

February 2019



Irish Water

Ringsend Wastewater Treatment Plant

Investigation into a Darkened Plume Formation at Discharge Point of the WWTP

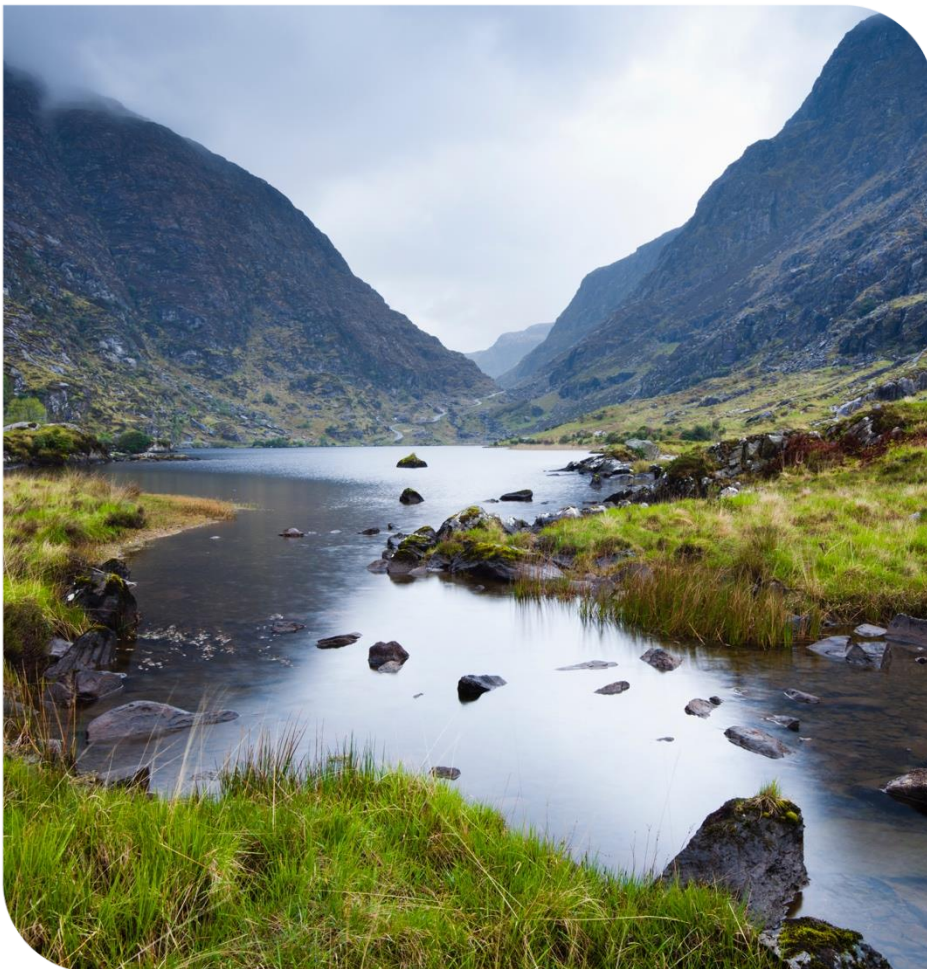


Table of Contents

1	Introduction.....	3
2	Ringsend WWTP	4
3	Events of 23 rd to 25 th February.....	5
3.1	Aeration Pipework Failure.....	5
3.2	Loading in Prior Week	7
3.3	Plume Formation	7
4	Investigations.....	9
5	Communications.....	11
6	Conclusions	13
7	Recommendations.....	14

1 Introduction

Summary

Following receipt of a Category 1¹ incident notification from Celtic Anglian Water in relation to a failure of the aeration system in one of the 24 Sequential Batch Reactor (“SBR”) cells at the Ringsend Wastewater Treatment Plant (“WWTP”), and following receipt of drone footage of a visible plume at the discharge point of the WWTP into Dublin Bay, Irish Water, and the Environmental Protection Agency (“EPA”), have carried out investigations into the matter. The Irish Water investigation has concluded that while the aeration system failure in SBR Cell 3B on 23rd of February 2019 was a contributory factor, the underlying cause of the plume formation was persistent solids loading at the plant in the weeks and days leading up to the plume formation and the inability of the already overloaded plant to deal with that solids loading.

Overview

This document has been prepared to provide an overview of the circumstances giving rise to the formation of a visible darkened plume at the discharge point of the WWTP. The purpose of this report is to provide:

- an overview of the operation of the Ringsend WWTP, including its design and current operating capacity, and plans for upgrade;
- a chronology of events giving rise to the identification of the discharge plume at the discharge point of the WWTP;
- an overview of the communications and stakeholder engagement that took place following the discovery of the discharge plume; and
- an overview of, and conclusion to, the subsequent investigation that took place during 25th-29th of February 2019.

¹ The EPA classification of incidents are carried out by reference to a scale of 1-5, with 1 being “Minor” and 5 being “Catastrophic”. A Category 1 incident is described as “No contamination, localised effects, Simple once off ELV breaches that do not have an impact on water quality”

2 Ringsend WWTP

The current Ringsend WWTP was constructed during the period 2003 to 2005 at the Poolbeg site which has long been the location of the treatment plant for Dublin City's wastewater. The plant was constructed under a Design, Build and Operate model, by the ABA Consortium, and post commissioning, was to be operated by the consortium for a term of 20 years. The operator of the plant, Celtic Anglian Water, is the operating element of the ABA consortium.

Shortly after the plant was commissioned, it was apparent that the plant was overloaded, in that the load arriving at the plant was in excess of the design capacity. It is not the purpose of this report to address the issues around the capacity of the plant in any detail, other than to note that the plant is, and has been for some time, receiving a load of in excess of 2.2m PE², where the design capacity is 1.64m PE.

Prior to the establishment of Irish Water, Dublin City Council had advanced plans to upgrade the plant and to install a long sea outfall tunnel. Upon the establishment of Irish Water, and due to advances in technology in that period, Irish Water proposed an alternative method of upgrading the plant and providing additional capacity. Irish Water, are in the process of spending €400m in providing additional capacity at the WWTP, and increasing the capacity to 2.4m PE. Capacity upgrades of 400,000 PE are forecast to be complete by 2020, with a total increase in capacity to 2.4m PE due to be complete by 2023. In the absence of the upgrade and due to ongoing overloading of the wastewater treatment plant, the discharge from the treatment plant does not comply with the Urban Wastewater Treatment requirements, nor does it comply with the conditions of its wastewater discharge licence. The inability of the plant, in its current guise, to adequately treat the load arriving at the plant, is common knowledge and Irish Water, Celtic Anglian Water and Dublin City Council are consistently working daily to minimise the extent of the exceedances.

The formation of the plume during February must be considered in the above context in order to properly and wholly consider the events that gave rise to the formation of the discharge plume.

² PE = Population Equivalent – In waste-water monitoring and treatment, Population Equivalent refers to the amount of oxygen demanding substances whose oxygen consumption during biodegradation equals the average oxygen demand of the waste water produced by one person.

3 Events of 23rd to 25th February

3.1 Aeration Pipework Failure

At 9am on the morning of the 23rd of February, the WWTP operator from Celtic Anglian Water carried out their daily routine walk around the site. At that point the plant was operating normally and there were no concerns. At approximately 9.30am, a spillage was observed from SBR Cell 3B which was reported to the plant operator. This spillage appeared to be due to a mechanical failure of some aeration pipework.

SBR Cell 3B is part of the system of aeration tanks of which there are 24 cells. The aeration process is classified as a secondary treatment stage in wastewater treatment, and as indicated below, at this stage of treatment, the raw effluent will already have been through a number of treatment stages including screening, grit removal and primary settlement:

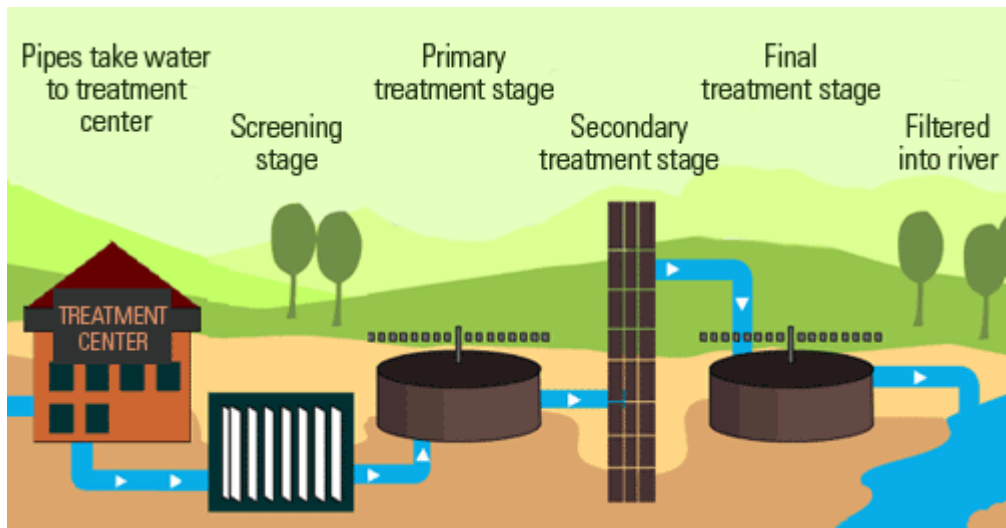


Fig 3.1 Typical Wastewater Treatment Stages

Following notification of this spillage, the plant operator isolated the SBR Cell and prevented it from receiving any more liquids. This isolation prevented any further emissions. As a result of the overflow, it has since been estimated that approximately 80-100m³ of inadequately treated effluent entered the discharge pipeline and entered Dublin Bay, with the discharge lasting for approximately 20 minutes. Irish Water staff on site, monitoring the upgrade works, were informed of the spillage, with staff agreeing at that stage that the incident was a low level incident. The plant operator then followed incident management procedures, noting that the incident was a low level incident, which would not necessitate immediate notification to the EPA. On Monday 25th February, the operator submitted the required incident notification form to Irish Water Operations staff, who in conjunction with Irish Water Compliance staff, noted

that the incident was a Category 1³ incident. It was decided however that, as breakdowns of critical plant and equipment are reportable incidents having regard to the EPA's guidance on incident reporting, an incident notification to the EPA would be advisable in this instance and Environmental Regulation contacted the EPA by phone on Monday morning (11:42) advising them of the incident on Saturday, classifying it as minor and advising that ambient monitoring would be carried out and further information was being collated from the plant operator. A preliminary written notification on the incident was uploaded to the EPA on Monday afternoon (4pm). Irish Water Operations also liaised with Dublin City Council's Environmental Section in order to arrange the carrying out of ambient monitoring in Dublin Bay.



Fig 3.2 Overflow Incident – 9.30am - 23rd February

The affected SBR Cell 3B remains shut down as repairs are carried out. It is envisaged that these repairs will take approximately one month, and while shut down; the plant will be operating with a 5%-8% reduction in treatment capacity. This has been notified to the EPA.

³ The EPA classification of incidents are carried out by reference to a scale of 1-5, with 1 being "Minor" and 5 being "Catastrophic". A Category 1 incident is described as "No contamination, localised effects, Simple once off ELV breaches that do not have an impact on water quality"

3.2 Loading in Prior Week

As noted, pending completion of upgrade works at Ringsend WWTP, the plant is operating under continuous conditions of organic overloading. Operators have advised that solids loading received to the plant in Q4 2018 & Q1 2019 have exceeded 'typical' expectations.

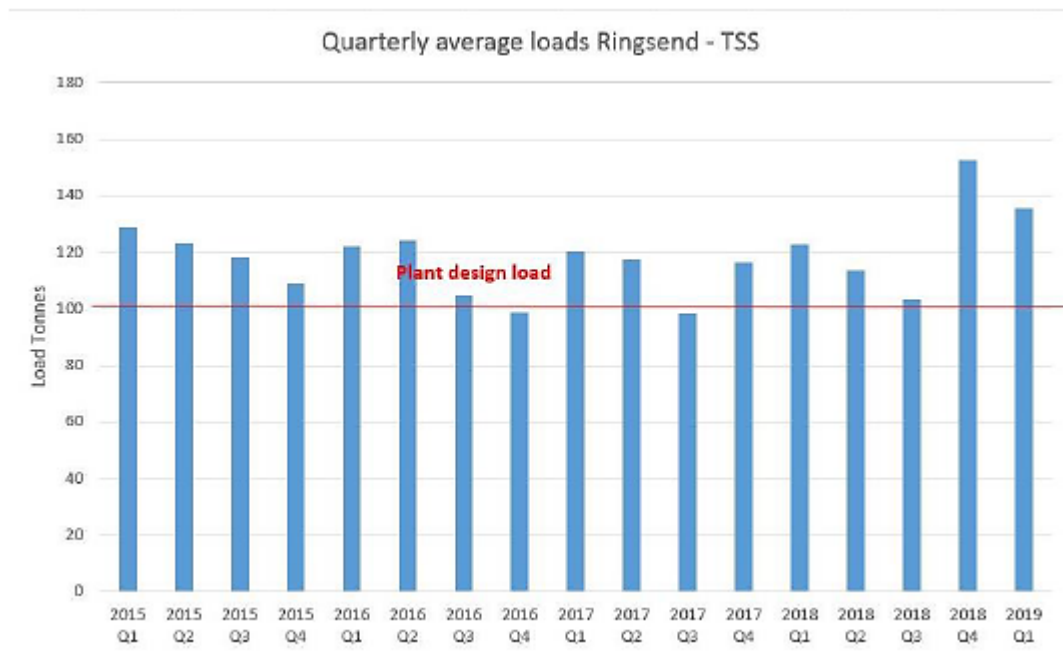


Fig 3.2 Quarterly Average Loads – TSS (Suspended Solids)

The plant is designed to treat 101 tonnes of suspended solids per day. Expectations of typical elevated levels, or normal overloading, would be for the WWTP to be operating at c.120 tonnes per day. However, during February 2019, c. 150 tonnes of solids per day was noted at the WWTP, while on 22nd of February 2019, c. 300 tonnes of solids was received at the inlet works. The consistently 'elevated' overloading conditions are now impacting on effluent quality and clarity of the effluent. In essence, this means that the on the day before the plume was observed, the loading of solids that arrived at the WWTP in the network was three times that which the plant was designed for, or twice the typical amount received at the plant.

3.3 Plume Formation

On Monday morning, Irish Water received a media query from the Irish Times, attaching a photograph taken by a drone photographer, which captured the formation of a visible darkened plume in Dublin Bay at the site of the discharge point from the WWTP into Dublin Bay. The subsequent communications and investigations into that query are addressed in the following sections of this report.



Fig 3.3 Drone Footage Received from Irish Times on 25 February 2019

4 Investigations

Upon receipt of the notification from Celtic Anglian Water to Irish Water Asset Operations, followed shortly by the media query received from the Irish Times, Irish Water commenced investigations into the matter. A chronology of these investigations is outlined below:

25/2/19 10:25: Celtic Anglian Water issued formal notification to Irish Water Operations of an incident at the WWTP on 23rd of February 2019. A diffuser head from the aeration system became detached during normal operations. This notification indicated that the incident was a low level incident, that a minor amount of MLSS (Mixed Liquor Suspended Solids) had overflowed a tank and made its way to the effluent discharge trough, but that there was no additional risk to the environment following said discharge, and that the impacted tank had been taken off line for repairs. Irish Water Operations provided this notification to Irish Water's Environmental Regulation, who are responsible for liaising with and notifying the EPA.

25/2/19 11:10 Drone footage is received and distributed to IW Operations and Compliance staff.

25/2/19 11:27 Irish Water Operations staff commenced investigations with Celtic Anglian Water into the incident, Celtic Anglian Water were requested to provide further information on the incident which occurred on the 23rd of February 2019, and to confirm volumes of discharge etc. Irish Water requested the Environment Section of Dublin City Council to undertake ambient water quality sampling.

25/2/19 15:00 A teleconference call took place with Celtic Anglian Water and Irish Water staff from Operations, Asset Planning and Compliance. On this call the Operators could not confirm if the photo was as a result of the aeration pipe failure or the volumes received at the WWTP in the preceding week. Photos of the discharge that was occurring on the evening of the 25th of February 2019 were requested from Celtic Anglian Water. These photographs indicated that there was an ongoing element of solids laden discharge, but that it was, at that time, impossible to conclude as to whether or not it was residual from the aeration failure or due to overloading at the plant in the prior days.

25/2/19: Media and Stakeholder updates are issued based on the available information, as detailed in Section 5.

26/2/19 13:00 EPA Audit at the WWTP, attended by Irish Water and Celtic Anglian Water staff. The volume of discharge due to aeration failure was determined to be low (less than 1% of total flow, and 3% of daily effluent solid load), based on the estimated volumes discharged. It was determined that the formation of the plume was most likely to have been as a result of the loading at plant in the immediate days prior to the 23rd-24th February 2019, rather than being significantly attributable to the aeration failure. Effluent quality varies significantly from day to day, so discolouration of the discharged effluent is also variable from day to day. In addition, a number of external factors are likely to have contributed to the apparent colour differential in the drone photograph

such as low tidal levels, sunlight, refraction, wind direction, receiving water temperatures and the absence of the dilution effect caused by rainfall. It is further noted that sampling results from Celtic Anlian Water on effluent quality are not real time and are not available for a number of days following the taking of the sample. The high solids content in the effluent would have been identified in the effluent sampling and would have likely indicated the potential for plume formation, had the sampling been available in real time.

27/2/19: Incident update issued to EPA and Stakeholders

28/2/19: EPA Statement issued:

<http://www.epa.ie/newsandevents/incidents/recent/name,65438,en.html>



Fig 4.1 Discharge Point – 25 February 2019

In addition to the above investigations, analysis of the influent being received at the plant would seem to indicate that the influent is laden with solids that are not from wastewater, but appear to be inert solids that are possibly entering the combined sewer network as a result of the increase in construction activity across the city. The peaks being experienced in sampling for Total Suspended Solids are not being replicated in typical sewage indicators such as Ammonia or BOD loading, which would suggest that the solids are not from wastewater discharges.

5 Communications

Following receipt of the media query, and in order to inform stakeholders of the incident, there were two statements prepared relating to the incident. These statements are reproduced below and were prepared as knowledge of the incident evolved. The statements were placed on the Irish Water website and communicated via social media.

Statement 1

“Irish Water can confirm that there was a failure at one of the tanks at Ringsend wastewater treatment plant at approximately 9am on Saturday 23 February, 2019. This caused a discharge of sludge into the Lower Liffey estuary via an outfall located approximately 1km from the plant. The tank was isolated and repairs are now progressing. An investigation into the cause of the incident is ongoing. Irish Water can confirm that there are currently no planned discharges of untreated effluent into Dublin Bay. However, due to ongoing overloading of the wastewater treatment plant, the discharge from the treatment plant does not comply with the Urban Wastewater Treatment requirements. In order to treat the increasing volumes of wastewater arriving at the plant to the required standard and capacity, Irish Water is investing over €400 million in the staged upgrading of Ringsend Wastewater Treatment Plant to allow the wastewater of an additional 400,000 population equivalent.

Work started in February 2018 works are progressing well. In June 2018, Irish Water submitted an application for strategic infrastructure development to An Bord Pleanála to further progress the upgrade of the Ringsend Wastewater Treatment Plant. This proposed further upgrade utilising Aerobic Granular Sludge (AGS) technology will enable future population growth and ensure the plant operates to the highest possible environmental standards. Irish Water is committed to safeguarding the environment and ensuring all wastewater is correctly treated and is safely returned to rivers, lakes and sea.”

Statement 2

“Irish Water can confirm that there was a failure at one of the tanks at Ringsend wastewater treatment plant on the morning of Saturday 23 February, 2019 which caused a discharge of activated sludge into the Lower Liffey estuary via an outfall located approximately 1km from the plant. The discharge occurred for approximately 20 minutes and it is estimated that 100 cubic metres of activated sludge was discharged. It should be noted that this discharge was not raw sewage and does not pose the same risk to public health or the environment as a raw sewage discharge would. The tank was isolated and repairs are now progressing. Irish Water would like to apologise for the discharge which we acknowledge was unsightly and which is not to the standards we set ourselves.

Irish Water has standard protocols in place when incidents of this nature occur and incidents are escalated on the basis of the potential impact to human health and the environment. Statutory stakeholders are notified in line with protocols and we can confirm that the EPA carried out an audit of the site today.

Currently the Ringsend wastewater treatment plant treats approximately 40% of the country's wastewater load. Due to ongoing overloading of the wastewater treatment plant, the discharge from the treatment plant does not comply with the Urban Wastewater Treatment requirements as the treated effluent discharging from the plant has higher amount of solids than is optimal and this could give rise to a coloured plume in the water. In order to treat the increasing volumes of wastewater arriving at the plant to the required standard and capacity, Irish Water is investing over €400 million in the staged upgrading of Ringsend Wastewater Treatment Plant to increase wastewater treatment capacity to cater for an additional 400,000 population equivalent.

Work on the upgrade started in February 2018 and in June 2018, Irish Water submitted an application for strategic infrastructure development to An Bord Pleanála to further progress the upgrade of the Plant utilising Aerobic Granular Sludge (AGS) technology to enable future population growth and ensure that the plant operates to the highest possible environmental standards. Irish Water is committed to safeguarding the environment and ensuring all wastewater is correctly treated and is safely returned to rivers, lakes and sea.

Irish Water can confirm that there are currently no planned discharges of untreated effluent into Dublin Bay from Ringsend Wastewater treatment Plant. Investigations into this matter are ongoing and a further update on request will be provided once available.”

6 Conclusions

Arising out of the investigations into this incident, Irish Water has reached the following conclusions about the formation of a darkened plume at the discharge point of the WWTP into Dublin Bay:

- That while a contributing factor, the failure of the aeration system in SBR Cell 3B was not the primary cause of the plume formation witnessed on the 23rd of February 2019. It is estimated that the amount discharged as a consequence of this failure was 80-100m³ or less than 1% of total daily flows;
- That the failure of the aeration system was in itself a Category 1 incident, which did not necessitate immediate EPA notification;
- That in the days immediately prior to the formation of the plume, the total suspended solids received at the plant was significantly higher than the design capacity of the plant, being three times higher than design capacity on the day immediately before the photographing of the plume, and twice the overloading;
- That repairs to SBR Cell 3B will take 2-4 weeks to complete, during which period the WWTP will be operating at a reduced capacity of 5%-8%;
- That it is likely that the formation of the plume was largely caused by the inability of the plant to deal with the excessive solids loading at the plant; and
- That what was discharged into the Dublin Bay and formed the plume was not raw sewage, having gone through a number of treatment stages, but was rather a partially treated discharge with a large amount of fine solids which would not pose the same risks to health as untreated effluent.

¹ The EPA classification of incidents are carried out by reference to a scale of 1-5, with 1 being "Minor" and 5 being "Catastrophic". A Category 1 incident is described as "No contamination, localised effects, Simple once off ELV breaches that do not have an impact on water quality"

7 Recommendations

Over 40% of the entire wastewater produced in Ireland is treated at the Ringsend facility. The management of the operation of this facility is a responsibility which Irish Water takes very seriously. Irish Water are committed to the upgrading of this plant over the next five years and until that upgrade is complete, we must ensure that all efforts are taken to minimise the impact of the inability of the current plant to treat the load that is arriving at the plant.

On this occasion however, the manner in which the plume formation was managed and communicated to stakeholders and the general public did not meet the standard that Irish Water consider acceptable. While all incident management processes, both internal and external, were correctly followed, it is accepted and acknowledged that more could have been done to identify the potential for plume formation and to notify stakeholders and the public of same.

Arising out of the above investigations, a number of recommendations are being explored by Irish Water and Celtic Anglian Water, including:

- The provision of real time photographic recording of the discharge point, in order to have an indication of the plume formation potential at the discharge point;
- A review of the Incident Notification protocol to ensure better communications to stakeholders, including Dublin City Council and the public in the event that a plume is identified;
- Modification of the process control to investigate optimum settlement times based on the outcome of recent upgrade works;
- Investigate options to increase sludge removal from the process during periods of high solids loading received at the plant, thereby allowing speedier through flow of solids through the plant; and
- Analysis to identify and minimise the extent and impact of solids in the network on the treatment plant.

Irish Water recognises that with the impending bathing season, it is incumbent on Irish Water as an organisation to minimise the impact of discharge from the overloaded WWTP into Dublin Bay.

ervia



Gas
Networks
Ireland

