Drinking Water Audit Report

County:	Donegal	**Date of Audit:**	19 August 2014
Plant(s) visited:	Bundoran Urban (L. Melvin) Water Treatment Plant	**Date of issue of Audit Report:**	02 September 2014
		File Reference:	DW2014/303
		Auditors:	Ms Derval Devaney
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 Report on *The Provision and Quality of Drinking Water in Ireland.* • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **Additional measures should be put in place to reduce the risk *Cryptosporidium* entering the supply given that backwash water and supernatant from the sludge lagoon is recycled to the head of the works.**
ii. **The cause for carry-over of pin-floc to the rapid gravity filters must be investigated and rectified.**
iii. **The storage of some chemicals on-site (alum bulk storage tank and PAC) requires attention to increase security of containment.**

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 Bundoran PWS was constructed in the early 1980's and now serves a population of 6,000 producing 2,489 m^3/day of drinking water (on average). The maximum water production at the plant during 2013 was 4,080m^3/day. The plant treats the Lough Melvin source water by clarification, filtration (3 No. rapid gravity filters), fluoridation and disinfection. The supply serves the Bundoran Urban population and the area south of the River Erne and eastwards as far as Beleek on the border with N. Ireland. It also serves the Lough Side (also known as the Askill) Group Water Scheme where there are from 80-120 connections. Tourism can lead to spikes in water demand during the summer months, particularly in July and August. The base population is 6,000 but this can rise to 35,000 during peak demand. Over the last 3 years much conservation work has been carried out on the networks for the supply to successfully minimise water losses. There is 150-160 km of distribution network with approx. 2.5km of cast iron mains of which 1km is problematic.

Irish Water (IW) informed the auditor that the Ballyshannon PWS is under review with Asset Strategy and is at Advanced Planning Stage. Asseroe lake supplies Ballyshannon and IW are reviewing proposals to construct a new water treatment plant for Ballyhsannon PWS with a network linking to Melvin (Bundoran PWS) and Ballintra PWSs for added security.

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

The opening meeting commenced at 2pm at the Bundoran Urban 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: Charles Travers, Waste Water Inspector; Sean McManus Assistant Waste Water Inspector; Paul Lyons, Engineer; Eddie McGrane, Supervisor; Martin Temple, Irish Water; Patrick Gallagher, Laboratory; Michael Breslin, Area Manager; Eamonn Kelly, Electrical Technician. Representing the Environmental Protection Agency: Derval Devaney, 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.	**Source Protection** a. The Bundoran PWS supply is sourced from Lough Melvin, with the abstraction point situated in the north-west of Co. Leitrim, about 4 km south of Bundoran (see Photo 1). The lake is approximately 13 km long by 3 km wide and lies on the border of Co Leitrim and Co Fermanagh (N. Ireland). b. Lough Melvin is a Special Area of Conservation and is listed on Annex I of the E.U. Habitats Directive. The site is also important for otter, for the presence of a unique fish community, including Atlantic Salmon, a species that is listed on Annex II of the E.U. Habitats Directive, and for a diverse flora which includes a number of rare plants, most notably, the protected Globeflower. c. The lake is used for boating, fishing and water abstraction, while much of the terrestrial part of the site is used for grazing (low intensity agricultural activity). Consequently, the main threats to the site are from agricultural pollution and recreational use. The lake is susceptible to algal blooms and the caretaker observes the lake for signs of accumulation of algae. d. Abstracted water (at a rate of 170 m^3/hr) is filtered through 20mm screens prior to being gravity fed to the raw water sump at the nearby water treatment plant. e. The raw water turbidity monitor read 0.59 NTU during the audit and colour was 50 Hazen. f. The *Cryptosporidium* risk score is 74 (moderate) for this supply.
2.	**Coagulation, Flocculation and Clarification** a. Prior to entry to the baffled contact tank, water is dosed with liquid alum (approx. 150 mg/l). There is approx. 2 minutes contact time between the dose and entry to the clarifier (1 No.). Polyelectrolyte is dosed (~ 0.125 mg/l) at the the outlet of the contact tank. There is a turbulent flow generator– at the outlet of the contact tank. Powdered Activated Carbon (PAC) is also dosed (~ 20 mg/l) at this point to treat the seasonal presence of algae in the raw water source (see Photo 2). b. The flat bottomed upflow clarifier was upgraded in 1997 where sludge draw off was

	improved and a sludge thickener and holding tank was installed. Sludge from the clarifier is diverted to the picket fence thickener and the thickened sludge is diverted to a sludge holding tank for tankering off-site for treatment while the supernatant from the process is sent to the on-site lagoon. The supernatant from the lagoon is diverted to the intake chamber along with the filter backwash water for recycling through the water treatment plant. c. The upflow rate in the clarifier is 3 m rise / hour with a surface area of 72.9 m^2. d. The turbidity meter on the clarified water read 0.14 NTU on the day of the audit. e. Pin-floc was observed in the settled water as it spilled into the decanting troughs within the clarifier (see Photo 3).
3.	**Filtration** a. Clarified water flows into one of 3 No. Rapid Gravity Filters with a surface area of 12 m^2 each and a filtration rate of 5.9- $m^3/m^2/hr$. b. The filters were upgraded 9 or 10 years ago with filter media replenished to a depth of 1.5m. Currently there is 1.1 m in Filter 1 & 3 and 1.2 m in Filter 2. c. Backwash was observed on Filter No 3 (see Photo 4). Air and water is injected for 5 minutes and then water only until the water runs clear (on average the water wash takes 20 minutes) at a backwash rate of 12.5 $m^3/m^2/hr$. The process can be set up to backwash automatically but manual backwash is carried out every 72 hours and is observed by the caretaker. d. Backwash water is diverted to the intake chamber on-site and recycled through the plant. The average raw water flow,- including recycled water,- through treatment is 215 m^3/hr (includes 170 m^3/hr is abstracted from source). e. There is a turbidity meter on each filter and a flow meter on the filtered and backwash waters. The turbidity meter during the audit read 0.06 NTU for Filters 1 and 2 and 0.11 NTU for Filter 3. The final water turbidity was 0.05 NTU. f. There is no run to waste, slow or delayed start on the filters once backwash is complete.
4.	**Chlorination and Disinfection** a. Post filtration, water is fluoridated (fluoride dose of ~ 0.7 mg/l) and chlorinated (dose of 1.86mg/l) to give a free chorine residual of approx. 1.2 mg/l post the clear water and backwash tank. The target chlorine residual in the clear water tank is 1.3 mg/l. The water is then pH corrected with ~ 20 mg/l soda ash. The target pH is 7.5. b. The clearwater- and backwash tank has a volume of 375 m^3 with an effective contact time of 15.6 mg.min/l. c. Sodium Hypochlorite 14/15% replaced gas chlorination as a form of disinfection approx. 5 months ago. The Water Supplier intends on installing a bulk chloros tank on-site. d. A final water chlorine residual sample is taken from the outlet of the clear water storage tank once the contact time has elapsed prior to its entry to the onsite reservoir. Chlorine is dosed into the supply along the sample return loop to the inlet of the contact tank. e. There is a duty and standby dosing arrangement in place for chlorine which is linked to flow and the online residual chlorine monitor. f. The process control chlorine monitor post the clear water tank is alarmed and trended on the SCADA system. The low low level alarm is set at 0.4 mg/l and low at 0.7 mg/l. The high level alarm is set at 1.5 mg/l and high high at 2 mg/l. During the audit the chlorine residual was 2.08 mg/l and notification of such alarm was sent by text to the relevant personnel for action as per the cascade system in place.
5.	**Treated Water Storage** a. High lift pumps at the headworks pump water from the clearwater- and backwash water tank to the final water reservoir on-site which has a 4,500m^3 volume. The chlorine residual in the reservoir is ~ 0.42 mg/l giving an effective contact time of 67 mg.min/l. b. Final water turbidity is monitored upon entry to this reservoir. On the day of the audit it read 0.05 NTU. The final water high alarm is set at 1 NTU- and high high alarm at 2 NTU. There is a text out facility to alert the water services authority if an alarm is triggered.
6.	**Monitoring and Sampling Programme for treated water** a. Four audit and 25 check samples were carried out during 2013 on the supply. Two audit

	samples were carried out so far in 2014 where a lead failure was found on a sample taken on 28/04/14. This was notified to the EPA on 02/05/14. b. There is a *Cryptosporidium* rig at the plant where samples are taken 6 times/year. Monitoring has never detected oocysts in the supply chain.
7.	**Exceedances of the Parametric Values** a. The EPA on 24/06/14 closed a lead file for this supply (Ref: DW2014/210) relating to a failure of 13.5 µg/l on 28/04/2014 at Rock Hospital, The Rock, Ballyshannon. As the failure occurred in a public building, Irish Water was advised to use its powers under Regulation 6 to ensure appropriate action is taken promptly and the domestic system is restored (i.e. the removal of any lead piping) so that the risk of non-compliance is eliminated. The Regulations provide for the issue of directions by the Water Supplier, as it considers necessary, for this purpose. Irish Water upon closure of the file advised the EPA that a Regulation 6 notice would be issued.
8.	**Chemical storage and bunds** a. Bags of Powered Activated Carbon were being stored uncontained on a pallet on top of contact tank which posed a risk of PAC unintentionally entering the water system if a bag was severed or unintentionally torn (see Photo 2). b. There is a bulk liquid alum and hydrofluorosilicic acid tank stored indoors in a bunded area at the plant. The bulk alum tank had a crack near its roof. c. Sodium hypochlorite drums are stored in a bunded area on-site and used to fill the day tank.
9.	**Management and Control** a. Brenntag supply sodium hypochlorite drums to the plant for use as a disinfectant (see Photo 5). The label of biocidal detergents is to contain all the relevant elements specified in Article 69 of the Biocidal Products Regulation (EU) No 528/2012 (e.g. the notification or approval number PCS 9xxxx or IE/BPA 7xxxx). The label did not appear to have such number displayed nor did it have an expiry date (The date 04.08.14 on Photo 5 refers to the manufacture date). Irish legislation requires that all biocides on the market in Ireland must as a first step be notified with DAFM. It is the responsibility of any company wishing to place a biocidal product on the market in Ireland to ensure that the product is notified in accordance with Statutory Instrument S.I. No. 625 of 2001. Further information can be found at http://www.pcs.agriculture.gov.ie/biocides.htm and by contacting the Pesticide Registration and Control Division at biocides@agriculture.gov.ie b. There were complaints in the past regarding taste and odour which were linked to the presence of algae in the source water. No complaints have been received in recent times and PAC was introduced to alleviate the issue. c. There is a standby generator in place in the event of a power failure which is tested on an ongoing basis.

3. AUDITORS COMMENTS

The Bundoran water treatment plant is well managed with good process control evident in supplying water to both the Bundoran PWS and the Lough Side Group Water Scheme. The supply was upgraded in 1997 to improve sludge handling facilities at the plant however further improvements can be made to increase the security of the supply and to reduce the risk of *Cryptosporidium* entering the supply.

4. RECOMMENDATIONS

Coagulation, Flocculation and Clarification

1. The Water Services Authority should carry out an investigation to identify the cause of floc carryover from the clarifier into the filters. In this regard the Water Services Authority shall consult Table 2 on Page 41 of the EPA publication "*Water Treatment Manual: Coagulation,*

Flocculation and Clarification" and investigate the use of polyelectrolyte and pH correction in line with the designed plant's operating procedures.

Filtration

2. The Water Services Authority should follow the guidance as specified in the EPA publication "*Water Treatment Manual on Filtration*" and in particular the following action is required as a priority;
   i. As the filter backwash water is returned to the head of the works ensure that, following backwashing, the filters are run to waste for an appropriate period of time or that there is a slow or delayed start when/prior to the filter being brought back into use.

Disinfection

3. As filter backwash water is returned to the head of the works, the Water Services Authority should investigate the feasibility of installing a UV unit to increase the safety and security of the supply and reduce the risk of *Cryptosporidium* entering the supply.

4. The Water Services Authority should ensure that the disinfectant product used for the treatment of this water supply is notified to the Pesticide Registration and Control Division of DAFM- in accordance with Statutory Instrument S.I. No. 625 of 2001. The label of biocidal detergents is to contain all the relevant elements specified in Article 69 of the Biocidal Products Regulation (EU) No 528/2012 which is to include the expiry date.

Exceedences of the Parametric Values

5. The Water Services Authority should confirm that the cause for the lead exceedance notified on 02/05/14 for Rock Hospital had been addressed and the risk to supply eliminated. Please include in your response a re-sampling result and method used (i.e. first flush) to confirm successful remediation.

Chemical Storage and Bunds

6. The Water Services Authority should ensure that crack evident on the liquid alum bulk storage tank is repaired so that the tank is fit for purpose.

7. The Water Services Authority should ensure that bags of Powered Activated Carbon are stored in a bund to ensure any spillage of material that might occur will not pose a risk to the water treatment process or environment.

Management and Control

8. The Water Services Authority should update the EPA if it is decided, under the Asset Strategy review, to expand this scheme or link to the Ballyshannon Public Water Supply.

Follow-Up Actions required by Irish Water

During the audit the Water Services Authority representatives were advised of the audit findings and that action must be taken as a priority by the Water Services Authority to address the issues raised. This report has been reviewed and approved by Mr Darragh Page, Drinking Water Team Leader.

The Water Services Authority 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: Derval Devaney

Derval Devaney

Inspector

Date: 02.09.14

Photo 1 Lough Melvin source

Photo 2 Powdered Activated Carbon stored on a pallet on top of the contact tank

Photo 3 Pin-floc evident in clarifer

Photo 4 Even distribution of backwash water on Filter No. 3

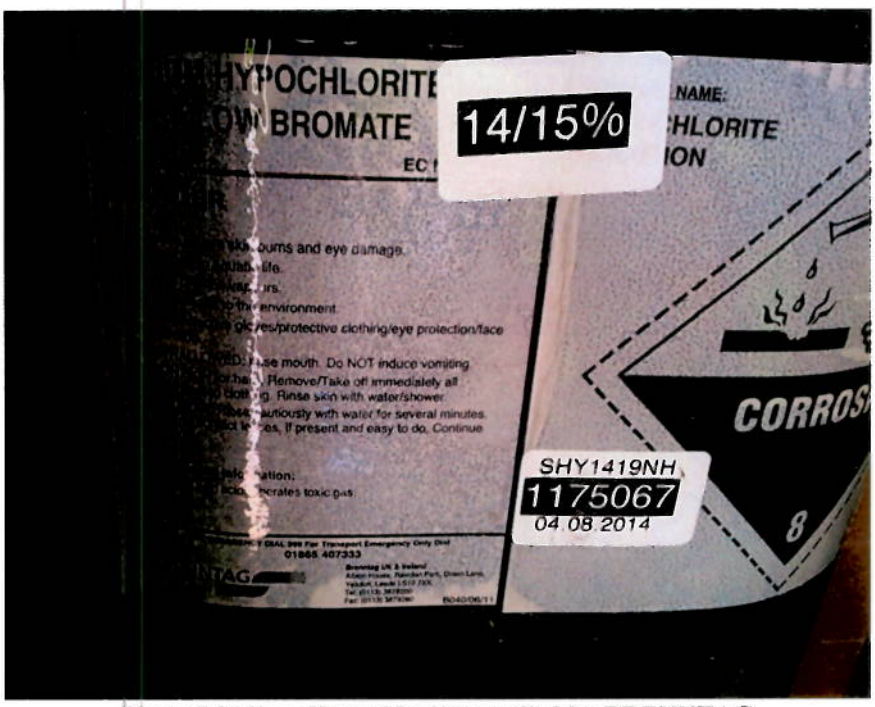

Photo 5 Sodium Hypochlorite supplied by BRENNTAG