Drinking Water Audit Report

County:	Carlow	**Date of Audit:**	10/02/2017
Plant(s) visited:	Sion Cross Water Treatment Plant Carlow Town PWS Scheme Code 0100PUB1001	**Date of issue of Audit Report:**	21/02/2017
		File Reference:	DW2017/15
		Auditors:	Ms Ruth Barrington Ms Pauline Gillard
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 *European Union (Radioactive Substances in Drinking Water) Regulations 2016 (S.I. 160 of 2016).* • World Health Organisation *Guidelines for Drinking Water Quality Fourth Edition*.		

MAIN FINDINGS

i. **The Sion Cross source for Carlow Town Public Water Supply (PWS) contains naturally occurring elevated levels of uranium. However, following treatment at the Sion Cross water treatment plant and blending with treated water from two sources with low natural uranium content, the water provided to consumers is below the World Health Organisation provisional guideline value.**

ii. **There is poor control over the proportions of treated water from the various sources entering supply. Irish Water should carry out works to enable the proportions of treated water from the three sources supplying Carlow Town Public Water Supply to be managed, maintaining levels of uranium at consumers' tap in compliance with the World Health Organisation guideline value.**

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 following the detection of elevated levels of uranium in water destined for the Carlow Town PWS.

The Carlow Town PWS serves a population of approximately 24,700 and 8,262 m^3/day of treated water is provided into supply. This treated water comes from three different sources, Rathvilly, Oakpark Wellfield and Sion Cross Water Treatment Plant (WTP).

The audit scope was limited to Sion Cross WTP, as following analysis by the EPA of a number of samples of water from each source, the Sion Cross water was found to have elevated levels of uranium. Analysis carried out by the EPA's Office of Radiation Protection and Environmental Monitoring (ORM) laboratories showed that the water is safe for human consumption from a radiological

perspective as the Indicative Dose is compliant with the drinking water standards, however the level of uranium present in some samples of the sources approached or exceeded the World Health Organisation provisional guideline value of 30 µg/l.

Treatment at the Sion Cross WTP comprises coagulation, flocculation, clarification, rapid gravity filtration and disinfection. There is also pH correction at two points in the treatment process to provide the tight control over pH necessary for effective removal of naturally occurring uranium using conventional water treatment processes.

The opening meeting commenced at 10.30 a.m. at Sion Cross WTP. 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 audit observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water:

Ms Deirdre O'Loughlin – Drinking Water Specialist
Ms Siobhán Clifford – Drinking Water Analyst

Mr Liam Brett – Drinking Water Lead

Representing Carlow County Council:

Mr Ger O'Brien – Senior Executive Engineer
Mr Billy Doyle – Caretaker
Mr Paddy Keogh – Caretaker
Ms Sharon Malone – Environmental Technician

Representing the Environmental Protection Agency:

Ms Ruth Barrington – Inspector
Ms Pauline Gillard – 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.	**Coagulation, Flocculation and Clarification (CFC)** a. The incoming raw water is split between two streams directed to two banks of clarification and rapid gravity filtration treatment representing the original plant set up with an adjacent newer (approximately 1980's) extension. The newer side of the plant receives a greater hydraulic load. b. The coagulation phase involves alum and polyelectrolyte dosing following acid dosing for pH correction. The contact time for alum and polyelectrolyte prior to clarification was unknown during the audit but is acknowledged as being inadequate. There is an action programme to install an additional flocculation tank to provide additional contact time. c. The CFC stage at Sion Cross WTP is relied upon to assist in uranium removal, requiring good control over the pH of the water. Acid dosing was introduced in 2012 to achieve this and the target for the CFC stage is pH 6.7. d. Dosing at the plant at the time of the audit was manual and largely based on caretakers' experience along with detailed logs maintained of previous dose changes, although jar testing has been undertaken from time to time. e. Automated chemical dosing was in the process of being provided at the plant at the time of

	the audit. The equipment had been installed with commissioning due to start on 20/02/2017. Automated dosing will assist in the operation of responsive dosing at all hours during plant operation and is an important upgrade given the variable raw water quality of the river source. f. During the audit a build-up of algal growth was observed on the walls of the clarifier tanks despite a cleaning schedule for the tanks being in place. g. An assessment of the aluminium levels in final treated water at Sion Cross was made by the audit team following the audit. The levels present during the period examined were compliant and do not indicate excessive carryover of aluminium from the treatment process. This also indicates that the CFC stage was operating well during the period examined.
2.	**Raw Water Sources and Capacity** a. At the time of the audit, the three sources contribute to the Carlow Town PWS as follows: Rathvilly provides 4,560 m3 /day; Sion Cross provides an average of 3,200 m3/day and the Oakpark Wellfield 500 m3/day. b. The design capacity of the Oakpark Wellfield is approximately 1,000 m3/day but due to consumer complaints relating to water hardness in the areas served by the Oakpark water, the abstraction from this source is not been maximised. Since the introduction of the wellfield, a large commercial user has ceased trading which has decreased the demand on the supply.
3.	**Treated Water Storage and Distribution Network** a. There are three reservoirs on the Carlow Town PWS, all located at Brownes Hill, which are used to mix and store water from the Rathvilly and Sion Cross sources. All three reservoirs are interconnected, but little is known about the flows and blending proportions between the three reservoirs. b. Treated water from Sion Cross WTP is directed to the Brownes Hill Reservoirs (Reservoir 1). Treated water from Rathvilly enters Reservoir 3. c. All water produced at Sion Cross is blended with other treated water from Rathvilly or Oakpark. No consumers are supplied direct from Sion Cross. d. The water supply to Carlow town is supplied via two mains serving different areas of the town, the 9" main leaving Reservoir 2, and the 16" main leaving Reservoir 3. e. During the audit, plans for improving the blending of the treated water streams were discussed. There is potential to re-route the layout of pipework at the reservoirs, to blend incoming water from Sion Cross and Rathvilly directly into Reservoir 3, from where the existing 16" main would remain in service. Blended water would also be returned to Reservoir 2 to supply the 9" main.
4.	**Monitoring and sampling programmes** a. Carlow County Council (and since 2014, Irish Water) have had a monitoring programme in place for uranium in the raw, treated, and the two lines of blended treated water for Carlow town for many years. The results of the monitoring carried out between 2012 and 2017 to date were examined by the audit team during the audit. b. Meetings are held on a quarterly basis attended by Carlow County Council, Irish Water and the HSE, to inform the HSE of the uranium monitoring results. c. The results of the monitoring show levels of uranium in the raw water from the River Burren exceeding the World Health Organisation provisional guideline value of 30 µg/l on occasions. The beneficial impact of treatment at the plant is also shown, with uranium in final treated water in most cases less than 30 µg/l. All water is blended prior to supply such that the levels were less than 30 µg/l. d. Finally, the monitoring results indicate a difference in uranium levels in areas of town served by the 16" main and the 9" main, with the 9" main areas having higher levels. e. The results in each of the samples at consumers' premises, both those served by the 16" and 9" mains, were less than 30 µg/l and thus below the World Health Organisation

	provisional guideline value.
5.	**Management and Control** a. Much of the control measures at the plant were made on a manual basis at the time of the audit, although the plant start-up is based on reservoir level and thus operates outside business hours. b. As mentioned above, automated dosing facilities are in the process of being provided at the plant. c. Raw water monitoring is also in place giving continuous data on pH, flow, turbidity, colour and ammonium, however no automatic plant actions were based on this information at the time of the audit. d. Staff described the abstraction source, the River Burren, as variable especially in reaction to periods of heavy rain.

3. AUDITORS' COMMENTS

The audit team acknowledges that there is no evidence to suggest that water supplied in the Carlow Town Public Water Supply was above the World Health Organisation provisional guideline value of 30 µg/l. In addition, the analysis carried out by the EPA's Office of Radiation Protection and Environmental Monitoring (ORM) laboratories showed that the water is safe for human consumption from a radiological perspective.

However, the raw water abstracted from the River Burren has elevated naturally occurring levels of uranium. It is important that these continue to be managed at levels less than the World Health Organisation provisional guideline value of 30 µg/l. The audit team consider that a better safety margin could be provided by improved control over the mixing and blending ratios of the individual sources for the supply, two of which have significantly lower levels of uranium than does the water treated at Sion Cross.

4. RECOMMENDATIONS

Blending of Treated Water

1. Irish Water should prepare and implement an action programme to optimise the blending and ratios of water from the three sources in order to maintain levels of uranium below the World Health Organisation guideline value in the Carlow Town Public Water Supply. This action programme should set out the specific measures and timescales to be achieved, considering both physical works to re-route pipework serving the reservoirs and the proportion of each source in supply. The monitoring of the impact of the works should also be provided for in the action programme.

Coagulation, Flocculation and Clarification

2. Irish Water should continue the works in progress and planned at the Sion Cross WTP to provide automated chemical dosing and a separate flocculation tank respectively.

3. Irish Water should ensure that the clarifier tanks are cleaned on a regular basis to prevent build-up of algae on the walls of the clarifier.

Management and Control

4. Irish Water should carry out an assessment, following commissioning of the automatic dosing facilities, to determine the feasibility of introducing other control measures, in particular automatic plant shut down in response to deteriorating raw water quality.

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.

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:** 21/02/2017

Ruth Barrington

Inspector