



# Public Drinking Water Monitoring Programme Audit Report

|                          |   |                                       |  |
|--------------------------|---|---------------------------------------|--|
| <b>County:</b>           | Carlow  | <b>Date of Audit:</b>                 | 21 <sup>st</sup> August 2018                           |
| <b>Location visited:</b> | Carlow County Council Offices   | <b>Date of issue of Audit Report:</b> | 29 <sup>th</sup> November 2018                         |
|                          |   | <b>Auditors:</b>                      | Ms. Derval Devaney (EPA)<br>Dr. John Gray (Consultant) |
| <b>Audit Criteria:</b>   | <ul style="list-style-type: none"> <li>• The <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014), as amended.</i></li> <li>• The <i>EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7).</i></li> </ul> |                                       |  |

## MAIN FINDINGS

- Weaknesses in procedures were identified, particularly for the selection and taking of compliance samples and pre-determining sampling locations and dates to ensure that compliance samples are evenly spread and representative of water in the supply zone.
- The sampling manual was not formalised and it was not a controlled document.
- Irish Water is in the process of developing a sampling manual and a procedure for responding to parametric exceedances.
- The failures in water quality standards detected in public drinking water supplies during 2017 were investigated by Carlow County Council and Irish Water to determine the cause.

## INTRODUCTION

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 carrying out effective monitoring of drinking water supplies to ensure the provision of clean and wholesome drinking water.

An audit of Irish Water’s 2017 monitoring programmes implemented in County Carlow was carried out at the Carlow County Council Offices on 21<sup>st</sup> August 2018. Prior to the audit, the EPA assessed monitoring returns to identify any areas of discrepancy between samples taken and analysed and reported to EPA for these four PWSs and what was observed during the audit and required to be reported. Using a questionnaire as a guide<sup>1</sup>, Irish Water and Carlow County Council 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 Section 2 and 4 of this report. The following were in attendance during the audit.

<sup>1</sup> The questionnaire was based on those used by the Drinking Water Inspectorate, London, and modified by Dr John Gray for the purpose of this audit.

Representing Irish Water: (\*indicates that person was also present for the closing meeting)

Mr. Brian Boylan – Irish Water Drinking Water Reporting Specialist\*

Mr. Patrick Duggan – Irish Water Drinking Water Specialist\*

Mr. Tommy Roche – Irish Water Drinking Water Compliance Analyst\*

Mr. Kieran Cullinane – Senior Engineer Water Services, Carlow County Council\*

Mr. Dermot Leonard – Executive Engineer Water Services, Carlow County Council\*

Ms Sharon Malone – Environmental Technician, Carlow County Council\*

Mr. James Byrne – Environmental Technician, Carlow County Council\*

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.*

|           |  |
|-----------|--|
| <b>1.</b> | <b>Compliance Monitoring Programme</b> <ul style="list-style-type: none"><li>a. The 2017 predetermined compliance monitoring programme was prepared by Irish Water and a copy is held by Carlow County Council. The “National Compliance and Operational Monitoring Sampling Plan – 2017” is a template to capture sampling and testing for every Irish Water Supply in 2017.</li><li>b. The compliance monitoring programme for 2017 included: a list of all public water supplies in the county, population data for each supply, the volume of water supplied by each scheme, the required number and frequency of all check and audit samples and predetermined sample locations.</li><li>c. Samples were collected within a monthly period although precise dates were not predetermined. Sample locations were generally public buildings although some samples were occasionally taken from private dwellings. Suitable alternative sample locations were not pre-determined in the 2017 monitoring programme and there was no protocol for the selection of alternative premises. If required, the selection of alternative samples was based on local knowledge of the sampler. In 2019, the selection of random addresses will be made by Irish Water using GPS.</li><li>d. Check samples were taken generally on Tuesday or Thursday and audit samples on Monday or Wednesday. These restrictions are due to the availability of the contract laboratories carrying out the analyses. Carlow Co. Co. is to move to sampling on Monday, Tuesday and Wednesday during the first two weeks of each month, the timing being constrained by subsequent reporting requirements to Irish Water.</li><li>e. No water supply zone (WSZ) was sampled on a reduced number or frequency of samples. Some WSZs (for example Bagenalstown PWS) are subject to a predetermined increased number of samples of up to 125% for check samples and up to 100% for audit samples</li><li>f. The number of samples required in each WSZ is based on either the volume of water supplied or the population. Irish Water reviews the population figure annually. If the population to volume ratio is <math>&gt; 2</math> the sampling frequency is based on volume, and if the ratio is <math>&lt; 2</math> the sampling frequency is based on population. An occupancy rate of between 2 and 4 persons per property was used, based on an average of occupancy rates which is dependent on the use of the property (domestic or business). This value is to be reviewed for 2019.</li><li>g. The volume of water supplied to each WSZ is derived from monthly District Metered Areas (DMAs) flow, although meter accuracy has not yet been validated and work to quantify unaccounted-for-water is in progress. To ensure any change to a WSZ boundary is known,</li></ul> |
|-----------|--|

|                  |   |
|------------------|---|
|                  | <p>boundary valves are not operated unless Irish Water has been previously informed.</p> <ul style="list-style-type: none"> <li>h. The sampling of water is carried out by Carlow Co. Co's Environmental Technician and in 2017 the analysis of compliance samples was sub-contracted out to accredited laboratories; ELS Laboratories for audit samples and to ALS for check samples. Scottish Water carried out the analyses for <i>Cryptosporidium</i>.</li> <li>i. A review of the temporal and spatial distribution of sampling, to ensure sampling represents the supply as accurately as possible, is carried out by the Environmental Technician and is based on local knowledge. Maps were examined showing the extent of each WSZ and sample locations. The maps showed the extremities of the WSZ were not monitored in many cases (e.g. Carlow Town PWS, Tullow PWS, Hackettstown PWS). Irish Water intend to formalise the sampling procedure in 2019.</li> <li>j. Examination of data recorded by the EPA showed a considerable shortfall in the number of samples taken for the determination of colour for some check and audit samples. Data held by Irish Water confirmed there was no shortfall and the discrepancy was attributed to the nomenclature used for recording the term "colour". EPA and Irish Water are to address the discrepancy.</li> </ul>  |
| <p><b>2.</b></p> | <p><b>Operational Monitoring Programme</b></p> <ul style="list-style-type: none"> <li>a. The 2017 operational monitoring programme was prepared by Irish Water.</li> <li>b. Operational samples are taken at the inlet to the water treatment plants depending on the source. Monitoring of final water leaving the plants includes turbidity, colour, aluminium, ammonia and chlorine residuals.</li> <li>c. Although there was no routine operational monitoring of service reservoirs, residual disinfectant is monitored in water leaving service reservoirs (and in the network) as required. Some reservoirs also have online ammonium monitors and larger schemes have more monitoring equipment than smaller schemes. Hydrants may also be used for operational monitoring undertaken in the network. Coliform bacteria and <i>E. coli</i> are not routinely included in the operational monitoring of reservoirs and water towers.</li> <li>d. It was stated during the audit that new sources or sources returned to use (as was the case in 2009) would be fully monitored although there is no written procedure in place to cater for this.</li> </ul>   |
| <p><b>3.</b></p> | <p><b>Monitoring Programmes for Specific Parameters</b></p> <ul style="list-style-type: none"> <li>a. The 2017 compliance monitoring programme included specific monitoring for nitrite and turbidity at certain water treatment plants, according to need.</li> <li>b. A specific pesticide monitoring programme has been established for the purpose of investigative sampling and is linked to the pesticide monitoring programme for public water supplies developed by Irish Water and included in the 2017 compliance monitoring programme for audit samples. Any exceedance would lead to increased sampling in the raw and the treated water at fortnightly intervals, subject to review, until samples became compliant.</li> <li>c. Trihalomethanes were monitored as part of audit monitoring. Any failure would lead to an increased frequency of investigative sampling until the issue was rectified and samples became compliant.</li> <li>d. Lead was monitored as part of audit monitoring and part of the Irish Water national lead monitoring programme.</li> <li>e. The 2017 compliance monitoring programme included radiological sampling for uranium in the Carlow Town supply. The uranium is naturally derived from the catchment. Accurate blending of the three sources for this water supply has minimised any potential issues. Samples are taken monthly from the raw water supplies and from two locations in the supply zone to monitor the effectiveness of blending.</li> <li>f. Carlow Co. Co. does not have a specific sampling programme for tankers although they would be disinfected before being deployed. Assistance, if required, would also be sought from the local fire service. 1 m<sup>3</sup> capacity disposable containers may also be deployed. Tankers and containers would have "Boil Water Advice" notices fixed.</li> </ul> |
| <p><b>4.</b></p> | <p><b>Sampling Procedures</b></p> <ul style="list-style-type: none"> <li>a. Compliance samples were not taken from water treatment plants or service reservoirs and no data from continuous monitors was used for compliance purposes.</li> </ul>   |

|                  |   |
|------------------|---|
|                  | <ul style="list-style-type: none"> <li>b. Carlow Co. Co. has a sampling manual which, although not a fully controlled document, is held by the Environmental Technician. It was originally developed in conjunction with the HSE and will be used until Irish Water release the manual it is currently developing. This will be a fully controlled document subject to at least annual review.</li> <li>c. The single sampler in Carlow Co. Co. maintains sampling records and transfers relevant information regarding samples and any failure to collect samples to a diary on a monthly basis.</li> <li>d. Samples are labelled locally on site at the time of sampling. Audit and Check samples are usually taken on different days so that mis-labelling can be avoided. Samples are taken by courier to the contract laboratories. Chains of custody are maintained by the Environmental Technician.</li> </ul>   |
| <p><b>5.</b></p> | <p><b>Data Handling</b></p> <ul style="list-style-type: none"> <li>a. Monitoring data for 2017 was recorded by the Environmental Technician in an Excel file. Data from ALS laboratories was received as a .pdf file and relevant information had to be transcribed by the Environmental Technician in Carlow Co. Co. into LabworksCarlo. There was no independent data validation or authorisation process. Monitoring results from the laboratory is now received in Excel format.</li> <li>a. Analytical data is sent to Irish Water and HSE monthly by email. Sample results received by Irish Water from Carlow Co. Co. are reported annually to the EPA via EDEN and failures are notified to the EPA via ODWNS by Carlow Co. Co, as required, once received by the laboratory. Information regarding data handling procedures within the HSE or the contract laboratories was not available for review during the audit.</li> </ul>  |
| <p><b>6.</b></p> | <p><b>Exceedances of Parametric Values</b></p> <ul style="list-style-type: none"> <li>a. A documented procedure is in place outlining the actions to be taken where a sample result shows an exceedance of the microbiological or chemical parametric values outlined in the <i>European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014), as amended</i>.</li> <li>b. The response to an exceedance is dependent on the parameter and scale of exceedance. Where appropriate, immediate action is taken to rectify the failure.</li> <li>c. If a result has failed, the laboratory emails the Council and Irish Water to alert them prior to the issue of the lab report. This allows for investigation of the failure without delay and notification of the EPA, if required, via ODWNS and the HSE.</li> <li>d. The auditors were informed during the audit that the HSE have their own procedures regarding notifications and parameter failures. Carlow Co. Co. and Irish Water meet with the HSE on a quarterly basis to discuss water quality issues.</li> <li>e. A new manual, the “Water Services Drinking Water Sampling Manual – Procedures for sampling drinking water” was issued by Carlow Co. Co. in 2018 and includes a procedure to be followed in the event of microbiological detections in compliance samples. A new procedure for responding to parametric exceedances is being prepared by Irish Water.</li> <li>f. One sample in the 2017 Drinking Water Returns from Ballinkillen PWS, on 24/04/17, showed an exceedance for nickel. The Council explained it investigated this failure and resamples were taken which were free from nickel. The Council and Irish Water attributed the initial failure to a laboratory error. The EPA closed this file upon receipt of the repeat compliant sample.</li> <li>g. A failure for nickel was reported for Borris PWS at O’Sheas Supermarket on 24/04/17. However, this failure was not reported to the EPA in its 2017 Annual Drinking Water Returns via EDEN. During the audit, it was explained that the Council and Irish Water did not report this via EDEN as it subsequently discovered that this premises is being served from a private commercial well. The EPA had therefore closed the file (DW2017/45) and advised Carlow Co. Co., as the Supervisory Authority for private supplies, to investigate the failure and include this supply on EDEN as a commercial private supply and continue to monitor it for compliance purposes.</li> <li>h. A sample in Carlow North Regional area on 12/07/17 reported to the EPA via EDEN showed an exceedance of the standard for pesticides (the herbicide MCPA). This failure was also reported to the EPA via ODWNS in July 2017 but had entered a sample date of 20/07/17 in error. In accordance with Irish Water’s procedures, at least monthly monitoring of the treated</li> </ul> |

|           |  |
|-----------|--|
|           | <p>water was carried until November 2017. The file remains open and monthly monitoring will continue between April – November 2018 until a minimum of one full growing season's worth of compliant results (over a period not exceeding 2 calendar years) is obtained.</p> <p>i. The EPA has open files for three small public water supplies in Co Carlow; Curranree, Tynock and Slyguff which it audited in 2014. The EPA audits found the disinfection process and controls at all three plants to be inadequate. Irish Water believe these supplies are not within its remit, however the EPA disagree with this view. The matter is currently with the Department of Housing, Planning and Local Government for resolution. Some failures have also been reported to the EPA for these supplies (e.g. iron, nitrate).</p> |
| <b>7.</b> | <p><b>Review of Sampling Data</b></p> <p>a. Samples were primarily collected between Monday and Thursday with none taken on Fridays.</p> <p>b. Sample collection was generally distributed throughout the year although significantly more were taken in June and July reflecting the fact that audit samples were grouped together at this time.</p> <p>c. The first samples in 2017 were taken on 26 January and the last on 12 December.</p>  |

### 3. AUDITORS COMMENTS

The monitoring programmes drawn up and implemented by Irish Water and Carlow County Council in 2017 were generally found to be satisfactory in assessing the quality water in public water supplies. Although a review was carried out by Carlow County Council to establish if sampling represented the public water supplies as accurately as possible, some weaknesses were highlighted in relation to the amount of randomness attributed to the selection of consumers' properties and the distribution of sampling to represent the entire Water Supply Zone. It was noted that the review process is to be formalised in future by Irish Water which should address these deficiencies.

A review of monitoring data submitted to the EPA by Irish Water determined that sample results were accurately reported to the EPA for the 2017 Annual Drinking Water Returns and failures in the distribution network appeared to be promptly investigated and by the Water Supplier.

### 4. RECOMMENDATIONS

#### Compliance Monitoring Programme

1. Irish Water should provide a predetermined narrow window of sampling dates to samplers.
2. Irish Water should provide predetermined alternative sample locations to samplers in the event that a sample location is unsuitable or inaccessible and develop a protocol for selecting alternative premises.
3. Irish Water should ensure that sampling is representing the entire water supply zone as accurately as possible and that the spread of sample days, times and locations within a monitoring programme is as wide as possible.
4. Irish Water should take steps to validate meter accuracy and quantify unaccounted-for water.
5. Irish Water should continue to work with the EPA to ensure that the nomenclature used for reported data for colour is that required by EPA.

#### Operational Monitoring Programme

6. Irish Water in its routine operational monitoring of service reservoirs and towers for adequate disinfection could also include analysis for bacteriological parameters such as coliform bacteria and *E. coli*.
7. Irish Water should develop a written procedure for the introduction of new sources and for sources returned to use after a prolonged period of shut-down. This is to ensure that the water source it uses is not contaminated with any unknown substance/organism before it uses that source. It also ensures that should

a contaminant be present, appropriate treatment can be put in place prior to the water supply going into service.

#### **Monitoring Programmes for Specific Parameters**

8. Although Irish Water disinfects tankers deployed in emergencies, it should also ensure that Section 4, Paragraph 5 “Compliance Sampling from Tankers” of the EPA’s Handbook is adhered to in relation to sampling required of water supplied from tankers.

#### **Sampling Procedures**

9. Irish Water should ensure the sampling manual is formalised as a fully controlled document.

#### **Exceedances of Parametric Values**

10. Irish Water should complete and issue its written procedure, currently being developed, for dealing with sample results that exceed the parametric values outlined in the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014), as amended*. The procedure should include actions to be taken to investigate the exceedance and report the exceedance to the HSE, the EPA and any other relevant party. A cross check of data entry when reporting failures should be made to ensure the correct data (e.g. date of failure) is reported.

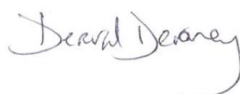
### **FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER**

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

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 will 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 to the monitoring programmes of all public water supplies operated and managed by Irish Water.

**Report prepared by:**



**Date:**

29<sup>th</sup> November 2018

---

EPA Inspector

John Gray, Consultant