

# Site Visit Report

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 to assess the performance of Irish Water in providing clean and wholesome water to the visited public supply.

The audit process is a sample on a given date of the facility's operation. Where a finding against a particular issue has been reported this should not be construed to mean that this issue is fully addressed.

Water Supply Zone	
<b>Name of Installation</b>	Bailieboro RWSS
<b>Organisation</b>	Irish Water
<b>Scheme Code</b>	0200PUB0102
<b>County</b>	Cavan
<b>Site Visit Reference No.</b>	SV19149

Report Detail	
<b>Issue Date</b>	14/02/2020
<b>Prepared By</b>	Derval Devaney

Site Visit Detail			
<b>Date Of Inspection</b>	12/12/2019	<b>Announced</b>	Yes
<b>Time In</b>	11:10	<b>Time Out</b>	16:45
<b>EPA Inspector(s)</b>	Derval Devaney Michelle Roche		
<b>Additional Visitors</b>			

<b>Company Personnel</b>	Irish Water: Pat O'Sullivan Yvonne McMonagle Peter Gallagher Francis Hughes (not present in afternoon of audit)  Cavan County Council: Declan Galligan Peter Crosby Emma McCarron Michael Heneghan Andrew Fannon Michael Divilly  HSE: Claire O'Dwyer
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## > Summary of Key Findings

1. The Bailieborough water treatment plant has serious deficiencies regarding management and control. These include a lack of turbidity and chlorine call out alarms and automatic plant shutdowns, a lack of automated chemical dosing to respond to changes in raw water quality and deficiencies in the filter backwash process. An upgrade to the plant was due for completion by the end of Q1 2019. The audit found these works had not progressed and a date for such works could not be provided during the audit.
2. Elevated Manganese levels in the lake source resulted in repeated manganese (Mn) failures since 9th October 2019 in water serving the Bailieborough PWS. The EPA was not notified of any Mn failures from 9th October to 1st December 2019.
3. Cavan County Council did not report the plant deficiencies and water quality failures to Irish Water and the Health Service Executive (HSE) when these occurred. This action prevented the HSE in determining the potential risk to human health posed to those consumers on the water supply in a timely manner.
4. Irish Water visited the site on 02/12/19 and discovered the matter of high turbidity and Mn failures at the plant, but there was a breakdown in communication of these issues within Irish Water. This meant the matter was not investigated in more detail, communicated to the HSE and the EPA and the appropriate risk to human health could not be assessed in a timely manner.
5. At the close of the audit the HSE decided to place a "Do Not Consume" Notice on the Bailieborough PWS to protect consumers' health until such time as the water quality is restored and adequate treatment plant systems and controls are in place.
6. Following the audit, Bailieborough PWS was added to the EPA's Remedial Action List for public water supplies in the Q4 2019 update, due to the treatment and management issues identified during the EPA audit.

## > Introduction

The Bailieborough public water supply serves a population of 7,785, with 2,686 m<sup>3</sup>/day treated water produced at the plant. The treatment comprises pH adjustment, manganese removal (via potassium permanganate), coagulation, flocculation, dissolved air flotation (DAF), rapid gravity filtration, chlorination and fluoridation. The raw water abstraction is from Skeagh Lough, a spring fed lake with neighbouring land use in mainly agricultural and woodland land use.

The purpose of the audit was to investigate the cause of the high number of complaints received by Irish Water regarding the Bailieborough water treatment plant. The audit focused on monitoring undertaken, communication of results, corrective action taken and the performance of Bailieborough water treatment plant.

## > Supply Zones Areas Inspected

The audit inspected the water treatment plant process from the intake point at the plant to the disinfection process. Monitoring results held on-site were also inspected and Cavan County Council and Irish Water staff were interviewed.

1.1

	Answer
Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No
<b>Comment</b>	
<ul style="list-style-type: none"> <li>• The Bailieborough Water Treatment Plant is operated by Cavan County Council (Co. Co.) under a Service Level Agreement with Irish Water. Any parametric failures or incidents occurring at the plant, which can potentially impact the final water quality, are required to be escalated by Cavan Co. Co. plant operational staff to management within Cavan Co. Co. and to Irish Water for investigation and action.</li> <li>• There were failures for Manganese (Mn) in the distribution network on 17/09/19 and 21/10/19 and repeated Mn failures in treated water leaving the plant from 09/10/19. There was a breakdown in the communication of these Mn failures between plant operational staff and management within Cavan County Council.</li> <li>• On 01/11/19 Cavan Co. Co.'s operational staff at the plant contacted Cavan Co. Co.'s Maintenance Team who called to the site and reinstated the potassium permanganate dosing system for Mn treatment that day.</li> <li>• However, Mn failures continued to occur in the final water throughout November (max. 374 ug/l vs. 50 ug/l parametric limit on 20/11/19).</li> <li>• On occasions during November the turbidity in the final water exceeded 1 NTU and this was not escalated within Cavan Co. Co. as a water quality incident.</li> <li>• On 20/11/19, Cavan Co. Co. alerted Irish Water to a Mn failure of 75 ug/l in the network in a compliance sample taken on 06/11/19. Irish Water generated an "Incident Notification Response" form alerting the HSE of the failure. However, due to a lack of information being provided by Cavan Co. Co., critical information was omitted; such as persistent Mn failures in the final water and network and high turbidity in the final which compromised the disinfection process. As a result, the HSE was unable to make an adequate assessment of the risk posed to public health. The HSE deemed the water safe to drink, as the Mn failure was deemed of low concentration and short-lived. The EPA was not notified of the failure, as Irish Water understood the Mn failure to be a once-off issue.</li> <li>• In parallel to the above treatment plant issues, routine and scheduled bi-annual mains flushing on the network commenced in Virginia from 28 Oct - 1 Nov and in Mullagh from 11 Nov - 22 Nov 2019. Advance notice for these works were placed on Irish Water's website.</li> <li>• From October 2019, Irish Water Customer Contact Centre received 96 complaints regarding the supply but did not escalate the high volume of complaints. Operational staff at the plant received the complaint details from Irish Water Customer Contact Centre and also received a number of complaints directly from the public regarding discoloured water. The operational staff at the plant stated all complaints received were responded to, and if required, distribution lines were flushed locally.</li> <li>• On 01/12/19 Irish Water received a call from Irish Water Customer Contact centre stating one complaint was received out of hours relating to Bailieborough PWS and was not responded to by Cavan Co. Co. Irish Water made contact with management in Cavan Co. Co.</li> <li>• On 02/12/19 Irish Water visited the treatment plant and reviewed the monitoring results and observed the persistent Mn failures and some turbidity failures &gt; 1 NTU at the plant's final water. The plant operational staff believed the elevated turbidity was due to the Mn reacting with the chlorine being dosed. Irish Water instructed that the chlorine dose be decreased. This decision was made without checking the Contact Time (Ct) Calculations to ensure adequate disinfection criteria was being met. There was a breakdown in communications within Irish Water in relation to compliance issues discovered on 02/12/19 at the plant.</li> <li>• On 03/12/19 the EPA received a complaint from a member of the public who stated that it complained to Irish Water twice about discoloured water but received no response. It stated that this matter has been on-going for weeks and was dissatisfied with the lack of communication and information regarding the matter. The EPA forwarded the complaint to Irish Water for investigation.</li> <li>• On 06/12/19 Irish Water notified two network failures for Mn taken on 02/12/19 (140 ug/l and 147 ug/l) to the EPA. Irish Water informed the EPA that there were issues with the potassium treatment system which was put in place in 2018 to treat high levels of Mn in the raw water.</li> <li>• On 11/12/19 Irish Water notified Mn failures in the network on 09/12/19, 10/12/19, 11/12/19 to the HSE and EPA.</li> </ul>	



## 2. Coagulation Clarification Flocculation (CFC) Stage

2.1

	Answer
Are the CFC processes appropriately controlled?	No
<b>Comment</b>	
<p>There are online raw water monitors for turbidity, pH and Temperature. Raw water is also monitored at the plant daily for TOC, iron and manganese. Colloidal and particulate manganese are not monitored in the raw water and throughout the treatment stages to determine if treatment needs to be adjusted to cater for the different fractions of manganese that exist in the water entering and travelling through the treatment processes.</p> <p>SCADA showed the raw and final pH meter readings did not record from 21 - 27 November 2019. Cavan Co. Co. stated that there was a communications issue between the monitors and SCADA.</p> <p>Caustic (Liquid Sodium Hydroxide 30%) is dosed into the raw water line prior to entering an on-site balancing tank for pH correction. The dose is not based on the raw water flows entering the plant (190 m3/hour) but instead is based on plant run time and throughput (150 m3/hour). This means when the raw water inlet pumps are shutdown, caustic continues to be dosed into the raw water line. This results in a misleading raw water pH reading. For e.g. SCADA showed levels of pH &gt; 9.5 from 19 - 21 November 2019 when the pH of the raw water is usually much lower entering the plant.</p> <p>Potassium permanganate is manually dosed into the raw water line, once the pH is corrected, on occasions when elevated manganese is present in the raw water. It was stated that a pH of 9 - 10 was optimum for potassium permanganate treatment. The manual dose means the treatment cannot automatically respond to changes in raw water quality. It was stated during the audit that if the levels of manganese exceed 500 ug/l in the raw water it will not be possible to dose the quantities of potassium permanganate required with the current system in place. Irish Water is reviewing the treatment process to bring about improvements to the final water quality but specific details could not be provided at the audit. Irish Water stated during the audit that it should be possible to reduce manganese levels to 5 ug/l leaving the plant. During the audit manganese remained elevated at 77 ug/l (vs. the parametric limit of 50 ug/l) in the final water which was brown in colour.</p> <p>Once the potassium permanganate is dosed it enters a balance tank. There was lack of clarity during the audit on the length of time water is stored in this tank. A period of 6 hours storage was estimated by Cavan County Council.</p> <p>Chemical dosing for the Coagulation, Flocculation and Clarification process is manually controlled (as opposed to an automated system which responds to changes in raw water quality). There are duty and standby chemical dosing pumps which automatically changeover every 24 hours. Liquid Aluminium Sulphate (8%) is dosed into the pipe exiting the balance tank and mixed with the aid of an inline static mixer. Polymer SNF FLOPAM AN905 is injected into the flocculation tank prior to entry into one of two DAF units. Two of the six poly injection points were observed to be blocked during the audit.</p> <p>The optimum coagulation pH is 5.7 but the online pH meter pre the DAF units was reading 6.08 during the audit.</p> <p>Irish Water's correspondence to the EPA on 19/09/18 (submitted under a now closed Mn file for this supply; EPA Ref. DW2017/186) stated the plant upgrade works (such as the provision of automated chemical dosing equipment to Irish Water's specification) were at an advanced stage and due for completion by Q1 2019.</p> <p>The auditors found that these proposed works had not commenced on-site, and Irish Water could not provide a date by when such works would commence at the plant.</p>	



### 3. Disinfection

3.1

Is the disinfection system verified using monitors and alarms, with trended data recorded and accessible?

**Answer**

No

**Comment**

There is a chlorine monitor on the final water which is linked to SCADA but it is not linked to a dial out alarm or automatic plant shutdown should the dose be inadequate.

The target chlorine dose and target residual chlorine in the final water was not known by Irish Water or Cavan County Council during the audit. Cavan County Council stated that the dosing system is arranged to dose based on the readout from the chlorine monitor and the final water flow. During the latter end of the audit the final water chlorine monitor (post the clear water tank) was reading 0.93 mg/l. The Plant Superintendent stated this reading varies and was reading 0.49 mg/l that morning.

Chlorine Contact Time Calculations were not available during the audit to determine if the chlorine dosing regime at the plant and the read out from the monitor was providing adequately disinfected water to the distribution network of the Bailieborough Public Water Supply.

The plant was surveyed under Irish Waters Disinfection Programme in January 2018. It was evident during the audit that proposed upgrade works have not commenced and Irish Water could not provide a date for commencement of these works. Irish Waters Q3 2019 Disinfection Programme update stated the disinfection upgrade will be complete at Bailieborough Water Treatment Plant by 01/12/2020. However the EPA has observed, with each passing quarterly update from Irish Water, the completion of such works has been delayed.



## 4. Reservoirs and Distribution Networks

4.1

	Answer
Is the distribution network adequately maintained to protect drinking water quality?	No
<p><b>Comment</b></p> <p>Operational monitoring was not routinely carried out in the distribution network on a frequent basis to ensure water is safe to drink. For example Manganese was only monitored monthly in September (on 17/09/19 Mn was 347 ug/l vs.50 ug/l) and October (on 21/10/19 Mn was 76 ug/l, 133 ug/l and 108 ug/l) despite failures being detected almost daily at the final water leaving the water treatment plant and in the network.</p> <p>The presence of Mn in the distribution network has also implications for other metals of concern such as the release of lead, arsenic, nickel, chromium and iron. Routine operational monitoring was not arranged for these parameters given the elevated concentrations of Mn persisting since October in the final water leaving the plant (max. Mn concentration in the final water was 374 ug/l on 20/11/19) and in the network.</p> <p>On 09/12/19 additional Mn failures in the network were submitted to the EPA taken on: 09/11/19 (77 ug/l; 177 ug/l and 183 ug/l); 10/12/19 (95 ug/l, 115 ug/l and 183 ug/l) and on 11/12/19 (134 ug/l and 195 ug/l). These samples were taken throughout Virginia, Mullagh and Bailieborough networks which are served by the Bailieborough PWS.</p> <p>At the time when turbidity was &gt; 1 NTU in the final water leaving the plant (for example 3.6 NTU on 11/11/19, 1.63 on 23/11/1 and 1.68 NTU on 26/11/19) and the disinfection treatment would have been compromised, monitoring for microbiological parameters was not carried out to determine if the water was safe to drink.</p>	



## 5. Management and Control

		<b>Answer</b>
5.1	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	No
<b>Comment</b>		
There is no automatic plant shutdown in place should the disinfection treatment system fail to provide adequately disinfected water or should the turbidity rise above 1 NTU in the final water.		

		<b>Answer</b>
5.2	Are relevant alarms dialled out via a cascade system to allow a timely response by plant operators?	No
<b>Comment</b>		
There is no dial out alarm with a cascade system in place for response to elevated turbidity post each individual filter and in the final water.		



## 6. Drinking Water Quality

	Answer
6.1 Have relevant failures to comply with the requirements of the European Union (Drinking Water) Regulations 2014, as amended, been notified to the EPA?	No
<b>Comment</b>	
<p>Cavan County Council plant operational staff did not notify management within Cavan Co. Co. of manganese and turbidity failures in the final water since October 2019 and manganese failures in the network since September 2019. When the matter was escalated within Cavan Co. Co. on 01/11/19, Irish Water was not informed to enable an investigation of the adequacy of the treatment processes on-site to ensure compliant water was leaving the plant.</p> <p>Irish Water was informed of an issue with water quality in Balieborough Public Water Supply by the Irish Water Customer Contact Centre on 01/12/19. This related to one complaint. There was a breakdown in communications within Irish water, which meant that the parametric failures and issues with the treatment system were not escalated following an Irish Water site visit to the plant on 02/12/19. This prevented an assessment of the risk to public health being carried out.</p> <p>On 03/12/19 the EPA received a complaint from a member of the public who stated that it complained to Irish Water twice about discoloured water but received no response. It stated that this matter has been on-going for weeks and was dissatisfied with the lack of communication and information regarding the matter. The EPA forwarded the complaint to Irish Water for investigation.</p> <p>The EPA was not notified of manganese or turbidity failures at the plant or in the network as soon as they were detected.</p>	

## Recommendations

Subject	Baileborough Audit Recommendations	Due Date	20/01/2020
Action Text	<p><b>Recommendations</b></p> <ol style="list-style-type: none"> <li>1. Irish Water and Cavan County Council should review their managerial and operational structures and procedures to ensure the reporting of exceedances and incidents, which could potentially impact the quality of water produced at Baillieborough water treatment plant, so relevant persons and parties (e.g. Irish Water, HSE, EPA) are notified in a timely manner.</li> <li>2. Following an incident or exceedance of a parametric value, Irish Water and Cavan County Council should ensure that all relevant information is provided in a timely manner to allow the HSE to determine if the water supply presents a risk to public health, and if consumers need to be informed promptly thereof and given the necessary advice.</li> <li>3. Irish Water should ensure appropriate alarms and automatic plant shutdowns are in place and are operating effectively. Such alarms and shutdowns should be linked to the plant SCADA system and have a cascade call-out system to alert plant operators to any malfunction of the water treatment process, incident or parametric value failure and allow for response without delay. Irish Water should ensure the turbidity monitor on each filter is alarmed and inked to a cascade alarm response system so that appropriate action is taken promptly to ensure water entering the distribution system is not compromised.</li> <li>4. Irish Water should review its internal communications procedures to ensure that when a high volume of complaints relating to a water supply are received, they are communicated to the relevant persons promptly so the matter can be investigated. This procedure should include how external contractors, who handle complaints and queries on behalf of Irish Water, manage and escalate such queries and complaints.</li> <li>5. Irish Water's website should provide information to its consumers that accurately reflects the nature of water quality issues. If there is an issue with the water treatment plant, this should be stated and appropriate advice provided with a timeline for resolution.</li> <li>6. Irish Water should provide a scope and revised timeframe for the upgrade works, as was proposed in its correspondence to the EPA dated 19/09/18 and 26/01/18. In addition to those works proposed in 2018, the upgrade works should also ensure:               <ol style="list-style-type: none"> <li>i. accurate raw water pH monitor readings are taken and recorded and optimum pH for potassium permanganate and coagulation is met;</li> <li>ii. automated chemical dosing systems are in place to respond to changes in raw water quality;</li> <li>iii. the coagulation process is optimised to address floc carryover from the DAF treatment process;</li> <li>iv. the filtration process is optimised to ensure adequate backwash rates are in place, the backwash process is linked to readings from the filter's online turbidity monitors, and there is a run to waste facility in place;</li> <li>v. the disinfection upgrade works are implemented to Irish Water's specification.</li> </ol> </li> <li>7. Irish Water must ensure that an operational monitoring programme for the supply is in place which includes:               <ol style="list-style-type: none"> <li>i. A raw water monitoring programme which determines the oxidation demand. Parameters such as manganese, iron, alkalinity, turbidity, UVT, pH, temperature, nitrate, ammonia, sulphate, DOC, organic compounds, should be included and the oxidation reduction potential trends assessed. Monitoring should increase during periods of lake turnover in the autumn and at periods of thermal stratification in the summer.</li> <li>ii. Soluble, colloidal and particulate fractions of manganese in the raw water entering the plant and throughout the treatment stages, reservoir and network to determine if treatment processes are sufficient;</li> <li>iii. A routine monitoring plan for the network to include relevant parameters that provides reassurance that the plant is operating effectively, water quality is compliant and any problematic distribution network areas are identified and rectified without delay.</li> </ol> </li> </ol>		

8. Irish Water should submit details of the chlorine contact time (Ct) calculations for disinfection and provide verification that adequate Ct is being achieved.
9. Irish Water should submit daily turbidity & manganese results taken in the final water and network monitoring results for turbidity, manganese, iron, lead and other metals of concern, free chlorine, total chlorine, microbiological parameters taken since 1 December 2019.
10. Irish Water should ensure that the poly dose line is regularly checked to ensure all injection nozzles are free from blockage.

#### **Follow-Up Actions required by Irish Water**

During the audit, Irish Water and Cavan County Council representatives were advised of the audit findings and that action must be taken as a priority by Irish Water and Cavan County Council to address the issues raised.

A Direction under Regulation 16(1) of the *European Union (Drinking Water) Regulations 2014 as amended*, was issued by the EPA subsequent to this audit on 20/12/2019, requiring Irish Water to install an alarm on the final water chlorine monitor and to link the final water chlorine and turbidity monitors to a call-out alarm response cascade system by 31/01/2020. Irish Water complied with this Direction on 23/01/2020.

This report has been reviewed and approved by Dr Michelle Minihan, Senior Inspector, Drinking Water Team.

Irish Water should submit a report to the Agency within **one month** 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 time frame 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 (DW2019/218) in any future correspondence in relation to this Report.