

	<h1 style="margin: 0;">Drinking Water Audit Report</h1>
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Local Authority:	Clare County Council	Date of Audit:	10/12/2013
Plant(s) visited:	Corofin Public Water Supply (0300PUB1010)	Date of issue of Audit Report:	10/01/2014
		File Reference:	DW2012/17
		Auditors:	Mr Niall Dunne
Audit Criteria:	<ul style="list-style-type: none"> • The <i>European Communities (Drinking Water) (No. 2) Regulations, 2007.</i> • 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> • The recommendations specified in the EPA Report on <i>The Provision and Quality of Drinking Water in Ireland.</i> • The recommendations in any previous audit reports. 		

MAIN FINDINGS

- i. *The Direction issued on the 19th July 2013 has been complied with by Clare County Council. The following works required under the Direction have been completed;*
 - a. *There is a continuous chlorine monitor on the final water, this is alarmed and linked to a recording device;*
 - b. *Automatic switch over between the duty and standby chlorine dosing points have been installed;*
 - c. *The turbidity monitors have been installed and linked to an alarm and a recording device.*
- ii. *There have been on going aluminium exceedances at this plant since 2012, the most recent, 410µg/l on the 18/11/2013. The Water Services Authority should ensure that the cause(s) of the aluminium exceedances are thoroughly investigated and remedial actions put in place to ensure compliance with the drinking water standards.*
- iii. *Coagulant dosing at this plant is based on a required alum dose of 120 mg/l. This dosing regimen does not take into account trends and variability of the raw water quality. The Water Services Authority should ensure that regular jar tests are carried out to determine the coagulation dosing and pH conditions to achieve optimum coagulation.*
- iv. *Since the last audit there have been improvement with regard to housekeeping, however, the standard of housekeeping at this plant still remains poor. The Water Services Authority should ensure that housekeeping standards are maintained to a high standard and that any rubbish and redundant equipment is removed from site.*

1. INTRODUCTION

Under the *European Communities (Drinking Water) (No. 2) Regulations 2007* the Environmental Protection Agency is the supervisory authority in relation to the local authorities and their role in the provision of public water supplies. This audit was carried out to assess the performance of the local authority in providing clean and wholesome drinking water and to assess whether the EPA Direction, issued on the 19th July 2013, for the improvement of the disinfection system and the upgrade of the turbidity monitors had been complied with. Where the text refers to the Water Service Authority this refers to Irish Water in accordance with Section 7 of the Water Services (No. 2) Bill 2013.

The Corofin Drinking Water Treatment plant supplies a population of approximately 1,500 with a daily throughput of 454 m³/day. Treatment at this plant consists of coagulation, clarification by dissolved air flotation combined with rapid gravity filtration followed by GAC pressure filtration. Disinfection is by chlorination using sodium hypochlorite. This plant is designed to treat 30 m³/hr. Clare County Council stated that this plant is under pressure to meet demand at certain times of the year. Clare County Council plans to connect the Corofin distribution network to an adjacent group water scheme (GWS). This will help to alleviate the demand on the Corofin supply during periods of high water demand. There is no timeframe for this proposal. This supply was previously audited on 17th July 2013 and a Direction for the upgrade of the chlorination system and turbidity monitors was issued to Clare County Council on 19th July 2013.

Photographs taken by Niall Dunne during the audit are attached to this report and are referred to in the text where relevant.

The opening meeting commenced at 10.00 am at the Corofin treatment plant. The scope and purpose of the audit were outlined at the opening meeting. The audit process consisted of interviews with staff, review of records and observations made during an inspection of the treatment plant. The audits observations and recommendations are listed in Section 2 and 4 of this report. The following were in attendance during the audit

Representing the Local Authority: (* indicates that person was also present for the closing meeting)
Caimin Dillon - Executive Engineer*; Maura McNulty - Executive Scientist*; Maeve Lait - Senior Executive Technician*; Roisin Breheny- Executive Technician*; Martin Carkill - Caretaker*.

Representing the Environmental Protection Agency*:
Niall Dunne – Inspector.

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.	Source Protection <ul style="list-style-type: none">a. Clare County Council (CCC) stated that the lake shore in the vicinity of the source is fenced off.b. CCC stated that they are to write to farmers regarding their responsibilities under the GAP regulations by the end of 2013.c. CCC stated that farm surveys within the vicinity of the source are scheduled to take place in the 2014/2015 program.d. CCC confirmed that the turbidity monitor on the raw water is operational and alarmed. The reading on the day of the audit was 1.85 NTU.
2.	Coagulation, Flocculation, Clarification and Filtration <ul style="list-style-type: none">a. Treatment at this plant consists of dissolved air flotation with integrated rapid gravity filtration.b. Liquid alum is stored in two intermediate bulk containers (IBCs) (see photograph 1). There is four weeks alum storage in each tank. Alum is also stored in two day tanks, a duty and standby tank each with a single dosing pump. There is manual switch over between the two tanks. CCC stated that the alum in the day tank is prepared every two days. The bulk IBCs appear to be of a temporary nature

	<p>and the piping from the tanks is not secured against accidental damage (see photograph 1).</p> <ul style="list-style-type: none"> c. CCC had written procedures in place for the coagulation preparation process. CCC stated that the required alum dose is 120 mg/l, which was determined in May 2013 by jar tests carried out by an external contractor when CCC switched from kibbled alum to liquid alum. CCC stated that they themselves do not carry out jar tests at the plant. (A recommendation of the last audit was that regular jar tests should be carried out). The alum used is 10% concentration. d. On observation the alum dosing point was observed not to be secured against accidental damage. e. CCC stated that the poly is delivered prepared to site. Poly is stored at the treatment plant in a single day tank with a single duty pump. f. Poly is dosed approximately 1 minute after the alum is dosed. CCC had not calculated the coagulant mixing time within the mixing chamber. g. A backwash cycle of the DAFF plant was observed. The unit does not drain down as part of the backwash process. h. There was no written filter maintenance procedure or no filter maintenance log book onsite. CCC stated that this logbook would be in place by February 2014. i. It was observed that the final water from the DAFF unit flows into an open channel adjacent to the plant prior to entering the clear water tank (see photograph 2). j. The DAFF unit itself was noted to be unclean and have accumulated rust and debris on its surfaces. (see photograph 3) k. There is no turbidity monitor after the DAFF plant; however, there is a turbidity monitor after the GAC filter.
3.	<p>GAC Filtration</p> <ul style="list-style-type: none"> a. The GAC filter was not operational at the time of the audit. CCC stated that the GAC in the filter had been replaced, but stated that the gravel layer under that GAC media has now to be replaced. CCC stated that the filter would be operational by the end of 2013.
4.	<p>Chlorination and Disinfection</p> <ul style="list-style-type: none"> a. In the Direction issued on the 19th July 2013, CCC was directed to install an operational continuous chlorine monitor on the final water. This was to be alarmed and linked to a recording device. The chlorine monitor, now located at the treatment plant, is in place and is linked to a recording device. The sampling point for the monitor is on the rising main prior to the reservoir. It is located prior to adequate contact time being achieved. CCC stated that the monitor was recently commissioned and that they are still experiencing some fluctuations with the chlorine readings on the monitor. A chlorine sample taken, at the plant, on the day of the audit returned a result of 1.22 mg/l while the monitor displayed a reading of 1.17 mg/l. b. The Direction also required CCC to install automatic switch over between the duty and standby chlorine dosing pumps. CCC confirmed that this is now in place and that the pumps are also on an 8 hour automatic switch over. c. CCC stated that the high and low chlorine alarm levels are set at 3.5 and 0.1 mg/l respectively and confirmed that alarms are dialled out. CCC stated that when the rising main is not pumping that the chlorine alarm is inhibited as there is no flow through the rising main. d. CCC stated that currently there is fixed chlorine dosing and that flow proportional chlorine dosing is to be installed by the end of 2013.
5.	<p>Treated Water Storage</p> <ul style="list-style-type: none"> a. Treated water is stored on site in a freestanding clear water tank. The holes observed in the top cover of the tank during the last audit appeared to be covered, but this seemed to be of a temporary nature (see photograph 4). No inspection/maintenance hatch was observed in the clear water tank. b. The clear water storage tank is located in a retention basin, where decanted sludge from the sludge holding tanks is held prior to percolation (see photograph 5). CCC stated that remedial works to resolve this issue will be completed by March 2014. Standing water was also observed in the retention basin.

6.	<p>Monitoring and Sampling Programme for treated water</p> <ul style="list-style-type: none"> a. CCC stated that the turbidity monitor on the final water was operational and that the dial out alarm was set at 1.2 NTU. The reading on the monitor at the time of the audit was 0.69 NTU. b. CCC stated that the turbidity monitors were connected to a recording device but not to SCADA.
7.	<p>Exceedances of the Parametric Values</p> <ul style="list-style-type: none"> a. In a previous audit carried out on 17/07/2013; CCC stated that when the coagulant was changed from kibbled alum to liquid alum a reduction in aluminium levels in the drinking water was noted. However, recently there has been an aluminium exceedance on the 18/11/2013, with a result of 410 µg/l. b. CCC stated that their investigations have focused on the static mixer, as it was being coated with sediment and was difficult to clean. CCC has replaced the mixer with one that is easier to maintain. CCC also stated that they are considering automated pH control. c. CCC noted that this exceedance also coincided with the changing of the carbon in the GAC filter. d. CCC confirmed that they carry out daily aluminium monitoring at the plant and within the network, using a Hach DR3900 spectrophotometer, while compliance monitoring is carried out by an external laboratory. The EPA noted that there can be considerable differences in aluminium results taken by CCC and by the external contractor. CCC stated that this was due to the different methods of analysis and the difference in the sophistication of the test equipment used.
8.	<p>Chemical storage and bunds</p> <ul style="list-style-type: none"> a. Alum is stored in IBCs (see photograph 1).The fill points are now located within the bunding. The IBCs are situated on top of the bunds and not within the bunds. b. The alum day tanks were in a bunded area, but the capacity of the bund did not appear to be 110% of the volume of the two tanks within it. c. Chemicals used were to IS:EN standard and this documentation was on site. d. CCC stated that there is now a protocol and procedure in place for the delivery of chemicals. e. The empty drums of sodium hypochlorite observed on site, during the last audit, were removed. f. CCC stated that there is now a procedure in place to check whether the stocks of chemicals are in date. g. Chemicals were observed to be stored adjacent to the treated water tank (see photograph 5).
9.	<p>Sludge Management</p> <ul style="list-style-type: none"> a. According to CCC the sludge tank is undersized and water from the tank is decanted into the percolation area via the floor of a retention basin. The sludge tank is not bunded and is located adjacent to the clear water tank. CCC stated that this is to be reviewed and measures to be put in place by March 2014.
10.	<p>Management and Control</p> <ul style="list-style-type: none"> a. CCC stated that there is no written procedure in place for response to alarms. b. CCC stated that the plant was not linked to SCADA system and could therefore not be accessed remotely. c. There was a documented site procedure manual in place. d. It was observed that the turbidity monitors did not have calibration stickers. e. While the chlorine monitor is connected to a recording device, the display unit on the recording device is small and does not lend itself to reading historical results in graph form easily or accurately.
11.	<p>Housekeeping and Hygiene</p> <ul style="list-style-type: none"> a. It was observed during the last audit that the standard of housekeeping at the plant was very poor. Some improvements have been made but overall the standard of housekeeping at the plant still remains poor, with redundant tanks in the alum dosing room, rubbish observed in the treatment plant and standing water observed at the location of the alum dosing point. b. The DAFF plant is now contained within a warehouse; however one of the sides of the warehouse still remains exposed.

3. AUDITORS COMMENTS

On the 19th July 2013, a Direction issued to Clare County Council which required the Council to;

- 1) Install a chlorine monitor on the final water, this monitor should be alarmed and linked to a recording device.
- 2) Install automatic switch over between the duty and standby chlorine dosing pumps.
- 3) Ensure that the turbidity monitors in the raw and final water are functioning correctly and linked to a recording device.

Clare County Council has complied with the requirements of the Direction as listed above. However, there still remain items that need to be addressed with regard to the treatment process at this plant.

The main item of concern with regard to this supply is the recent aluminium exceedance of 410 µg/l on the 18/11/2013. The Water Services Authority must investigate the cause for the aluminium exceedance and as a matter of priority put remedial measures in place to address this issue.

Coagulant dosing at this plant is based on trying to achieve a required alum dose of 120 mg/l, which was determined by jar testes carried out over a one month period. This current dosing regimen does not take into account trends and variability of raw water quality. The Water Services Authority should ensure that regular tests are carried out to determine the coagulation dose and pH to achieve optimum coagulation for various raw water conditions. In this regard regular jar tests should be carried out at the plant over an extended period of time to determine the trends in the raw water.

During the audit it was noted that there were differences in the aluminium results taken by the County Council and those taken by an external contractor. The Water Services Authority should investigate these discrepancies and put measures in place to ensure that the monitoring results taken by the Water Services Authority are accurate and representative of the supply.

Clare County Council stated that the sampling point for the chlorine monitor is located on a rising main before the reservoir and before adequate contact time has been achieved. The Water Services Authority should review that location of the monitoring point to ensure that continuous accurate chlorine readings are achieved and that the chlorine sampling point is located after the required contact time.

Some housekeeping issues have been resolved; however the housekeeping at the plant still remains of a poor standard. The Water Services Authority should put measures in place to ensure that the housekeeping at this supply and at all other supplies in its ownership are maintained to high standards.

4. RECOMMENDATIONS

Source Protection

1. The Water Services Authority should write to farmers in the vicinity to remind them of their responsibilities under the *European Communities (Good Agricultural Practice for the Protection of Waters) Regulations 2010 (SI No.610 of 2010)*.
2. The Water Services Authority should undertake farm surveys within the vicinity of the abstraction point.

Coagulation, Flocculation and Clarification and Filtration

3. The Water Services Authority should ensure that coagulation / flocculation processes tests are regularly carried out at the water treatment works. Jar testing of the raw and coagulated waters as outlined in Section 3.3.1 and Appendix C of the EPA publication "*Water Treatment Manual: Coagulation, Flocculation and Clarification*" to determine the optimum chemical coagulant dose and pH for the treatment of the water should be used. The frequency of checks should be appropriate to the nature of supply and changing condition. Results should be recorded at the treatment works and used for control of the treatment plant.

4. The Water Services Authority should ensure that there are duty and standby pumps with automatic switch over and alarms in place on the on the primary and secondary coagulation dosing points.
5. The Water Services Authority should review the mixing of the primary and the secondary coagulants, prior to flocculation, to ensure that there is adequate mixing and contact time of the coagulant/coagulant aids, especially in the mixing tank.
6. The Water Services Authority should ensure that all chemical dosing points are secured against accidental damage.
7. The Water Services Authority should review the operation of the DAFF plant to ensure that adequate coagulation and filtration is being achieved.
8. The Water Services Authority should investigate the feasibility of installing an alarmed turbidity monitor directly after the DAFF plant to ensure that any deviation in the quality of the filtered water is immediately detected.
9. The Water Services Authority should ensure that the treated water in the open channel adjacent to the DAFF plant is fully covered against the ingress of animals and insects.
10. The Water Services should ensure that the DAFF plant is thoroughly cleaned on a regular basis.
11. The Water Services Authority should develop documented management and maintenance programs for the GAC filter media to ensure that the media is regularly tested and replaced.
12. The Water Services Authority should ensure that a filter logbook is kept for both the DAFF plant and the GAC filter and contains the following:
 - i. A record of all maintenance work and inspections carried out on the filter;
 - ii. Details of the media depth and the condition of the filter when it is drained down;
 - iii. Where appropriate, details of the operation of the backwashing / air scouring systems and underdrains;
 - iv. Details of any changes or required changes to filters, the backwashing /air scoring systems or underdrains; and
 - v. Details of any trial work carried out on the filters.

Disinfection

13. The Water Services Authority should ensure that the chlorine monitor sampling point is located after the point where adequate chlorine contact time is achieved.
14. The Water Services Authority should ensure that chlorine dosing is changed from fixed to flow proportional dosing.

Treated Water Storage

15. The Water Services Authority should carry out an integrity assessment of the clear water tank and should ensure that the cover to the tank is properly sealed and that any holes in the cover are permanently repaired. The Water Services Authority should also ensure that the tank is inspected internally and cleaned out regularly and that appropriate access in the tank is provided to allow this.
16. The Water Services Authority should ensure that the clear water tank is fully protected against the decanted water from the sludge holding tank and from the chemicals stored within its vicinity.

Exceedances

17. The Water Services Authority should ensure that the cause of aluminium exceedances are investigated and that remedial actions are put in place to ensure compliance with the drinking water standards.
18. The Water Services Authority should ensure that the monitoring results taken by the Water Services Authority are accurate and representative of the supply and that appropriate equipment is used to ensure that the results are accurate and reliable.

Chemical Storage and Bunds

19. The Water Services Authority should review chemical storage arrangements for the alum bulk and the alum day tanks. The Water Services Authority should ensure that the chemicals must be stored within bunded areas capable of containing at least 110% of the volume of chemicals stored therein.
20. The Water Services Authority should investigate the possibility of installing a permanent bunded bulk storage tank for the alum. The Water Services Authority should also ensure that the piping from the tanks is secured against accidental damage.

Sludge Management

21. The Water Services Authority should review the current sludge holding and decanting arrangements and should put measures in place to ensure that the storage capacity of the sludge holding tanks is adequate for the through-put of the treatment works.
22. The Water Services Authority should ensure that the sludge holding tank is bunded to 110% of the capacity of the tank.

Hygiene and Housekeeping

23. The Water Services Authority should undertake a complete review of housekeeping and waste storage at the plant and take measures to ensure that the plant is well maintained, clean and tidy and that there are no areas of standing water within the plant.
24. The Water Services Authority should ensure that the housing around the DAFF plant is fully completed.

Management and Control

25. The Water Services Authority should ensure that the all dial out alarm level settings are reviewed to ensure that the caretaker is given adequate notice to resolve issues in a time efficient manner.
26. The Water Services Authority should ensure that there is a written procedure for response for alarms in place, setting out the actions to be taken and by whom, in the event of different alarm levels.
27. The Water Services Authority should investigate the possibility of linking the treatment works to a SCADA system, so that the performance of the treatment works can be viewed remotely and that historical data can easily be retrieved and examined.
28. The Water Services Authority should ensure that calibration stickers are place on all monitoring and dosing equipment.

FOLLOW-UP ACTIONS REQUIRED BY THE LOCAL AUTHORITY

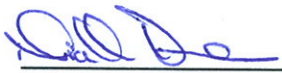
During the audit the Clare County Council representatives were advised of the audit findings and that action must be taken to address the issues raised. This report has been reviewed and approved by Ms Yvonne Doris, Drinking Water Team Leader.

The Water Services Authority should submit a report to the Agency by the 10/02/2014 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 timeframe 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 the Water Services Authority.

Please quote the file reference Number DW2012/17 in any future correspondence in relation to this Report.

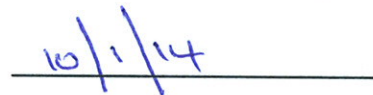
Report prepared by:



Niall Dunne

Inspector

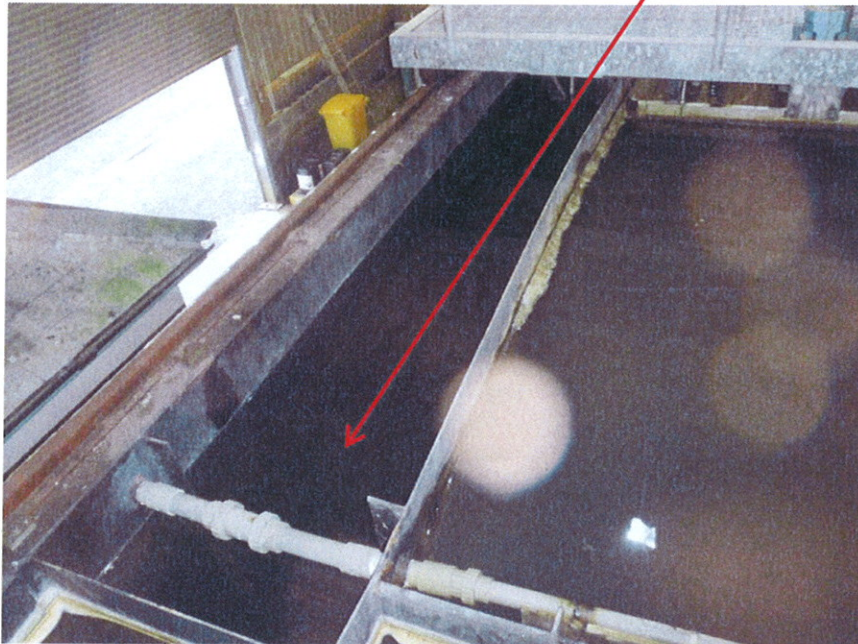
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Picture 1: Alum contained in IBCs, these were not adequately banded. The IBC's should be within the bunding. The IBCs seem to be of a temporary nature and the piping from the tanks is not secure against accidental damage.



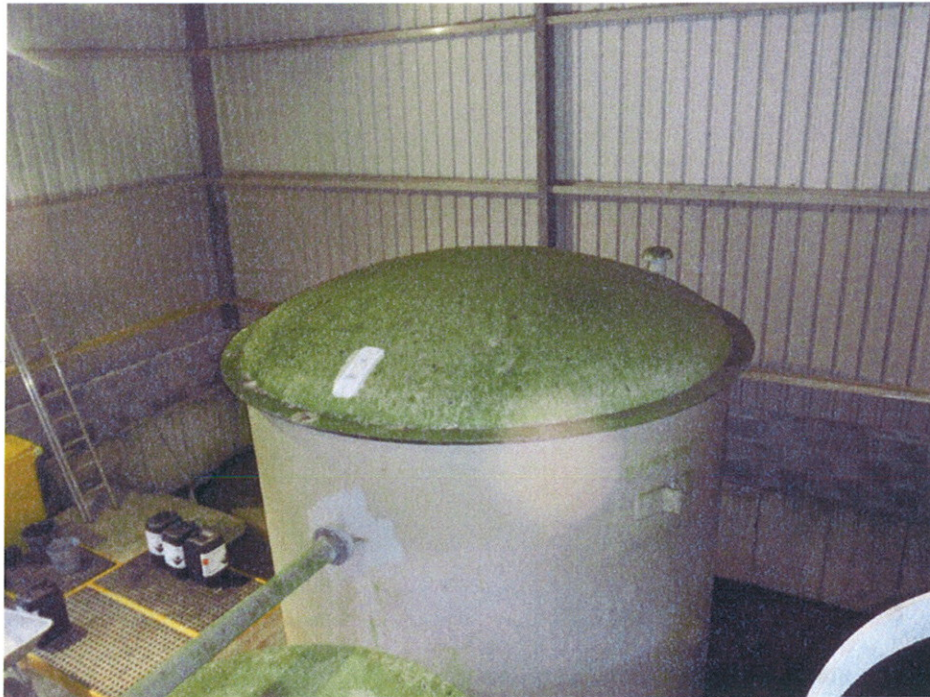
Picture 2: Treated water in exposed open channel beside DAFF unit.



Picture 3: Daff plant was observed not to be clean.



Picture 4: Treated water tank, patching in unit seems to be of a temporary nature and no access point for maintenance purposes was observed in the tank.



Picture 5: Clear water tank, adjacent to the sludge holding tank. These are in a retention basin where decanted sludge is held prior to the percolation area. Standing water was observed in the retention basin. Chemicals are also stored adjacent to the clear water tank.

Clear water tank.

Sludge holding tank

