Drinking Water Audit Report

County:	Donegal	**Date of Audit:**	21st September 2016
Plant(s) visited:	Cresslough Water Treatment Plant	**Date of issue of Audit Report:**	14th October 2016
		File Reference:	DW2011/48
		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 *Drinking Water Report*. • EPA Drinking Water Advice Notes No's 1 to 15.		

MAIN FINDINGS

i. **The construction of a new plant is to commence in Q1 2017 with completion due by the end of 2018 and should address THMs failures, the plant's capacity issues and provide a greater control on the treatment of its source waters.**
ii. **The disinfection programme will address areas of low chlorine residuals in the network and provide automation of the dosing pumps.**

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 Cresslough Water Treatment Plant was constructed in 1955 with 4 pressure filters and manual chlorination treating water from Lough Aghar. Four new filters were added in 1981 and an additional source, a stream from Muckish Mountain, which today provides 80% of the raw water to the plant. In 1996 the 8 filters were replaced with 2 larger pressure sand filters and they operate 24/7. Onsite Chlorination (OSEC) was introduced as a form of disinfection in 1999 to replace chlorine gas. The current treatment includes pH correction, filtration, chlorination and fluoridation. The plant operates 24/7 and produces on average 2,061 m^3/day serving a population of 5,375 to the towns and hinterlands of Cresslough, Dunfanaghy and parts of Falcarragh (the supply interfaces with the Gortahork supply in Falcarragh). Information for this supply on EDEN states that the supply serves 4,327 persons and provides 2,000 m^3/day. The plant's output can increase to 2,880 m^3/day during the summer months, putting the plant's capacity under pressure, as this supply serves the largest tourist area in the county with 1,044 holiday homes making up the total of 2,334 housing units on the supply. The provision of a new treatment plant nearby at Kildarragh, due for completion in December 2018, will address the shortfalls of this supply scheme.

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 1:15 pm at Cresslough 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: Martin Temple, Operations and Maintenance; Yvonne McMonagle, Compliance. Donegal County Council: John McCarrow, Senior Executive Engineer; Eoin Kerrane, Executive Engineer/ Area Engineer; Danny Meehan, Area Technician; Eamonn McEhinney, Waterworks Caretaker/Inspector; Hugh Kerr, Chief Technician; Patrick Gallagher, Laboratory. Representing the Environmental Protection Agency: Derval Devaney

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 source intake areas were visited during the audit. Eighty per cent of the source water is abstracted from a stream which originates in Muckish Mountain. Its water quality is better than Lough Aghar which makes up the remainder 20% of water serving the plant. However poor weather conditions can quickly affect the stream's water quality leading to increased colour. b. Plant records show that the Muckish Stream is a flashy source with TOC varying from 0.77 to 12 mg/l and Colour (apparent) from 4.9 to 73 Hazen. c. In 1989, in an effort to improve the stream's source water quality further, the intake area was moved away from a peat extraction area. This new intake area is fenced and has sand traps and screens to filter out the fine white sand from the mountain stream (see Photo1). d. Both sources are extremely remote on peaty upland bogs with very little agricultural activity other than turf cutting. Some mountain sheep were evident in commonage areas and the catchment is known to contain deer. e. The *Cryptosporidium* risk score for this supply is 80 (high risk) due to the type of treatment in place. The score on EDEN is 73 (moderate risk). There is a *Cryptosporidium* rig on the raw and final water at the plant. The raw water rig is not used frequency but it is planned to use it to assist in characterising the source to plan for adequate treatment as part of the provision of a new plant at Kildarragh. f. There is no flow meter on the individual sources at the intake due to the remoteness of the locations. Water from both sources enters a raw water mixing chamber adjacent to Lough Aghar with an average flow of 86 m^3/hr. to the plant (and max. flow of 120 m^3/hr.). The inlet flow meter on the day of the audit was reading 100 m^3/hour. The maximum (design capacity) for the plant is 84 m^3/hour. g. The combined raw water is manually monitored daily for pH and colour. Records on-site show that pH varies from 6.9 - 7 and TOC varies from 0.14 to 5.56 mg/l. If colour is found to increase significantly the intake is shut-down manually or flow to the plant is reduced. There is a turbidity monitor on the raw water which is set to alarm at 1.5 NTU. Raw water turbidity was 0.36 NTU on day of audit. h. The raw water is pH corrected; using 3 mg/l soda ash (sodium bicarbonate) delivered from the day tank to the raw water pipeline at the plant and prior to entry to the pressure filters, to meet a target pH of 7.3-7.4. Soda ash is dosed at a fixed rate with duty and standby pumps which have to be interchanged manually. pH is checked daily using a handheld monitor. Adjustments to the dosing are not a frequent occurrence and tend to only occur

	during the summer months when demand increases due to the tourist season.
2.	**Filtration** a. The 2 large pressure filters have 650 mm of sand media which were installed in 1996. The air and filter media was inspected in 2015 and again on 12/09/16. Photos from the latter inspection were provided during the audit and it was stated that an even distribution of air scour and water during backwash was evident. b. A backwash is initiated based on time at a daily frequency with 3 minutes of air scour, 8.5 minutes of water scour and a 1 minute 15 seconds rest prior to the filter being brought back into service. There is no run to waste facility on the filters. c. The average filtration rate is 7.12 $m^3/m^2/hr$. with 10.2 $m^3/m^2/hr$. being reached at maximum flow conditions. Irish Water stated that at times the plant can come under capacity pressure to meet the water demand during the summer months due to the tourist season. d. There is a turbidity meter on each filter set to alarm at 1 NTU and on the final water which is set to alarm at 0.5 NTU. There is a cascade system in place to respond to alarms. Filters No.1 and 2 had turbidity readings of 0.29 NTU and 0.30 NTU respectively on the day of the audit. The Final Water turbidity was 0.31 NTU. Information on EDEN states that there are no turbidity monitors after each filter.
3.	**Disinfection** a. An on-site electrolytic chlorination (OSEC) system is used onsite to assist in producing 0.6 % sodium hypochlorite solution. Approximately 1,310 litres of 0.6 % chloros is used at the plant per day. There are some drums of 10 % sodium hypochlorite stored on-site in the event that a top up is required in order to meet 0.6 % sodium hypochlorite. b. Water from the 2 filters enters an injection chamber (for chlorine and fluoride) before entering the reservoir on-site. c. The chlorine dose is approximately 3.9 mg/l to meet a target free chlorine residual of 1.3 mg/l. There is a duty and standby chlorine pump but needs to be switched over manually. d. There is a CL17 chlorine analyser at the inlet to the reservoir and its outlet. The inlet was reading 2.33 mg/l and the outlet 1.28 mg/l on the day of the audit. The inlet chlorine monitor alarms at 1.6 mg/l and the outlet at 0.8 mg/l. There is a cascade system in place to alert the relevant persons of an alarm. e. The caretaker takes total and free chlorine residual samples at the plant and compares the readings to the chlorine analysers and logs in the daily log book. f. The caretaker records free chlorine residuals in the network twice weekly basis. There are areas in the network prone to low chlorine residual levels of < 0.09 mg/l (e.g. Cresslough). The records listed the town land but not the location where the sample was taken. g. There is no secondary chlorination / booster chlorination on the network.
4.	**Treated Water Storage and Distribution Network** a. The headworks (Kildarragh) reservoir has a capacity of 364 m^3 and was visited during the audit. It is roofed, its vents have mesh in place and its inspection points are secure with locks. It was last cleaned in 2013. b. There are 6 reservoirs in total on this supply. The headworks reservoir feeds 4 additional reservoirs; Gortnaleck Reservoir (45 m^3), Cresslough Reservoir (273 m^3), Faugher Reservoir (455 m^3) and Purt Reservoir (727 m^3) which in turn feeds the Hornhead Reservoir (60 m^3). c. There is 167 km of water main serving the Cresslough PWS with 83% being PVC/HDPE, 16 % asbestos and 1% cast iron.
5.	**Monitoring and Sampling Programme for treated water** a. Two audit and 4 check samples are required to be carried out in 2016 and an additional 2 audit samples are planned to be taken this year.
6.	**Exceedances of the Parametric Values** a. Compliance sampling showed colour was 24.5 Hazen in a network sample and there was a Coliforms failure (1 MPN/100ml) in August 2016 and an iron failure (625 ug/l) in June 2016. It is thought that the area serving the iron failure has no cast iron mains and the cause

	is a source water quality matter. b. THMs failures found during 2016 are being dealt with under the existing THMs/ RAL file (DW2011/48) and are being reported on a quarterly basis to the EPA.
8.	**Management and Control** a. Irish Water has been approved planning permission and land has been purchased 100 yards from the current WTP to build a new plant (Kildarragh WTP). Construction is to commence in Q1 2017 with an estimated complete timeframe of the end of December 2018.This should address the persistent THMs failures on this supply and the capacity issues during the summer months when water demand is greatest.

3. AUDITORS COMMENTS

This supply is on the EPA's RAL due to persistent THMs in the water supply. The plant also can exceed its design due to increased water demand during the tourist season. The construction of a new plant to commence in Q1 2017 with completion due by the end of 2018 and should address THMs failures, the plant's capacity issues and provide a greater control on the treatment of its source waters.

In the interim, the disinfection programme will address areas of low chlorine residuals in the network and provide automation of the dosing pumps.

4. RECOMMENDATIONS

Disinfection

1. (a) Irish Water should ensure the duty and standby chlorine dosing pump has automatic switch-over in the event of the failure of one of the pumps.

   (b) Irish Water should ensure that free residual chlorine levels at the end of the distribution network are maintained at 0.1mg/l and records of free chlorine residual levels in the network include the location of the sample.

   It is understood that the above will be addressed as part of the disinfection upgrade. The estimated completion date has not yet been determined and depends on the disinfection programme roll-out county wide which is to commence at Frosses-Inver WTP in Q3 2016.

Management and Control

2. Irish Water should review the 2016 compliance sample failures; investigate the cause of the failures and take re-samples at the failed locations to verify compliance once measures are taken to ensure the matter is rectified.

3. Irish Water should ensure that the water supply upgrade (i.e. a new water treatment plant) planned for commissioning in Q1 2017 with a completion date of the end of 2018 will address the deficiencies found at the current treatment plant during the audit (e.g. the persistent THMs failures, the plant capacity issues at times when water demand increases during the summer months, the manual dosing of pH based on a fixed rate, the lack of an online pH monitor on the raw and treated water and the manual switchover between the duty and standby pH pump, the lack of a run to waste facility on the filters.)

4. Irish Water should update EDEN to reflect the current status of the supply (e.g. population served, volume produced, turbidity monitors on each filter and *Cryptosporidium* risk score).

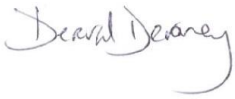
FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

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 Emer Cotter, 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:  **Date:** 14th October 2016

Derval Devaney

Inspector

Photo 1 Silt and Sand trap on Lough Muckish stream