

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	DCC Zone 6
Organisation	Irish Water
Scheme Code	0700PUB1007
County	Dublin
Site Visit Reference No.	SV23044

Report Detail	
Issue Date	22/12/2021
Prepared By	Aoife Loughnane

Site Visit Detail			
Date Of Inspection	10/12/2021	Announced	Yes
Time In	10:00	Time Out	13:15
EPA Inspector(s)	Aoife Loughnane Michelle Minihan		
Additional Visitors	HSE: Helena Murray, Niamh McGrath		
Company Personnel	Irish Water: John Leamy, Edward Haythornthwaite, Peter Thornton, Joe Reilly, John Prendeville, Paul McLoughlin Veolia (operating the plant under DBO contract with Irish Water): Frank Murphy, Tomas Cummins, Elodie Kaiser Nicholas O'Dwyer Ltd. Consulting Engineers: Alistair Cussen, Graham Reynolds, Cathal Kinsella		

> Summary of Key Findings

1. The new Vartry water treatment plant is now operational and providing a high quality treated water supply to over 200,000 people in North Wicklow and South Dublin. This major upgrade has significantly improved the safety and security of the Vartry water supply.
2. There were two chemical dosing incidents at the new plant in early December; a disinfection failure incident on 06/12/21 and a fluoride dosing incident on 10/12/21. These incidents occurred while the plant was still in commissioning phase. The operators have undertaken corrective actions to prevent a reoccurrence, including 24/7 operator presence on site, implementing an alarm response cascade system, and a lessons learned review to ensure increased vigilance in overseeing plant operations.
3. Irish Water is undertaking a comprehensive THM verification monitoring programme to support their submission to remove Vartry from the EPA's Remedial Action List (RAL). The EPA will assess all available information before making a decision on whether the 7 Vartry-fed supplies can be removed from the RAL at the end of January 2022.

> Introduction

Vartry water treatment plant is the fourth largest water treatment plant in Ireland and provides drinking water to over 200,000 people in North Wicklow and South Dublin. Irish Water has constructed a new treatment plant adjacent to the old plant at Vartry. The new plant was put into continuous operation on 01/11/21 following a period of testing and ramping up production. At the time of the audit, the plant was still in commissioning phase and producing approximately 48 ML/day. The design capacity of the new plant is 80 ML/day.

Treatment at the new plant comprises the following:

- Raw water conditioning to boost alkalinity to maintain the optimum coagulation pH;
- Coagulation, flocculation and clarification using a Dissolved Air Flotation (DAF) process. There are 4 DAF units at the plant;
- Filtration in 8 rapid gravity filters containing dual media (sand & anthracite);
- UV disinfection for protozoal inactivation;
- Chlorine disinfection to provide primary disinfection using sodium hypochlorite;
- Fluoridation of the water supply;
- Treated water pH correction to achieve the target final water pH;
- Ortho Phosphoric Acid dosing for lead mitigation purposes (expected to commence in early 2022);
- Return of backwash supernatant to the head of the works (the planning permission prohibits discharge to the Vartry River);
- Sludge treatment facilities.

There are 7 supplies on the EPA's Remedial Action List (RAL) which are supplied by Vartry water treatment plant; DLR Zone 6 (Roundwood), Wicklow Regional, Bray, Enniskerry, Greystones / Windgates / Templecarrig, Newtownmountkennedy / Newcastle / Kilcoole, and Kilmacanogue. These supplies fall under two RAL categories;

1. Elevated levels of THMs above the standard in the Drinking Water Regulations,
2. EPA Audit Observations – treatment and management issues.

This audit was carried out to assess the progress of the RAL action programme and in response to the Boil Water Notice issued by Irish Water from 06/12/21 to 10/12/21 as a precaution to protect the health of 17,497 people following a disinfection failure incident at the plant.

> Supply Zones Areas Inspected

The new Vartry water treatment plant processes, equipment and controls were inspected as part of the audit.



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?	Yes
Comment	
<p><u>Boil Water Notice Incident:</u></p> <p>1. On 06/12/21, Irish Water issued a Boil Water Notice affecting 17,497 people, to protect public health following a disinfection incident which caused the shutdown of the new Vartry water treatment plant. The subsequent draining of the treated water reservoir caused water with high turbidity to enter the distribution network, which meant the water was potentially unsafe to drink. As the water had undergone primary disinfection at the plant, the Boil Water Notice was limited to areas of potentially inadequate chlorine levels, i.e. areas that don't receive secondary disinfection by booster chlorination.</p> <p>2. The cause of the incident was identified as a disinfection failure due to an airlock in the chlorine pump which caused it to stop dosing. The low chlorine alarm was activated when levels dropped to 0.7 mg/l in treated water, and the plant automatically shut down at 00:36 on 06/12/21. The covered reservoir outlet pumps continued to operate until 04:20, when they stopped pumping due to the low level in the reservoir. As the reservoir emptied, the outlet turbidity began to rise, reaching a maximum of 4.11 NTU at 07:05. Free chlorine at the reservoir outlet started to drop at 03:45 from 0.92 mg/l to 0.1 mg/l at 06:20.</p> <p>3. The plant was not manned overnight at the time of the incident. The low chlorine alarm sent a text message to alert Veolia staff, but the alarm was not responded to until approximately 4 hours later. At 04:25 the plant was restarted and chlorine dosing resumed. Free chlorine at the reservoir outlet was restored to 0.7 mg/l at 06:45 and the turbidity levels dropped steadily, to 0.5 NTU at 09:18, 0.3 NTU at 10:10 and 0.2 NTU at 10:42.</p> <p>4. The following corrective actions were taken in response to this incident:</p> <ul style="list-style-type: none"> • A night-time shift has been put in place so there is now 24/7 operator presence on site. Following the audit, Irish Water confirmed that the 24/7 staffing arrangement will remain in place for the foreseeable future, and that any proposal to change this arrangement will be fully risk assessed and informed by evidence of effective and stable plant operations, including alarm management. • Changeover of duty pump on low chlorine flow so that if a pump airlocks, it will trigger a changeover to the standby dosing pump. • A cascade text message system has now been put in place for responding to alarms. The cascade system now requires an operator to reply to acknowledge they are dealing with the alarm. Veolia stated that there are 9 to 10 staff in the cascade system. <p>5. Investigative samples were taken in the distribution network once the plug of compromised water had passed through the affected areas. The samples taken on 08/12/21 showed compliant microbiological quality and satisfactory chlorine levels in the Wicklow area. The samples taken on 09/12/21 showed compliant microbiological quality and satisfactory chlorine levels in DLR Zone 6. Irish Water lifted the Boil Water Notice on 10/06/21, following consultation with the HSE.</p> <p><u>Fluoride Dosing Incident:</u></p> <p>1. On 10/12/21, a fluoride analyser ran out of reagent causing the reading to drop to zero, which in turn triggered a low fluoride alarm at 04:05 am. The operator on site responded to the alarm, saw that the fluoride dosing pump was not operating (one filter was backwashing at the time so there was no flow going forward), and set the pump to manual mode rather than flow proportional. This caused fluoride over-dosing for approximately 1 hour. Upon discovery of the error, the operator stopped the fluoride dosing pump for an hour to allow final water fluoride levels to dilute in the covered reservoir which contained approximately 8,500 m3 at the time. The fluoride levels entering distribution peaked at 1.07mg/L.</p> <p>2. Following the audit, Irish Water confirmed that Veolia have undertaken a number of corrective actions including a lessons learned review of the incident and a toolbox talk with operators to discuss the findings, and an updated troubleshooting guide for all water quality instruments at the plant.</p>	



2. Reservoirs and Distribution Networks

2.1

	Answer
Are reservoirs adequately inspected and maintained?	No
Comment	
<p>1. Irish water confirmed that the covered treated water reservoir at the plant (10,000 m3 capacity) is in operation since 2006 and has not been cleaned since. At the audit there was no confirmed timeframe for cleaning this reservoir and it was not planned in the scope of the major WTP upgrade project.</p> <p>2. Irish Water confirmed that reservoir cleaning will now be scheduled. There are two cells in the reservoir which will allow for one cell to be drained & cleaned while the other cell remains in use.</p> <p>3. There are 13 treated water reservoirs in the Vartry distribution network. Following the audit, Irish Water provided details of reservoir cleaning as follows:</p> <ol style="list-style-type: none">1. Drummin (Bray): 8,000 m3 capacity. Last cleaned in 2020.2. Giltspur: 6,820 m3 capacity. Last cleaned in 2015.3. Kilageer: 5,600 m3 capacity. Last cleaned in 2019.4. Broomhall: 2,500 m3 capacity. In operation since 2014. On reservoir cleaning programme - date to be confirmed.5. Cronroe (WTW): 2,273 m3 capacity. Last cleaned in 2020.6. Priestnewtown: 1,900 m3 capacity. Last cleaned in 2019.7. Ballynerrin: 450 m3 capacity. Last cleaned in 2020.8. Greenhills: 450 m3 capacity. Last cleaned in 2017.9. Mariners Point: 400 m3 capacity. In operation since 2011. On reservoir cleaning programme - date to be confirmed.10. Kilmolin: 230 m3 capacity. Last cleaned in 2019.11. Windgates: 95 m3 capacity. Last cleaned in 2020.12. Carigoona: 90 m3 capacity. Last cleaned in 2019.13. Rathmichael: 10,600 m3 capacity. No details of reservoir cleaning were provided.	



3. Management and Control

		Answer
3.1	Is the plant suitably managed and controlled to maintain the designed log credit on each treatment stage?	Yes
	Comment	
	<p>1. Irish Water has calculated a 3-log protozoal log removal requirement for the Vartry Reservoir source. The new Vartry WTP exceeds this requirement as it provides a 6-log barrier, i.e. 3-log credit for the clarification and filtration processes and a further 3-log credit for UV disinfection.</p> <p>2. The controls on filter turbidity and UV disinfection are set at an appropriate level to verify the log credit performance of the treatment processes.</p>	
		Answer
3.2	Are suitable plant shutdowns/inhibits in place to prevent the entry of inadequately treated water entering the distribution network?	Yes
	Comment	
	<p>There are suitable plant shutdowns/inhibits in place on individual filtered water turbidity, final water free chlorine residual, final water pH, low UV dose and low UVT (post filtration).</p>	
		Answer
3.3	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>1. There are suitable alarms in place to alert operators to a failure of a critical treatment process.</p> <p>2. Irish Water confirmed that the new Vartry WTP is not yet connected to their National Operations Management Centre (NOMC) in Colvill House. The plant alarms will be connected into the NOMC, which is due to be staffed on a 24/7 basis in Q1 2022. This will allow centralised oversight and access to SCADA data regarding the operational performance and critical alarms at the Vartry plant, the 4th largest water treatment plant in the country.</p>	



4. Drinking Water Quality

		Answer
4.1	Have relevant failures to comply with the requirements of the European Union (Drinking Water) Regulations 2014, as amended, been notified to the EPA?	Yes
Comment		
<p>Since the new Vartry WTP began continuous operation on 01/11/21, Irish Water has notified the EPA of 4 exceedances of the Drinking Water standards:</p> <ul style="list-style-type: none">• 109 ug/l THM and 1 mg/l fluoride at Boghall Council Depot, Bray in a sample taken on 03/11/21. Irish Water confirmed that this sample was taken before water from the new plant had reached the sample tap and these results are therefore considered to be representative of water quality from the old Vartry plant.• 53 ug/l manganese at Roundwood Final (Reservoir at Plant) and 55 ug/l manganese at Roundwood Final (Callow Hill) on 26/11/21. At the time of issuing this audit report, the EPA awaits information from Irish Water regarding the outcome of their investigation into the cause of the manganese exceedance and corrective actions taken to restore compliance, the results of follow up sampling and an action plan with timeframe for cleaning the covered reservoir at Vartry WTP.		

		Answer
4.2	Is <i>Cryptosporidium</i> monitoring being carried out in accordance with Irish Water's 'Rationale for Determining the Frequency of <i>Cryptosporidium</i> Monitoring in Public Water Supplies'?	Not Applicable
Comment		
<p>1. The monthly report from Dublin City Council Central Laboratory shows that weekly sampling for <i>Cryptosporidium/Giardia</i> continued at Vartry final water (reservoir at plant) for the month of November 2021, after the cessation of production at the old plant. There were no detections of <i>Cryptosporidium/Giardia</i> in the weekly samples taken in November.</p> <p>2. Following the audit, Irish Water clarified that because the new Vartry water treatment plant operates with a zero log deficit, parasitology monitoring is not necessary. Irish Water stated that they will liaise with Dublin City Council Central Laboratory to clarify the arrangements for parasitology monitoring at Vartry going forward.</p>		



5. Supply on the Remedial Action List

		Answer
5.1	Do the audit findings support progress made with the Remedial Action List upgrades?	Yes
Comment		
<p>1. The new Vartry water treatment plant was put into continuous operation on 01/11/21 following a period of testing and ramping up production. At the time of the audit, the plant was still in commissioning phase and producing approximately 48 ML/day. The design capacity of the new plant is 80 ML/day.</p> <p>2. Treatment at the new plant comprises the following:</p> <ul style="list-style-type: none"> • Raw water conditioning to boost alkalinity to maintain the optimum coagulation pH; • Coagulation, flocculation and clarification using a Dissolved Air Flotation (DAF) process. There are 4 DAF units at the plant; • Filtration in 8 rapid gravity filters containing dual media (sand & anthracite); • UV disinfection for protozoal inactivation; • Chlorine disinfection to provide primary disinfection using sodium hypochlorite; • Fluoridation of the water supply; • Treated water pH correction to achieve the target final water pH; • Ortho Phosphoric Acid dosing for lead mitigation purposes (expected to commence in early 2022); • Return of backwash supernatant to the head of the works (the planning permission prohibits discharge to the Vartry River); • Sludge treatment facilities. <p>3. The RAL action programme to upgrade Vartry water treatment plant is now complete and awaiting verification of the effectiveness of the action programme. The verification process involves this EPA audit at the new plant and a comprehensive THM verification monitoring programme across the 7 Vartry-fed water supply zones.</p> <p>4. Irish Water's THM verification monitoring programme began on 03/11/21. The results available up to 06/12/21 show a significant reduction in THM levels across the distribution network since the introduction of the new Vartry treatment plant into supply.</p>		

		Answer
5.2	Is further information needed to assess completion of the Remedial Action List upgrade?	Yes
Comment		
<p>1. Irish Water is due to submit the remaining results of the THM verification monitoring programme to the EPA for consideration for RAL removal in the Q4 2021 RAL update, due to be published by 31/01/22.</p> <p>2. At the audit, the EPA requested a weekly THM sampling frequency across the 7 Vartry-fed water supply zones until late January 2022, so that there is a comprehensive data-set to demonstrate THM compliance across the distribution network.</p>		



6. Site Specific Issues

		Answer
6.1	Are the rodent control measures appropriate for use at a water treatment plant?	Yes
Comment		
<p>1. During the audit, a professional pest control operator was tending to rat bait boxes at the plant. The auditors raised a concern about the use of rodenticides on site, because rats consuming rodenticides are likely to seek a source of water following ingestion and this creates a risk of the poisoned rat entering the water at the plant. <i>EPA Drinking Water Advice Note 13: Pesticides in Drinking Water</i> states that the use of rodenticides at a water treatment plant should be avoided unless absolutely necessary, and where they are used, it should be for a limited duration until the problem is brought under adequate control.</p> <p>2. Following the audit, Irish Water confirmed that the rodent control programme at Vartry WTP uses a non toxic rodent attractant lure made of plastic which is impregnated with aromas to attract rodents. Rodents entering the bait boxes are killed and an alert is sent to the post control operator. This mitigates the potential risk to drinking water quality arising from the rodent control measures at Vartry WTP.</p>		

		Answer
6.2	Is there a reliable and secure power supply to the water treatment plant?	No
Comment		
<p>1. During the audit, the operators and consulting engineers identified that the power supply to the new plant is unstable and unreliable, with at least 1 to 2 power cuts per day. The ESB has been doing works on the supply lines which has caused power interruptions.</p> <p>2. There is a diesel generator on site which provides a key mitigation to keep the plant running during power cuts. The generator ran for two nights to keep the plant operating during Storm Barra on 07/12/21.</p> <p>3. Irish Water stated that they are engaging with the ESB regarding the reliability and security of power supply to the plant.</p>		

Recommendations

Subject	Vartry New WTP Audit Recommendations	Due Date	24/01/2022
Action Text	<p>Recommendations</p> <p>Irish Water is responsible for ensuring a safe and secure supply of drinking water. To address these issues, Irish Water should implement the following recommendations without delay.</p> <ol style="list-style-type: none"> 1. Irish Water should submit a comprehensive dataset of THM verification monitoring results across the 7 Vartry-fed water supply zones by 24/01/22 for consideration for RAL removal. 2. Irish Water should clean the covered reservoir cells at Vartry water treatment plant as a matter of priority, to remove the build-up of sediment in the reservoir which gave rise to elevated turbidity levels in final water during the disinfection incident on 06/12/21. 3. Irish Water should prepare and implement a reservoir cleaning programme for all treated water reservoirs in the Vartry distribution network. 4. Irish Water should connect the new Vartry water treatment plant to the National Operations Management Centre in Colvill House without delay, to allow centralised oversight and access to SCADA data regarding the operational performance and critical alarms at the plant. 5. Irish Water should engage with the ESB to improve the reliability and security of the power supply to the new Vartry water treatment plant. 6. Irish Water should evaluate the effectiveness of continuing the <i>Cryptosporidium/Giardia</i> monitoring programme in final water, considering that the new Vartry water treatment plant operates with a zero log deficit. <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 Dr. Michelle Minihan, Senior Inspector, Drinking Water Team.</p> <p>Irish Water should submit a report to the Agency on or before 24/01/22 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.</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>		