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	Three Mile House and Togan
Organisation	Irish Water
Scheme Code	2400PUB2027
County	Monaghan
Site Visit Reference No.	SV20524

Report Detail

Issue Date	25/09/2020
Prepared By	Daryl Gunning

Site Visit Detail

Date Of Inspection	04/09/2020	**Announced**	Yes
Time In	11:00	**Time Out**	13:25
EPA Inspector(s)	Daryl Gunning Ruth Barrington		
Additional Visitors	Michelle Minihan*, Orla Harrington* *only present at pre-audit meeting		
Company Personnel	Irish Water: Patrick O'Sullivan*, Patrick Collins, Peter Gallagher* Monaghan County Council: John Paul McEntee, John Reilly, Damien Thornton, Oliver Murtagh, Scott Swetak** *only present at pre-audit meeting **only present at site-visit		

Summary of Key Findings

1. Irish Water issued a "Do Not Consume" (DNC) notice for the Three Mile House & Togan public water supply (PWS) on 29/07/20, due to elevated levels of manganese being detected leaving the Togan water treatment plant (WTP) and in the network. This DNC notice impacted a population of 290 people. This notice was rescinded on 05/08/20 following compliant re-sample results and with the requirement to provide weekly samples for at least six weeks post the DNC notice being lifted.

2. Monaghan County Council (operators of Togan WTP under service level agreement with Irish Water) did not follow procedures for the timely notification of parametric value exceedances and of treatment process failures. The failure to notify the EPA of parametric value exceedances is an offence under Regulation 10(3) of *the European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014), as amended*.

3. The *Cryptosporidium* barrier at the Togan WTP has been compromised since 22/07/20, as a result of high turbidity levels (>0.3 NTU) after the filters. The Three Mile House & Togan PWS is subject to *Cryptosporidium* monitoring as per Irish Water's *Cryptosporidium* Monitoring Rationale (weekly *Cryptosporidium* monitoring) until the *Cryptosporidium* barrier is reinstated.

4. The Togan WTP did not have a standby chlorine dosing pump with automatic switchover, which is a minimum disinfection requirement. Following the audit, Irish Water confirmed that the standby chlorine pump was installed on 22/09/20.

Introduction

The Togan WTP produces approximately 1547 m3/day of water serving a population of 290 on the Three Mile House & Togan PWS. This WTP also supplies a blended tank (Gortakeegan reservoir and Crosses WTP), however, this PWS was outside the scope of this audit. Raw water is abstracted from Greagh and Corcaghan lakes. However, as of 18/08/20, water is only being abstracted from Corcaghan lake in order to reduce the level of manganese in the raw water entering the WTP. Treatment consists of coagulation, flocculation, clarification (CFC), pH correction, potassium permanganate dosing, rapid gravity filtration, chlorination, and fluoridation.

This audit was carried out in response to: i) the DNC notice imposed on the Three Mile House & Togan PWS on 29/07/20; ii) repeated manganese exeedances in the Three Mile House & Togan PWS; and iii) the failure to notify the EPA of these exceedances and of treatment failures that had occurred at the plant in June and August 2020.

Supply Zones Areas Inspected

All areas of the treatment process at the water treatment plant were inspected during the audit.

1. Incident Management

		Answer
1.1	Was the incident suitably alerted to the plant operators, escalated and managed in order to maintain water quality and protect public health?	No

Comment

Manganese exceedances:

On 29/07/20, Irish Water issued a Do Not Consume (DNC) notice for the Three Mile House & Togan PWS due to elevated levels of manganese being detected leaving the WTP and in the network. This DNC notice impacted a population of 290 people. This notice was rescinded on 05/08/20 following compliant re-sample results and with the requirement to provide weekly samples for at least six weeks post the DNC notice being lifted.

Following the issuing of the DNC notice, an emergency meeting was held with Monaghan County Council, Irish Water, the EPA, and the HSE on 30/07/20. At this meeting, Irish Water advised that the WTP was not able to achieve compliance for manganese since early June and that it had lost its C*ryptosporidium* barrier. An Irish Water / Monaghan County Council incident management team was set up to investigate and complete mitigation measures to return the Togan WTP to compliance.

Subsequently, data provided to the EPA by Irish Water indicated that Monaghan County Council had recorded a number of manganese exceedances (>50 ug/l) in the network and in the final water leaving the plant, on a number of occasions in June and July 2020. These exceedances were not notified to Irish Water in a timely manner and consequently not notified to the EPA and HSE.

Disinfection failure:

On 07/08/2020 Irish Water informed the EPA that the chlorine dosing pump stopped working for approximately 3 hours on 18/06/20. The caretaker cleaned the pump and restarted it within this timeframe. The pump was also not operational from approximately 22:00 on 21/06/20 until 18:00 on 22/08/20. Contractors were onsite on 21/08/20 to carry out repairs. Inadequately disinfected water (no chlorine) was entering the network during these failures. These disinfection failures were not notified to the EPA or the HSE in a timely manner. The EPA were also informed that there is no standby chlorine dosing pump with automatic switchover at the WTP, which is a minimum requirement for disinfection systems.

Coagulant dosing failure:

Through an assessment of Togan WTP operational records received from Irish Water on 18/08/20, the EPA became aware of an aluminium sulphate pump failure and increased chlorine demand that occurred from the 15/08/20 to the 16/08/20. This incident was not notified to Irish Water, the EPA, and the HSE. Monaghan County Council were instructed to notify the HSE during the pre-site meeting (03/09/20) and site visit (04/09/20).

A low level chlorine alarm (1 mg/l) was received by the caretaker at 22:00, on 15/08/20. The caretaker arrived onsite on the morning of 16/08/20 and sampled for free chlorine. A result of 0.7 mg/l confirmed the low chlorine alarm. Following an inspection of the coagulant pumps, it was found that the duty aluminium sulphate dosing pump had failed due to an airlock. This resulted in no coagulant being added to the raw water from 15/08/2020 to 16/08/2020. The exact time of the pump failure is unknown and no alarm was initiated. The caretaker brought the pump back into operation on 16/08/20.

The caretaker also noted that the clarity of the water in the clarifier and through to the filters, was of poor quality on the same date. This was supported by an increase in turbidity (2 NTU in the settled water). This may have increased the chlorine demand, causing a reduction in chlorine levels leaving the plant. Subsequently, the caretaker increased the chlorine dose rate on the morning of 16/08/20 for 2 hrs and returned the dosing system to automatic mode before leaving the plant. The caretaker returned to the WTP at 18:00 and recorded 0.33 mg/l free chlorine level leaving the plant. Chlorine levels in the final water returned to >1 mg/l on 17/08/20, with 1.12 mg/l recorded. Network chlorine residuals in the Three Mile House & Togan PWS remained above 0.1 mg/l during this period.

2. Coagulation Clarification Flocculation (CFC) Stage

		Answer
2.1	Were the CFC processes visually observed to be operating appropriately during the audit?	Yes

Comment

1. Aluminium sulphate, soda ash & polyelectrolyte are dosed at the mixing chamber. Mixing is achieved via a series of weir walls.
2. Raw water gravitates from the mixing chamber to a pair of hopper bottom clarifiers.
3. An additional soda ash dosing point was added post clarification on 29/07/20, to mitigate against increased manganese levels in the raw water.
4. A potassium permanganate dosing system was installed post clarification on 31/07/20 to remove manganese from the raw water.
5. Clarified water rises through each clarifier, enters a series of decanting channels, which feed into a common outlet channel. This channel feeds onto a pair of rapid gravity sand filters.
6. The sludge bleeds operate for 20 seconds every 10 minutes.
7. The sludge blanket was not stable from 12/08/20 to 16/08/20 and on 19/08/20 and 20/08/20.
8. There was no evidence of pin floc or rising sludge at the time of the audit.

3. Filtration

		Answer
3.1	Does monitoring indicate that the filters are operating effectively?	No

Comment

1. There are two rapid gravity filters (RGFs) at the Togan WTP.
2. Each filter is equipped with a hydrostatic level sensor, the signal from which is used to control a modulating outlet valve in order to maintain a constant level in the filter. A head-loss meter is used to trigger a back wash. There is also a turbidity monitor on each filter.
3. The sand and underdrain pipework was changed in filter 1 on 04/01/18 and in filter 2 on 30/07/13.
4. Filter backwash water is provided from a high level tank, which is pumped from the WTP's contact tank. Backwashing lasts approximately 14 minutes (10 minutes of air scour and 4 minutes of water scour). Backwashing is currently initiated manually.
5. A backwash of filter 1 was observed during the audit. Pits and boils were noted on the surface of the filter media post backwash.
6. Backwash frequency was altered from every 2nd day to every day on 30/07/20.
7. The run-to-waste process following the backwash lasts 10 minutes, however, the duration can be extended manually.
8. There are no alarms or automatic run-to-waste process in place to control to control filter turbidities and maintain the filter outflow below 0.3 NTU. A review of backwashing procedures is ongoing as part of the CFC programme.
9. The turbidity of the raw water (pre-filters) ranges from 4-7 NTU. Normally, a post filter turbidity of <0.3 NTU is achieved approximately 95% of the time. However, incidents of post filter turbidities >0.3 NTU have increased significantly since soda ash and potassium permanganate dosing were added to the treatment process post clarification (on 29/07/20 and 31/07/20, respectively). The *Cryptosporidium* barrier has been compromised as a result of high turbidity levels (>0.3 NTU) after the filters.
10. The sample lines for the turbidity monitors are quite long and may require more frequent maintenance to ensure they are operating optimally.
11. Four tonnes of greensand was scheduled to arrive at the WTP during the week commencing 31/08/20. This sand will be applied to the dead zones at the back of filter 1. The purpose of the greensand is to remove manganese from the filtered water. The remaining shipment of greensand is due to arrive at the WTP within the next 7 weeks, and the total volume will be evenly distributed between both filters.
12. An alarm is triggered for final water turbidity (>1 NTU), when this level is maintained for >30 minutes. A cascade system is in place to alert staff in the event of an alarm being triggered.

4. Disinfection

		Answer
4.1	Are duty and standby chlorine pumps/ UV units in operation?	No

Comment

1. On the day of the audit there was no standby chlorine dosing pump with automatic switchover at the Togan WTP.
2. A standby chlorine pump was installed at the WTP on 22/09/20, with commissioning scheduled for 23/09/20.

		Answer
4.2	Is the chlorine dosed appropriately?	Yes

Comment

1. Filtered water from the RGFs gravitates to a baffle-walled contact tank, where soda-ash and chlorine are dosed for final pH correction and disinfection. Water gravitates to four hydraulically linked clear-water tanks (CWTs) via underground ductile iron piping. It is into this piping that fluorine is injected. A sample is taken from one of the CWTs and fed to the on-site laboratory, where treated water fluorine and residual chlorine levels are monitored.
2. The chlorine dosing pump stopped working for approximately 3 hours on 18/06/20. The caretaker cleaned the pump and restarted it within this time frame. The chlorine dosing pump was also not operational from approximately 22:00 on 21/06/20 until 18:00 on 22/08/20. Contractors were onsite on 21/08/20 to carry out repairs. An unknown volume of undisinfected water entered the network during these times.
3. The chlorine residual in the network on the 19/06/20 was 0.21 mg/l and on 23/06/20 was 0.1 mg/l. There was no residual chlorine data from the network from 20/06/20 to 22/06/20.
4. Chlorine residuals of >0.1 mg/l are consistently achieved in the Three Mile House & Togan PWS network which demonstrates the water in the distribution network is adequately disinfected.
5. An alarm is triggered for low chlorine (<1 mg/l) and high chlorine (> 2 mg/l) at the WTP, when these levels are maintained for >15 minutes. A cascade system is in place to alert staff in the event of an alarm being triggered.

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?	No

Comment

1. There are no turbidity alarms on the individual filters at the Togan WTP. Subsequently, the caretaker is not alerted when the individual filter turbidity levels rise above 0.3 NTU, which compromises the performance of the the plant's *Cryptosporidium* barrier.
2. Irish Water plan to upgrade the plant's alarms and automatic shutdown procedures as part of the disinfection programme, due to be completed by the end of 2020.

6. Drinking Water Quality

		Answer
6.1	Have failures of the parametric values or the detection of pathogenic micro-organisms or parasites in the water supply been adequately investigated?	No
	Comment	

Despite the investigations and mitigation measures carried out to date (detailed in the previous sections of this report and below), failures of the parametric value for manganese and failures of the chlorine and aluminium sulphate dosing pumps were not investigated in a timely manner or escalated to the appropriate management. These exceedances and failures were also not reported by Monaghan County Council to Irish Water, the HSE, or the EPA, as they occurred.

Investigations carried out by Irish Water and Monaghan County Council found that:

- Increased algal concentration in one of the source lakes (Greagh Lake) has resulted in increased manganese levels, owing to water chemistry changes (e.g. a drop in oxygen levels).
- Raw water manganese levels >250 ug/l since early June have compromised WTP treatment processes.
- On the 18/08/20, both source lakes (Greagh and Corcaghan) were sampled for manganese levels and were 519 and 239 ug/l, respectively. As a result, the decision was made to temporarily shut off the Greagh lake source to help reduce the manganese level coming into the plant. To date, the WTP is only being supplied by Corcaghan lake.

The following mitigation measures have also been actioned at the WTP:

- Monaghan County Council installed a raw water sample point for each source on 24/08/20, with a plan to reintroduce the Greagh supply when the raw water manganese levels are at a level that the WTP can cope with.
- The Three Mile House & Togan network was flushed on 30/07/20 and 20/08/20. Future network flushings will be planned on a reactive basis.
- Monaghan County Council senior water services staff received "incident management procedure" training on 12/08/20.
- An automatic scour valve was installed on 02/09/20, close to the end of the 150mm cast iron watermain supplying the Three Mile House & Togan PWS.
- The Three Mile House & Togan PWS is subject to *Cryptosporidium* monitoring as per Irish Water's *Cryptosporidium* Monitoring Rationale (weekly *Cryptosporidium* monitoring) until the *Cryptosporidium* barrier is reinstated.

Overview of parametric exceedances:

Prior to the DNC notice being issued on 29/07/20, a number of manganese exceedances (>50 ug/l) were recorded by Monaghan County Council in the network in 2020 (x1 in January, April, May; x4 in June; x2 in July). Three of these exceedances were also above the threshold recommended by the HSE as unsafe levels for human consumption (>120 ug/l). Monaghan County Council failed to notify Irish Water, the EPA, and the HSE of these exceedances in a timely manner.

Monaghan County Council were also aware that the final water leaving the WTP exceeded the parametric limit for manganese 9 times in June and 24 times in July.

Monaghan County Council also failed to notify turbidity exceedances in the network (x3 in June; x1 in July) to Irish Water, the EPA, and the HSE in a timely manner.

An aluminium failure (218 ug/l) was recorded at the WTP on 05/08/20 by Fitz Scientific as part of investigative monitoring. An aluminium failure was not recorded at the WTP through sampling conducted by the caretaker on the same day. Monagahan County Council are investigating this anomaly.

During the time period that the DNC notice was in place (29/07/20 to 05/08/20), manganese exceedances in the network occurred twice, on both occasions being above the limit that the HSE deems safe for human consumption. A turbidity of 1.3 NTU was also recorded in the network on one occasion during this time.

Following the rescinding of the DNC notice on 05/08/20, manganese exceedances occurred in the network on 7 occasions (August 2020), none of which were above the HSE limit deemed unsafe for human consumption. A turbidity of 1.12 NTU was also recorded in the network on one occasion after the DNC notice was rescinded.

All results post DNC notice were provided to the EPA on a regular basis as part of the investigative monitoring agreed between Irish Water, Monaghan County Council, the EPA, and the HSE.

Recommendations

Subject	Three Mile House audit recommendations	Due Date	25/10/2020
Action Text	**Recommendations** ***Disinfection:*** 1. Irish Water should ensure that the chlorine standby dosing pump is fully commissioned including automatic switchover between the duty and standby dosing pumps at Togan water treatment plant (WTP). 2. Irish Water should provide alarms and suitable automatic plant shutdowns to alert staff to any failure of the disinfection system or failure of the *Cryptosporidium* barrier. ***Filtration:*** 1. Irish Water should confirm the media depth of both rapid gravity filters following greensand installation. 2. Irish Water should ensure that remedial actions are taken to improve the performance of the rapid gravity filters to restore the *Cryptosporidium* barrier. ***Management and Control:*** 1. Irish Water should continue with C*ryptosporidium* monitoring until the C*ryptosporidium* barrier has been reinstated at Togan WTP. After that, the frequency may be reviewed in line with Irish Water's *Cryptosporidium* monitoring protocol. 2. Irish Water should identify and implement a permanent solution to prevent further manganese exceedances leaving Togan WTP and occurring in the network. 3. Irish Water should ensure that all drinking water parametric exceedances and treatment process failures are escalated to senior management within Monaghan County Council and notified to Irish Water, the EPA, and the HSE, in a timely manner. **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 issuing 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 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 Action Reference Number DW2020/65 in any future correspondence in relation to this Report.		