Drinking Water Audit Report

County:	Roscommon	**Date of Audit:**	03/07/2014
Plant visited:	North Roscommon Regional Water Supply Scheme	**Date of issue of Audit Report:**	17/7/2014
		File Reference:	DW2009/320
		Auditors:	Ms Yvonne Doris
Audit Criteria:	• The *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014).* • *The EPA Handbook on the Implementation of the Regulations for Water Services Authorities for Public Water Supplies (ISBN: 978-1-84095-349-7)* • The recommendations specified in the EPA Report on *The Provision and Quality of Drinking Water in Ireland.* • The recommendations in any previous audit reports.		

MAIN FINDINGS

i. **Operational improvements required at the North Roscommon Regional treatment plant include: onsite SCADA system, continuous online monitoring of raw water, pH correction prior to coagulation, re-finishing of settlement tank and filter walls, replacement of lamellae plates, slow start or run to waste after filter backwashing, trialling of GAC for removal of taste/odour and the cleaning of all reservoirs.**

1. INTRODUCTION

Under the *European Union (Drinking Water) Regulations 2014,* 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 drinking water. 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) Act 2013.

The North Roscommon Regional Water Supply Scheme serves 6,500 persons in a large area surrounding Ballaghaderreen. The source of the supply is a Lower Lough Gara. The treatment plant was commissioned in 1981-2 and was upgraded in 1991 with the addition of two filters, a sludge processing plant and a clear water tank. The abstraction rate is 470m^3/hr for 18 hours per day. The plant produces 7,000m^3/day. The distribution network is the largest in the county. Photographs taken by Yvonne Doris during the audit are attached to this report and are referred to in the text where relevant.

The opening meeting commenced at 10.30am at the North Roscommon Water 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 Irish Water: (* indicates that person was also present for the closing meeting)
Name – Job Title
Sean Higgins, Water Engineer, Irish Water*

Vincent Walsh, Senior Executive Engineer, Roscommon County Council*
Orla Sheehan, plant operator, Roscommon County Council*
Michael Timon, caretaker, Roscommon County Council
Michael Mc Dermott, General operator, Roscommon County Council
Representing the Environmental Protection Agency:
Name – Job Title
Yvonne Doris, 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** a. The source is Lower Lough Gara, a shallow lake fed by the Breedoge river and possibly by a number of springs (photograph 1). The lake level varies by approximately 1.5m. The lake experiences regular algal blooms. The intake is an unknown distance from the edge of the lake. The intake has course screens that are not inspected or cleaned. An automatic water jet rotating screen is also in place. The intake was moved from its original location in the early 1990s following surveys. Cattle can access the lake but fencing prevents access to the area close to the intake. The abstraction is 470m^3/hr for 18 hours a day. b. Raw water is monitored manually daily for colour, pH, turbidity and TOC. Raw water turbidity is usually around 3 but can be as high as 5 NTU. Raw water colour is typically 100-200 Hazen Units but can be as high as 450 Hazen Units. Raw water TOC ranges from 9 to 11mg/l. Raw water UVT ranges from 11 to 81%. At the time of the audit raw water turbidity was 3.42 NTU and colour was 100 Hazen Units. c. No farm surveys or catchment inspections have been done in the catchment. Farmers have not been written to. There are no buffer zones established. Catchment surveys will be scheduled but not in 2014. The *Cryptosporidium* Risk Assessment Score is very high risk but the score was not available at the time of the audit.
2.	**Coagulation, Flocculation and Clarification** a. The raw water quality is highly variable. Dosing of Chemifloc 103 (aluminium sulphate/sulphuric acid mix) is flow proportional into the rising main. The dosing rate is 200-450mg/l depending on the quality of the raw water and at the time of the audit it was 260-270mg/l. Powdered carbon slurry is added at 14 ppm just prior to contact tank, to counteract a taste and odour problem but it does not solve the problem entirely and there is still is an earthy, musty taste from the water. The mixing time between addition of aluminium sulphate and the poly is unknown. Poly is made up and dosed at the contact tank. The aluminium sulphate storage tank was bunded since the last audit. All chemical deliveries are supervised. b. Jar tests are carried out fortnightly and the results are recorded and available for inspection. c. There are three settlement tanks with lamellae plates as part of the design (photograph 2). A number of lamellae plates were missing or broken. Once a year, each tank is cleaned out. The settlement tank was last cleaned in January 2014. The walls of the tank are cleaned out 3-4 times a year (last cleaned in early July 2014). Algae were observed on the walls of the settlement tanks. The sludge bleeds are every 20 minutes for 4 minutes (adjusted based on visual observation of bleeds). The sludge blanket in the settlement tanks appeared to be low and intact. No carryover of floc was observed. The channels were clean and level and there was a uniform upflow in the settlement tanks. The settlement tanks are exposed to cross winds.
3.	**Filtration** a. There were five rapid gravity sand filters (3 built in 1981 and 2 in 1991). The trigger for a

	backwash is 2m head loss or 48 hours, whichever is soonest. Backwashing frequency is not related to turbidity levels. There are turbidity filters on each filter but these cannot be accessed centrally to manage the backwashing process. The backwash sequence is four minutes air scour (rate unknown) followed by a 10 minutes water wash at 320m^3/hr. The sand was fully replaced in all five filters in the last 5 years. The filters comprise 1 metre of sand over a 20cm bed of stone. A backwash of Filter No. 2 was observed. The air scour and water wash appeared even. The top of the filter could not be observed for cracking/mudballing. Algae was observed on the walls of the filters and the top of the filter. After the backwash, the turbidity meters on each filter were reading: Filter 1: 0.147 NTU, Filter 2: 0.188 NTU, Filter 3: 0.142 NTU, Filter 4: 0.129 and Filter no. 5: 0.157 NTU. b. The filters are not run to waste prior to returning to supply nor is there a slow start into supply. c. Backwash water goes straight to the lake and has never been tested. The plant was originally designed for backwash water to go through the sludge process but this was stopped when sand was overflowing from the filters and destroying the pumps. d. At the time of the audit, turbidity readings were: Raw water: 3.42NTU , Final water: 0.18 NTU
4.	**pH control and Disinfection** a. Facilities for dosing with lime to adjust the pH are in place. pH correction was not being done at the time of the audit due to problems with lime clogging due to dampness. b. Disinfection is by chlorine gas and dosing is fixed to a constant pumping rate. The dosing rate is between 2.5 and 4mg/l and is manually adjusted based on residual chlorine readings at the end of the network and a residual of 0.2mg/l at the end of the network is aimed for. There are three duty and three standby cylinders with automatic switchover between duty and standby. A chlorine monitor is operational. Final water free chlorine leaving the plant was 1.65mg/l with a high alarm at 3mg/l and low alarm at 0.5mg/l. Dial out alarms to the plant operator and caretakers are operating and chlorine response procedures are in place both during office hours and outside of office hours – the plant operator lives 10 minutes away. The chlorine contact time is >1.5 days but the effective chlorine contact time has not been calculated. c. Chlorine residual readings are taken in the network daily including the ends of the network. Chlorine residual at the ends of the network is typically 0.3mg/l
5.	**Treated Water Storage and Distribution Network** a. Two reservoirs are located at the treatment plant (one built in 1981 and one in 1991). There was no information available as to when they were last cleaned. Vegetation has grown over the reservoir built in 1991 (photograph 3) and access hatches were not locked (photograph 4). b. Two reservoirs are located off site. Lissacurkia reservoir and Fairymount reservoir were both built in 1989. There was no information available as to when they were last cleaned. A camera survey was conducted on the Lissacurkia reservoir in 2011. It was deemed to be structurally ok but had 4-5 inches of sediment. The Lissacurkia reservoir is overgrown and the surface could not be accessed (see photograph 5). Roscommon County Council confirmed that the access hatches were locked but that the vents were not meshed. Fairymount reservoir is a double celled round reservoir (see photograph 6). Vents were not meshed and only one of four access hatches was locked. c. Unidirectional flushing and souring is done in the network. It is done based on time every three months. Operators aim to reduce turbidity to below 1 NTU when flushing. There are parts of the network that have insufficient scour valves and therefore are not being scoured. **d.** Unaccounted for water is approximately 50%. Roscommon County Council has a dedicated repair crew working on leaks in the supply.
6.	**Hygiene and Housekeeping** a. The treatment plant was clean, tidy and well maintained.
7.	**Management and Control** a. There is no SCADA system at the treatment plant to manage the treatment processes optimally. b. All monitors are on a quarterly maintenance contract. c. A comprehensive system of manual record-keeping is maintained by the plant operator

8.	**Complaints from Consumers** a. Roscommon County Council regularly receive complaints about the earthy, musty taste from consumers on the supply
9.	**Sludge Management** a. Pressed sludge goes to Lagan Cement for incineration

3. AUDITORS COMMENTS

The North Roscommon Regional treatment plant is a moderately well-run plant. The treatment processes could be further optimised with the implementation of a number of solutions: onsite SCADA system, continuous online monitoring of raw water, pH correction prior to coagulation, re-finishing of settlement tank and filter walls, replacement of lamellae plates, slow start or run to waste after filter backwashing, trialling of GAC for removal of taste/odour and the cleaning of all reservoirs.

4. RECOMMENDATIONS

Source Protection

1. The Water Services Authority should ensure that the source protection and catchment risk assessment score for the *Cryptosporidium* risk assessment is reviewed and provided to the EPA.

2. The Water Services Authority should implement the requirements of the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)* to ensure, unless an alternative setback distance has been set as per Article 17 that:
    i. Organic fertiliser or soiled water is not applied to land within 200 m of the abstraction point; and
    ii. Farmyard manure held in a field prior to landspreading is not placed within 250 m of the abstraction point.

3. The Water Services Authority should examine the appropriateness of the setback distances in the *European Union (Good Agricultural Practice for the Protection of Waters) Regulations 2014 (SI No.31 of 2014)* for the source of the supply. The Water Services Authority should have regard to the EPA guidance on alternative setback distances.

4. The Water Services Authority should characterise the variability in raw water quality and compile a source water safety plan in order to mitigate any risks to the abstracted water (http://whqlibdoc.who.int/publications/2009/9789241562638_eng_print.pdf). Trends in raw water quality should be analysed and used to determine the optimum treatment conditions for the water at the plant. Data should be used to identify whether rapid variations in raw water quality give rise to problems with the treatment process.

5. The Water Services Authority should install the following continuous automatic monitors to alert plant operators of any changes in raw water quality; pH, colour and TOC to determine the degree of treatment and controls required in the supply.

Coagulation, Flocculation and Clarification

6. The Water Services Authority should investigate the feasibility of introducing an automated pH correction system prior to coagulation in order to optimise the chemical dosing process. EPA Advice Note No.15: Optimisation of Chemical Coagulant Dosing at Water Treatment Works provides guidance for Water Services Authorities on the optimisation of chemical coagulant dosing. The Advice Note is available at http://www.epa.ie/pubs/advice/drinkingwater/dwadvicenote15.html.

7. The Water Services Authority should review the mixing chamber to ensure that there is adequate mixing and contact time of the coagulant/coagulant aids prior to entry into the clarifier.

8. The Water Services Authority should review the operation of the clarifier to ensure that the clarifiers are not being operated under conditions above the design capacity of the clarifier. Broken or missing lamellae plates should be replaced.

9. The Water Services Authority should ensure that the walls of the settlement tanks can be adequately cleaned on a regular basis to prevent build-up of algae and refinishing of the walls should be considered.

Filtration (General)

10. The Water Services Authority should inspect the surface of the filter media for evidence of boils, cracks and mudballs and remove any algae from the surface of the filters and should take appropriate action to optimise the operation of the filter.

11. The Water Services Authority should trial the use of Granular Activated Carbon and assess its effectiveness for the removal of taste and odour at the treatment plant.

12. The Water Services Authority should ensure that the walls of the filters can be adequately cleaned on a regular basis to prevent build-up of algae and refinishing of the walls should be considered

13. The Water Services Authority should follow the guidance as specified in the EPA publication "*Water Treatment Manual on Filtration*" and in particular the following action is required as a priority;
    i. Ensure that the filtration rate in the rapid gravity filters does not exceed 7.5 m^3/ m^2/hour ;
    ii. Review the filter backwash process to ensure that the maximum backwash water flow rate does not exceed 20 m^3/ m^2/hour ;
    iii. Ensure that, following backwashing, the filters are run to waste for an appropriate period of time or that there is a slow start when the filter is brought back into use ; and
    iv. Review the operation of the filters to ensure that the levels of turbidity in the filtered water are as low as possible and no greater than 0.5 NTU. If the plant is a high risk *Cryptosporidium* plant then the turbidity of the filtered water should not exceed 0.25 NTU.

14. The Water Services Authority should connect the continuous turbidity monitors on each filter and the final treated water to a recording device and generate an alarm in the event of a deviation from the acceptable operating range of the filters. Plant operators should be able to access these recordings in order to best manage the filtration process.

15. The Water Services Authority should cease the direct discharge of backwash water to the lake (source of the supply). Backwash water should be treated in the sludge management process (as per the plant design) and any supernatant discharged to the lake should be tested for aluminium and poly.

Disinfection

16. The Water Services Authority should calculate the effective contact time for chlorine disinfection and submit the calculation to the Agency.

17. The Water Services Authority should consider chlorine dosing linked to the residual chlorine monitor.

Treated Water Storage

18. The Water Services Authority should clean all four reservoirs (the two reservoirs at the plant and the Lissacurkia and Fairymount reservoirs).

19. The Water Services Authority should ensure that all vents and access hatches on all four reservoirs are secured against ingress of animals or deliberate introduction of any contaminant or acts of vandalism.

20. The Water Services Authority should remove all vegetation from the sides and cover of the reservoir built in 1991, at the treatment plant and the Lissacurkia reservoir, to ensure that the reservoirs can be visually inspected on all sides and also to prevent damage to the integrity of the reservoir.

Distribution System

21. The Water Services Authority should arrange for the installation of appropriate scouring valves in the network to facilitate effective flushing and scouring of the mains.

Management and Control

22. The Water Services Authority should ensure that all monitors are linked to recording devices and, where appropriate, alarmed. A procedure should also be put in place defining the actions to be taken in response to the different levels of alarm.

FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

During the audit the Water Services Authority representatives were advised of the audit findings and that action must be taken as a priority by the Water Services Authority to address the issues raised. This report has been reviewed by Mr Nigel Hayes, Drinking Water Inspector.

The Water Services Authority should submit a report to the Agency within one month of the date of this audit report 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 Irish Water.

Please quote the File Reference Number in any future correspondence in relation to this Report.

Report prepared by: Yvonne Doris

Yvonne Doris

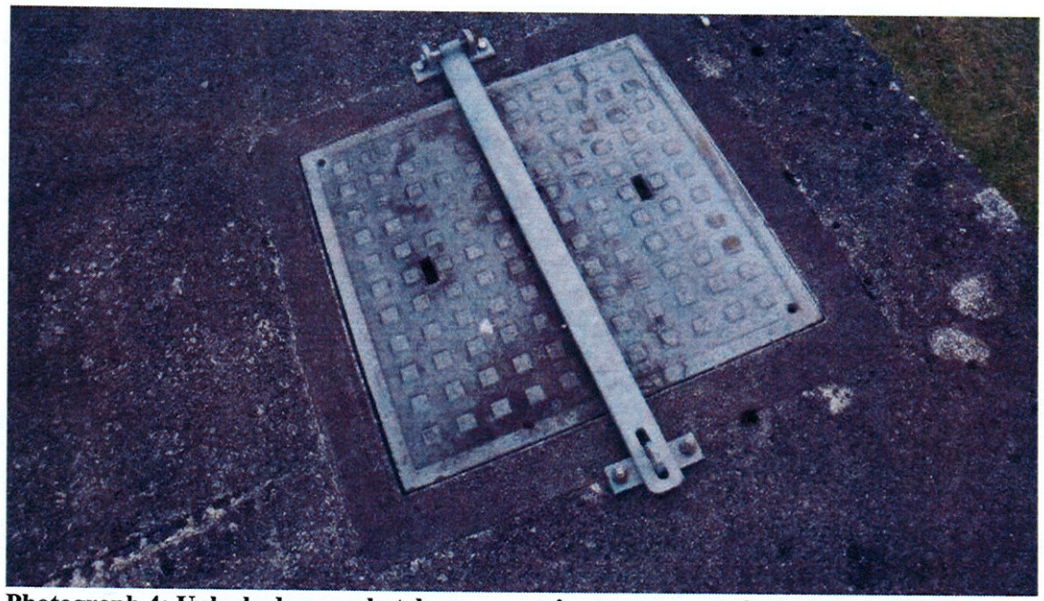
Inspector

Date: 17th July 2014

Photograph 1: View of Lower Lough Gara from treatment plant

Photograph 2: Three settlement tanks (1981)

Photograph 3: Overgrown reservoir on treatment plant site (built in 1991)



Photograph 4: Unlocked access hatch on reservoir at treatment plant (built in 1981)

Photograph 5: Lisacurkia Reservoir – overgrown

Photograph 6: Fairymount reservoir – unmeshed vents and only one of four access hatches were locked.