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Environmental
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Katherine Walshe
Irish Water
Colvill House
24-26 Talbot Street
Dublin 1.

22/08/2014

Re: Drinking Water Audit –Killadysert Public Water Supply (DW2014/282)

Dear Ms Walshe,

The Environmental Protection Agency carried out an audit of the Killadysert Drinking Water Treatment Plant on 07/08/2014. The audit was carried out as part of the role assigned to the EPA under the *European Union (Drinking Water) Regulations 2014*.

A copy of the audit report from the visit is attached for your attention. The audit report includes a number of important recommendations in relation to the treatment plant and water supply. The EPA advises that Irish Water should address these recommendations as a matter of priority.

Please note that this audit report will be placed on the EPA's Website one month from the date of issue of this letter at the following link: http://www.epa.ie/pubs/advice/drinkingwater/audits/. The EPA recommends that Irish Water publish EPA drinking water audit reports and your response to the audit reports in a prominent position on your website to facilitate public access.

Please furnish a report to the EPA within one month of the date of this letter with details on the action taken or planned (with timeframes) to address the recommendations in the attached audit report.

Yours sincerely,

Niall Dunne
Inspector
Office of Environmental Enforcement

cc: DrinkingWaterComplianceSouthern@water.ie

Drinking Water Audit Report

County:	County Clare	**Date of Audit:**	07/08/2014
Plant(s) visited:	Killadysert (0300PUB1008)	**Date of issue of Audit Report:**	22/08/2014
		File Reference:	DW2014/282
		Auditors:	Mr Niall Dunne
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. **On 22nd July 2014 significant levels of manganese were detected in the Killadysert supply. Irish Water and Clare County Council made significant efforts with regard to the resolution of this issue. Irish Water should now develop and implement proposals to ensure against future high levels of manganese in the treated water supply.**

ii. **During the audit it was noted that the chlorine alarm had not been operational since 20/06/2014 and that the turbidity monitor on the final water and the hand held turbidity monitor were not working properly. Irish Water must ensure that all essential monitoring equipment is operational at all times and that appropriate contingencies measures are in place to prevent incidents such as this occurring.**

iii. **Elevated levels of manganese were detected in this supply in the treated water since 22/07/2014.The EPA was not notified of this issue until 29/07/2014. Irish Water must ensure that all exceedances are notified to the EPA as per the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)* and as per Section 6 of the EPA Handbook.**

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 in response to the notification by Irish Water dated 29/07/2014 of the failure to meet the manganese parametric value (as specified in Table C of Part 1 of the Schedule of the Regulations) in the Killadysert PWS. 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 Killadysert PWS is as supply fed by surface water from Gortglass Lake, which is fed by Cloonsnaghta lake. The supply produces 1,000m^3/day and supplies a population of 1,500 in the Labasheeda, Coolmeen – Cranny and Killadysert areas. The surface water is treated at the plant through coagulation using aluminium sulphate, clarification, rapid gravity filtration, chlorination, pH correction using soda ash and fluoridation. Powdered activated carbon is used to treat taste issues caused by algal blooms in the Gortglass lake.

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 15.30 at Killadysert 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)

Conor Foley; IW Above Ground Water Lead*;

Kevin Murphy; IW Water Engineer*;

Derek Troy; CCC Area Engineer*;

Noreen Shannon; CCC Technician*;

Paul Cusack, CCC Plant Operator*.

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. Exceedances of the Parametric Values

a. On the 29/07/ 2014 the EPA received a notification of 3,000 µg/l manganese exceedance, in the Killadysert supply, which had occurred on the 23/07/2014.

b. Clare County Council (CCC) stated during the audit that on 18/07/2014 manganese levels of 5,740 µg/l and 3,860 µg/ were detected in the raw and treated water respectively; following these results CCC stated that they started dosed sodium hypochlorite and sodium carbonate into the water prior to filtration, to assist in removal of manganese.

c. Follow up manganese sampling results for the raw and treated water are listed below;
   - 22/07/2014: 2,443 µg/l in the raw and 149 µg/l in treated water;
   - 23/07/2014: 3,668 µg/l in raw and 117 µg/l in treated water;
   - 25/07/2014: 3,922 µg/l in raw and 151 µg/l in the treated (879 µg/l in treated after the reservoir, which has three days storage);
   - 29/07/2014: 4,747µg/l in raw and 400 µg/l in the treated water; pH 9.6 in treated water.
   - 30/07/2014: 3,606 µg/l in the raw water. Samples also taken for coliform bacteria and *E.coli* returned clear results; ammonium results were 0.502 mg/l.

d. CCC stated that they contacted the HSE on the 21/07/2014 and a precautionary notice was put in place on the 29/07/2014. The EPA was notified on the 29/07/2014. Irish Water (IW) stated that they were not notified of the incident until the 29/07/2014.

e. On the 28/07/2014 CCC noted that aluminium results in the treated water were rising, close to 200 µg/l, due to the high pH required for the removal of manganese.

f. On the 29/07/2014 the chlorine dosing pumps were blocked; CCC stated that chlorine levels within the network were not affected due to the three days storage capacity and the already high levels of

	chlorine within the reservoir. g. On the 01/08/2014 CCC changed the location of the abstraction point to the edge of the lake as manganese levels were significantly less at this location. h. Further manganese sampling results were as follows; • 02/08/2014: 178 µg/l in raw and 10 µg/l in the treated water. • 03/08/2014: 188 µg/l in raw and 1 µg/l in the treated water; and 190 µg/l aluminium in the final water. • 04/08/2014: 195 µg/l in the raw and 3µg/l in the treated water; pH 8.05 in the treated water; 200 µg/l aluminium in the final water; • 05/08/2014: 196 µg/l in raw and 5µg/l in the final; 154 µg/l aluminium in the final water. i. On the 06/08/2014 CCC placed approximately 50 mm of green sand on the filters. CCC stated that this would take a few days for its impact to be seen; manganese results were 192 µg/l in raw and 15 µg/l in final; aluminium results were 202 µg/l with a pH 8.0 in the final water. j. On the 07/08/2014 CCC stopped dosing sodium hypochlorite before the filters, as the green sand was installed. k. CCC stated that they were driving to a laboratory in Galway with samples on a daily basis to get the daily provisional results. l. CCC stated that drinking water from the Kilrush supply was being transported by tanker which were in place in two locations for one hour at a time twice a day. CCC confirmed that boil before consumption notices were on the tankers. m. CCC is currently manually dosing powered activated carbon into the water prior to treatment. n. CCC estimated that it takes approximately 5 days for water to reach the extremities of the network. o. IW stated that the notice will remain in place until such time as a full complement of compliant results is obtained.
2.	**Source Protection** a. Prior to the exceedance, the abstraction point from the Gortglass lake was located 80 meters into the lake, at a depth of 12 meters and 1 meter from the bottom of the lake. The abstraction point was originally moved to this location to avoid issues with algal blooms, which are prevalent in the lake from May to July and from September to October. CCC stated that they were unaware of the specific reason for the algal blooms in the lake such as increased nutrient levels. b. According to IW the reason for the high manganese levels in the lake was due to the decay of algae and anaerobic/anoxic conditions at depth. c. CCC stated that manganese samples taken within the lake in January were satisfactory. d. Since the exceedance, and as a temporary measure, the abstraction point has been relocated to the edge of the lake, two meters below the surface, to avoid the anoxic conditions and the stratified manganese layer within the lake. Manganese results taken at different depths showed results of 165 ug/l at two meters and 75-100 µg/l at the surface of the lake. e. According to CCC the long term proposal is to install an intake within the lake the depth of which can be manually adjusted. f. CCC stated that the *Crypto* risk score for the supply is low and that farming in the catchment consists of low density cattle grazing stock. g. CCC confirmed that all farmers in the vicinity of the abstraction point had been written to as per the GAP Regulations and that a follow up letter is sent to farmers within the buffer zone each year.
3.	**Coagulation, Flocculation and Clarification** a. CCC stated that the plant is designed to treat up to 70m^3/hr and that the plant is now operating at full capacity. b. At the time of the audit CCC was dosing alum; poly; soda ash and powered activated carbon (PAC) into the mixing chamber prior to clarification. c. An alum solution is made up on site on a daily basis; a poly solution is made up every three days. No bunding was observed around the day tanks (see photograph 1) d. There is no automatic switch over between duty standby dosing pumps in place for chemical dosing. CCC stated that there is one spare pump that can be made available if required. e. PAC is dosed prior to and during periods of algal blooms.1 bag a day is dosed when there is an algal bloom within the lake. The PAC dosing chamber is now being used to dose soda ash as part of the treatment for manganese.

	f. CCC is dosing soda ash prior to filtration to assist in the removal of manganese. g. According to CCC jar tests are carried out every 2-3 months and chemical dosing is manually adjusted. h. Pin floc was observed in the clarifier (see photograph 2). i. Sludge bleeds are carried out every 30 minutes for one minute.
3.	**Filtration.** a. Filtration consists of two rapid gravity filters (see photograph 3), the filtration rate through each filter is estimated at $35m^3/hr$. b. According to CCC sand is topped up within the filters every few months. It was last replaced two years ago, no sand depth gauge was observed within the filter. c. CCC stated that the back wash cycle consists of 3 mins to drain; 5-10 min air and 5-10 mins water; back washing is carried out twice a day, the length of the cycle is based on visual observations. d. CCC could not confirm the backwash rate on the day of the audit. e. Back wash water is run to waste for a period of 20 mins before the filter is brought back into service. f. A back wash cycle on filter no 2 was observed by the auditor. g. In response to the manganese exceedance; 50 mm of greensand was placed on each filter; the nominal size of the green sand is 0.6 mm with a specific gravity of 3.8. Additional layers of green sand are to be placed on the filters; CCC is awaiting delivery of green sand. h. There are turbidity monitors on each filter, the observed turbidity results on filter 1 and filter 2 were 0.081 NTU and 0.032 NTU respectively; there are no dial out alarms on the turbidity monitors. i. A black scum was observed on the walls of the filter (see photograph 3).
4.	**Chlorination and Disinfection** a. It was observed at the time of the audit that the chlorine monitor had not been working properly since 20/06/2014. According to CCC this may be due to the levels of manganese in the water. The chlorine monitor is connected to a recording device. b. There is duty standby chlorine dosing with auto switch over in place. The next calibration date for the pumps was 28/08/14. CCC stated that there are dial out alarms on the chlorine monitor. c. CCC stated that chlorine levels are tested daily within the plant. A result taken on the day of the audit returned a sample result of 1.54 mg/l after the filter, the sample location was inadequate as there was insufficient chlorine contact time. d. The chlorine dosing point, into the clear water channel, directly after the filters was observed to be unsecure (see photograph 4). e. There was no lockable cover on the chlorine fill point and the fill point was observed not to be in an adequate location to prevent spillage (see photograph 5).
5.	**Fluoridation** a. Two bulk hydrofluosilcic acid storage tanks were observed on site (see photograph 6); CCC stated that hydrofluosilcic is delivered every six months and that there is three days storage within the day tanks. The volume of the bunded area did not appear to be 110% of the volume of the bulk tanks. b. There was no lockable cover on the fill point. c. Fluoride is dosed at 0.7 mg/l and there are duty standby dosing pumps with auto switch over. d. No proper extraction vent was observed within the room containing the day tank.
6.	**Monitoring and Sampling Programme for treated water** a. The reading on the final water turbidity monitor was observed to be 1.55NTU; CCC stated that the monitor was not working properly and this may be due to the level of manganese in the water. On review of records there was no turbidity readings taken since 31/07/2014 and on the day of the audit the hand held turbidity monitor was not working.

7.	**Management and Control** a. CCC stated that the distribution mains were scoured the first week of July 2014. b. There was no documented sign off procedure for the deliver of chemicals. c. Record keeping at the site was good. d. CCC stated that there were no alarms on the turbidity monitors. e. The plant was tidy but some housekeeping could be improved (see photograph 1).

3. AUDITORS COMMENTS

On the 29/07/2014 the EPA received a notification of 3,000 µg/l manganese in the Killadysert supply. A precautionary notice was placed on the supply on 29/07/2014 and rescinded on the 22/08/2014. From observations made during the audit Clare County Council responded well to the exceedance and made significant efforts to resolve the issue. At the time of writing the audit report, manganese levels had declined, however, increased levels of aluminium; ammonium and pH were noted during the audit. Irish Water should ensure that remedial measures are put in place to ensure that future manganese exceedances are avoided and that other parameters as set out in the 2014 Drinking Water Regulations are maintained with their parametric limits.

It was observed during the audit that the chlorine monitor had not been working properly since 20/06/2014; that the turbidity monitor on the final water and the hand held turbidity monitor was not working correctly. Irish Water must ensure that all essential monitoring equipment is operational at all times to prevent exceedances of the parametric limits of the drinking water regulations within the supply. Irish Water should as a priority ensure that these monitors are fixed and are operational as soon as possible.

During the audit it was observed that there was a manganese exceedance on the 22/07/2014 of 149 µg/l in the supply. The EPA was not notified of this until the 29/07/2014. Irish Water must ensure that exceedances are promptly notified to the EPA as per the European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014) and as per Section 6 of the EPA Handbook (available at http://www.epa.ie/pubs/advice/drinkingwater/publicwatersupplieshandbook/).

4. RECOMMENDATIONS

Source Protection

1. The Water Services Authority should ensure that the location of the intake is reviewed to take account of seasonal changes in algal blooms and levels of manganese in the raw water.

2. The Water Services Authority should carry out a feasibility study to determine whether any remedial actions can be undertaken to reduce the proliferation of the algal blooms in the lake and their effect on the drinking water.

Coagulation, Flocculation and Clarification

3. The Water Services Authority should carry out an investigation to identify the cause of pin floc formation and floc carryover. In this regard the Water Services Authority shall consult Table 2 on Page 41 of the EPA publication "*Water Treatment Manual: Coagulation, Flocculation and Clarification*" and investigate the use of polyelectrolyte and pH correction in line with the designed plant's operating procedures.

4. The Water Services Authority should investigate the efficiency of the sludge bleeds and should establish the optimum regime of sludge draw-off.

5. The Water Services Authority should ensure that all there is duty standby dosing in place for all essential chemical dosing systems.

6. The Water Services Authority should ensure that a process optimisation assessment is undertaken at the plant and that recommendations of this assessment are undertaken without delay.

Filtration (General)

7. The Water Services Authority should ensure that a sand depth gauge is place within the filter so that sand levels can be observed; recorded and that sand can be replaced when required.

8. The Water Services Authority should ensure that the walls of the filter are washed down regularly; especially after this manganese exceedance.

9. The Water Services Authority should ensure that filter backwash durations take into account post-filter turbidity results.

10. In relation to the observations above on filtration 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 ;

Disinfection

11. The Water Services Authority should ensure that the continuous chlorine residual monitor is operational at all times.

12. The Water Services Authority should ensure that the chlorine samples are taken at a location after a sufficient contact time has elapsed.

Fluoridation

13. The Water Services Authority should ensure that the area containing the fluoride day tank is properly vented.

Exceedences of the Parametric Values

14. The Water Services Authority should submit all follow up sampling results for this supply. Sampling results should include for microbiological; ammonium; pH, turbidity and chlorine results.

15. The Water Services Authority must ensure that all exceedances are promptly notified to the EPA as per EPA as per the *European Union (Drinking Water) Regulations 2014 (S.I. 122 of 2014)* and as per Section 6 of the EPA Handbook. The Water Services Authority should submit via the online system the aluminium exceedance for this supply without delay.

Chemical Storage and Bunds

16. The Water Services Authority should review chemical storage arrangements at the treatment plant. Chemicals must be stored in bunded areas capable of containing at least 110% of the volume of chemicals stored therein. Fill points for storage tanks inside the bunds should be within the bunded area. Refer to EPA guidance document –"*IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities*".

17. The Water Services Authority should ensure that there are lockable covers on all chemical delivery points and that they are in an appropriate location so as to prevent spillage.

Management and Control

18. The Water Services Authority should ensure that the turbidity monitors have dial out alarms installed to ensure that the caretaker and appropriate personnel are alerted of any significant increases of turbidity within an appropriate time frame.

Monitoring and Sampling Programmes for Treated Water

19. The Water Services Authority should commence daily monitoring of the final treated water for turbidity and chlorine.

20. The Water Services Authority should ensure that the site is kept clean and tidy.

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 and approved by Ms Yvonne Doris, Drinking Water Team Leader.

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.

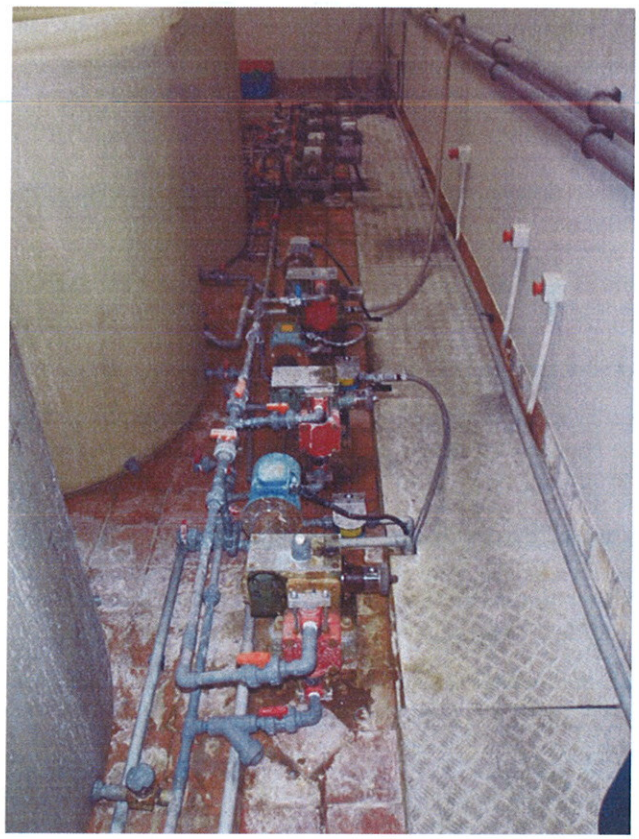
Please quote the File Reference Number DW2014/282 in any future correspondence in relation to this Report.

Report prepared by:  **Date:** 22/08/14

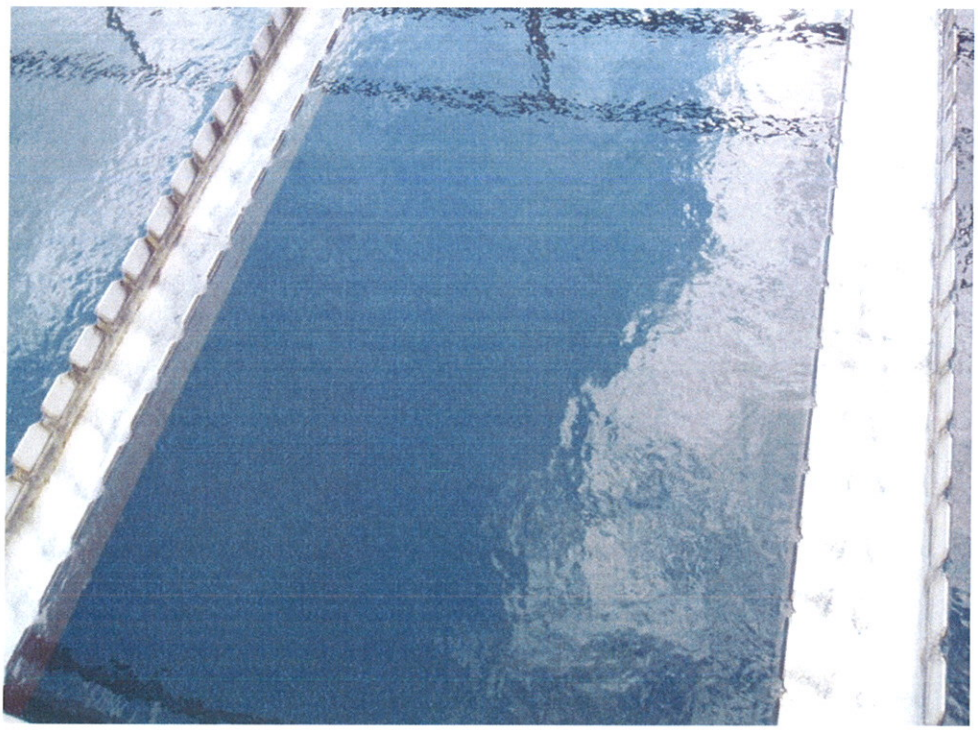
Niall Dunne

Inspector

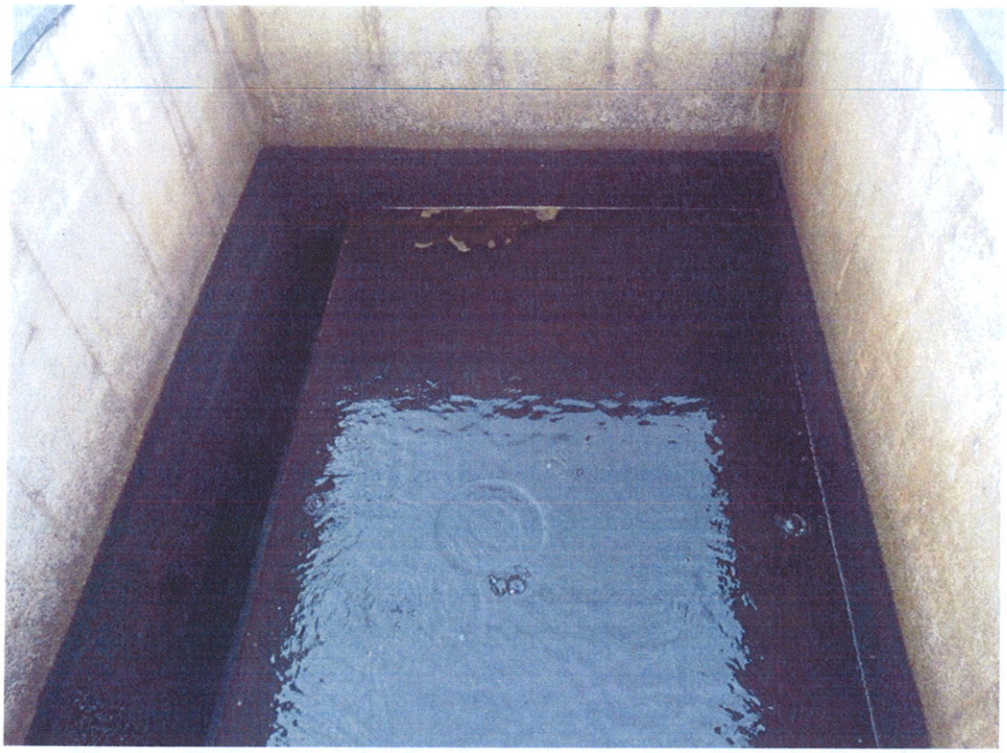
Photograph 1: No bunding observed on chemical dosing day tanks.



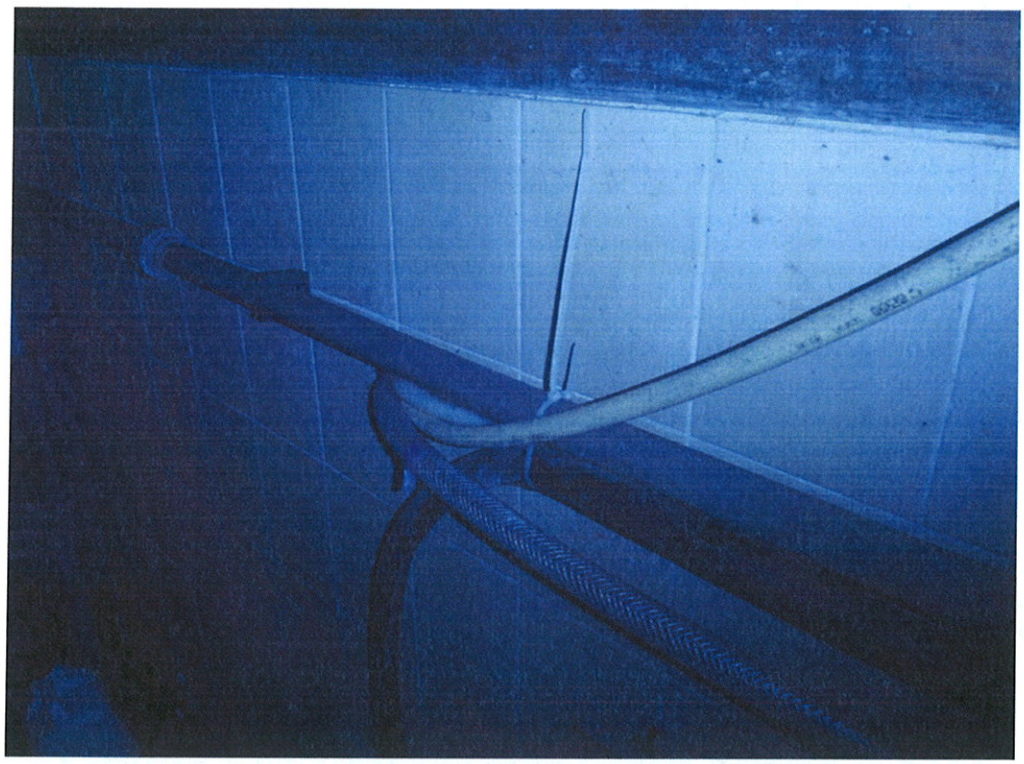
Photograph 2: Pin floc observed in clarifier.



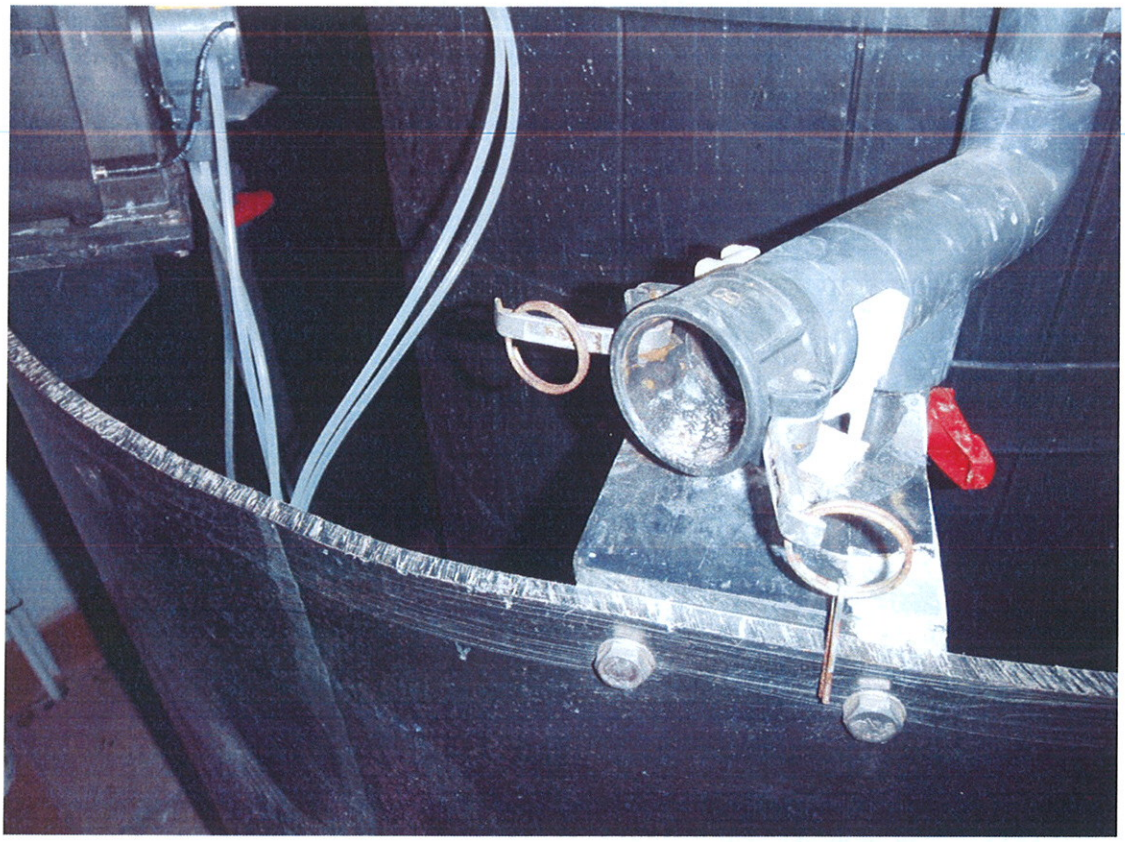
Photograph 3: Black scum observed on walls of Rapid gravity filter.



Photograph 4: chlorine dosing point unsecure.



Photograph 5: Chlorine fill point, no cover and in a location that would not prevent spillage.



Photograph 6; Hydrofluosilcic acid bulk storage tanks.