Drinking Water Audit Report

County:	Tipperary	**Date of Audit:**	04/07/19
Plant(s) visited:	Galtee Regional (Scheme Code 2900PUB0130)	**Date of issue of Audit Report:**	11/07/2019
		File Reference:	DW2019/105
		Auditors:	Ms. Criona Doyle
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended*. • *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. • The recommendations in the audit report of 24/11/2015.		

MAIN FINDINGS

i. **The aluminium and turbidity exceedances in Galtee Regional Public Water Supply on 5th and 6th June 2019 were caused by rapid changes in raw water quality following an intense rainfall event, which caused problems with the clarification process at the treatment plant. This resulted in destabilisation of the sludge blanket and carryover of aluminium into the final treated water.**

ii. **The switch over to an upgraded automatic coagulation dosing system, based on pH and colour bands rather than raw water DOC levels, has not yet been implemented because the current PLC system cannot facilitate the changeover.**

iii. **A number of recommendations from the previous EPA audit in November 2015 have not been implemented at Galtee Regional Water Treatment Plant. These include recommendations with respect to filtration and the installation of an automatic raw water shut off in response to high turbidity in the stream sources.**

1. INTRODUCTION

Under the *European Union (Drinking Water) Regulations 2014 as amended* 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 in response to the notification by Irish Water dated 05/06/19 of the failure to meet the aluminium parametric value in the Galtee Regional Public Water Supply (PWS) on 05/06/2019. A further notification was received on 13/06/19 of the failure to meet the aluminium parametric value on 06/06/2019 and the turbidity value on 05/06/19.

The Galtee Regional public water supply provides a daily volume of approximately 8,373m^3/d and serves a population of 11,436. Raw water is abstracted from the Muskry Stream and the College Stream. Treatment includes coagulation, flocculation, clarification, filtration, disinfection (chlorination),

fluoridation and pH correction. The plant was constructed in 1951 and serves the area extending from Emly to Cashel.

The opening meeting commenced at 10:30am at the Galtee Water Treatment Plant (WTP) at Rossadrehid. 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:

Pat Duggan – Compliance Specialist
Catherine Rice – Compliance Analyst
Colin Cunningham – Water Engineer
Duane O'Brien – Operations
Teresa Burke – Compliance

Representing Tipperary County Council:

Brid Whelan – Acting Executive Chemist
Sharon O'Dwyer – Process Technician
Ailbe Grace – Caretaker
Joe Burke – Executive Engineer

Representing the Environmental Protection Agency:

Criona Doyle - 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.	**Exceedances of the Parametric Values** a. On 05/06/19 the EPA was notified of an exceedance of the aluminium parametric value (700 µg/l compared to 200 µg/l) in the treated water at the Galtee Regional WTP from a sample taken on 05/06/19. The likely cause of the exceedance was indicated as chemical dosing issues and carryover in response to a flood event on 04/06/19. Rapidly changing raw water quality can give rise to issues with the coagulation process at the Galtee WTP which results in destabilisation of the sludge blanket and carryover of aluminium. b. On 04/06/19 at 18:28 the low chlorine alarm was triggered and was responded to by the caretaker who reset the booster chlorine dosing pump by 21:00. c. At 07:00 on 05/06/19 the aluminium level in the final treated water at the WTP was 700 µg/l and the turbidity 1.46 NTU. At 08:00 the colour monitor was reading 19 hazen. This rose to 233 hazen by 10:30 with a settled water turbidity of 6.45 NTU. The caretaker tried to adjust the soda ash dosing to improve the coagulation process. It is not possible to adjust the aluminium sulphate dosing rate as this is locked into the DOC algorithm. At 16:00 the aluminium level in the final treated water was 804 µg/l. d. Sampling was carried out in the network and flushing undertaken on 05/06/19 in response to the elevated aluminium measured in the treated water at the WTP. An aluminium level of 656 µg/l was recorded in Bansha Village and 684 µg/l in Rossadrehid. A *Cryptosporidium* sample was also taken at the plant in response to the potential loss of the *Cryptosporidium* barrier. *Cryptosporidium* was not detected. Microbiological samples were also undertaken. e. The HSE were consulted with respect to the possible loss of the *Cryptosporidium* barrier, the elevated turbidity and the low residual chlorine levels detected at sampling locations in the network on 05/06/19. f. Further sampling was undertaken on the network on 06/06/19 which indicated a reduction in

	the aluminium level in Bansha village (210 µg/l). The final treated water aluminium level had returned to 110 µg/l on 07/06/19. g. Irish Water have indicated that the cause of the exceedance was intense rainfall and high DOC values entering the treatment plant. h. There is no online aluminium monitor at the WTP. Daily tests are undertaken on site and results recorded on the daily logbook. i. In September 2016 Irish Water had outlined that it was proposed to install a colour monitor in place of the DOC probe to control alum dosing. While the algorithm has been developed to control dosing using both colour and pH bands the current PCL system cannot accommodate the new algorithm due to a coding issue. At the audit Irish Water outlined that any changes to the current PLC system will also need to be compatible with the proposed upgrade works under the disinfection programme. This is leading to a delay in the work taking place.
2.	**Coagulation, Flocculation and Clarification** a. The raw water from the Muskry and College stream is mixed prior to treatment. b. The settled water (raw) turbidity alarm is set at 1 NTU which generates a text alert but there is no automatic raw water shut off valve. c. Soda ash dosing (6%) takes places to ensure the correct pH for optimal coagulation and dosing is automatically controlled. d. Aluminium sulphate (8%) is used as the coagulant and is automatically dosed based on the raw water DOC readings. e. A new static mixer was installed in 2015. f. A flocculation tank was installed in 2018 to assist with coagulation. A contact time of 28 minutes (based on flow 400m^3/hr) is now provided. g. Poly aluminium chloride (PAC) 0.14% is used as the coagulant aid and dosed at 0.2mg/l. Dosing takes place after the flocculation tank. h. There are 5 no. hopper bottomed settlement tanks with lamellae plates. i. The decanting channels are cleaned on a daily basis. The tank walls and lamellae plates are washed down every three months. j. The decanting channels were level and clean and no floc carryover was visible. k. The design treatment capacity of the plant is 500m^3/hr but the throughput at the plant is limited to 400m^3/hr due to the levels of the tanks. l. Sludge bleeds are set for a duration of 15 seconds every 700 seconds. m. It is proposed to switch over to automatic dosing of the coagulant based on colour and pH (rather than raw water DOC levels) to provide better control of coagulation in response to rapidly changing colour and turbidity in the raw water linked to rainfall events. The dose bands have been developed but the installation of a new PLC system is required.
3.	**Filtration** a. There are 12 no. rapid gravity filters on site. There are no filter sand depth markers in place. The filter media was last replaced in 2009. An assessment of the filters has recently been completed and is currently being reviewed by Irish Water. b. Automatic backwashing of the filters takes place on a timed basis (every 12 hours). There is no automatic backwashing linked to head loss or turbidity. c. A backwash of filter No. 10 was observed. An even air scour was observed and no dead zones were noted. d. An online continuous turbidity monitor is in place on each individual filter and on the combined filtered water. At the audit the following turbidity levels were observed Filter No. 1 0.03 NTU; Filter No. 2 0.04 NTU; Filter No. 3 0.03 NTU; No. 4 0.03 NTU: No. 5 0.03 NTU; No. 6 0.03 NTU; No. 7 0.03 NTU; No. 8 0.03 NTU; No. 9 0.03 NTU; No. 11 0.04 NTU; No. 11 0.04 NTU and combined filtered water 0.06 NTU. The turbidity monitor on Filter No. 10 was not working at the time of the audit and was displaying 0.00 NTU. e. The high-level turbidity alarm is set at 0.5 NTU on the combined filtered water turbidity. f. The automatic backwash sequence is 5 minutes air scour followed by 12 mins upwash with water. After backwashing a slow start of 7 to 8 minutes is provided. g. The turbidity trends are only available to view on the on-site PLC and are not on countywide SCADA.

	h. Soda ash 6% is dosed to provide pH correction of the final water. Duty and standby dosing pumps are provided and alarmed. The pH on the day of the audit was 7.38 pH units.
4.	**Disinfection** a. The site has been assessed under Irish Water's Disinfection Programme for County Tipperary. Irish Water are currently reviewing the design queries from the contractor prior to the scope of works being agreed. b. Sodium hypochlorite 14-15% is used for chlorination. Dosing is flow proportional and linked to the residual chlorine monitor on the outlet of the reservoir. c. Duty, standby and assist chlorine dosing pumps are in place. The pumps automatically changeover every 24 hours. d. 2 no. bunded bulk storage tanks are provided (3,000 litres each) providing 6 to 7 weeks supply in each bulk storage tank. e. The day tank is topped up daily. f. The residual chlorine target level at the WTP is 1.0 mg/l. The level on the day of the audit was 0.99 mg/l. g. The low-level chlorine alarm is set at 0.6mg/l. There is no automatic shutdown of the supply linked to the low chlorine alarm. h. Chlorine residuals are undertaken on the network on a daily basis and at the end of the network on a weekly basis.
5.	**Source Protection** a. The raw water intakes from the Muskry and College stream were inspected. Both intakes are fenced off however some sections of the palisade fencing have been removed/vandalised at the Muskry intake and the gate has been removed at the College Stream intake. The access hatch at the College stream intake was not locked. Both intakes are inspected every two days and the screens cleaned. b. The land surrounding both intakes is forested and in the ownership of Coillte. c. The *Cryptosporidium* risk score is 64 (moderate risk). d. Online monitoring of the raw water includes colour, DOC, pH and turbidity.
6.	**Treated Water Storage and Distribution Network** a. The reservoirs supplied by the WTP were not inspected as part of the audit. All reservoirs served by the supply are on the Irish Water reservoir cleaning programme.
7.	**Monitoring and Sampling Programme for treated water** a. The treated water monitoring results were reviewed and were satisfactory with all exceedances notified.
8.	**Chemical storage and bunds** a. All chemical storage tanks were bunded. b. The lime silo is not currently in use due to health and safety issues. The final pH correction is being undertaken using soda ash.
9.	**Management and Control** a. Good record keeping was observed. b. There was good signage and labelling of all equipment at the WTP.
10.	**Previous Audit** a. An audit of the Galtee WTP had previously been undertaken by the EPA in November 2015. The recommendations relating to filtration (Audit Report DW2015/156 – Recommendation No. 5, 6 and 7) have not been implemented. Irish Water had previously outlined (29/06/16) that these issues would be addressed when the coagulation issues were addressed. The installation of automatic raw water shut off valves was not undertaken as it had been considered that the replacement of the static mixer would resolve the coagulation issues.

3. AUDITORS COMMENTS

The audit found that Galtee Regional water treatment plant is well operated by a team of dedicated staff. The caretaker responded quickly to try to adjust the chemical dosing in response to the intense rainfall event on 04/06/19, however issues remain with respect to the coagulation process. Work has been undertaken to develop an upgraded automatic coagulation dosing system based on pH and colour bands to improve the coagulation process in response to rapid variations in raw water quality. The switch over to the new dosing bands has not taken place as the current PLC system cannot facilitate the changeover. Irish Water outlined that any changes to the PLC system will need to be compatible with the proposed upgrade works under the disinfection programme. This has delayed the implementation of the new dose bands.

The implementation of the new dosing bands is required without further delay. An action plan is required from Irish Water detailing the timeframe for completion of these works.

Since the previous audit in 2015 a new static mixer and flocculation tank have been installed to improve the coagulation process. However, a number of recommendations from the 2015 audit in relation to filtration and the installation of an automatic raw water shut off in response to high turbidity have not been implemented.

4. RECOMMENDATIONS

Coagulation, Flocculation and Clarification

1. Irish Water should submit an Action Plan with timeframes for the completion of the works associated with the switch over of the automatic coagulant dosing to the colour and pH based bands, to provide better control of coagulation in response to rapidly changing raw water quality during rainfall events.

2. Irish Water should assess the feasibility of installing an automatic raw water shut off linked to turbidity, to reduce the risk from turbid waters which destabilise the coagulation and clarification processes at the plant.

3. Irish Water should assess the feasibility of installing an online aluminium monitor on the final treated water, to allow for better operational control of the coagulation, flocculation and clarification processes.

Filtration

4. Irish Water should confirm if the recent assessment of the filter media condition and depth found that the filters meet the guidance specified in the EPA publication "Water Treatment Manual on Filtration". Provide an update to the Agency on any proposed remedial works and timeframes.

5. Irish Water should assess the following options, to allow for better management of the filtration processes:

    (i) initiating filter backwashes based on turbidity and head loss;
    (ii) allowing filters to run to waste for an appropriate period of time following backwashing; and
    (iii) bringing the filters back into service based on a specified turbidity set-point.

6. Irish Water should confirm that the issue with the online turbidity monitor on Filter No. 10 has been rectified.

7. Irish Water should assess the feasibility of linking the data from the turbidity monitors to SCADA.

Disinfection

8. Irish Water should assess the feasibility of installing automatic shutdown of the final treated water linked to the low chlorine alarm.

9. Irish Water should ensure that monitoring of the chlorine residuals at the end of the distribution network is undertaken several times per week, with results recorded and available for review.

Source Protection

10. Irish Water should ensure the fencing is repaired at both abstraction points and the sources are made secure.

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 Aoife Loughnane, Drinking Water Team Leader.

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: Fiona Doyle **Date:** 11/07/19

Inspector