Drinking Water Audit Report

County:	Wexford	**Date of Audit:**	24th July 2014
Plant(s) visited:	Sow Regional (Kilmallock plant and Ballynellard)	**Date of issue of Audit Report:**	1st September 2014
		File Reference:	DW2012/58
		Auditors:	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 Report on *The Provision and Quality of Drinking Water in Ireland*. • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **The disinfection system in the Ballynellard portion of the Sow Regional Supply is not in accordance with *EPA Advice Note Number 3. E.coli in drinking water*;**
   a. **The arrangement of the chlorine day tank is not optimal and the dilution of sodium hypochlorite is not prepared accurately**
   b. **The rate of chlorine dosing (fixed or flow proportional) is unknown.**
   c. **The performance of the chlorine monitor is unknown.**
   d. **There is no automatic switch over between the duty and standby chlorine dosing pumps.**
   e. **The effective chlorine contact time to the first consumer is unknown.**

   Irish Water must as a priority ensure that the disinfection system, at this and at all treatment plants under its control, is in accordance with EPA guidelines.

ii. **Further improvements to the supply including source protection works in the Sow catchment improved access to Scada information, integrity testing, inspection and cleaning or reservoirs, a regular programme of uni-direction flushing and scouring and a review of chemical coagulant dosing should be progressed.**

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 supply was placed on the EPA Remedial Action List in 2009 for persistent aluminium exceedances. Where the text refers to the Water Service Authority this refers to Irish Water in accordance with Section 7 of the Water Services (No. 2) Act 2013.

The Sow Regional supply serves 4,200m^3/day to a population of 9,500. The sources of the supply are the Sow River serving the Kilmallock treatment plant which supplies three reservoirs and most of the area of the water supply and the Ballynellard borehole which serves a small portion of the supply. Treatment of the Sow River comprises coagulation, settlement, rapid gravity filtration, chlorination and fluoridation. The Ballynellard borehole is disinfected with sodium hypochlorite and treated with fluoride. The Kilmallock plant was built in the 1940s and is operating as per the original design apart from the addition

of lamellae plates to the clarifiers. The design capacity is unknown. It is currently operating at 130m^3/hr. the Ballynellard borehole was drilled in 2005 and serves 700m^3/day directly into supply (no reservoir).

The opening meeting commenced at 13:45 at Kilmallock treatment plant. The scope and purpose of the audit were outlined. 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.

Representing Irish Water: (* indicates that person was also present for the closing meeting)

Name – Job Title

Kieran Cullinane, Irish Water Above Ground Level Lead*

James Whelan, Senior Executive Engineer, Operations, Wexford County Council*

Paul Delahunty, Quality Engineer, Wexford County Council*

Mark Redmond, Caretaker, Wexford County Council*

Tony Quirke, Area Engineer, Wexford County Council*

Representing the Environmental Protection Agency:

Name – Job Title

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.	**Source Protection** a. The intake point at the Sow River was inspected. The abstraction rate is 130m^3/hour for 24 hours per day. b. Two boreholes at the plant supply about 600m^3/day. The boreholes are capped, sealed and housed in concrete chambers with locked hatches. Borehole water is treated with chlorine and fluoride only and blended with treated river water prior to entering supply. c. Agricultural activity in the catchment is mainly grazing of sheep and tillage. d. The Cryptosporidium risk assessment score is 114 – very high risk. e. Wexford County Council (WCC) has not written to farmers in the catchment to inform them of the drinking water abstraction from the Sow river. Landspreading buffer zones have not been delineated as per the Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014). f. Daily raw water monitoring of pH, colour and turbidity is done manually g. 700m^3/day (40m^3/hour 24 hours per day) is abstracted from the Ballynellard borehole which serves a discrete part of the Sow Regional supply including Blackwater to the north of the supply. Ballynellard borehole water does not enter a reservoir and is not blended with the rest of the supply. The borehole was drilled in 2005 and is capped, sealed and housed in a locked concrete chamber.
2.	**Coagulation, Flocculation and Clarification** a. Automatic dosing is based on raw water colour and feedback from final water aluminium levels. Dosing of 8% aluminium sulphate, at the pipe entering the mixing tank, is at the rate of 92mg/l (9 litres/hr). Mixing time is 24 seconds plus the size of the mixing tank (not yet calculated by Irish Water/WCC). Dosing of 0.1% polymer is at a rate of 7 gallons/hr at the outlet of the mixing tank. b. Lamellae plates were added to the two hopper bottomed clarifiers about 20 years ago to increase surface area. c. The channels are cleaned daily and the clarifiers are cleaned out once a month. d. The sludge blanket appeared very stable but there was some floc visible high in the clarifier. WCC said this was as a result of the recent very sunny weather.

	e. The sludge bleeds are every 40 minutes for 1 minute and 40 seconds. This is adjusted in winter to every 30 minutes for 1 minute and 40 seconds.
3.	**Filtration** a. Three rapid gravity filters are backwashed daily. The walls of the filter are cleaned daily. Due to the pressure on the plant to keep reservoirs full it was not possible to observe a backwash of a filter during the audit. b. The caretaker stated that Filter No. 1 had an uneven air scour and that cracks were visible on the surface of the filter. The sand was replaced in Filter No. 1 in 2013, in Filter No. 3 in March 2014 and the sand in Filter No. 2 has yet to be replaced.
4.	**Chlorination and Disinfection** a. Disinfection at the Kilmallock plant is by chlorine gas. Duty and standby cylinders with automatic switchover are operating. There is a single chlorine dosing unit and a standby chlorine dosing unit that is switched over manually. The chlorine monitor has a low alarm of 0.9mg/l and a low low alarm of 0.6mg/l and no high level alarms. The alarms dial out to the caretaker, supervisor and area engineer. There is no cascade system in place. b. Disinfection at the Ballynellard treatment plant is 10/11% sodium hypochlorite. The chlorine day tank has a capacity of 1600 litres. A sodium hypochlorite solution of about 1:10 is made up by hand by mixing 1 drum (25 litres) with 200 litres water (measured by eye according to the graduations of the day tank). About 200 litres of this solution is used each week. In effect one drum of neat 10/11% sodium hypochlorite is consumed per week. It is not known whether chlorine dosing is fixed or flow proportional. There is a duty and standby chlorine dosing pump but no automatic switchover from duty to standby pump in the event of a failure of the duty pump. There is no chlorine monitor in the Ballynellard portion of the supply. WCC stated that a chlorine monitor is installed at the Blackwater waste water treatment plant. The alarm set point on the chlorine monitor is unknown. The alarm dial out set up is unknown. The caretaker has never received an alarm from the chlorine monitor. The effective chlorine contact time to the first customer in the Ballynellard portion of the supply is unknown.
5.	**Treated Water Storage and Distribution Network** a. The Sow Regional supply has three reservoirs (Ballymurn Tower, Screen 1 and Screen 2) all built in the 1970s. It was not known when these three reservoirs were last inspected or cleaned. Flushing is done in response to complaints about the quality of the water or where chlorine levels in the network become reduced. b. WCC plan to commence a programme of uni-directional flushing county-wide including the Sow Regional supply. The programme will implemented outside of the tourist season to avoid the period of high demand during the summer months.
6.	**Monitoring and Sampling Programme for treated water** a. Daily monitoring of final water pH is done manually. b. 5 *Cryptosporidium* samples have been taken in 2014 and all were clear of *Cryptosporidium*.
7.	**Exceedances of the Parametric Values** a. The Sow Regional supply was placed on the EPA Remedial Action list in 2009 for persistent aluminium exceedances. b. Aluminium results for 2014 are all compliant with the aluminium standard Drinking Water regulations and many were less than 20ug/l.
8.	**Chemical storage and bunds** a. Four unbunded 10/11% sodium hypochlorite drums were observed at the Ballynellard treatment plant.

10.	**Management and Control** a. Review of Scada results during the audit was hampered by a slow internet connection.
11.	**Monitoring and Sampling Programmes for Treated Water** a. A continuous final water aluminium monitor is in place at the Kilmallock plant. b. The caretaker takes residual chlorine readings at the Ballynellard treatment plant. They are typically between 0.2 and 0.4mg/l. The network served by the Ballynellard borehole is sampled by WCC.

3. AUDITORS COMMENTS

The disinfection system in the Ballynellard portion of the Sow Regional Supply is not in accordance with *EPA Advice Note Number 3. E.coli in drinking water*. Irish Water must as a priority ensure that the disinfection system, at this and at all treatment plants under its control, is in accordance with EPA guidelines. Further improvements to the supply including source protection works in the Sow catchment improved access to Scada information, integrity testing, inspection and cleaning or reservoirs, a regular programme of uni-direction flushing and scouring and a review of chemical coagulant dosing should be progressed.

4. RECOMMENDATIONS

Source Protection

1. The Water Services Authority should implement the requirements of the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)* to ensure, unless an alternative setback distance has been set as per Article 17 that:
    i. Organic fertiliser or soiled water is not applied to land within 200 m of the abstraction point; and
    ii. Farmyard manure held in a field prior to landspreading is not placed within 250 m of the abstraction point.

2. The Water Services Authority should examine the appropriateness of the setback distances in the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)* for the source of the supply. The Water Services Authority should have regard to the EPA guidance on alternative setback distances.

Coagulation, Flocculation and Clarification

3. The Water Services Authority should review the mixing chamber to ensure that there is adequate mixing and contact time of the coagulant/coagulant aids prior to entry into the clarifier.

4. The Water Services Authority should undertake a review of the coagulation / flocculation processes at the water treatment works by way of a review by Irish Water process optimisation personnel. The review should take account of the recently published EPA Advice Note 15: Optimisation of Chemical Coagulation Dosing at Water Treatment Works available online at http://www.epa.ie/pubs/advice/drinkingwater/dwadvicenote15.html.

5. The Water Services Authority should review the operation of the clarifier to ensure that the clarifiers are not being operated under conditions above the design capacity of the clarifier.

Filtration (General)

6. The Water Services Authority should replace the media in Filter 2.

7. The Water Services Authority should review the performance of each of the three filters, investigate the cause of the cracks in the filter media and should take appropriate action to optimise the operation of the filters.

Disinfection

8. The Water Services Authority should review the contact time for chlorine disinfection to ensure that the effective contact time achieved is 15mg.min/l and that the first connections in the Ballynellard portion of the supply are receiving appropriately disinfected drinking water. The Water Services Authority should submit a calculation of the effective contact time to the Agency.

9. The Water Services Authority should install a continuous chlorine residual monitor on the final water in the Ballynellard portion of the supply and this monitor should be alarmed and linked to a recording device to ensure that either a sudden increase in chlorine demand or a failure of the chlorine dosing system is immediately detected.

10. The Water Services Authority should install automatic switch over between duty and standby chlorine dosing units with in the event of the failure of one of the dosing units at both the Kilmallock and Ballynellard treatment plants.

11. The Water Services Authority should ensure that dosing of chlorine is flow proportional or is linked to the residual chlorine monitor at the Ballynellard treatment plant. Where the dosing pump is fixed the Water Services Authority should replace the pump(s) with flow proportional pumps or pumps capable of dosing based on the residual chlorine monitor.

12. The Water Services Authority should review the preparation of sodium hypochlorite in the Ballynellard treatment plant and the capacity of the chlorine day tank and ensure that a record is kept each time a fresh batch of chlorine disinfectant is prepared. Records should include date of preparation, dilution factor used, quantity prepared, name of person who prepared disinfectant and details on whether the neat disinfectant used is produced in accordance with an appropriate IS:EN or BS:EN standard or are on the *List of Approved Products and Processes* as published by the Drinking Water Inspectorate of England and Wales (www.dwi.gov.uk).

13. The Water Services Authority should ensure that the chlorine monitor and/or handheld chlorine analyser are regularly maintained and calibrated in accordance with the manufacturer's instructions.

Treated Water Storage and Distribution System

14. The Water Services Authority should carry out an integrity assessment of the three service reservoirs to ensure that there is no ingress into the reservoirs.

15. The Water Services Authority should ensure that the three service reservoirs are inspected and cleaned out on a regular basis and any maintenance and repairs completed as soon as possible after the need has been identified.

16. The Water Services Authority should instigate a regular programme of uni-directional flushing and scouring of the mains.

Chemical Storage and Bunds

17. The Water Services Authority should review chemical storage arrangements at the Ballynellard treatment plant. Chemicals must be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein. Fill points for storage tanks inside the bunds should be within the bunded area. Refer to EPA guidance document –"*IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*".

18. The Water Services Authority should put a system in place so that stocks of reagents and chemicals kept on-site are regularly checked to see if they are in date.

Management and Control

19. The Water Services Authority should ensure that all monitors are linked to recording devices and, where appropriate, alarmed. A procedure should also be put in place defining the actions to be taken in response to the different levels of alarm.

20. The Water Services Authority should implement a cascade system for all significant alarms to ensure that alarms are responded to promptly and effectively.

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: Yvonne Doris **Date:** 1st September 2014

Yvonne Doris

Inspector