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	Mid Kerry - Gearha (H) 300A
Organisation	Irish Water
Scheme Code	1300PUB1063
County	Kerry
Site Visit Reference No.	SV20601

Report Detail

Issue Date	13/11/2020
Prepared By	Regina Campbell

Site Visit Detail

Date Of Inspection	01/10/2020	**Announced**	Yes
Time In	11:00	**Time Out**	13:50
EPA Inspector(s) **Additional Visitors**	Regina Campbell Orla Harrington		
Company Personnel	Irish Water: Deirdre O' Loughlin*, Kian Guihen, Ian O' Mahoney*, Oliver Harney** Kerry Council: Paul Neary, Seamus O' Mahony, Brian Lennon*, John Horgan**, Dan Heffernan** * Attended pre site visit meeting on 30/09/20 only. ** Attended site visit meeting on 01/10/20 only. *Attended pre-site visit only **Attended site visit only		

Summary of Key Findings

1. The Mid-Kerry (Gearha) Water Treatment plant is a direct filtration plant and does not have a clarification stage. Exceedances of the turbidity and aluminium parametric values in the final water were notified to the EPA for dates between 17th and 21st August and these were attributed to the plant not being able to treat the source water effectively due to flood conditions in the River Gaddagh. The river is flashy and is subject to high turbidity levels in periods of extreme rainfall. During flood conditions, the plant may struggle to deal effectively with the poor raw water quality and to maintain an effective protozoal barrier at all times.

2.The rapid gravity filters at the plant are not currently being operated in accordance with the EPA's turbidity performance criteria of 0.2 NTU (using the turbidity approach) or 0.3 NTU (using the log credit performance approach). This means the performance of the plant's protozoal barrier cannot be verified. Irish Water should review and implement turbidity alarms and shutdowns at the plant having regard to the EPA turbidity performance approach. Irish Water need to identify how the protozoal compliance log deficit at the plant will be addressed.

3. There is a concern about the resilience of the Mid-Kerry (Gearha) water treatment plant and its ability to operate satisfactorily during poor raw water quality conditions. There is approximately three hours treated water storage at the plant and this becomes a critical issue if plant production is reduced during times of poor river water quality. Currently up to 40% of the raw water is sourced from the River Gaddagh as the quantity of water from Lough Callee is restricted due to the quality of the intake pipe. The possibility to shut off the river source during flood events is constrained by the lack of treated water storage available at the plant. The intake from the lake source cannot be increased due to problems with the quality of the pipe. The other reservoirs on the network are not linked to SCADA which makes it difficult to manage supply and demand across the network.

Introduction

The Mid-Kerry (Gearha) Public Water Supply (PWS) serves a population of 5,742 and produces 7,183 m3/day. The sources of the supply are Lough Callee and the River Gaddagh. The plant operates 24 hours/day and treatment consists of pH correction, coagulation, flocculation, rapid gravity filtration, chlorination and fluoridation. The audit was undertaken to assess Irish Water's performance in producing clean and wholesome water following the notifications of turbidity and aluminium exceedances in the supply on dates between 17/08/20 and 21/08/20. The exceedances were attributed to flood conditions in the River Gaddagh source which impacted on the plant's ability to treat the raw water satisfactorily.

The results of treated water *Cryptosporidium* sampling undertaken on the 18th August were clear. Testing at varying locations on the network for microbiological parameters and residual chlorine levels were satisfactory.

Irish Water advised at the audit that the protozoal log credit requirement for the source water is 4 log but that the methodology for source classification is currently under review. The direct filtration system provides 2.5 log credits if operated in accordance with the log credit performance approach and this indicates that there is a -1.5 log deficit at the plant. *Cryptosporidium* monitoring takes place 5 times per year and no detections have been notified to the EPA.

Supply Zones Areas Inspected

The intake at the river source and the treatment processes were inspected.

In light of Covid-19 social distancing and enhanced hygiene measures the audit comprise of a video conference with all relevant parties on 30/09/20 followed by a site visit with essential audit participants on 01/10/20.

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?	Yes

Comment

The EPA were notified of turbidity and aluminium exceedances in the final water leaving the plant on dates between 17/08/20 and 21/08/20. The exceedances were attributed to flood conditions in the River Gaddagh source which impacted on the plant's ability to treat the raw water satisfactorily. Kerry County Council advised that the raw water conditions were beyond the ability of the plant to treat effectively as it is a direct filtration plant with no clarification stage. During flood conditions, the plant may struggle to deal effectively with the river source and to maintain an effective protozoal barrier at all times. In response to poor river water quality, flow through the plant was reduced as much as possible to try to get the plant operating normally again. The results of treated water *Cryptosporidium* sampling undertaken on the 18th August and raw water *Cryptosporidium* sampling on the 19th of August were clear. Testing at varying locations on the network were satisfactory for microbiological parameters and residual chlorine levels.

Trends submitted showed low chlorine in the final water on 20/08/20 which was caused by a loss of sample to the chorine monitor when the level of treated water in the reservoir dropped to very low levels (<1.5 m) as a result of the poor raw water quality. Kerry County Council advised that chlorine was dosed manually for this period to ensure adequate disinfection and manual chlorine readings were taken. When the reservoir level recovered the sample return pump was primed and reactivated. Kerry County Council said that the low reservoir level affected the sample pump for the final water turbidity monitor during this time also.

Currently up to 40% of the raw water is sourced from the River Gaddagh as the quantity of water from Lough Callee is restricted due to the quality of the intake pipe. The river is subject to high turbidity levels in periods of extreme rainfall. The possibility to shut off the river source during these events is constrained by the lack of treated water storage available at the plant. Turbidity trends for the period 18th to 24th August for each filter and for combined filtered water showed consistently elevated turbidity levels > 0.2 NTU and this demonstrates that the filters were not operating effectively as a protozoal barrier during this time.

Irish Water and Kerry County Council consulted with the HSE having completed an initial risk assessment. Taking this risk assessment into account the HSE deemed that the incident did not pose a risk of such significance that consumers should be notified immediately.

2. Source Protection

		Answer
2.1	Is the abstraction source(s) adequately protected against contamination?	Yes

Comment

The sources of the supply are Lough Callee (~ 200 m3/hr) and the River Gaddagh (~ 150 m3/hr). Lough Callee is located in a mountainous area with some sheep grazing with no housing or intensive agriculture in the vicinity. Kerry County Council said that the lake source is of high quality and consistency but that the pipe feeding the plant from the lake is old and prone to leaks and bursts. The River Gaddagh is fed by two mountain lakes with some non-intensive agriculture in the catchment. The river is flashy during high rainfall events which leads to high turbidity and colour in the river source.

The two sources are mixed and monitored continuously for UVT, colour and turbidity. There is an alarm on the raw water of 70% UVT which when triggered reduces the intake from the river. The mixed raw water had a reading of 86.6 % UVT on the day of the audit. The raw water turbidity alarm is set at 4 NTU.

Irish Water advised at the audit that the protozoal log credit requirement for the source water is 4 log but that the methodology for source classification is currently under review.

The EPA 's EDEN system lists the River Gageborough as one of the sources for the plant but Kerry County Council advised that this source is not used.

3. Coagulation Clarification Flocculation (CFC) Stage

		Answer
3.1	Is the pH within a suitable range for the coagulant used?	Yes

Comment

pH adjustment takes place using soda ash. There are duty and standby pumps in place with automatic switchover and the target pH is 6.3.

		Answer
3.2	Is the CFC process optimised to respond to changes in raw water quality?	Yes

Comment

Aluminium sulphate is used as a coagulant at the plant. There are duty and standby alum dosing pumps with automatic switchover. Dosing is controlled by the flow and true colour of the combined raw water sources.

		Answer
3.3	Are the CFC processes appropriately controlled?	Yes

Comment

Coagulant is dispersed using a static mixer and then the water is mixed in a flocculation tank (enclosed 4-5 m high tank). Retention time in the tank is approximately 15 minutes. There is a floc pH monitor on the outlet of the mixing tank which is used to monitor flocculation. There is no clarification stage at the plant.

4. Filtration

		Answer
4.1	Are the filters designed and managed in accordance with EPA guidance?	No

Comment

There are 8 no. rapid gravity filters at the plant. On day of the audit Filter No. 8 was out of service as an issue had been discovered with the underfloor drainage system. Kerry County Council said that the media in the filters comprises of about 700mm sand and 200mm anthracite but that the anthracite is prone to loss during backwashing. The media depth levels are regularly checked by operational staff. There is no media depth gauge in place on any filter to assist with monitoring the media depth. The filters were installed in 2012.

Backwashing takes place automatically every 16 hours. Backwashing is not triggered by turbidity or headloss which would be considered best practice. The backwash sequence is as follows: 6 minutes air, 3 minutes air and water, 9 minutes fast wash, 3 minutes setting time and filters are then run to waste for 20 minutes before being put back into service.

Kerry County Council advised that there is approximately 3 hours treated water storage capacity at the plant which is a constraint to more frequent backwashing particularly if the filters are under stress due to poor quality raw water during heavy rainfall.

		Answer
4.2	Was there visual indication that the filters were operating appropriately?	Yes

Comment

A backwash of Filter 7 was observed and no particular issues were noted on the day.

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

Comment

There are continuous turbidity monitors on each filter but no turbidity alarms or shutdowns on each filter. The continuous turbidity monitor on the final water is alarmed at 0.4 NTU (15 minutes delay) with no turbidity shutdown in the final water in place. Shutdown is based on aluminium in final water which is triggered by aluminium of 200 ug/l after 30 minutes.

The turbidity alarms and shutdown setpoints at the plant are not in accordance with the EPA's turbidity performance criteria for rapid gravity filters of 0.2 NTU (using the turbidity approach) or 0.3 NTU (using the log credit approach).

Turbidity trends for the period 18th to 24th August for each filter and for combined filtered water showed consistently elevated turbidity levels > 0.2 NTU and this demonstrates that the filters were not operating effectively as a protozoal barrier during this time.

Kerry County Council advised that they are unhappy with the performance of the continuous turbidity monitors in use at the plant and that they are prone to giving inaccurate results.

The turbidities from Filters 1-7 ranged from 0.02 NTU to 0.06 NTU and final water turbidity was 0.063 NTU on the day of the audit. The filtered water aluminium monitor was reading 15 ug/l.

5. Disinfection

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

Comment

Disinfection take place using 10-15 % sodium hypochlorite. The target residual chlorine is 0.95 mg/l with a high chlorine alarm of 1.5 mg/l and a low chlorine alarm of 0.4 mg/l in place. There is also a low chlorine shutdown setpoint of 0.4 mg/l. There is no high chlorine shutdown setpoint in place.

		Answer
5.2	Are duty and standby chlorine pumps/ UV units in operation?	Yes

Comment

Duty and standby chlorine dosing pumps are in operation with automatic switchover in place.

		Answer
5.3	Is the chlorine dosed appropriately?	Yes

Comment

Chlorine is dosed flow proportionally with trim based on the target residual chlorine.

		Answer
5.4	Is the residual chlorine monitored at a suitable sample location after contact time has been completed?	Yes

Comment

The residual chlorine is monitored after contact time has been achieved.

		Answer
5.5	Does the trend in chlorine residual at the treatment plant indicate adequate and stable levels of disinfection?	Yes

Comment
Scada trends viewed at the plant showed adequate and stable levels of disinfection.

		Answer
5.6	Are manual chlorine tests carried out and recorded on final treated water to compare with the continuous monitor results?	Yes

Comment
Manual chlorine tests are undertaken and recorded in the daily log sheet at the plant.

		Answer
5.7	Is there adequate chlorine contact time before the first connection?	Yes

Comment
The chlorine contact time was confirmed to be 24.2 mg.min/l which is adequate.

		Answer
5.8	Is there a suitable monitoring frequency for residual chlorine in the network with records available?	No

Comment
Records showed that they are gaps of up to 7 days between sampling for residual chlorine in the network which is too infrequent to ensure that any water quality issues in the network are identified in a timely manner.

		Answer
5.9	Is there a chlorine residual ≥0.1 mg/l throughout the network?	No

Comment
Monitoring results submitted reported a residual chlorine level of 0.03 mg/l in a sample taken at Kilboanane Cemetary, Ballymallis on 07/07/20 which is less than the recommended level of 0.1 mg/l.

6. Reservoirs and Distribution Networks

		Answer
6.1	Are reservoirs adequately inspected and maintained?	No

Comment

There are 5 no. reservoirs on the network including the reservoir at the plant. Lahard reservoir was cleaned in 2019 and Sunhill reservoir was cleaned in 2018. However it could not be confirmed when the reservoirs at the plant, at Barleymount or at Lahern were last cleaned. All the reservoirs on the supply should be put on a inspection, maintenance and cleaning schedule.

There is a concern about the resilience of the Mid-Kerry (Gearha) water treatment plant and its ability to operate satisfactorily during poor raw water quality conditions. There is approximately three hours treated water storage at the plant and this becomes a critical issue if plant production is reduced during times of poor river water quality. Currently up to 40% of the raw water is sourced from the River Gaddagh as the quantity of water from Lough Callee is restricted due to the quality of the intake pipe. The possibility to shut off the river source during flood events is constrained by the lack of treated water storage available at the plant. The intake from the lake source cannot be increased due to problems with the quality of the pipe. The other reservoirs on the network are not linked to SCADA which makes it difficult to manage supply and demand across the network

7. Treatment Process Chemicals

		Answer
7.1	Are treatment process chemicals appropriately managed and stored?	No

Comment

No drip tray or lockable cover was observed on the aluminium sulphate storage tank.

8. Management and Control

		Answer
8.1	Are relevant alarms dialled out via a cascade system to allow a timely response by plant operators?	Yes

Comment

A cascade system is in place for responding to alarms.

		Answer
8.2	Is the data obtained from sampling and monitoring used to actively inform the processes on site and in the distribution network?	No

Comment

The supply is served by a reservoir at the plant (with approximately 3 hours treated water storage) and 4 other reservoirs located in the network. None of the reservoirs are linked to SCADA which makes it very difficult to manage water supplies in the network when the plant is under pressure due to high turbidity and colour in the raw water.

		Answer
8.3	Are instrument calibrations within date?	Yes

Comment

All instruments checked were within calibration dates.

Recommendations

Subject	Mid-Kerry (Gearha) Audit Recommendations	**Due Date**	13/12/2020
Action Text	**Recommendations** 1. Irish Water should review and implement turbidity alarms and shutdowns on each filter and on the final water to ensure that the plant operates in accordance with the the EPA turbidity performance criteria in order to demonstrate that there is an effective protozoal barrier at the plant. 2. Irish Water should take action to improve the resilience of the Mid-Kerry (Gearha) public water supply by ensuring that the supply has sufficient treated water supply at the plant to meet demand during periods of poor source water quality and by connecting the reservoirs in the network to SCADA so that the water supply can be better managed. 3. Irish Water should undertake an assessment of the filters at the plant. The assessment should include the underfloor drainage system of each filter, an assessment of the media and the reasons why anthracite is being lost and depth marker posts should be installed in the filters. 4. Irish Water should confirm the protozoal log treatment requirement for the plant and identify how the log deficit will be addressed. 5. Irish Water should continue to monitor the supply in accordance with Irish Water's *'Rationale for Determining the Frequency of Cryptosporidium Monitoring in Public Water Supplies'*. 6. Irish Water should install a shutdown based on high residual chlorine in the final water. 7. Irish Water should investigate the online turbidity monitors on each filter to ensure that they are operating correctly. 8. Irish Water should ensure that residual chlorine monitoring takes place in the network several times a week so that any disinfection issues in the network are picked up in a timely manner. 9. Irish Water should move the location of the final water sample point for the turbidity monitor and residual chlorine monitor to a more suitable location so that the sample pump is not affected by low reservoir levels. 10. Irish Water should update EDEN with the correct sources for the supply. **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 Dr. Michelle Minihan, Drinking Water Team Leader. Irish Water should submit a report to the Agency on or before 13/12/20 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 DW20200080 in any future correspondence in relation to this Report.		