



Drinking Water Audit Report

County:	Mayo	Date of Audit:	21 February 2014
Plant(s) visited:	Lough Mask Water Treatment Plant	Date of issue of Audit Report:	04 March 2014
		File Reference:	DW2007/464
		Auditors:	Ms Derval Devaney Mr Darragh Page
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 upgrade of the Lough Mask Water Treatment Plant is currently in the commissioning phase and while the plant's capacity has increased and final water quality improved, the terms of the EPA's Direction issued on 21/04/14 was not being complied with on the day of the audit.
- ii. Mayo County Council stated that fifteen to twenty per cent of abstracted water continues to by-pass the coagulation, flocculation and clarification treatment stage at the Lough Mask Drinking Water Treatment Plant.
- iii. THMs monitoring results, reviewed during the audit, were compliant with the parametric value in the Lough Mask Public Water Supply.

1. INTRODUCTION

Under the *European Communities (Drinking Water) (No. 2) Regulations 2007* 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 providing clean and wholesome drinking water and to assess compliance with the Regulation 10(4) Direction issued to Mayo County Council on the 21st of April 2009 under the *European Communities (Drinking Water) (No. 2) Regulations, 2007*.

The opening meeting commenced at 9:10 am at the Lough Mask Regional Public Water Supply (PWS) Drinking Water Treatment Plant in Tourmackeady, Co Mayo. 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 Lough Mask Regional PWS supplies approximately 34,000 m³/day to an estimated population of 30,698. The design capacity of the plant was 27,300 m³/day and during the opening meeting it was stated that the upgrade works have increased the plant's capacity to 40,600 m³/day with typical throughput of 32,000 m³/day. Mr Shalley provided an update to the EPA of such upgrade works. The

intake filters, associated pumps, screens and intake pipeline have been upgraded providing additional capacity for water treatment at the Lough Mask Water Treatment Plant (WTP). At the WTP one new clarifier and four new filters were installed in addition to the sludge press capacity increasing to double its previous size. The gas disinfection system has been retrofitted with liquid chlorination. Mr Shalley also informed the audit team that the plant upgrade is still in its commissioning phase (with the contractors "Response") and this is to last for a number of months. Currently SCADA systems are being reviewed in addition to snag-list items (e.g. alarm settings, operation of pumps and valves, etc.).

At the opening meeting Mr Shalley also outlined the difficulties arising with the coagulation process and issues regarding carry-over of pin-floc to the filters. Frank Harvey was consulted and carried out studies into the ferric dosing system and outlined recommendations including the installation of a static mixer to assist in improved mixing prior to dosing with poly. Irish Water is currently addressing this issue.

The audits observations and recommendations are listed in Section 2 and 4 of this report. Photographs taken by Derval Devaney during the audit are attached to this report and are referred to in the text where relevant.

The following were in attendance during the audit.

<p>Representing Irish Water:</p> <p>Anthony Skeffington, Regional SLA Lead Engineer, Irish Water; Kieran Shally, S.E.E, Mayo Co Co; Justin Doran, Waste/Water Engineer, Irish Water; Martin Lardner, Plant Manager, Mayo Co Co and Conor O'Toole; Plant Caretaker, Mayo Co Co.</p> <p>Representing the Environmental Protection Agency:</p> <p>Derval Devaney, Inspector, EPA and Darragh Page, Inspector, EPA.</p>

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.	<p>Source</p> <ul style="list-style-type: none"> a. Water is abstracted from Lough Mask. The intake filters, associated pumps, screens and intake pipeline have been upgraded providing additional capacity for water treatment at the Lough Mask Water Treatment Plant (WTP). b. Mayo County Council stated that raw water is generally stable. The intake filters, associated pumps, screens and intake pipeline have been upgraded providing additional capacity for water treatment at the Lough Mask Water Treatment Plant (WTP). pH is generally 8 and colour from 16-28 Hazen. The pH is affected by heavy rainfall (dropping to 7.6) or drought (increasing to 8.2). c. A raw water turbidity meter was installed as part of the upgrade and its monitor read 0.572 NTU during the audit.
2.	<p>Coagulation, Flocculation and Clarification</p> <ul style="list-style-type: none"> a. A new clarifier was installed in addition to the 2 existing clarifiers as part of the plant upgrade. b. Ferric sulphate is added by volume and is going to be changed to mg/l. The water is then dosed with 0.15% solution of poly. The WSA is experiencing issues with the floc settling at the mixing chamber post poly injection. This is particularly evident when throughput is increased through the clarifiers. c. As a result of the issues with floc carry-over, 15-20% of the abstracted water continues to by-pass the clarification stage and is mixed with the clarified water and passed through to filtration. d. The target coagulation pH is 6.8.

	<ul style="list-style-type: none"> e. During the audit pin-floc was observed in the clarified water in the filters. f. Mayo County Council commissioned a consultant, Frank Harvey, to review the coagulation issue. Mr Harvey recommended the installation of a static mixer. Irish Water is to incorporate these recommendations and has also indicated it is to review the use of specific chemicals for pH correction prior to ferric dosing in an effort to reduce the quantities of ferric used and the generation of floc to sludge. g. The audit team noted damage to some lamella plates. Mayo County Council explained that this occurred during cleaning as a result of the high winds (See Photo 1). h. Jar tests are carried out on site when variations in water quality occur and results are recorded on-site.
3.	<p>Filtration</p> <ul style="list-style-type: none"> a. Four new filters were installed as part of the upgrade and the existing four filters were fully refurbished. The new filters were commissioned in the last 2 weeks. b. Backwash is automated based on time and occurs every 24 hours. Backwash is to be also linked to turbidity once the monitors on each filter are fully commissioned. Mayo County Council explained that there was a time delay on the turbidity monitors reading from the filters and is to be addressed as part of the commissioning phase. c. There is a filter log book held on-site to record data regarding operation and maintenance of the filters. The HACH vs. manual turbidity readings were being recorded to investigate delay in monitor reading results. Mayo County Council also observed an issue with valves opening. When these issues are resolved, the water supplier can determine the when to backwash and the sufficient run to waste time based on the turbidity meters read-out. d. Filter No. 2 was backwashed during the audit. e. During the audit the turbidity monitors read 0.161 NTU for filter 5. This filter was backwashed at 8am) and 0.04NTU for filter 6. f. A Report on Review of Plant Operations/Upgrades at the Lough Mask Water Treatment Plant was carried out in December 2013 by HRA Environmental Services. The report found that the TOC post filtration has improved since prior to the upgrade works (e.g. 1.68 mg/l TOC was found in Filter 5 post upgrade works and the UVT has increased from 80% to 93.5%). Mayo County Council stated that this has led to a subsequent improvement in THM levels in the network.
4.	<p>Disinfection and Final Water Adjustments</p> <ul style="list-style-type: none"> a. The final water is dosed with soda ash to bring the water to a target pH of 7.2. b. The disinfection system was upgraded to include sodium hypochlorite thereby replacing chlorine gas. There are two chlorine dosing points - one for each group of four filters. There are 5 chlorine dosing pumps. Two pumps per dosing point operate on a duty and standby arrangement with automatic switchover on trip with dosing switchover yet to be configured. The 5th pump is on standby in the event of one of the other four pumps malfunctioning. c. The disinfected water passes to two reservoirs - 45% of the treated water goes to Reservoir 1 and 55% to Reservoir 2. d. The chlorine analyser takes its reading from Reservoir 1. There are concerns over there being sufficient contact time for the chlorine analyser sample. e. The low level alarm settings on the sample taken by the chlorine analyser is set at 0.5mg/l. f. The manual chlorine test is taken from the combined reservoir outlet and therefore this result cannot be compared to the chlorine analyser result. g. Mayo County Council stated that since the upgrade the chlorine dose has decreased due to the improved final water quality.
5.	<p>Treated Water Storage</p> <ul style="list-style-type: none"> a. Irish Water stated that they were to meet with Irish Water Capital, Mayo County Council and consultants to discuss the build of a new reservoir with the view of extending the supply of treated water to Westport, Co. Mayo.
6.	<p>Monitoring and Sampling Programme for treated water</p> <ul style="list-style-type: none"> a. The clear water turbidity was 0.136 NTU. b. The final water pH was 6.92, 9.3^oC and 0.132 NTU on the monitor in the new filter gallery.

	c. There is a permanent <i>Cryptosporidium</i> rig at the treatment plant and a weekly sample is taken on the final water. Mayo County Council stated that the results are satisfactory.
7.	<p>Exceedances of the Parametric Values</p> <p>a. Since the upgrade the Mayo County Council and the EPA had received odour and taste complaints. Mayo County Council investigated these complaints and believe they related to the refurbishment of filter media. Mayo County Council stated that the complaints issue has since been resolved.</p> <p>b. Monitoring results for samples taken of the treated water in the network were reviewed during the audit. THMs were complaint (e.g. THMs 28 ug/l on 03/02/14) however Mayo County Council stated that there was an issue with Iron concentrations in the network since end of January 2014 (e.g. 597 ug/l v.s PV of 200 ug/l on 04/02/14). Irish Water are investigating this issue as part of the coagulation process review.</p>

3. AUDITORS COMMENTS

While the EPA has found that the upgrade works have significantly improved the safety and security of the Lough Mask PWS, 15-20% of the flow (as opposed to 55% before the upgrade) still by-passes the clarification stage. The EPA recognises that the plant is still at the commissioning phase however it requests that the difficulties experienced with the coagulation process are addressed without delay. Investigations into the use of chemicals to aid pH correction in the coagulation process is also encouraged. Once the bypassing of the clarification stage is ceased and complaint THMs are evident in the network the EPA can close out this file and its associated Direction.

4. RECOMMENDATIONS

Management and Control

1. Irish Water shall take measures to ensure that priority is given to upgrade the Lough Mask WTP as outlined in Mayo County Council's Action Programme which was agreed by the EPA on 24th July 2009 in response to the EPA's Regulation 10(4) Direction issued on 21st April 2009.
2. Irish Water shall notify the EPA once the commissioning phase is complete and confirm that the following snag-list issues have been rectified: pumps and valves operational issues; turbidity read-out delay issues; commissioning of chlorine monitor; operation of SCADA and alarms set to appropriate levels (e.g. chlorine residual, turbidity alarms); shut-off is linked to low/high chlorine residual and power failure.
3. Irish Water should ensure that the observations and recommendations in the "Report on the Review of Plant Operations/Upgrades at the Lough Mask Water Treatment Plant" carried out in December 2013 by HRA Environmental Services are addressed and implemented. Irish Water shall submit a timeframe to the EPA for addressing such observations and recommendations.

Coagulation, Flocculation and Clarification

4. Irish Water should address the coagulation issue as a matter of priority and ensure that by-passing of the coagulation / flocculation processes at the water treatment works is not allowed to occur once this issue is addressed.
5. Irish Water should review the chemical dosing arrangements for coagulation with a view to investigating if pH correction can bring about efficiencies in chemical use and waste generation and improved final water quality.
6. Irish Water should repair the damaged lamella plates in the clarifiers.

Disinfection

7. Irish Water should ensure that the manual test for chlorine residual in the final water is taken at same point as the chlorine analyser's sampling point and that the results are recorded for comparative purposes. Irish Water should also ensure that the chlorine analyser's sample is taken after a sufficient contact time has elapsed.

FOLLOW-UP ACTIONS REQUIRED BY IRISH WATER

During the audit the Irish Water and Mayo County Council representatives were advised of the audit findings and that action must be taken as a priority to address the issues raised. This report has been reviewed and approved by Mr Darragh Page, Drinking Water Team Leader.

Irish Water 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: Derval Devaney Date: 04/3/14

Derval Devaney

Inspector

04.03.2014

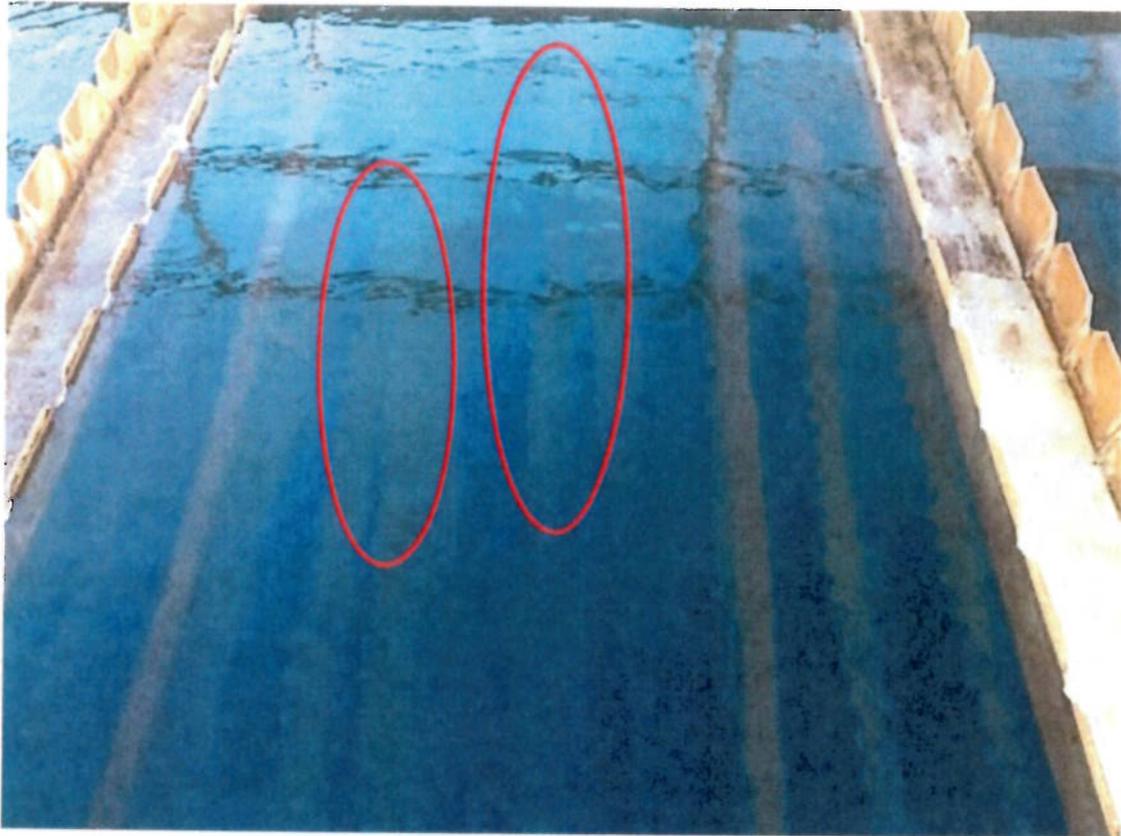


Photo 1 Broken Lamella plates in clarifier