Public Drinking Water Monitoring Programme Audit Report

County:	Limerick City and County Council	**Date of Audit:**	21st August 2019
Location visited:	Limerick City and County Council Offices	**Date of issue of Audit Report:**	4th December 2019
		Auditors:	Ms. Derval Devaney (EPA) Dr. John Gray (Consultant)
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended*. • The *EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7).* • The *EPA Information Note issued January 2019 to Irish Water and Local Authorities.*		

MAIN FINDINGS

- **Irish Water did not notify the EPA of aluminium, iron and turbidity failures which occurred in January, April and May 2018 in the Limerick City Environs PWS. The EPA became aware of the failures upon a review of the 2018 monitoring data for Limerick City and Co. submitted by Irish Water to the EPA in Q1, 2019.**
- **Weaknesses in procedures were identified, particularly for the selection and pre-determination of sampling locations to ensure that compliance samples are evenly spread and representative of water in the supply zone.**
- **Irish Water did not carry out compliance monitoring for nitrite at public water treatment plants. There was no protocol to determine the concentrations of acrylamide, epichlorohydrin and vinyl chloride in drinking water where these chemicals are used in treatment and supply.**
- **Irish Water did not have a written procedure for identifying the cause of any sample result that exceeds the parametric values outlined in the *Drinking Water Regulations***

***(S.I. no 122 of 2014) as amended*, and the remedial action required.**

- **Irish Water's protocol for the notification of failures of chemical and microbiological parameters illustrates that Irish Water carries out a risk assessment of the failure. This step should include consultation with the HSE to determine if there is a risk to public health.**

1. Introduction

Under the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended,* the Environmental Protection Agency (EPA) 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 carrying out effective monitoring of drinking water supplies to ensure the provision of clean and wholesome drinking water.

An audit of the Irish Water 2018 monitoring programmes implemented in County Limerick was carried out at the Limerick City and County Council Offices, Lissanalta House, Dooradoyle, Limerick, V94H5RR. Prior to the audit, the EPA assessed monitoring returns to identify any areas of discrepancy between samples taken and analysed and reported to EPA. Using a questionnaire as a guide, Irish Water and Limerick City and County Council (Co. Co.) staff were interviewed to ascertain the principles and methodology for establishing monitoring programmes, sample point selection, sample classification, integrity of data reporting and notification procedures.

The audit observations and recommendations are listed in Sections 2 and 4 of this report. The following were in attendance during the audit.

Representing Irish Water:

Sarah Kearney - Drinking Water Compliance Analyst- Environmental Regulation
Kian Guihen – Drinking Water Compliance Analyst - South
Tommy Roche – Drinking Water Compliance Analyst - South

Representing Limerick City and County Council:

Claire Linehan – Acting Senior Executive Scientist
John O'Halloran – Executive Scientist
Tom Tarpey – Senior Engineer
Rona Saunders – Assistant Scientist
Sinead Kennedy – Senior Executive Engineer
Eithne Lynch – Executive Technician

Representing the Environmental Protection Agency:

Ms. Derval Devaney - Inspector, EPA
Dr. John Gray - Consultant

2. Audit Observations

The audit process is a random sample on a particular day of a facility's operation. Where an observation or recommendation against a particular issue has not been reported, this should not be construed to mean that this issue is fully addressed.

1.	**Compliance Monitoring Programme** a) Irish Water had registered 36 public water supplies on the EPA's Environmental Data Exchange Network (EDEN) system for 2018 which are located in Limerick City and County. b) The 2018 compliance monitoring programme was prepared by Irish Water and Limerick City and Co. Co. and was based on population (derived from Geographic Information System data and Irish Water's data book, multiplied by an occupancy rate of three per property) or volume. Census data from 2016 was also considered. The population and volume data are reviewed annually. c) The compliance programme is recorded on Irish Water's Information Technology system and held locally on the Council's electronic system. d) The 2018 compliance monitoring programme included for each of the 36 public water supplies in Limerick City and Co. Co. a list of: source type; source name; water supply zone (WSZ) code; a summary of treatment type; population; daily volume supplied; the ratio of population to volume (P/V); the number of Group A and Group B samples required; and approximate sampling dates within a monthly period. e) The 2018 compliance monitoring programme did not include pre-determined sample locations. f) Limerick City and Co. Co. operates the public water supply systems on behalf of Irish Water under a Service Level Agreement. The sampling programme is carried out by Limerick City and Co. Co. with whom there is an Irish Water framework agreement for levels of service. g) Some samples are analysed in Limerick City and Co. Co.'s laboratory which is accredited by the Irish National Accreditation Board (INAB), to undertake testing for specified parameters in potable water in compliance with the International Standard ISO/IEC 17025:2005 2nd Edition. Where Limerick City and Co. Co.'s laboratory is not accredited for a parameter, an accredited lab is subcontracted to undertake the sampling. The external laboratories used include Southern Scientific, Co Kerry; City Analysts, Dublin and; ELS, Cork. h) Regulatory changes were identified by Irish Water early in 2018 (with the introduction of the *European Union (Drinking Water) (Amendment) Regulations 2017, (S.I No. 464 of 2017*) and amendments were made to the 2018 compliance monitoring programme in Q1, 2018. i) Turbidity (for surface water supplies) and nitrite are required to be monitored for compliance purposes at the water treatment plant in addition to the

	network. While each water treatment plant has an online and continuous final water turbidity meter, nitrite is not being monitored in the final water at public water treatment plants in Limerick City and County. j) No provision has been made to analytically determine acrylamide, epichlorohydrin and vinyl chloride levels in drinking water and reliance is placed instead on product specification and accurate control of dosing of polymer at the treatment plant. However, information regarding the latter was not available to inspect during the audit to determine adherence to guidance specified in the EPA's Handbook for Pubic Water Supplies (Section 4, Paragraph 4). k) Maps of the public supplies distribution system, created by Irish Water, were presented during the audit. These identified water supply zones; location of treatment works and reservoirs; and the 2018 sampling locations. l) The spatial distribution of compliance samples in 2018 throughout the public water supply distribution networks was limited in places. There was no formal review undertaken by Irish Water during 2018 to ensure sample locations were evenly distributed. It was noted that for Rockhill supply zone there are three distinct areas one of which (Rockhill Booster) was not sampled in 2018. m) It was stated that the Limerick City and Co. Co's sampling coordinator reviews the sampling programme to ensure sampling is spread across the month. The approximate date on which a sample should be taken is recorded. n) The compliance monitoring results are published in summary form on Irish Water's website (https://www.water.ie/water-supply/water-quality/results/summary/). o) Details of the source water type, treatment provided, daily output and population served were reported to the EPA as part of the 2018 Annual Drinking Water Returns for supplies in Co. Limerick.
2.	**Operational Monitoring Programme** a) Operational samples were taken during 2018 as and when required of raw waters (e.g. for *E. coli*. *Enterococci*, UVT); to monitor plant performance (e.g. for aluminium, turbidity, pH) and to investigate non-compliant results. Samples were also taken weekly from service reservoirs and the caretakers carry out sampling in the network (e.g. for chlorine and temperature). b) Booster chlorination is carried out when required at reservoirs and in these circumstances, on-line chlorine residual monitoring is in place. c) Irish Water intend to prepare Standard Operating Procedures (SOPs) for future operational sampling.
3.	**Monitoring Programmes for Specific Parameters** a) Specific monitoring programmes were in place in 2018 for pesticides. Where a pesticide non-compliance is detected in a Group B sample in a water supply, additional investigative monitoring is carried out monthly at times of risk between April and November.

	b) Monitoring for radioactivity is carried out when required, in accordance with the EPA's Radiological Monitoring Programme. c) There is a specific monitoring programme for lead with monthly checks of designated properties to assess the effectiveness of lead reduction where treatment by phosphate dosing is in place. Should a lead sample exceed the lead parametric value, further large volume samples would be taken from the affected property and any adjacent property. Irish Water would consult with the Health Service Executive (HSE) and write to the affected property.
4.	**Sampling Procedures** a) Limerick City and Co. Co. have a detailed SOP for sampling ("Standard Operating Procedure for Drinking Water Sampling (Audit) Drinking Water Audit Monitoring – SOP-FIELD-9"). This details safety concerns; sample containers and preservatives; filling instructions; criteria for tap selection; and transport requirements for bacteriological samples. b) In the event that tankers or bowsers are deployed in an emergency, the sampling protocol according to the EPA Handbook would be followed. Bowsers would normally be filled at service reservoirs and refilled within 48 hours of deployment. Notices concerning advice to any boil water taken would be attached to deployed bowsers. No records or procedure were available for inspection during the audit however. c) The sampling manual is a controlled document issued by the Quality Team and is subject to annual review on a pre-determined date. Any suggested changes are reviewed by the Quality Manager and amendments are recorded on the system. No hard-copy record is kept of its issue since the IT system logs when the manual is accessed. d) It is policy not to repeat sample points on each weekly list. The manual also requires that to avoid potential contamination, samples should not be taken from petrol stations, butcher shops, hairdressers, taps with filters or water softeners. However, any premises supplying drinking water should be included in the random selection of sampling locations. The SOP states compliance samples should preferably be taken from cold water taps in kitchens, which the EPA agrees is the correct location for compliance monitoring. e) Limerick City and Co. Co. has a list of sampling locations which are referred to year on year by the samplers for the 36 public water supplies. Weekly sampling sheets are emailed by the Sampling Coordinator to each sampler which outline the number of samples to be taken within the WSZ of a public water supply and the general area to be sampled. The type of sample (i.e. Group A or Group B or investigative) to be taken is clearly identified. f) The compliance sample locations are not pre-determined; instead, the sample location is at the sampler's discretion. The sampler selects the individual property to be sampled based on his/her local knowledge and judgement (e.g. the sampler tries not to re-visit a location that was already sampled that year). g) Samples to be taken are pre-logged in the laboratory and given a number prior

	to the sampling event. If a sample could not be obtained the sample number is abandoned. The sampler records receipt of the sample in the lab once the sampling event is complete with the time it was checked in and this is also noted on the field sheet. h) Should a property be unsuitable (because of the type of tap, location or other issues) an alternative location would be determined by the sampler, again based on local knowledge and previous sample locations. The Laboratory Coordinator would be advised that an alternative property had been sampled but this fact would not be recorded. There is no protocol for guiding the selection of alternative addresses should the first selected sample point be inaccessible. i) In the event that a contracted lab is required for analysis, the contract laboratory receives pre-labelled sample bottles. Otherwise, Limerick City and Council lab uses a permeant marker to label its sample bottles and securely fixes the label to the sample containers. Compliance samples are pre-designated as such and as the containers are pre-labelled before filling, it is not possible to alter the designation. The auditors did not inspect sample handling at the laboratory. j) A chain of custody is maintained throughout by the sampler delivering the sample and the analyst who receives them and distributes them to different analytical areas. The Laboratory Information Management System (LIMS) does not allow the generation of duplicate sample numbers. Individual and unique sample numbers are generated when samples are logged on to the system by laboratory staff. k) If there are any issues arising with the integrity of the sample, it would be abandoned, and a second sample taken with a new reference number.
5.	**Data Handling** a) Analytical and associated data is recorded on the sampler's field sheet for on-site tests and in the laboratory by the relevant analyst. After the relevant Analytical Quality Control (AQC) data has been verified the analytical data is entered on the LABWORKS LIMS system and archived. b) If a result on the database is subsequently shown to be incorrect it may be changed before the data is archived. After archiving, only the Certifying Team has editing rights. The system is capable of producing an audit trail of access to the system and of data entries. c) If the data from the laboratory is shown subsequently to be incorrect, a new laboratory report would be issued with corrected data to be entered on the system.
6.	**Exceedances of Parametric Values** a) The HSE issued a "Guideline for the Management of Initial Notification of a Drinking Water Issue of Potential Danger to Human Health" which was used by the water supplier in 2018. b) Irish Water has developed a protocol (IW-PRT-EPA-001) for the notification of

failures of chemical and microbiological parameters and for recording the initial consultation (INR) with relevant stakeholders. A process map is included which involves relevant stakeholders including Limerick City and Co. Co., the HSE and the EPA. This protocol was introduced in 2019. The process map requires Irish Water to determine risk from the failed result once notified of the failure by Limerick City and Co. Co. It was stated by the auditors that Regulation 9 of the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) as amended* requires that the determination of risk to public health be completed in consultation with the HSE.

c) Any non-compliant data would be reported by the analyst to and investigated by the Technical Manager of Limerick City and Co. Co. who would consult by email and telephone with Irish Water and the HSE. Following a risk assessment, an action plan would be developed. The Irish Water Compliance Team would ensure that appropriate procedures have been followed which may include reporting to the EPA via ODWNS, when required.

d) Circumstances surrounding the failure to notify the EPA of the presence of four samples containing high concentrations of aluminium (up to 1002 µg/l), of which two samples also had elevated concentrations of iron and turbidity in the Limerick City Environs PWS during 2018, were discussed. There was previously an aluminum file for this supply which was closed by the EPA on 30 November 2017 due to the receipt of compliant results. Regarding the sample taken on 21 May 2018 from the distribution network of Limerick City Environs PWS (containing 1,002 µg /l aluminium, 1,713 µg/l iron and a turbidity of 13.7 NTU), Limerick City and Co. Co. confirmed that the result was reported to Irish Water and the HSE on 24 May 2018 and health advice sought and received the same day. A follow-up sample taken on 22 May 2018 was compliant for the three parameters. However, the failures were not reported to the EPA via the ODWNS as required. The EPA discovered these failures upon review of Irish Water's 2018 Annual Drinking Water Returns. A failure for aluminum of 1,369 µg/l in the supply on 31 August 2018 was notified to the EPA via ODWNS and as a result the aluminum file for this supply was re-opened (EPA Ref. No. DW2019/153). There was no explanation for the failure to notify the EPA of the four failures relating to the Limerick City Environs PWS. Regarding the cause, it was considered that it was possible that work was being carried out on the distribution system in the area which led to the high levels of aluminum, iron and turbidity. However, the EPA notes an aluminium file remains open during 2019 for this PWS due to continued aluminium failures in the network.

e) There are no procedures in place to guide the identification of reasons for non-compliant results or for any remedial actions required. Data would be reviewed, and relevant staff consulted. Completion of the Irish Water INR protocol would assist in identifying reasons for the non-compliance. The HSE would also be consulted for health advice.

7.	**Review of Sampling Data** a) Samples were collected mainly on Mondays and a lesser number on Tuesdays. b) Sample collection was generally well distributed throughout the year. c) The first samples in 2018 were taken on 2 January and the last on 10 December.

3. Auditors' comments

Arrangements by Limerick City and County Council with the oversight of Irish Water in assessing the quality of public water supplies for 2018 was generally found to be satisfactory. Weaknesses were however identified regarding the lack of notification to the EPA of non-compliant indicator parameters and ensuring compliance monitoring is undertaken for the required parameters (e.g. nitrate, acrylamide, etc.) as required.

Weaknesses were also identified in relation to the selection of sampling locations and suitable alternative locations to ensure samples are evenly spread and representative of the water supply zone.

Finally, the auditors found that Irish Water's notification procedure now in place for the reporting of failures did not adhere to the requirements of Regulation 9, in that the HSE should be consulted with regarding potential risk to public health for all parametric failures obtained in the treated water.

4. Recommendations

Compliance Monitoring Programme

1. Irish Water should ensure that:
   a) the spread of sample locations within a monitoring programme are as wide as possible to ensure that compliance samples are representative of water quality consumed throughout the year as required by the Drinking Water Regulations;
   b) compliance monitoring for nitrite is undertaken, as required, at public water supply water treatment plants;
   c) a protocol is put in place to ensure acrylamide, epichlorohydrin and vinyl chloride levels in drinking water are determined at the required frequency where such chemical is used in the water treatment process or where uPVC pipes are used for distribution mains;
   d) the compliance sampling programme includes specific predetermined sampling locations;
   e) samplers are provided with a water supply zone map for each public water supply to ensure sample locations selected are representative of the WSZ; and
   f) a formal review of compliance sampling is undertaken to ensure samples are evenly distributed and representative of the entire water supply zone.

Operational Monitoring Programme

2. Irish Water should ensure that its proposed SOP's for operational monitoring are completed and implemented as soon as possible.

Sampling Procedures

3. Irish Water should review the procedure for compliance sampling to ensure that:
   a) it includes criteria for the selection of random addresses for compliance monitoring at consumer's premises and for the selection of alternative addresses, if required, in the event that a sample location is unsuitable or inaccessible;
   b) it requires a record to be kept of the use of an alternative location and the reason why this alternative sampling location was used and chosen;
   c) it includes sampling of commercial premises that provide drinking water including petrol stations, hairdressers and butchers;
   d) it includes requirements for labelling of samples (for e.g. include the requirement to use pre-printed labels rather than permanent marker);
   e) a record is kept of the abandonment of any samples due to loss of integrity of the sample and the reasons why; and
   f) it outlines sampling required on water in tankers and bowsers in accordance with Section 4, Paragraph 5 of the EPA's Handbook for Public Water Supplies and that appropriate records are kept of their preparation and deployment.

Exceedances of Parametric Values

5. Irish Water should:
   a) ensure that the EPA is notified as soon as it becomes aware of a failure to meet the parametric values in Part 1 of the Schedule of the Drinking Water Regulations 2014, as amended; and
   b) develop and implement a written procedure for dealing with sample results that exceed the parametric values outlined in the Drinking Water Regulations (S.I. no 122 of 2014), as amended.
      The procedure should include:
      i. actions to be taken to investigate the exceedance and determine its cause;
      ii. reporting the exceedance to the HSE, the EPA and any other relevant party; and
      iii. remedial action required.
      The circumstances that constitute trivial and the more serious exceedances should be clearly defined. Reference should be made to the EPA's Handbook Section 6, Paragraph

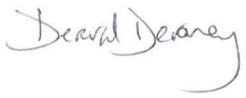
4.3 regarding the reporting of non-compliance with indicator parameters and Regulation 9 of the Drinking Water Regulations 2014, as amended regarding consultation with the HSE regarding risk to public health when a failure occurs.

Follow-Up Actions Required by Irish Water

This report has been reviewed and approved by Emer Cooney, Inspector, EPA Drinking Water Team.

Irish Water is recommended to put such measures in place as are necessary to implement the recommendations listed in this report. The actions by Irish Water to address the recommendations taken may be verified by the Agency during any future audits.

The EPA also advises that the findings and recommendations from this audit report should, where relevant, be applied on a national basis to future public water supply monitoring programmes.



Report prepared by:	**Date:**
Derval Devaney Inspector	04 December 2019