

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	Limerick City Environs PWS
Organisation	Irish Water
Scheme Code	1900PUB1032
County	Limerick
Site Visit Reference No.	SV20576

Report Detail	
Issue Date	19/10/2020
Prepared By	Orla Harrington

Site Visit Detail			
Date Of Inspection	24/09/2020	Announced	Yes
Time In	10:35	Time Out	13:10
EPA Inspector(s)	Aoife Loughnane Orla Harrington		
Additional Visitors			
Company Personnel	Irish Water: Darragh Conneely*, Deirdre O'Loughlin **, Siobhan Clifford * DBO - Veolia: Enda Cahalane **, Charlotte O'Hare ** Limerick City and County Council: Natasha McGarry *, Ger Sheehan * *attended pre-site meeting 23/09/2020 ** attended pre-site meeting 23/09/20 and site visit 24/09/20		

> Summary of Key Findings

1. The filters at Clareville water treatment plant (WTP) are not currently being operated in accordance with the EPA's turbidity performance criteria for rapid gravity filters of 0.2NTU (using the turbidity approach) or 0.3NTU (using the log credit approach). This means the performance of the plant's *Cryptosporidium* barrier cannot be verified. Irish Water should review turbidity alarm set points on individual filters and the backwash trigger level, having regard to the EPA turbidity performance criteria.
2. Lime is dosed for pH correction between the clarifiers and the filters. This is not normal practice in water treatment plants and is likely to be causing the elevated turbidity levels in the filtered water. Irish Water should examine alternative options to the addition of lime pre-filtration to ensure that the filters meet the EPA turbidity performance criteria in order to demonstrate an effective *Cryptosporidium* barrier.
3. There is scope to improve the effectiveness of orthophosphate treatment by optimising the pH levels at Clareville WTP, in order to minimise levels of lead in Limerick City Environs public water supply.
4. A protozoal compliance log deficit exists at Clareville WTP, which means the level of treatment is currently not proportionate to the risk posed by the River Shannon source water. There is a weekly sampling programme for *Cryptosporidium* at the WTP and all results carried out to date have been clear. To ensure the ongoing safety of the water supply, Irish Water need to identify how the protozoal compliance log deficit is to be addressed.

> Introduction

Clareville WTP is operated by Veolia on behalf of Irish Water. There are two sources of raw water for the WTP, namely a canal feed (65%) adjacent to the plant linked to the River Shannon and a gravity feed from the Clonlara headrace (35%), which supplies water to Ardnacrusha hydroelectric power station. Both sources are downstream from Lough Derg.

Treatment comprises of screening, pH correction using sulphuric acid, coagulation, flocculation, clarification (Degremont and Actiflo clarifiers), pH correction using lime, rapid gravity filtration, further pH adjustment using lime, chlorination (using chlorine gas and chlorine dioxide depending on Trihalomethane formation), ortho-P dosing and fluoridation. There is sludge treatment on-site, consisting of a picket fence thickener and centrifuges.

The treatment plant has a design capacity to produce 87,000 m³/day of water. The plant is currently operating below design capacity and abstracts approximately 45,000 m³ /day of water servicing a population of 114,138.

Irish Water has not confirmed the protozoal log credit requirement for the source water, however the River Shannon is considered to be in the highest risk category for a surface water source (lowland catchment with high concentration of animals and humans in immediate vicinity or upstream, and waste water treatment outfall upstream). This indicates either a 5 log or 4 log credit treatment requirement to achieve protozoal compliance. The current treatment processes at the plant provide 3 log credits for protozoa. Therefore a protozoal compliance log deficit currently exists at Clareville WTP. An additional log credit for enhanced filtration could be considered if the plant is upgraded so that the filters deliver consistently good performance of less than 0.1NTU.

> Supply Zones Areas Inspected

The purpose of the audit was to assess Irish Water's performance under the European Union (Drinking Water Regulations) 2014, as amended and included a walk through of the WTP from the raw water intake point to the final stage of fluoridation. The offsite storage reservoirs were not inspected during this audit.



1. Coagulation Clarification Flocculation (CFC) Stage

		Answer
1.1	Is the CFC process optimised to respond to changes in raw water quality?	Yes
Comment		
<ol style="list-style-type: none">1. The raw water is dosed with aluminium sulphate for coagulation and sulphuric acid for pH adjustment in the flash mixing chamber. It is then dosed with polymer prior to entry to the clarifiers.2. The raw water has typically a pH of 8.1 which is brought down to pH 6.4 to 6.5 for optimum coagulation. The coagulant dosing is flow proportional and any adjustment is manual. Irish Water are investigating options to upgrade to automated control of coagulant dosing.3. A visual inspection of the clarifiers found there was no evidence of floc carryover to the filters.		

		Answer
2.1	Are the filters designed and managed in accordance with EPA guidance?	No
Comment		
<ol style="list-style-type: none"> 1. The combined water from the clarifiers passes to 7 No. rapid gravity filters. There are turbidity monitors on the individual filters and on the combined filtered water. 2. A dual media bed with sand and anthracite, supported by gravel, is in place on all filters. The filter media was last replaced in 2014 and has a total media depth of 760mm (460mm anthracite and 300mm sand). This is less than the EPA recommended filter media depth of 1,000mm to 1,200mm to ensure effective filtration. 3. The filters automatically backwash if the turbidity reaches the alarm of 0.6 NTU or loss of head of 2.5 metres or every 48 hours, whichever comes first. 4. The turbidity monitor on the combined filtered water has a high alarm setpoint of 0.3 NTU and a high high shutdown setpoint of 0.6 NTU (for > than 10 minutes). These setpoints 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). 5. The SCADA graph of turbidity levels leaving the plant during a 5 week period (12/08/20 - 16/09/20) indicate consistently elevated turbidity results of >0.2 NTU. Lime dosing for pH correction between the clarifiers and the filters is likely to be contributing to the elevated turbidity. 		

		Answer
2.2	Was there visual indication that the filters were operating appropriately?	Yes
Comment		
<p>A filter backwash was observed on filter No. 1 during the audit. The backwash sequence is 5 minutes air scour followed by 15 minutes water scour. A programmed slow start runs for approximately 15-20 minutes after the backwash. The filtration rate for all filters is approximately 6m³/hr, which is within the recommended filtration rate of <7.5m³/hr. The media and distribution of air and water appeared to be even across the filter bed with no dead zones apparent.</p>		



3. Disinfection

3.1

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

Answer

Yes

Comment

1. Primary disinfection is achieved using chlorine gas. The chlorine gas arrangement consists of 3 duty and 3 standby chlorine gas drums which are configured to change over automatically when the pressure drops to 0.8 bar in one drum. The chlorine dose is flow proportional with residual trim.
2. There are four residual chlorine monitors, two immediately following dosing and two following contact time on the rising main as final water leaves the plant. A chlorine contact time of 1 hour and 35 minutes is provided and indicates an effective contact time at full production.
3. The low and high chlorine alarm settings are 0.8mg/l and 2mg/l. There is automatic shutdown of the plant at a low low chlorine alarm setting of 0.5mg/l. There is no automatic shutdown of the plant at a high high chlorine alarm of 2.5mg/l.
4. The chlorine monitor was reading 1.25mg/l leaving the plant at the time of the audit which is in line with the chlorine residual target of 1.2 - 1.3mg/l.
5. All chlorine alarms are linked to a dial out system that alerts relevant operators and a cascade system is also in place for responding to alarms.
6. There is a chlorine dioxide unit which operates over the summer months and during periods of high THM formation. The chlorine dioxide is made onsite from sodium chlorite and chlorine gas. The unit is manually turned on if THM levels are >60ug/l leaving the plant, turned off if THM is <50ug /l and operates in parallel to the chlorine gas. Treated water samples are analysed weekly for THMs.



4. Reservoirs and Distribution Networks

		Answer
4.1	Are reservoirs adequately inspected and maintained?	No
Comment		
<p>There are five reservoirs in total on the network; Newcastle (x2), Friarstown, Knockbrack and Knockalisheen (Co. Clare). The reservoirs were not visited as part of the audit.</p> <p>Limerick City and County Council advised during the pre-audit meeting on 23/09/20 that reservoirs at Newcastle and Friarstown were due to be cleaned but this work has been delayed due to the Covid-19 pandemic. Knockbrack Reservoir was cleaned in 2019.</p>		



5.1

Have relevant failures to comply with the requirements of the European Union (Drinking Water) Regulations 2014, as amended, been notified to the EPA?

Answer

Yes

Comment

There are two open EPA files relating to exceedances of the Aluminium and Iron parametric values at network locations in the Limerick City Environs PWS since 2019. Irish Water's investigation into the exceedances indicate that the cause is attributed to issues in the distribution network, rather than the water quality leaving Clareville WTP, which complies with the aluminium and iron parametric values in the *Drinking Water Regulations 2014, as amended*.

A programme of flushing of the affected areas has been implemented and Irish Water is due to submit the results of further sampling carried out post flushing to the EPA.



6. Site Specific Issues

		Answer
6.1	Has the protozoal compliance log treatment requirement been identified for Clareville WTP?	No
Comment		
<p>Irish Water has not confirmed the protozoal log credit requirement for the source water, however the River Shannon is considered to be in the highest risk category for a surface water source (lowland catchment with high concentration of animals and humans in immediate vicinity or upstream, and waste water treatment outfall upstream). This indicates either a 5 log or 4 log credit treatment requirement to achieve protozoal compliance. The current treatment processes at the plant provide 3 log credits for protozoa. Therefore a protozoal compliance log deficit currently exists at Clareville WTP. An additional log credit for enhanced filtration could be considered if the plant is upgraded so that the filters deliver consistently good performance of less than 0.1 NTU.</p> <p>Irish Water outlined at the audit that the log deficit for the plant is currently being reviewed under their new Source Cryptosporidium Risk Assessment Methodology. Irish Water have a weekly monitoring programme for <i>Cryptosporidium</i>/<i>Giardia</i> at the plant and there have been no detections to date.</p> <p>Irish Water are preparing a Drinking Water Safety Plan (DWSP) for the Clareville WTP to ensure the safety and security of the water supply by identifying and managing the risks.</p>		

		Answer
6.2	Is there adequate raw water monitoring of the source?	No
Comment		
<p>At the audit, the water intake points and screens were inspected for the Clareville source adjacent to the plant. The Clareville raw water intake is monitored continuously for turbidity, pH, temperature, colour and conductivity. The Clonlara raw water intake is not monitored continuously. Daily grab samples are taken by the plant operators. Raw water turbidity was 1.8 NTU at the time of the audit.</p> <p>There is a polycyclic aromatic hydrocarbon (PAH) monitor on the Clareville source with an automatic shutdown of the plant at 500 ug/l. There has been no recorded exceedance of this trigger level. The Drinking Water Regulations 2014, as amended, specify a parametric value of 0.1 ug/l for PAH's in drinking water. The 500ug/l trigger level set for PAH is likely to be too high to protect the plant in the event of a PAH contamination incident. All monitors are linked to SCADA and monitoring information is easily available to the plant operator.</p>		

		Answer
6.3	Is the orthophosphate dosing system optimised at Clareville WTP?	No
Comment		
<p>An orthophosphate dosing system was installed at Clareville in 2016 to achieve a reduction in lead levels in the drinking water supply to Limerick City Environs. This has resulted in an increase in lead compliance from 94.8% to 97.6% (as reported in Irish Water's Lead Programme Update to the Lead Mitigation Advisory Group in January 2020) but there is room for further improvement by optimising the pH levels at Clareville WTP. Irish Water has already identified the need to optimise the pH dosing systems at the plant to achieve a steady 7.3 pH, in order to improve the effectiveness of orthophosphate dosing.</p>		

Recommendations

Subject	Clareville Audit Recommendations	Due Date	19/11/2020
Action Text	<p data-bbox="272 338 517 371">Recommendations</p> <ol data-bbox="300 398 1433 1525" style="list-style-type: none"><li data-bbox="300 398 1433 546">1. Irish Water should examine and implement alternative options to the addition of lime pre-filtration, to ensure that the filters meet the EPA turbidity performance criteria for filtered water of <0.2NTU (using the turbidity approach) or <0.3NTU (using the log credit approach), in order to demonstrate an effective <i>Cryptosporidium</i> barrier at Clareville water treatment plant.<li data-bbox="300 573 1433 663">2. Irish Water should optimise the pH dosing systems at Clareville water treatment plant to improve the performance of ortho-phosphate treatment, in order to minimise the levels of lead in drinking water.<li data-bbox="300 689 1433 779">3. Irish Water should review the individual filter turbidity alarm setpoints and backwash trigger level, and the combined filter turbidity alarm setpoint, to ensure the filters meet the EPA turbidity performance criteria.<li data-bbox="300 806 1433 862">4. Irish Water should top up the filter media to ensure between 1000 - 1200mm media depth above the support gravel.<li data-bbox="300 889 1433 945">5. Irish Water should investigate the feasibility of upgrading to automated control of chemical coagulant dosing at Clareville water treatment plant.<li data-bbox="300 972 1433 1028">6. Irish Water should install an automatic shutdown of the plant if the final water reaches a critically high chlorine setpoint.<li data-bbox="300 1055 1433 1144">7. Irish Water should install continuous automatic monitors for raw water turbidity, pH, conductivity and colour on the Clonlara source, to alert plant operators to any changes in raw water quality.<li data-bbox="300 1171 1433 1227">8. Irish Water should review the PAH shutdown setpoint on raw water at the Clareville canal source, to ensure it is set at an appropriate level.<li data-bbox="300 1254 1433 1310">9. Irish Water should complete the Drinking Water Safety Plan for Limerick City & Environs public water supply.<li data-bbox="300 1337 1433 1393">10. Irish Water should identify how the protozoal compliance log deficit is to be addressed at Clareville water treatment plant.<li data-bbox="300 1420 1433 1509">11. Irish Water should ensure that the treated water storage reservoirs at Newcastle and Friarstown are inspected and cleaned as a matter of priority. Irish Water should also inspect Knockalishen Reservoir and undertake reservoir cleaning if necessary. <p data-bbox="272 1603 810 1637">Follow-Up Actions required by Irish Water</p> <p data-bbox="272 1664 1433 1720">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 data-bbox="272 1747 1433 1780">This report has been reviewed and approved by Regina Campbell, Drinking Water Team Leader.</p> <p data-bbox="272 1807 1433 1863">Irish Water should submit a report to the Agency a month from date of issue detailing how it has dealt with the issues of concern identified during this audit.</p> <p data-bbox="272 1890 1433 1946">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 data-bbox="272 1973 1433 2029">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 data-bbox="272 2056 1433 2112">Please quote the Action Reference Number DW20190193 in any future correspondence in relation to this Report.</p>		

