



# Drinking Water Audit Report

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| <b>County:</b>           | Tipperary  | <b>Date of Audit:</b>                 | 2 <sup>nd</sup> November 2015          |
| <b>Plant(s) visited:</b> | Galtee Regional Water Treatment Plant  | <b>Date of issue of Audit Report:</b> | 24 <sup>th</sup> November 2015         |
|                          |  | <b>File Reference:</b>                | DW2015/156                             |
|                          |  | <b>Auditors:</b>                      | Ms. Michelle Roche<br>Ms. Yvonne Doris |
| <b>Audit Criteria:</b>   | <ul style="list-style-type: none"> <li>• The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)</i>.</li> <li>• <i>The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)</i></li> <li>• The recommendations specified in the <i>EPA Drinking Water Report</i>.</li> <li>• The recommendations in any previous audit reports.</li> </ul> |                                       |  |

## MAIN FINDINGS

- i. **Irish Water should optimise the management of the raw water received at the plant. Installation of automatic shut off valves on the raw water sources or a raw water balancing tank would enable the plant to completely avoid or deal more effectively with highly coloured and turbid water which occurs following heavy rainfall events.**
- ii. **Irish Water should consider the installation of a new static mixer and flocculation tank at the water treatment plant to improve coagulant contact time.**
- iii. **Irish Water should review the clarification process at the water treatment plant. Actions such as installing a cover on the clarifiers and removing retro-fitted lamellae plates may improve the stability of the floc blanket.**

## 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 in response to the notification by Irish Water dated 18/09/15 of the failure to meet the aluminium parametric value (as specified in Table C of Part 1 of the Schedule of the Regulations) in the Galtee Regional public water supply. Subsequent failures on dates between 21/09/15 and 25/09/15 were also notified to the Agency.

The Galtee Regional public water supply serves a population of 21,327 people with a volume of approximately 8,500m<sup>3</sup>/day of treated water. The supply is served by three water sources, the Muskry Stream, the Springmount wells and the College Stream, which is used as a supplemental water source in dry weather. Both surface water sources are located in within Coillte forestry land and treated at the Galtee Regional water treatment plant located in Rossadrehid, County Tipperary. Treatment at the water treatment plant consists of the following;

- pH correction with Soda Ash;
- Coagulation with Aluminium Sulphate;

- Clarification in 5 hopper bottomed settlement tanks;
- Filtration in 12 filters, 9 outdoor and 3 indoor;
- Disinfection with Sodium Hypochlorite; and
- Fluoridation.

Water from the Springmount wells is disinfected with Sodium Hypochlorite prior to distribution. The distribution network for the supply stretches across from Emly in south west Tipperary to Cashel and includes 9 reservoirs.

On 16/09/15 check sampling was carried out on the Galtee Regional supply following a period of heavy rainfall that occurred after a prolonged period of dry weather. An aluminium exceedance detected as part of the check sampling was notified to the EPA on 18/09/15. A process optimisation report produced by Irish Water following the exceedance concluded that in times of heavy rainfall the surface water sources become laden with organic matter from the forestry and surrounding peaty subsoil. The highly organic nature of the solids in the surface water resulted in an increased coagulant dose and an unstable floc blanket, which gave rise to aluminium exceedances in the final water.

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

The opening meeting commenced at 11.15am at the Galtee Regional 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.

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| <p>Representing Irish Water: (* indicates that person was also present for the closing meeting)</p> <p>Ms. Deirdre O’Loughlin – Water Compliance Specialist, Irish Water*</p> <p>Ms. Colette Moloney – Executive Chemist, Tipperary County Council*</p> <p>Ms. Áine Butler – Process Technician, Tipperary County Council*</p> <p>Mr. Joe Burke – Executive Engineer, Tipperary County Council*</p> <p>Mr. Pat Keating – Caretaker, Tipperary County Council*</p> <p>Mr. Ailbe Grace – Caretaker, Tipperary County Council*</p> <p>Mr. Flan Real – Assistant Scientific Officer*</p> <p>Representing the Environmental Protection Agency:</p> <p>Ms. Michelle Roche – Inspector, EPA</p> <p>Ms. Yvonne Doris – Inspector, EPA</p> |
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## 2. AUDIT OBSERVATIONS

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| <p><i>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.</i></p> |
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| <p><b>1.</b></p> | <p><b>Source Protection</b></p> <ol style="list-style-type: none"> <li>a. The raw water intake points from the Muskry and College streams were not inspected on the day of the audit, however it was confirmed that the intakes are fitted with single layer screens which are cleaned twice daily and both intake points are fenced off from animals.</li> <li>b. Automatic dissolved organic carbon (DOC) and turbidity monitors are installed on both</li> </ol> |
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|                  | <p>surface water intakes and manual pH readings of the raw water are taken daily at the plant. A turbidity of 2 NTU or greater will activate an alarm and alarms are responded to according to a cascade system. The alarm will not automatically shut-off the intake.</p> <p>c. The <i>Cryptosporidium</i> risk score for the Muskry Stream is low to moderate (64) and <i>Cryptosporidium</i> monitoring has been carried out on the Muskry Stream in the past.</p>  |
| <p><b>2.</b></p> | <p><b>Coagulation, Flocculation and Clarification</b></p> <ul style="list-style-type: none"> <li>a. Soda ash of 6% concentration is automatically dosed on the raw water using a duty standby dosing arrangement, to regulate the raw water pH for optimal coagulation. A pH of between 6.5 and 7.5 is aimed for and pH on the day of the audit was 7.4.</li> <li>b. The soda ash dose can be manually adjusted by the plant operators if necessary.</li> <li>c. Aluminium sulphate coagulant is automatically dosed on the raw water using a duty standby dosing arrangement. The dose is delivered by a feed-forward system based on raw water DOC readings and cannot be manually adjusted.</li> <li>d. At the time of the audit plant operators had concerns about the operation of the static mixer after the coagulant dose as it had not been replaced since 1998 and no inspection access was available. A new static mixer is due to be installed by the end of November and a temporary static mixer will be installed in the interim.</li> <li>e. No flocculation tank is in place at the plant.</li> <li>f. Poly of 0.15% is dosed at a single injection point after the flash mixer, using a duty standby dosing arrangement.</li> <li>g. The water treatment plant has five hopper bottomed settlement tanks which have been retro-fitted with lamellae plates. Lamellae plates are cleaned monthly and settlement tanks are fully cleaned annually.</li> <li>h. The floc blanket in the clarifiers was inspected during the audit. The floc blanket was observed to be high in the clarifiers and a certain amount of rise and fall (blanket movement) was occurring. Small particles of flocculant were observed to have floated to the surface of the water in the clarifiers (Photograph 1 and Photograph 2).</li> <li>i. Sludge bleeds are typically set at 600 seconds intervals and open for 30 seconds. Sludge bleed intervals can be manually adjusted by plant operators if required.</li> </ul> |
| <p><b>3.</b></p> | <p><b>Filtration</b></p> <ul style="list-style-type: none"> <li>a. The Galtee Regional water treatment plant has 9 uncovered filter beds located outdoors and 3 covered filter beds located indoors.</li> <li>b. Filter media depth is measured annually and media in all filters was replaced in 2010.</li> <li>c. Filter backwash is initiated on a time of 20 hours or on headloss and consists of 5 minutes air scour and 7 minutes upwash with water. Filters are brought back into use on a slow start of 6 minutes following a backwash.</li> <li>d. A backwash in Filter 5 was observed during the audit. An even air scour was observed and no dead zones were noted.</li> <li>e. Individual turbidity monitors are installed on all filters; however no alarm limits are set on the monitors.</li> </ul>   |
| <p><b>4.</b></p> | <p><b>Chlorination and Disinfection</b></p> <ul style="list-style-type: none"> <li>a. Sodium Hypochlorite of 14% concentration is dosed flow proportionately using a duty standby dosing arrangement.</li> <li>b. The chlorine day tank is filled every day from the main storage tank which is filled once a month. Both storage tanks are fully banded.</li> <li>c. Chlorine is dosed to achieve a chlorine residual reading of 0.9 mg/l or higher at the automatic chlorine residual monitor located at the reservoir outlet. A chlorine dose of 0.8 mg/l is sufficient to give a contact time of 15mg.min/l after the reservoir.</li> <li>d. The automatic chlorine monitor has a low alarm of 0.9 mg/l and a high alarm of 1.3 mg/l. Alarms are responded to according to a cascade system.</li> <li>e. Where a chlorine residual of less than 0.9 mg/l is detected at the reservoir outlet a chlorine booster pump will automatically activate to provide additional chlorine residual.</li> <li>f. Chlorine residuals are manually taken at the end of the network on a daily basis and</li> </ul>  |

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|           | recorded by the caretaker.  |
| <b>5.</b> | <p><b>Treated Water Storage and Distribution Network</b></p> <ol style="list-style-type: none"> <li>a. Treated water from the Galtee Regional water treatment plant is stored in an onsite dual-celled reservoir prior to distribution.</li> <li>b. The reservoir was constructed in 1999 and is due to be cleaned in 2016.</li> <li>c. All inspection hatches on the reservoir were sealed and locked.</li> <li>d. Air vents on the reservoir were covered in mesh; however the mesh was not fine enough to prevent access to insects and in some cases the mesh had come away from the sides of the vent openings.</li> </ol> |
| <b>8.</b> | <p><b>Management and Control</b></p> <ol style="list-style-type: none"> <li>a. It was highlighted during the audit that in all cases where a duty standby dose delivery arrangement was in place there was scheduled automatic switchover between the duty and standby pumps every 24 hours, but automatic switchover was not set-up to occur in the event of one pump failing.</li> </ol>  |

### 3. AUDITORS COMMENTS

The Galtee Regional water treatment plant was found to be extremely well managed by highly competent and dedicated staff. Considerable efforts have been made to investigate and address the issue of aluminium exceedances at the water treatment plant following heavy rainfall events that typically bring highly coloured and turbid water to the plant. Actions to address the issue were discussed between Irish Water, Tipperary County Council and the EPA during the audit and include; installation of automatic shut off valves on the raw water sources or a raw water balancing tank to enable the plant to avoid or deal more effectively with highly coloured and turbid water, installation of a new static mixer and flocculation tank at the water treatment plant to improve the contact time of coagulant dosed on the raw water and further investigation into optimisation of the clarification process. These actions are included in the Recommendations section of this audit report.

### 4. RECOMMENDATIONS

#### Source Protection

1. Irish Water should investigate installing automatic raw water shut-off valves on the Muskry Stream and College Stream in times of heavy rainfall to avoid dealing with the highly coloured and turbid waters which destabilise the coagulation and clarification processes at the plant.
2. Irish Water should investigate installing a raw water balancing tank at the water treatment plant to allow highly coloured and turbid waters a period of settlement before being introduced to treatment, reducing the turbidity of the raw water.

#### Coagulation, Flocculation and Clarification

3. Irish Water should review the coagulant mixing process to ensure that there is adequate mixing and contact time of the coagulant prior to entry into the clarifier. Irish Water should implement the following actions as discussed during the audit;
  - i. Install a new static mixer after coagulant dosing; and
  - ii. Install a flocculation tank at the water treatment plant.
4. Irish Water should review the operation of the clarifiers to ensure that they are operating as effectively as possible and producing a stable floc blanket. The following items should be reviewed;
  - i. The installation of a cover on the clarifiers to reduce wind interference; and

- ii. The use of the retro-fitted lamellae plates in the clarifiers.

**Filtration (General)**

- 5. Irish Water should review the option of initiating filter backwashes based on turbidity readings.
- 6. Irish Water should review the option of allowing filters to run to waste for an appropriate period of time following backwashing and to bring filters back into service using turbidity readings.
- 7. Irish Water should ensure that all individual turbidity monitors installed on each filter are suitably alarmed with an alarm response procedure in place.

**Treated Water Storage**

- 8. Irish Water should ensure that all vents on the reservoirs are secured against ingress of animals and insects or deliberate introduction of any contaminant or acts of vandalism.

**Distribution System**

- 9. Irish Water should instigate a regular programme of flushing and scouring of the mains.

**Management and Control**

- 10. Irish Water should ensure that all chemical duty and standby dosing pumps are programmed to automatically switchover to the other pump in the event of failure of one of the pumps.

**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 Yvonne Doris, 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.

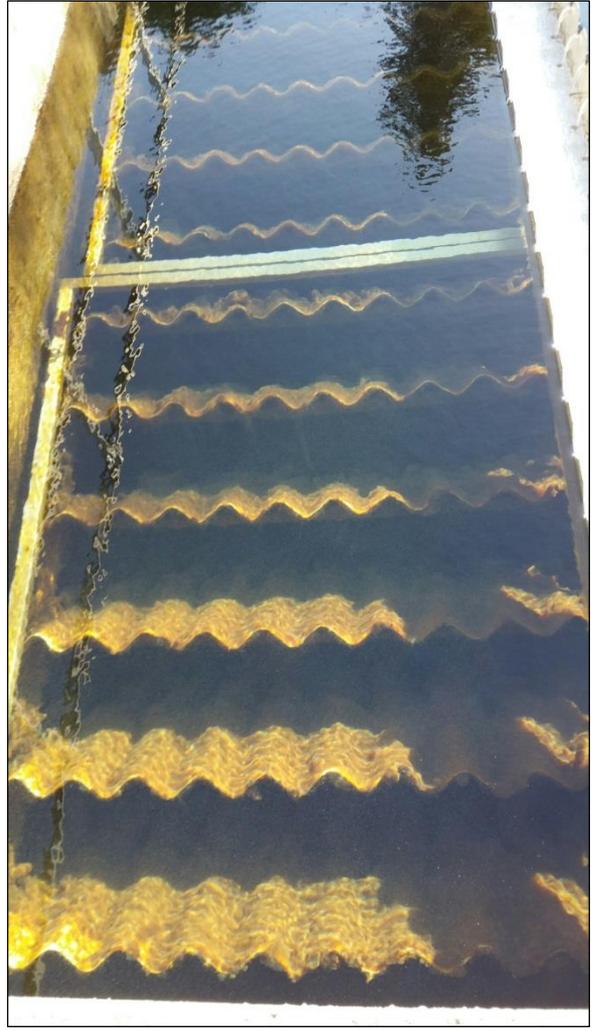
**Report prepared by:**  **Date:** 24<sup>th</sup> November 2015

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Inspector



Photograph 1: Floc on surface of water in clarifier



Photograph 2: Floc breaking off lamellae plates