, UVI in the reactor, flow rate through the reactor and reactor temperature is recorded continuously. The UVT monitor is checked weekly using a portable UVT monitor and is verified monthly. The flow monitor is calibrated every 6 months. d. Target UV dose is 14.4mJ/cm² in order to ensure the minimum required UV dose of 12 mJ/cm²

	<p>is achieved. An alarm set-point at $13.2\text{mJ}/\text{cm}^2$ alerts the plant operator to a reducing UV dose. Flow rate through the reactor is typically around $67.5\text{m}^3/\text{hr}$.</p> <ul style="list-style-type: none"> e. The UV reactor houses 4 UV lamps. At the time of the audit lamp hours were 1596. Lamps reach operating temperature after 300 seconds. No water flows through the UV reactor until the lamps reach operating temperature. All lamps will be replaced at the same time. Spare lamps are stored in Boyle. Replacing a lamp takes 10 minutes and is done when the UV reactor is not operating. Lamp coffins are carried by the technician in the event that a lamp breaks during replacement. An evacuation procedure is in place if a lamp breaks and mercury is released. f. An automated mechanical cleaning system cleans the reactor sleeve once a day. No chemicals are used in the cleaning process. High manganese in the raw water is removed in the aeration vessel to prevent fouling of the quartz sleeve. g. The UV reactor has one UVI sensor which is calibrated monthly against a spare sensor. Spare sensors are stored in Boyle. h. No water can flow through the reactor when it is not operating. i. The UV reactor is not operating (as the plant is not running) for about four hours each day. This time is available for maintenance and repairs if needed. There is also 36 hours storage in the network reservoir should repairs require additional time. Spare ballast cards (for the UV control system) and O-rings (for the mechanical sleeve cleaning system) are stored in Boyle. <p>Chlorine disinfection</p> <ul style="list-style-type: none"> j. To provide further and residual disinfection, chlorination using neat 10-14% sodium hypochlorite is in place. A day tank with 2 days storage is replenished every two days. Dosing levels are 0.9-1.0mg/l leaving the plant. Dosing is flow proportional and linked to chlorine residual. Duty and standby chlorine dosing pumps with automatic switchover are in place in the event of the duty pump failing. The duty and standby chlorine dosing pumps are switched every 24 hours. A chlorine monitor is in place and alarms to the plant operator. Alarm response procedures are in place and alarms are responded to on a 24/7 basis. Sufficient effective chlorine contact time is achieved in the reservoirs (36 hours storage). k. Residual chlorine levels leaving the Kilronan reservoir are typically 0.8-0.9mg/l. Residual chlorine levels in the network are monitored weekly by Roscommon County Council and range from 0.18 to 0.8mg/l.
6.	<p>Fluoridation</p> <ul style="list-style-type: none"> a. Duty and standby hydrofluorosilicic acid dosing pumps with automatic switchover are in place in the event of the duty pump failing. b. A fluoride monitor is in place and alarms to the plant operator. Alarm response procedures are in place and alarms are responded to on a 24/7 basis.
7.	<p>Treated Water Storage and Distribution Network</p> <ul style="list-style-type: none"> a. Flushing and scouring is ongoing in the network. Each section of the distribution network is flushed and scoured every four weeks. It is intended to carry out a programme of uni-directional flushing and scouring of the distribution network in 2016. b. The Kilronan reservoir was constructed in 2015. There are two locked access hatches and three vents. The mesh on the vents is not fine enough to prevent insect access.
8.	<p>Chemical storage and bunds</p> <ul style="list-style-type: none"> a. Chemicals are delivered directly into the bulk tanks and are supervised by the plant operator. No delivery can be made without access being provided by the plant operator. b. All chemicals (chlorine, fluoride) are in double linked bulk tanks and day tanks are banded. All chemical tanks are fitted with level sensors to indicate when tanks are almost full. Spill kits are carried in the plant operator's vehicle. c. The fillpoints of the bulk tanks are not contained in a banded area (photograph 1).

	d. All chemical storage tanks are appropriately labelled and fitted with appropriate health and safety signage.
9.	Monitoring and Sampling Programmes for Treated Water a. Roscommon County Council staff test chlorine residual readings daily in the network and communicate the results of their testing to the Glan Agua staff operating the treatment plant. The extremities of the network are not being tested for residual chlorine.
10.	Sludge Management a. Chlorinated water is used to backwash the filters. Sodium thiosulphate (20%) is dosed into the decanted water as the discharge licence requires no chlorine in the discharged water. Backwash water is sent to a sludge holding tank. Decanted water is discharged to a nearby stream, which eventually flows into the Feorish river. b. Settled sludge will be treated by a mobile dewatering unit and tankered to Boyle DWTP. Very little sludge is generated and may only need to be removed once a year unless the coagulation stage is brought into service.

3. AUDITORS COMMENTS

The Ballyfarnan treatment plant is well designed with duty-standby on all key process equipment and there is storage capacity to allow for UV and other plant maintenance and repairs. The design and operation of the UV reactor provides a barrier to *Cryptosporidium* for the supplies served by Ballyfarnan treatment plant. Documented process controls and continuous monitoring alerts the plant operator to changes in raw water conditions and treated water quality in sufficient time to make relevant adjustments to the treatment process. The plant operators were very familiar with the operation of the plant under the various conditions that may arise. A review of three months of UVT data was carried out prior to the audit, showing the UV reactor was operating within its validated range at all times. Treated water leaving the plant currently meets the standards required in the Drinking Water Regulations 2014. The Arigna Regional supply has been removed from the RAL.

4. RECOMMENDATIONS

Source Protection

1. Irish Water should liaise with Roscommon County Council to ensure that landowners are informed of their responsibilities under the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)*.
2. Irish Water should liaise with Roscommon County Council to ensure that farm surveys and are undertaken in the zone of contributions to the source boreholes.

Chemical Storage and Bunds

3. Irish Water should review chemical storage arrangements at the treatment plant. Fill points for storage tanks should be within a bunded area. Refer to EPA guidance document –“*IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*”.

Treated Water Storage

4. 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

5. Irish Water should ensure that a programme of uni-directional flushing and scouring is scheduled for the Arigna network.
6. Irish Water should ensure that residual chlorine samples are taken at the end of the distribution network and maintained at 0.1mg/l.

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 Mr Darragh Page, Senior Inspector Drinking Water Team.

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: Yvonne Doris Date: 14th October 2015
Inspector



Photograph 1: Example of delivery pipe to bulk storage tank not within bunded area.