

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	
Name of Installation	Cavan RWSS
Organisation	Irish Water
Scheme Code	0200PUB0100
County	Cavan
Site Visit Reference No.	SV20385

Report Detail	
Issue Date	21/07/2020
Prepared By	Michelle Roche

Site Visit Detail			
Date Of Inspection	22/06/2020	Announced	No
Time In	09:00	Time Out	10:30
EPA Inspector(s)	Michelle Roche Daryl Gunning		
Additional Visitors	Michelle Minihan		

Company Personnel	<p>Irish Water: Yvonne McMonagle* Pat O'Sullivan ** Peter Gallagher ** Anthony Skeffington ** Frances Hughes **</p> <p>Cavan County Council: Gary Boyd * Frank Rudden * Eamonn Boylan * Raymond Warrington * Vincent Craig ** Martin Quigley ** Paddy Connaughton ** Adrian Burke **</p> <p>HSE: Claire O'Dwyer ** Dr. Keith Ian Quintyne **</p> <p>*Attended pre-site visit meeting and site visit of Cavan RWSS water treatment plant. **Did not attend site visit of Cavan RWSS water treatment plant.</p>
--------------------------	---

> Summary of Key Findings

1. The treatment process to remove *Cryptosporidium* from the final water at Cavan RWSS was not working adequately for a period of approximately 30 hours from Sunday 7th June to Monday 8th June 2020. The aluminium sulphate coagulant dosing pumps were not working during this time and final water turbidity was above the critical set-point of 0.3 NTU. This meant that there was a risk of *Cryptosporidium* breaking through the treatment process and entering the distribution network during that time.
2. The disinfection treatment process at Cavan RWSS was not working adequately for a period of approximately 25 hours from Sunday 7th June to Monday 8th June 2020. The sodium hypochlorite disinfectant duty dosing pump failed and the stand-by dosing pump had not been working since November 2018. This meant that un-disinfected final water entered the distribution network during that time and there was a risk of *E. coli* or other microbiological parameters in the water supply.
3. Cavan County Council operational staff did not report either of the above water treatment failures to Irish Water, the Health Service Executive (HSE) or the EPA when they occurred. The failure to report these incidents prevented the HSE in determining the potential risk to consumer health on the Cavan RWSS, and also prevented any timely actions to protect consumer health, such as issuing a boil water notice. The failure by Cavan operational staff to escalate water quality incidents to management within Cavan County Council and Irish water indicates a serious misunderstanding of the responsibility of providing safe and wholesome drinking water to consumers.

> Introduction

The Cavan Regional Water Supply Scheme (Cavan RWSS) serves a population of 12,208 people, including Cavan Regional Hospital, with 3773 m³/day of treated water produced at the Cavan RWSS water treatment plant. The treatment comprises pH adjustment, manganese removal (via potassium permanganate), coagulation, flocculation, clarification, rapid gravity filtration and chlorination and fluoridation. The raw water abstraction is from Lough Acanon Dam.

The initial purpose of the audit was to assess Irish Water's performance under the 2014 Drinking Water Regulations as amended. As part of Irish Water's audit preparations, they became aware of two recent drinking water quality incidents that were not reported by Cavan County Council to Irish Water, the EPA or the HSE. The incidents related to a coagulation dosing failure and a disinfection dosing failure. As a result, the purpose of the audit was adjusted to focus on investigating the details and impact of the incidents and the reasons for Cavan County Council's failure to report the incidents to Irish Water, EPA and HSE.

The audit was one of three pilot audits the EPA carried out to test new auditing procedures put in place with COVID-19 social distancing and enhanced hygiene measures in place. The audit comprised of a video conference meeting with all relevant parties on 22/06/20, a site visit with essential Irish Water and Cavan County Council staff only on 23/06/20, and an audit closing meeting via video conference with all relevant parties on 26/06/20.

> Supply Zones Areas Inspected

The audit included a review of water quality results and online monitoring data submitted by Irish Water and a walk through of the Cavan RWSS water treatment plant from the first stage of coagulation treatment to the final stage of disinfection treatment. The Lough Acanon source and the final water reservoir were not inspected during this audit.



1. Incident Management

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
Comment	
<p>The Cavan RWSS 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.</p> <p>Between Sunday 7th June 2020 and Monday 8th June 2020, two operational incidents occurred at Cavan RWSS water treatment plant which negatively impacted on the final water quality leaving the plant. The incidents related to a failure of the coagulation dosing pumps and a failure of the disinfection dosing pumps. Neither incident was escalated to management within Cavan Co. Co. or to Irish Water, highlighting a serious breakdown in the vital communication chain within Cavan Co. Co. and from Cavan Co. Co. to Irish Water. In addition, neither incident was communicated to the HSE, therefore the HSE could not determine any potential risk to consumers' health on the Cavan RWSS water supply in a timely manner. Without the HSE risk assessment no measures, such as a boil water notice, were put in place to protect consumers' health from the risks posed by inadequately treated and un-disinfected drinking water.</p> <p>Failure on the part of Cavan Co. Co. plant operational staff to notify Irish Water or the HSE in a timely manner, meant that no water quality verification testing was carried out in the distribution network following the water quality incidents. Cavan Co. Co. were instructed to carry out this testing by the HSE during the audit process on 22/06/20, however this was two weeks after the incidents occurred.</p> <p>The EPA carried out incident response audits at two other public water supplies in the Cavan region during 2019. The recommendations from these audits required Irish Water and Cavan Co. Co. to review their managerial and operational structures and procedures to ensure that exceedances and incidents, which could potentially impact the quality of water produced at all water treatment plants, are reported, and relevant persons and parties (e.g. Irish Water, HSE, EPA) are notified in a timely manner.</p> <p>The audit found that these recommendations had not been completed by Irish Water and Cavan Co. Co. Irish Water stated that Cavan Co. Co. management were provided with training on Irish Water's incident notification procedure (INR) at two Irish Water Cavan region compliance meetings during 2019. This information was not transferred to Cavan Co. Co. plant operational staff. The caretakers at Cavan RWSS were not aware of any Irish Water incident notification procedure and were not involved in any incident notification training. No training records were provided during the audit to verify that plant operators had been trained in incident notification.</p> <p>Following this audit, Irish Water submitted a step-by-step operational improvement action programme to the EPA, which aims to ensure all Cavan Co. Co. operational staff are fully trained in incident response management and communication. The action programme also aims to provide greater oversight by Irish Water and Cavan Co. Co. over water treatment plants in the Cavan region, through increased operational monitoring and SCADA controls.</p> <p>Failure to escalate water quality incidents and allow the HSE to assess potential impacts to public health indicates a serious misunderstanding of the responsibility of providing safe and wholesome drinking water to the consumers on a drinking water supply. Failure to fully address previous EPA audit recommendations, despite written assurances by Irish Water that measures had been put in place to address them, is also a serious concern for the EPA.</p> <p>Full details of both water quality incidents are provided in Section 2 and Section 4 of this audit report.</p>	



2. Coagulation Clarification Flocculation (CFC) Stage

2.1

	Answer
Were the CFC processes visually observed to be operating appropriately during the audit?	Yes
<p>Comment</p> <p>The coagulation, flocculation, clarification process includes pH correction prior to dosing of aluminium sulphate coagulant. The coagulant dose is manually controlled by the caretaker based on daily checks of raw water conditions. A static mixer is in place after the coagulant dosing point and poly coagulant aid is then dosed into the water in a further mixing chamber.</p> <p>There is one clarifier on-site with three clarification chambers and all treated water passes through each of the three chambers. The clarifier walls were observed to be clean, as were the clarifier channels. Water flow through the clarifier channels was observed to be even.</p> <p>Clarifier sludge bleeds automatically occur every 20 minutes for a period of three minutes. Clarifier sludge is directed to the on-site picket fence thickener.</p> <p>Coagulation dosing incident</p> <p>At approximately 10am on the morning of 07/06/20 the caretaker on duty arrived to the Cavan RWSS water treatment plant to carry out his daily checks. He noted that the sludge blanket in the clarifier was very low and he immediately checked the HMI and noticed that the coagulant (aluminium sulphate) dosing duty and standby pumps were not working. The caretaker did not know how long the pumps had been off. The caretaker called the standby caretaker and Cavan Co. Co. maintenance team for assistance.</p> <p>It was discovered that the automatic level sensor in the aluminium sulphate bulk storage tank had triggered the low level alarm and this had caused the coagulant dosing pumps to be switched off. On further investigation it was confirmed that the aluminium sulphate level in the bulk storage tank was not low and no leak had occurred, however condensation on the level sensor probe was causing the level sensor to read low. The caretaker cleaned the level sensor probe and the coagulant dosing pumps were restarted at approximately 12:30pm on 07/06/20.</p> <p>Water quality impact of coagulant dosing pump incident</p> <p>Cavan RWSS water treatment plant has a maximum final water turbidity set-point of 0.3 NTU, to ensure that the final water has been adequately treated to remove parasites such as <i>Cryptosporidium</i>, which may be present in the source water. As a result of the coagulant dosing pump failures, final water turbidity rose above 0.3 NTU from 12:30am on 07/06/20 to 7am on 08/06/20. This meant that for a period of 30 hours there was a risk that the water delivered to consumers on the Cavan RWSS was not adequately treated for <i>Cryptosporidium</i> and other parasites.</p> <p>Added to the 30 hours above is the two days it takes for treated water to travel through the distribution network, therefore Cavan RWSS consumers were at risk from inadequately treated water for approximately 3 days. Had the incident been notified to IW, the HSE and EPA it would likely have resulted in a boil water notice on the supply, to protect consumers health, until the inadequately treated water had left the distribution network.</p>	



3. Filtration

3.1

	Answer
Does monitoring indicate that the filters are operating effectively?	Yes
Comment There are four rapid gravity filters at the Cavan RWSS water treatment plant. Clarified water is directed evenly through each of the four filters. Filter media and lateral filter nozzles were replaced approximately one and a half years ago under the Irish Water CFC programme. Filter backwash is initiated based on time every 24 hours. There is a run to waste, to the backwash water holding tank, for approximately 3 minutes before filters are brought back in to operation based on a slow-start. Final water turbidity was 0.06 NTU at the time of the audit, indicating that the filters are operating effectively. Final water turbidity data for the month prior to the audit also indicate that the CFC process is operating effectively, outside of the coagulant dosing incident on 07/06/20 and 08/06/20.	



4. Disinfection

		Answer
4.1	Are duty and standby chlorine pumps/ UV units in operation?	Yes
Comment		
<p>At the time of the audit site visit on 23/06/20 both the duty and standby sodium hypochlorite dosing pumps were operational and there was automatic switchover in place between the pumps.</p> <p>During the audit investigation of the disinfection dosing failure that occurred on 07/06/20, Cavan Co. Co. stated that the standby pump had been out of operation since November 2018 and it was not obvious to the EPA that any effort was made on behalf of Cavan Co. Co. to bring the standby pump back into operation until after the duty pump dosing failure on 07/06/20. Cavan Co. Co. also failed to notify Irish Water that a key piece of water treatment infrastructure was out of operation from November 2018 to June 2020. Irish Water were not made aware that the standby pump was out of operation until the audit process began.</p> <p>Cavan Co. Co. maintenance staff serviced the standby pump and brought it back into operation on 09/06/20. It was not explained during the audit why the pump could not have been fixed previously in the intervening 20 months.</p> <p>The EPA view this as a serious failure to attend to the basic maintenance of the Cavan RWSS water treatment infrastructure. A standby disinfection dosing pump is a basic risk management measure required by the EPA to be in place at all water treatment plants across the country where chlorination is used as a disinfection treatment (EPA Drinking Water Advice Note No. 3 - <i>E. coli</i> in Drinking Water).</p> <p>Had the standby disinfection dosing pump been operational at the time of the disinfection dosing incident, and working correctly, it would have taken over from the duty pump and the final water would have continued to receive adequate disinfection. No disinfection failure would have occurred in the Cavan RWSS on that date.</p>		

		Answer
4.2	Is the chlorine dosed appropriately?	Yes
Comment		

At the time of the audit, sodium hypochlorite disinfectant was dosed flow proportionally with a duty and standby dosing pump arrangement and automatic switchover between the pumps. Cavan Co. Co. stated that the standby dosing pump had been fixed on 09/06/20 having been out of service since November 2018.

There is a low chlorine alarm set-point at 0.6 mg/l and a high chlorine alarm set-point at 1.9 mg/l. There is no plant shut-down based on these alarm settings but alarms do call out to Cavan Co. Co. plant operational staff. There was no alarm response cascade system in place at the time of the audit. (See Section 5). The final water chlorine residual reading observed during the audit site visit was 1.47 mg/l.

Disinfection dosing incident

On the morning of 07/06/20 when the duty caretaker arrived to the Cavan RWSS water treatment plant he noted the final water low chlorine residual alarm had been triggered. The caretaker had not received the alarm on his mobile phone (See Section 5). The caretaker discovered that the duty disinfection (sodium hypochlorite) dosing pump was not working but he did not know how long the pump had been off. The standby disinfection dosing pump had been out of operation since November 2018 (See Section 4.1 above).

The Cavan Co. Co. maintenance team cleaned the duty pump dosing line and the pump was restarted at approximately 2pm on 07/06/20. No checks were performed or samples taken to verify that chlorine residual levels in the network had returned to normal levels.

Water quality impact of disinfection dosing incident

Cavan RWSS water treatment plant has a minimum final water chlorine residual set-point of 0.6 mg/l in place, to ensure that water is properly treated to remove *E. coli* and other microbiological parameters. As a result of the disinfection dosing pump failure, final water chlorine residuals were below 0.6 mg/l from approximately 3am on 07/06/20 to 4am on 08/06/20. This means for a period of 25 hours inadequately disinfected water was leaving the Cavan RWSS water treatment plant.

Added to this is the two days it takes for treated water to travel through the distribution network, therefore Cavan RWSS consumers were at risk for inadequately disinfected water for approximately 3 days.

4.3

Is there adequate chlorine contact time before the first connection?

Answer

Yes

Comment

The audit found that there is adequate chlorine contact time before the first consumer connection, however the contact time calculation provided to the EPA prior to the Cavan RWSS audit was not specific to the on-site conditions at the water treatment plant. Parameters such as average flow, final water turbidity and the subsequent minimum final water chlorine residual target were hypothetical in the contact time calculation.

The EPA use the contact time calculation during water treatment plant audits to verify that on-site conditions are sufficient to achieve the adequate contact time required. Accurate contact time equation values are essential for this reason.

4.4

Is there a suitable monitoring frequency for residual chlorine in the network with records available?

Answer

No

Comment

At the time of the audit, a review of chlorine residual monitoring in the distribution network showed that chlorine residuals were being monitored once every two weeks. It was discussed at the audit that Irish Water and Cavan Co. Co. had plans to increase this monitoring to every few days. This would allow any water quality failures in the network to be discovered and addressed in a timely manner.

Chlorine residual monitoring records for the distribution network were reviewed as part of the audit and there were occasions when the chlorine residuals were below the EPA minimum requirement of 0.1 mg/l.



5. Management and Control

		Answer
5.1	Are suitable alarm settings in place to alert operators to deteriorating water quality and/or the failure of a critical treatment process?	Yes
Comment		
<p>Specific to the water quality incidents investigated during the Cavan RWSS audit, the water treatment plant has a final water turbidity alarm set-point at 0.3 NTU and a low level final water chlorine residual alarm set-point of 0.6 mg/l. There is no automatic plant shut-down in place based on either of these alarms.</p> <p>In order to verify full log removal of <i>Cryptosporidium</i>, final water at Cavan RWSS must achieve a turbidity value of below 0.3 NTU. A final water turbidity alarm set-point lower than the current 0.3 NTU would afford Cavan Co. Co. staff more time to respond to a deterioration in water quality before the maximum allowable value of 0.3 NTU is reached.</p>		

		Answer
5.2	Are relevant alarms dialled out via a cascade system to allow a timely response by plant operators?	No
Comment		
<p>The audit found that there is no alarm response cascade system in place at Cavan RWSS. The water treatment plant alarms call out to the mobile phone of the caretaker on duty but do not call out to any other Cavan Co. Co. staff if the alarm is not responded to.</p> <p>In the case of both water quality incidents investigated during the audit, alarms were triggered at the water treatment plant and called out to the mobile phone of the caretaker on duty, however his phone was not working at the time. The alarms were not received by anybody else and the incidents were not responded to for a number of hours, until the caretaker arrived at the water treatment plant.</p> <p>Had a cascade system been in place and the final water alarms been responded to quickly, the duration and severity of the water quality incidents would have been reduced for consumers on the Cavan RWSS supply.</p>		



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? Comment Irish Water are required under Regulation 9 of the 2014 Drinking Water Regulations, as amended, to notify the EPA of any incident in a drinking water supply that constitutes a potential danger to human health. Cavan Co. Co. plant operational staff did not escalate the coagulant dosing pump failure or the disinfection dosing pump failure to management within Cavan Co. Co. or to Irish Water. As a result the EPA were not notified of the incidents until 19/06/20, the Friday before the audit was to commence. As soon as Irish Water became aware of the incidents they did notify the EPA and the HSE, however the EPA are concerned that without the prompt of the EPA audit on the Cavan RWSS, Cavan Co. Co. would not have informed Irish Water of the water quality incidents.

Recommendations

Subject	Cavan RWSS Audit Recommendations	Due Date	21/08/2020
Action Text	<p>Recommendation(s)</p> <ol style="list-style-type: none"> 1. Irish Water should implement the operational improvement action programme with Cavan County Council, that was provided to the EPA following the audit. All measures necessary should be taken to ensure that Cavan County Council staff understand the responsibilities of providing safe and wholesome drinking water to consumers and that exceedances and incidents, which could potentially impact the health of those consumers are escalated appropriately to Cavan County Council Management and Irish Water. This will enable timely consultation with the HSE on the potential risk to consumers' health and allow Irish Water to put in place protective measures if necessary. 2. Irish Water and Cavan Co. Co. should ensure all treatment plant operational staff are aware of the importance and method of reporting plant infrastructure faults and outages to Irish Water in a timely manner. 3. Irish Water and Cavan Co. Co. should ensure that all chemical dosing pumps at Cavan RWSS water treatment plant are maintained in proper working order and serviced regularly in accordance with the manufacturer's instructions. 4. Irish Water and Cavan Co. Co. should ensure a water treatment plant alarm cascade system is in place at Cavan RWSS to ensure that water treatment plant alarms are received and responded to by Cavan County Council. 5. Irish Water should review the final water turbidity alarm set-point to provide water treatment plant operational staff with adequate time to respond to a deterioration in final water quality before the critical turbidity set-point (to verify the performance of the <i>Cryptosporidium</i> barrier) of 0.3 NTU is reached. 6. Irish Water should update the contact time calculation for chlorine disinfection to ensure the parameter values used in the calculation are reflective of daily on-site conditions at the Cavan RWSS water treatment plant. 7. Irish Water should review the network chlorine residual monitoring programme to ensure that the frequency and sample locations are sufficient to verify that at least 0.1mg/l free residual chlorine is present at the extremities of the distribution network, for adequate disinfection of the water supply. Irish Water should aim to monitor network chlorine residuals every 2-3 days. <p>Follow-Up Actions required by Irish Water</p> <p>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.</p> <p>This report has been reviewed and approved by Aoife Loughnane Drinking Water Team Leader.</p> <p>Irish Water should submit a report to the Agency on or before 21st August 2020 detailing how it has dealt with the issues of concern identified during this audit.</p> <p>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.</p> <p>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.</p> <p>Please quote the Action Reference Number, DW2020/44 in any future correspondence in relation to this Report.</p>		

