FUJIFILM Diosynth biotechnologies

Surface Water Risk Assessment

Substantial Permit Variation

31st March 2026

Project No.: SOL_26_P042_FUJ

...consulting sustainability

sol environment

Document Details	
Document title	Surface Water Risk Assessment
Document subtitle	Substantial Permit Variation
Project No.	SOL_26_P042_FUJ
Date	31st March 2026
Version	QMS_7.5.38_TEM – Template – Report Long Form – New Style (Perm) v3
Author	Michael Sylvester, Steve Butler
Client Name	FUJIFILM Diosynth Biotechnologies UK Limited

Document History				
Version	Comments	Date	Author Initials	Reviewer Initials
I1	First Submission to the EA	31st March 2026	MS/SB	SR

Signature Page

31st March 2026

Surface Water Risk Assessment

Substantial Permit Variation

Mike Sylvester

Technical Director

Sophie Rainey

Senior Environmental Permitting Manager

This report has been prepared by Sol Environment with all reasonable skill, care, and diligence, and taking account of the Services and the Terms agreed between Sol Environment Ltd and the Client. This report is confidential to the client, and Sol Environment accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Sol Environment Ltd beforehand. Any such party relies upon the report at their own risk.

Sol Environment disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the Services

Registered office: 10 The Lees, Malvern, Worcestershire, WR14 3HT

Company Registered in England no. 7068933

Sol is ISO 9001:2015 certified by British Assessment Bureau Limited, a UKAS Accredited Certification Body number 8289 for the scope of Environmental Consultancy providing a range of services to companies in the UK and Europe. Certificate number: 259774.

CONTENTS

List of Tables

List of Figures

Acronyms and Abbreviations

Name	Description
EA	Environment Agency
FDA	Food and Drug Administration
GMP	Good Manufacturing Practice
SCR	Site Condition Report
SPA	Special Protection Area

1. INTRODUCTION

1.1 Background

This document has been prepared by FUJIFILM Diosynth Biotechnologies UK Limited ("Fujifilm") and its environmental consultant Sol Environment ("Sol") in support of a bespoke permit variation application as required by the *Environmental Permitting (England and Wales) Regulations 2016* concerning current and proposed activities to be undertaken at FUJIFILM Diosynth Biotechnologies UK Limited, PO Box 2, Chilton Lifesciences EA/EPR/BJ8987IQ, Belasis Avenue, Cleveland, TS23 1LH (the "Site").

This document has been prepared in line with the current Environment Agency (EA) Guidance, i.e. Surface water pollution risk assessment for your environmental permit (Environment Agency, 2026).

1.2 Current Permitted Activities

Fujifilm Diosynth Biotechnologies UK Limited operates a manufacturing site at the northern boundary of the Billingham site, grid reference NZ 466 226. The Billingham site comprises several installations within a site boundary, each operated by a different company.

The site comprises manufacturing, office and laboratory areas (not included within the installation) and is within a predominantly industrial area on the north bank of the River Tees.

The installation undertakes the manufacture of a range of pharmaceutical products based on chemical and biological manufacturing. These products are sold for further onward processing by third parties to form finished products or are included in pharmaceutical products such as tablets.

Processing involves fermentation and biotransformation using a range of raw materials and varying process conditions. Manufacturing takes place in closed vessels, which are supplied with nutrients and air. Processing conditions such as pH, temperature and oxygen availability are kept under control. The main emissions from the process are water vapour and carbon dioxide.

Following completion of the fermentation process, the product may be preconditioned by adjusting the temperature or pH. This stage can be followed by purification by filtration or chromatography. The product is harvested using centrifugation and other filtration techniques. Once harvested the product is further purified in some cases by washing and then spray dried before packaging. Products are held in chilled storage before dispatch.

All processes are carried out under Good Manufacturing Practice (GMP) and are approved by the Food and Drug Administration (FDA).

There are eight permitted emission points to air, four of which originate from fermenters. The remaining four are from the boilers, the spray drier and an emergency purification vent. The spray drier has abatement equipment. There is a discharge to the River Tees, which runs to the south of the Billingham site and is used by other installations. Emissions to water from the Site are monitored at the discharge point into the Billingham drain. The Teesmouth and Cleveland Coast Special Protection Area (SPA) habitat site is located within 10 km of the installation.

The installation operates an Environmental Management System not certified to ISO 14001. The system includes an environmental policy, objectives and procedures.

The installation is a member of a Climate Change Agreement (Agreement Dated: 1st day of April 2013, Agreement Identifier: CIA/T00088 v1, TU Identifier: CIA/T00088).

1.3 Proposed Variation Application

The application variation includes the following key elements associated with Schedule 1 activities listed within the *Environmental Permitting (England and Wales) Regulations 2016*:

- Borealis – The operation of a new 26,800m2 (GIA) biotech manufacturing facility, comprising an array of production suites, warehouse and storage, buffer preparation and hold facilities, laboratories, and offices. Borealis includes a new liquid waste treatment plant, solid waste management building, and standby generator. This project introduces new process release points to air including an emission point from an emergency generator, new discharges to foul sewer and potential noise emissions (from a roof-mounted plant room). All foul discharges will be to the Northumbrian Water Limited (NWL) combined sewer. This will be regulated as a new Stationary Technical Unit Section 4.5 Part A(1)(a).
- BIC-UK – Development and construction of offices and laboratories purely for R&D purposes. Discharges from this facility are all discharged to foul sewer via the Cowpen Road combined sewer. Although BIK-UK is for R&D purposes only, as per the Environment Agency Note 4.3 of Regulatory Guidance Note No. 2 Understanding the meaning of regulated facility - Appendices 1 and 2, the facility cannot be defined as pure R&D. It is therefore understood that the facility will be required to be permitted as a separate Section 4.5 Part A(1)(a) Activity.
- Minor operational changes – The inclusion of existing emission points previously missed or not included within previous permit variation applications.

The application includes the following changes to the Directly Associated Activities (DAA):

- Boiler plant upgrades – Upgrade of boiler plant from current >20 MWth to circa 10 MWth.
- Dewar Store and Nitrogen Tank – Installation of a bulk nitrogen storage tank, and small external store building for storing small dewars (nitrogen storage bottles). This is considered a Directly Associated Activity.

Concerning the discharge of effluent, the proposed variation includes the following elements:

- a new discharge point to sewer (to be referred to as S1) from Borealis; and
- a new discharge point to sewer (to be referred to as S2) from BIC-UK. The discharge to sewer from the purpose-built R&D and Quality Control building is anticipated to be small (a maximum of 500 litres per day).

The proposed variation application requires additional land and therefore changes the permitted installation boundary (Figure 1-1).

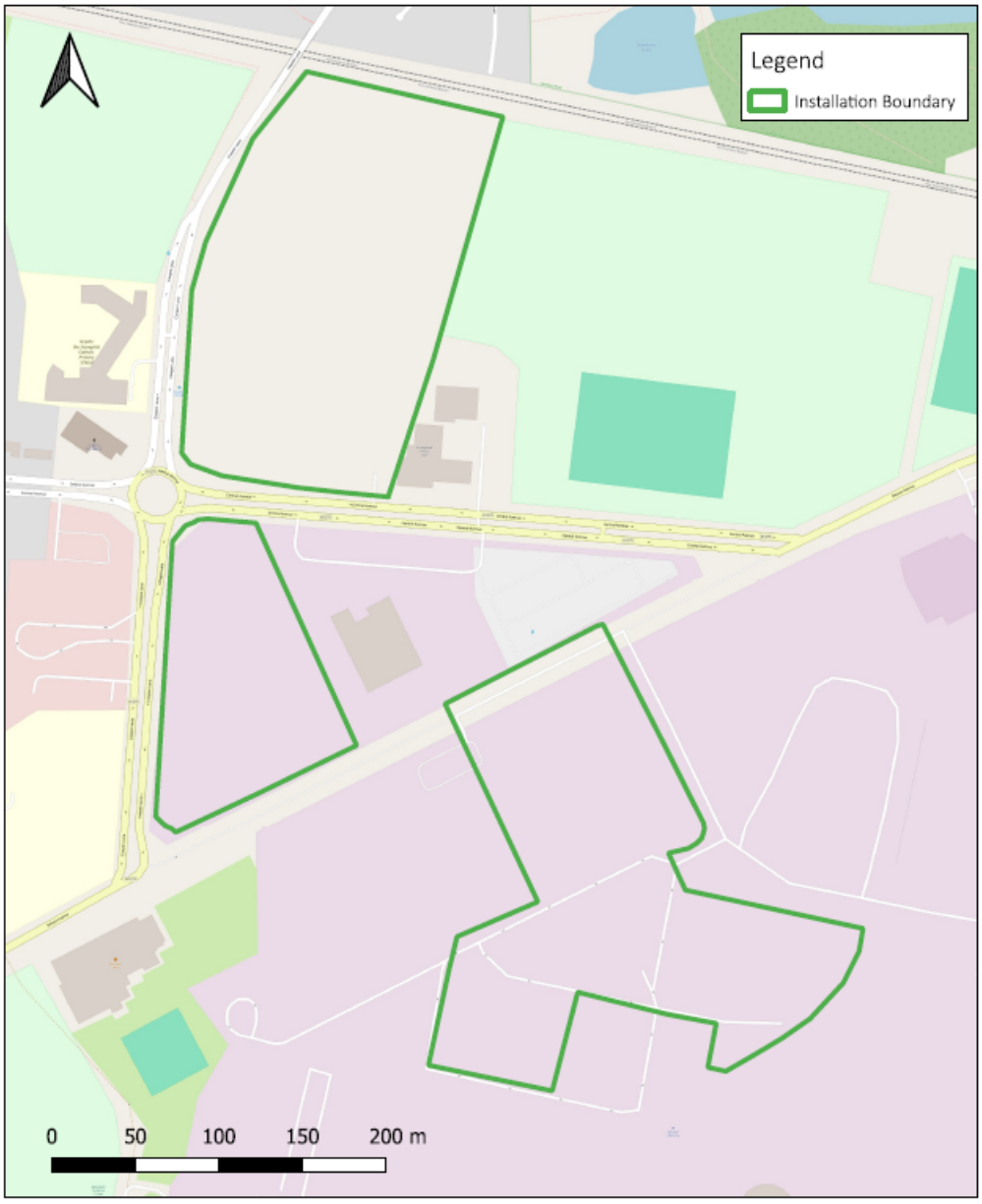


Figure 1-1 – Proposed Permit Boundary

2. DESCRIPTION OF THE DRAINAGE SYSTEM

2.1 Introduction

Operations commenced at Billingham in 1917 when the Ministry of Munitions selected the Billingham Site to manufacture nitrogen for explosives, in the face of increasing action by U-boats against Chilean nitrate supply ships.

Chilton Site (originally known as the Research Site) was commissioned in about 1925 to support the manufacture of ammonia and nitrochalk on the Main Site, which (at that time) was primarily a munitions factory. Research carried out included catalyst and fertiliser development and engineering research. In 1932, research commenced into the production of petrol from coal.

In 1937, work on the "Tube Alloys Project" commenced in "B" & "C" Buildings on the Research Site. All work associated with this project, which subsequently became the "Manhattan Project", was transferred to Los Alamos in New Mexico in 1941. All other aspects of research continued during the war years, with continuing work on oil refining and steam reforming of petrochemicals.

Starting in 1946, considerable work was carried out on the production of downstream chemicals from hydrocarbons in preparation for the commissioning of the new Wilton Site. Research into a new process to produce methanol commenced in the 1950s.

Hydrocarbon research continued until the early 1970s when it was transferred to the Wilton Centre. Engineering research work was also terminated at Billingham, except for metallurgy and control electrical research, which continued on-site until the late 1980s. However, these areas were replaced by research into biotechnology.

The legacy of this large historic site has carried forward to the current day, as the drainage system is now shared by five separate operators (**Table 2-1**) all of which combine to release via a single point (RTO1) into the Tees Estuary (**Figure 2-1**)

Table 2-1 – Site Operators

Operator	Description of Discharge
Johnson Matthey PLC	Upstream of FUJIFILM but feeding directly into their drainage system.
FUJIFILM Diosynth Biotechnologies UK Limited	This variation application.
Marlow Foods Limited	Downstream of FUJIFILM, discharging via the combined release point RTO1.
SNF Oil and Gas Ltd	Downstream of FUJIFILM, discharging via the combined release point RTO1.
C F Fertilisers UK Limited	Downstream of FUJIFILM, discharging via the combined release point RTO1.

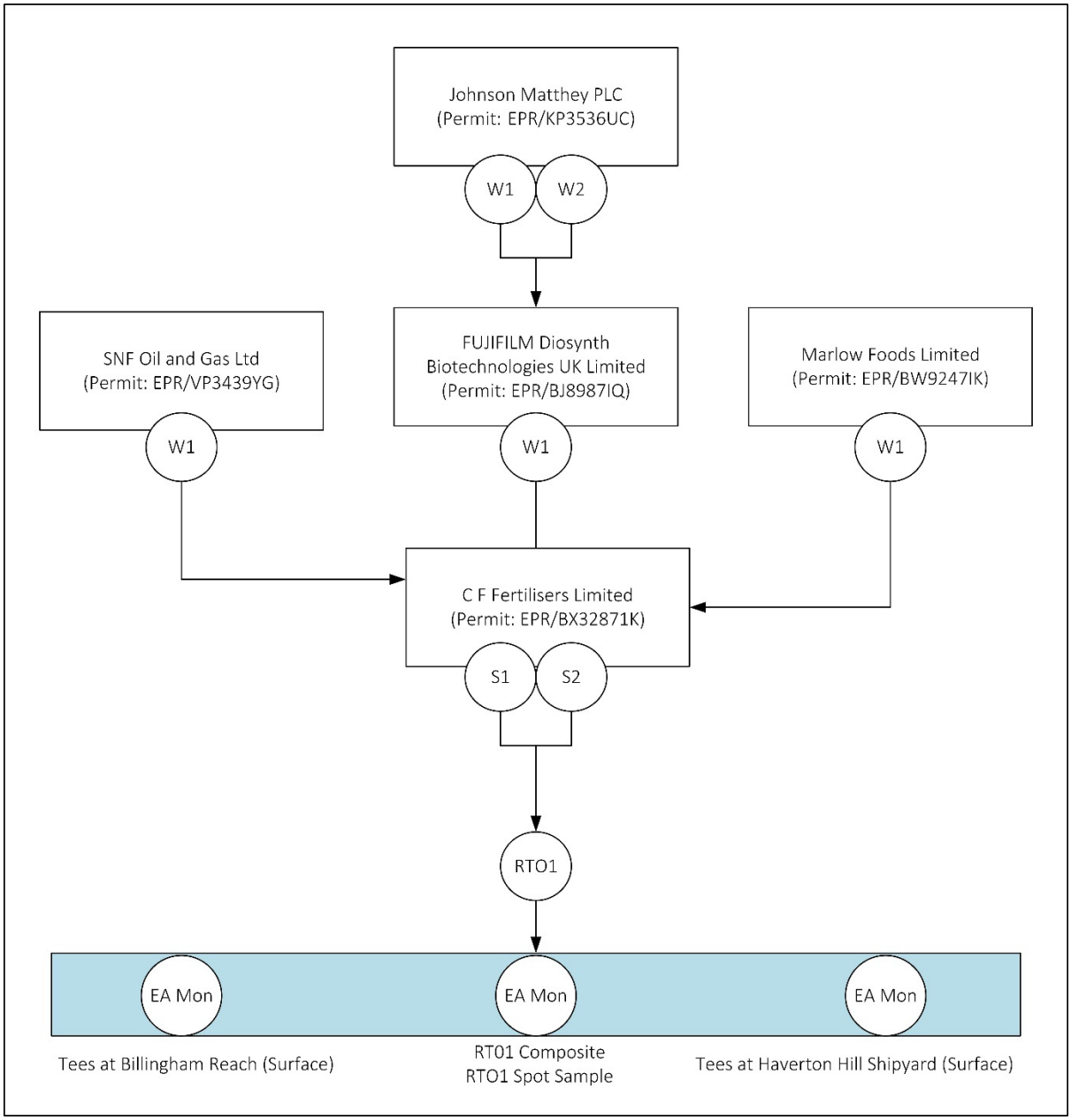


Figure 2-1 – Drainage connection associated with RTO1

2.2 Johnson Matthey PLC – Discharges

Within the Chilton Manufacturing Area, the operator undertakes research and development activities, as well as the manufacture of a small range of speciality and high-performance materials in processes that involve batch (non-continuous) and short-campaign continuous production. There are two release points identified within the permit:

- W1 (JM) – AR4 process is supported by a reverse osmosis unit to purify input water. The discharge includes surface water run-off from external areas, uncontaminated cooling water and reverse osmosis unit retentate.
- W2 (JM) – AR5 process is supported by a reverse osmosis unit to purify input water. The discharge includes surface water run-off from external areas, uncontaminated cooling water and reverse osmosis

unit retentate. The discharge also includes surface water from the drum storage yard. It was reported by the EA (during a call on 17/01/2025) that process effluent is no longer discharged by Johnson Matthey PLC via emission point W2.

The discharge from these permitted activities enters the local JM drainage network before entering the Fujifilm drainage system. The EA has not set any volume or chemical limits on the release from the JM-permitted installation.

2.3 FUJIFILM Diosynth Biotechnologies UK Limited – Discharges

Emissions to water from the installation include the discharge of process, cooling waters and condensate. Some liquid waste streams generated on-site contain Genetically Modified Organisms (GMOs), which are destroyed at the source using heat treatment, with the resulting effluent subject to off-site removal, treatment and disposal.

The process, cooling waters and condensate are discharged to drain via MH27 (Permit reference W1), which then flows into a shared drainage system that runs through the Billingham site (operated by C F Fertilisers UK Limited). This discharge terminates in an outflow directly into the River Tees (RT0O1). Water from the site is monitored at MH27 for Flow, pH, suspended solids, BOD, COD and Ammoniacal N.

The drain is utilised by other installations on the Billingham site, not connected to Avecia, and so streams are mixed before discharge. The discharge point labelled RTO1 is consented under the Water Resources Act 1991 (245/1419), as operated by C F Fertilisers UK Limited, FUJIFILM Diosynth Biotechnologies UK Limited and Johnson Matthey, who work with C F Fertilisers UK Limited (via formal local agreements) to ensure standards set by the consent are not breached. FUJIFILM Diosynth Biotechnologies UK Limited are responsible for ensuring compliance with the conditions of the consent, and meetings are regularly held with all interested parties to ensure that compliance continues.

There is no interceptor or collection system before discharge to MH27. Discharges to this are controlled by management procedures.

2.4 Marlow Foods Limited - Discharges

Marlow Foods Limited operates a production facility where a fermentation process is used to produce mycoprotein paste, the raw material used in Quorn food products. Following the partial revocation of the permit on the 7th of November 2017, the Section 4.7 activity was removed. Therefore, the operation of the deep shaft aerated effluent treatment plant (under Section 5.4 Part A(1)(a)(i)) is the only permitted activity occurring on the site.

The activity treats aqueous waste from on-site processes using two effluent treatment systems, i.e. ETP1 (a deep shaft activated sludge treatment plant) and ETP2 (a 5-stage biological treatment process with 3-stage solids removal). The discharge is released into the privately owned ‘Billingham Site Export Line’, which discharges into the C F Fertiliser Limited site before discharging via RTO1.

2.5 SNF - Discharges

SNF is the world’s leading manufacturer of water-soluble polymers and acrylamide monomer, which is the primary ingredient for polyacrylamide-based flocculants. SNF U.K. is a supplier of polyacrylamide and associated products to the Municipal, Oil & Gas, and Industrial Markets, with head offices in Wakefield, West Yorkshire, and a major manufacturing site in Billingham, Teesside. Billingham is the second major integrated

production site for SNF in Europe and significantly increases the security of supply to U.K. customers and overall production capacity in the region.

There is one emission to surface water from the site (W1). Uncontaminated rainwater and purge water from the cooling towers are discharged to the Billingham Industrial Complex combined sewer system and subsequently to the River Tees via a discharge point RT01 (discharge point NGR NZ4809421900). This is an existing discharge point used by the wider industrial estate. There is also one point source emission to the foul sewer from the site. The discharge will consist of process effluent, chiller unit purge water and contaminated rainwater. The discharge to sewer is under a trade effluent consent from Northumbrian Water Limited before treatment at the Bran Sands Treatment Works.

2.6 C F Fertilisers UK Limited

The C F Fertilisers UK Limited site is permitted under:

- Section 4.2 Part A(1)(a)(i) producing inorganic chemicals (ammonia plant);
- Section 4.2 Part A(1)(a)(ii) producing inorganic chemicals (nitric acid plants);
- Section 4.3 Part A(1(a) Producing nitrogen-based fertilisers (Nitram plant);
- Section 4.8 Part B(a) Ammonia storage and distribution.

The site drains discharge into the upper Tees estuary via River Tees Outfall No. 1 (RTO1). This is controlled under the Water Industry Act Consent owned by C F Fertilisers UK Limited. There is also an unused parallel system that has cross connections with the RTO1 system. Several Operators discharge into the drain system under a set of local agreements (as outlined above).

The RTO1 system can be considered to consist of two main legs, North and South. These meet at Manhole 8, where the main site monitoring effort is concentrated.

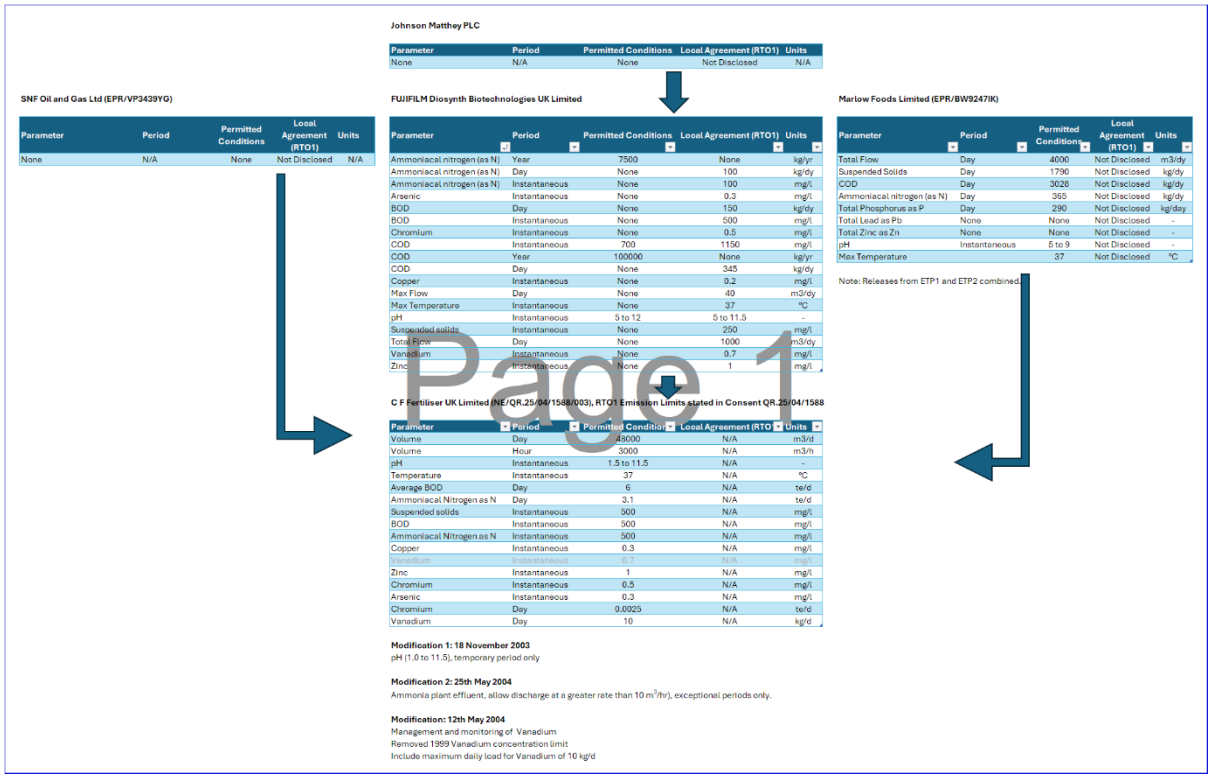
The main emissions from C F Fertilisers UK Limited's operations discharged to the North leg of the site drainage system are Ammonia Plant general site drainage and oil-water separator discharges, plant condensates, Carbon Dioxide Recovery Section effluent, cooling water purge, CO_2 Plant cooling water purge and site drainage, Demineralised Water Plant process effluent, site drainage and storm water

Main emissions from C F Fertilisers UK Limited's operations are discharged to the South leg of the site drainage system. These are Process effluents from the Nitrates Area in conjunction with site drainage and stormwater. Process effluents and storm water drainage from the Portrack Site are discharged into Billingham Beck via two outfalls. The North Tees Ammonia Storage Site drains via an outfall that discharges to the lower Tees estuary.

Emissions to water (Tees estuary) that could affect water quality are ammonia, nitrate and suspended solids.

In 2023, C F Fertilisers UK Limited publicly stated that it was to close its mothballed ammonia plant at its Billingham complex permanently. The company said it would continue to produce AN fertiliser and nitric acid at Billingham using imported ammonia.

All environmental permits and local agreement emission limits are outlined in Figure 2-2.



Johnson Matthey PLC

Parameter	Period	Permitted Conditions	Local Agreement (RTO1)	Units
None	N/A	None	Not Disclosed	N/A

SNF Oil and Gas Ltd (EPR/VP3439YG)

Parameter	Period	Permitted Conditions	Local Agreement (RTO1)	Units
None	N/A	None	Not Disclosed	N/A

FUJIFILM Diosynth Biotechnologies UK Limited

Parameter	Period	Permitted Conditions	Local Agreement (RTO1)	Units
Ammoniacal nitrogen (as N)	Year	7500	None	kg/yr
Ammoniacal nitrogen (as N)	Day	None	100	kg/dy
Ammoniacal nitrogen (as N)	Instantaneous	None	100	mg/l
Arsenic	Instantaneous	None	0.3	mg/l
BOD	Day	None	150	kg/dy
BOD	Instantaneous	None	500	mg/l
Chromium	Instantaneous	None	0.5	mg/l
COD	Instantaneous	700	1150	mg/l
COD	Year	100000	None	kg/yr
COD	Day	None	345	kg/dy
Copper	Instantaneous	None	0.2	mg/l
Max Flow	Day	None	40	m3/dy
Max Temperature	Instantaneous	None	37	°C
pH	Instantaneous	5 to 12	5 to 11.5	-
Suspended solids	Instantaneous	None	250	mg/l
Total Flow	Day	None	1000	m3/dy
Vanadium	Instantaneous	None	0.7	mg/l
Zinc	Instantaneous	None	1	mg/l

Marlow Foods Limited (EPR/BW9247IK)

Parameter	Period	Permitted Conditions	Local Agreement (RTO1)	Units
Total Flow	Day	4000	Not Disclosed	m3/dy
Suspended Solids	Day	1790	Not Disclosed	kg/dy
COD	Day	3028	Not Disclosed	kg/dy
Ammoniacal nitrogen (as N)	Day	365	Not Disclosed	kg/dy
Total Phosphorus as P	Day	290	Not Disclosed	kg/day
Total Lead as Pb	None	None	Not Disclosed	-
Total Zinc as Zn	None	None	Not Disclosed	-
pH	Instantaneous	5 to 9	Not Disclosed	-
Max Temperature		37	Not Disclosed	°C

Note: Releases from ETP1 and ETP2 combined.

C F Fertiliser UK Limited (NE/QR.25/04/1588/003), RTO1 Emission Limits stated in Consent QR.25/04/1588

Parameter	Period	Permitted Condition	Local Agreement (RTO	Units
Volume	Day	48000	N/A	m3/d
Volume	Hour	3000	N/A	m3/h
pH	Instantaneous	1.5 to 11.5	N/A	-
Temperature	Instantaneous	37	N/A	°C
Average BOD	Day	6	N/A	te/d
Ammoniacal Nitrogen as N	Day	3.1	N/A	te/d
Suspended solids	Instantaneous	500	N/A	mg/l
BOD	Instantaneous	500	N/A	mg/l
Ammoniacal Nitrogen as N	Instantaneous	500	N/A	mg/l
Copper	Instantaneous	0.3	N/A	mg/l
Vanadium	Instantaneous	0.7	N/A	mg/l
Zinc	Instantaneous	1	N/A	mg/l
Chromium	Instantaneous	0.5	N/A	mg/l
Arsenic	Instantaneous	0.3	N/A	mg/l
Chromium	Day	0.0025	N/A	te/d
Vanadium	Day	10	N/A	kg/d

Modification 1: 18 November 2003
pH (1.0 to 11.5), temporary period only

Modification 2: 25th May 2004
Ammonia plant effluent, allow discharge at a greater rate than 10 m^3/hr), exceptional periods only.

Modification: 12th May 2004
Management and monitoring of Vanadium
Removed 1999 Vanadium concentration limit
Include maximum daily load for Vanadium of 10 kg/d

Page 1

Figure 2-2 – Current permit and local agreement emission limits (RTO1)

2.7 Local Hydrology

The River Tees, at Bamlet's Bight (adjacent to Bamett's Wharf), lies one and a half kilometres to the southeast.

The River Tees rises in the Pennines and flows one hundred and sixty kilometres to Tees Bay, where it enters the North Sea. Below Darlington, the Tees was tidal up to the weir at Low Worsall, due to the very low gradient, until the completion of the Tees Barrage.

The EA maintains a river gauging station on the Tees at Low Moor, some thirty kilometres above the barrage and four kilometres above Low Worsall. This is the lowest gauging station in the Tees network. The average annual mean flow at that point, based on 2007 -2021 data, is 24.9 m^3/sec. The only significant flow into the Tees, above the barrage, below that point is from the Leven, on which there is a gauging station at Leven Bridge, which has an average annual mean flow of 2.1m^3/sec. The average annual mean flow to the barrage is therefore 27 m^3/sec.

The Environment Agency's Catchment Data Explorer[1] confirms that the waterbodies in the study area are contained within the Northumbria River Basin District, the Tees Lower and Estuary TraC Operational Catchment. The Tees Waterbody (water body ID: GB510302509900) is heavily modified and, in 2022 (Cycle 3), was classified as:

- Ecological quality – Moderate;

[1] https://environment.data.gov.uk/catchment-planning/WaterBody/GB510302509900

- Physico-chemical quality – Moderate;
- Hydromorphological Supporting Elements – Supports Good;
- Chemical (Priority hazardous substances and priority substances) – Fail (2019), Does not require assessment (2022).

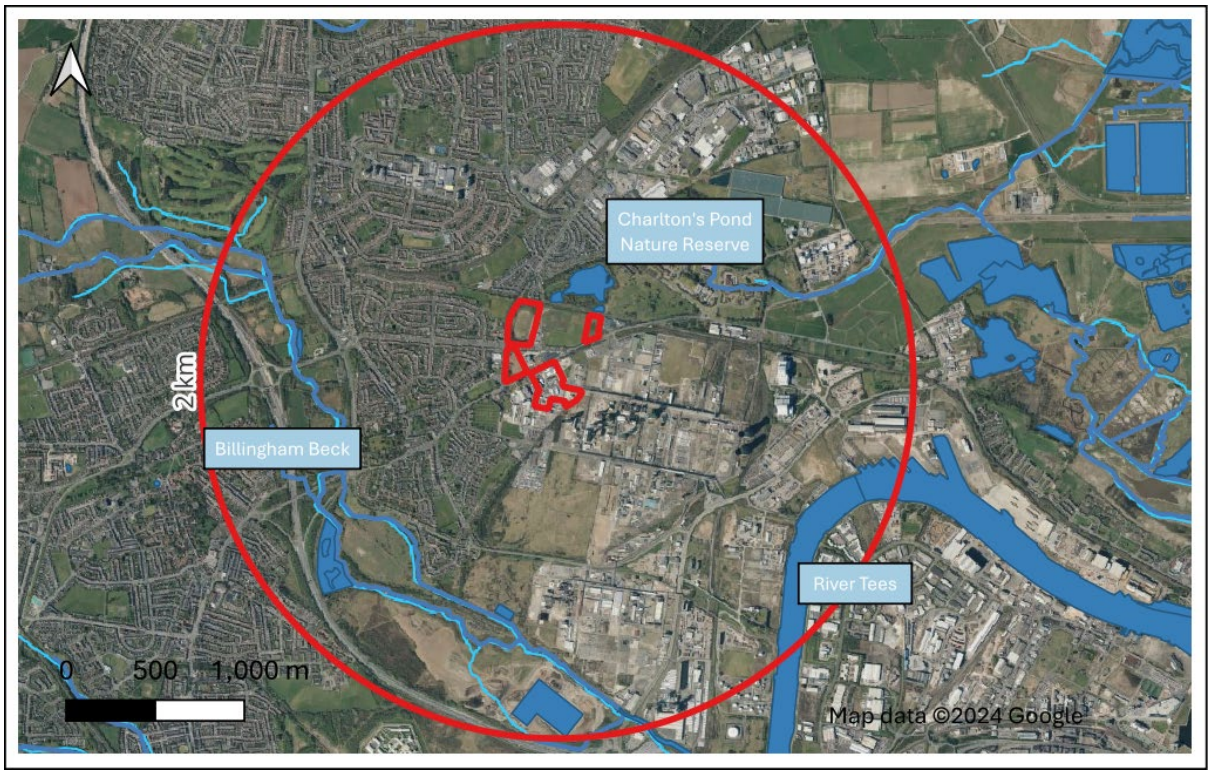


Figure 2-3 – Hydrology within 2km of the permitted installation

The Reasons for not achieving good (RNAG) and reasons for deterioration (RFD) for this waterbody include, amongst other things, the following:

- RNAG Point source - Trade/Industry discharge Industry – Macroalgae;
- RNAG Point source - Sewage discharge (continuous) - Water Industry - Dissolved Inorganic Nitrogen; and
- RNAG Point source - Trade/Industry discharge – Industry - Dissolved Inorganic Nitrogen.

The full list of RNAG and RFD for the waterbody is available on the EA's Catchment Explorer.

The inorganic nitrogen in aquatic ecosystems includes dissolved N_2 gas, oxidised ions such as nitrate (NO_{3-}) and nitrite (NO_{2-}), the reduced ammonium ion (NH_{4+}), and the reduced ammonia gas (NH_3). Nitrate is the most oxidised form of nitrogen, while ammonia and ammonium are the most reduced.

2.7.1 Nutrient Neutrality

In freshwater habitats and estuaries, poor water quality due to nutrient enrichment from elevated nitrogen and phosphorus levels is one of the primary reasons for habitat sites being in unfavourable condition. Excessive nutrient levels can cause rapid growth in certain plants through eutrophication. The effects of this look different depending on the habitat; however, in each case, there is a loss of biodiversity, leading to sites

being in 'unfavourable condition'. To achieve the necessary improvements in water quality, it is becoming increasingly evident that, in many cases, substantial reductions in nutrients are needed. In addition, for habitats sites that are unfavourable due to nutrients, and where there is considerable development pressure, mitigation solutions are likely to be needed to enable new development to proceed without causing further harm.

Activities that require an environmental permit should be subject to a Habitats Regulations Assessment (HRA) where they are carried out within the catchment of a habitats site, and there is a risk that they may affect water quality within that catchment. Where a likely significant effect on the habitat site cannot be ruled out, they should be subject to an appropriate assessment. Mitigation will be required if an adverse effect on the integrity of the site cannot be ruled out, although, depending on the type of permit being considered, it may not be appropriate to apply the standard nutrient neutrality methodology to such plans and projects. This would need to be considered on a case-by-case basis.

The Teesmouth & Cleveland Coast SPA/Ramsar has been listed by Natural England as a habitat site in unfavourable condition due to excessive nutrients (Nitrogen), which require a HRA and where nutrient neutrality is a potential solution to enable development to proceed.

2.7.2 Ecological Receptors

The RTO1 discharge point discharges directly into the Tees estuary. The statutory designated areas and selected screening distances are outlined in Table 2-2.

Table 2-2 – Designated Areas

Designation	Screening Distance	Description and Status
Ramsar	10 km	**No direct discharge.** Teesmouth And Cleveland Coast (ID: UK11068)
SPA	10 km	**Impact pathway identified (direct discharge).** Teesmouth And Cleveland Coast (ID: UK9006061)
SAC	10 km	None
Marine Conservation Zone	10 km	None
SSSI	2 km	**Impact pathway identified (direct discharge).** Teesmouth And Cleveland Coast (ID: 1003200)
NNR	2 km	None
LNR	2 km	**No potential impact pathway.** Charlton's Pond – Charlton's Pond is largely made up of two waterbodies as well as woodland and open-cut grassland. The lake at the site is the largest waterbody in the Borough and includes a restricted area that was designated as a conservation area for birds in 1968. The lake and the smaller pond were originally brick clay extraction pits from the late 1800s. Cowpen Bewley Woodland Country Park – Once a waste disposal site, and before that, clay was quarried here and used locally for brick making. It was

		transformed into a woodland park in the 1990s with the planting of around a quarter of a million trees. Billingham Beck Valley – The low-lying land frequently floods, which, in combination with traditional summer hay cutting or grazing, has resulted in a whole host of wildflowers such as meadowsweet, flag iris and valerian. These areas also attract butterflies in the summer, including the meadow brown, common blue and dingy skipper.
Ancient Woodlands	2 km	None
LWS/SINCs	2 km	**No potential impact pathways.** Billingham Beck Valley Country Park Norton Bottoms Billingham Norton Bottoms Reedbed Treatment System Gravel Hole Teessaurus Park Provided from the EA Nature and Heritage Conservation Screening (13/12/24).

3. EMISSIONS TO SEWER

3.1 Introduction

The permit variation includes various new areas and activities, some of which could (during operation) discharge to the sewer via release points S1 and S2 (Table 3-1). These are indirect releases.

Table 3-1 – Discharges to Sewer

Variation	Description of Change	Impact
Project Borealis	All wastewater from Project Borealis is to be discharged to the sewer under the consent of Northumberland Water.	New discharge, to be referred to as S1
Minor operational changes	No connection to the sewer.	None
Boiler plant upgrades	No connection to the sewer.	None
Dewer Store and Nitrogen Tank	No connection to the sewer.	None
BIC-UK	Discharges from R&D, processing and manufacturing are all discharged to the foul sewer via the Cowpen Road combined sewer. It is anticipated that the volumes will be very low (c. 500 litres per day).	New discharge to be referred to as S2

3.2 Borealis

Following detailed approval (19/1921/FUL) in November 2021 and outline approval (19/1922/OUT) in December 2021 for expansion of the bio-campus on land south of Central Avenue and north of Belasis Avenue, FUJIFILM's intention to further expand its operations to meet its requirement for a new purpose-built manufacturing facility to meet the global demands on its services.

In 2020, FUJIFILM Corporation announced its intention to invest £613 million across the US and UK, including to increase capacity to manufacture components of the Coronavirus vaccine. A significant proportion of this investment was allocated to the Northeast. Teesside is fast becoming world-renowned for its cluster of outstanding biotech services, and concerning this recent investment, Teesside is placed at the heart of the UK's advanced industrial sector, particularly in pharmaceutical research and development.

The main building: a new bio-tech manufacturing facility, will extend to around 26,800 sqm (GIA) over three floors, which comprises an array of production suites, work-in-progress warehouse and storage, buffer preparation and hold facilities, laboratories and offices. A liquid waste treatment plant, a solid waste management building and a standby generator are situated to the north of the main facility. A gatehouse is situated to the east of the main facility and is erected to manage incoming/outgoing service traffic.

The development will be set within new hard and soft landscaping areas, with vehicular, foot and cycle access taken from Central Avenue, utilising and improving the existing vehicle access/egress. A new foot/cycle path will be created as part of the proposal and will be taken from Central Avenue, and lead to the main entrance of the facility.

3.2.1 Discharges to Sewer (via S1)

In line with the other permitted activities, the wastewater generated within the facility will follow one of two paths:

- Washings – subject to pH neutralisation and then discharged to drain and sewer; and
- Aqueous effluent - this can be high in ammonia, have a high COD and/or require a kill cycle (where necessary). In all cases, the effluent stream is subject to on-site treatment, storage and then removal for (via tanker) off-site treatment and disposal. This treatment stream **does not** enter the sewer.

FUJIFILM applied to Northumbrian Water for a discharge consent to sewer (Ref. T1955). The consent includes the following compliance requirements:

- Maximum volume – 12.5 m^3 (over 24 hours);
- Maximum rate – 10 litres/second;
- pH – 6 to 10;
- Non-volatile matter (oil and grease) – 100 mg/l;
- COD – 20,000 mg/l;
- Suspended Solids – 500 mg/l;
- Chloride – 400 mg/l;
- Iron – 10 mg/l;
- Copper – 1 mg/l;
- Zinc – 10 mg/l;
- Manganese – 1 mg/l;
- Nitrogen Ammoniacal – 25 mg/l;
- Phosphorus – 5000 mg/l;
- Sulphide – 0.2 mg/l;
- Sulphate – 600 mg/l;
- Cobalt thiocyanate Active Substances – 75 mg/l; and
- Anionic Detergents – 75 mg/l.

3.3 Bioprocessing Innovation Centre UK (BIC-UK)

Originally referred to as Project Newton / Kibou, the facility is now referred to as BIC-UK.

It is a purpose-built R&D and Quality Control building for the development and analytical testing of biological pharmaceutical products. It comprises labs, office space and meeting rooms. Processes involved within the laboratories are:

- speculative technique and process development;
- transfer of processes from customers/other Fujifilm sites;
- development of processes involved in the manufacturing of biologics at laboratory scale in order to transfer into a manufacturing facility for clinical purposes; and
- analytical activities associated with clinical manufacture.

The laboratories are predominantly small-scale, operating up to 20 litre upstream processes and subsequent downstream purification. There are 2 labs in the building which have the capacity to operate up to 500 litre upstream processes and subsequent downstream purification. Biologics in use can be microbial, mammalian and viral gene therapy components.

There are no emissions from the building to W1.

The laboratory has three waste types:

- Effluent stream 1 - is straight to drain (e.g., tap water, sanitary effluent).
- Effluent stream 2 - is anything that can be neutralised in the type 2 tank (P7). There is a flowmeter to monitor this.
- Effluent stream 3- is all harmful stuff, this is all segregated for off-site treatment and disposal, i.e. there is no discharge to drain.

3.3.1 Discharge to Sewer (via S2)

The trade effluent discharge to the sewer is to be composed of small-scale, low volumes of materials derived from lab sinks, fume cupboards, etc.

Given the nature of the activities taking place in these labs, there is the potential for wastewater with both high and low pH to be generated. To ensure that the wastewater sent to drain is suitable, a pH correction system is required to neutralise the wastewater before discharging it to the sewer.

The design and operation of the system are outlined in the Operation and Maintenance Manual for Puretech Process Systems Ltd. For Fujifilm Billingham pH Correction System (REV0, 13/11/2024).

The maximum amount of the trade effluent discharged during any one period of 24 hours shall not exceed 0.5 cubic metres, whilst having a pH value in the range of 6 to 10. These limits are in line with the expected NWL discharge requirements.

3.4 Discharge From Bran Sands (Treatment Location for S1 and S2 Discharges)

The discharge from the Northumbrian Water Industrial Effluent Treatment Works at Bran Sands (Ref. EPR/LP3439LK) is subject to EA monitoring and assessment for a range of emissions including Total Suspended Solids (24-hour and 5-day rolling average), pH, Temperature, Flow, Copper, BOD, Ammoniacal Nitrogen (24-hour and 5-day rolling average), daily volume, Mercury, Cadmium, Visible oil and grease, COD and E.coli.

The closest surface water monitoring station to the Bran Sands release point is

- River Tees At Dabholme Gut Confluence (NE-45401356), Saline Water – Estuarine Sites – Non-Bathing/Shellfish, 153 samples taken between 2024 and 2006.

4. EMISSIONS TO SURFACE WATER

4.1 Introduction

There are no new or altered discharges (direct releases) to the surface water discharge point W1.

The installation has continuously monitored the effluent at the compliance point W1 for flow, and pH, whilst a weekly composite sample has been taken for Chemical oxygen demand (COD), Biochemical oxygen demand (BOD), estimated, Suspended Solids and Ammoniacal Nitrogen (NH4-N). The discharge also contains other wastewater streams that originate outside the EPR-regulated areas, e.g., from laboratories and an adjacent upstream permitted operator (i.e., Johnson Matthey PLC).

The designated sampling point is manhole MH27 located behind Building L5.

Given the lack of changes, no new surface-water assessment of the W1 release has been conducted.

5. IMPACT ASSESSMENT

5.1.1 Assessment of Compliance with BAT-AELs

The emissions from the site have been compared against the BAT Associated Emission Levels (BAT-AELs) as defined in the following guidance:

- Environment Agency (2009) Speciality Organic Chemicals Sector (EPR 4.02), March 2009. (Environment Agency, 2009).
- European Union (2016). Best Available Techniques (BAT) Reference Document for Common Wastewater and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW). (European Union, 2016).
- European Union (2016). Commission Implementing Decision (EU) 2016/902 of 30 May 2016 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for common wastewater and waste gas treatment/management systems in the chemical sector (notified under document C(2016) 3127). (European Union, 2016).

The applicable BAT-AELs are defined in BAT Conclusion (BATc) 12 of the CWW BREF, and compliance with these limits is summarised in **Table 5-1**. The predicted emissions comply (with mean and 95th percentile values) with all the relevant (current) BAT-AELs.

Table 5-1 – Summary of BAT-AEL Compliance

Parameter	BAT-AELs
COD (mg/l)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 30 – 100 mg/l [(1) (2)] **EPR 4.02 (2009), Annex 1** 30 – 125 mg/l **EPR Permit (Ref. BJ8987IQ) (for point W1, S1 is a new release point)** 700 mg/l weekly flow proportional sample 100,000 kg rolling 12-month period This is no longer aligned with the current BAT-AEL.
BOD (mg/l)	**EPR 4.02 (2009), Annex 1** 20 – 30 mg/l
Suspended Solids (mg/l)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 5.0 – 35 mg/l [(3)] **EPR 4.02 (2009), Annex 1** 20 – 30 mg/l
TOC	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 10 – 33 mg/l
TSS	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 5.0 – 35 mg/l
Total Nitrogen	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)**

Parameter	BAT-AELs
	5.0 – 25 mg/l
Total phosphorus	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 0.50 – 3.0 mg/l
Adsorbable organically bound halogens (AOX)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 0.2 – 1.0 mg/l
Chromium (expressed as Cr)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 5.0 – 25 µg/l
Copper (expressed as Cu)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 5.0 – 50 µg/l
Nickel (expressed as Ni)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 5.0 – 50 µg/l
Zinc (expressed as Zn)	**BATc (2016), BAT 12, Section 3.4 (direct emission to a receiving water body, yearly average)** 20 – 300 µg/l
NH_4-N (mg/l)	**EPR 4.02 (2009), Annex 1** 10 – 20 mg/l **EPR Permit (Ref. BJ8987IQ) (for point W1, S1 is a new release point)** 7,500 kg rolling 12-month period
pH	**EPR Permit (Ref. BJ8987IQ) (for point W1, S1 is a new release point)** 5 – 12

Notes:
(1) No BAT-AEL applies to Biochemical oxygen demand (BOD). As an indication, the yearly average BOD biological wastewater treatment plant will generally be ≤ 20 mg/l.
(2) The BAT-AEL applies if the emission exceeds 10 t/yr.
(3) The BAT-AEL applies if the emission exceeds 3.5 t/yr.

The primary environmental quality standard (EQS) for estuarine waters appropriate to emissions or potential emissions from FUJIFILM Diosynth Biotechnologies UK Limited, via S1, is Total ammonia (N).

The Annual Average EQS for unionised ammonia in saline water is 21 µg/l. The sewer discharge is expressed in terms of total ammoniacal nitrogen and factors need to be applied to convert the 21 µg/l EQS into total ammonia.

The conversion formula is outlined below:

$$UIA\ (mg/l) = \frac{Total\ Ammonia\ (mg/l)}{(1.0 + 10^{(10.055 - 0.0324t - pH)})}$$

The table below (**Table 5-2**) has been calculated for a range of temperatures and pH for 1 mg/l of unionised ammonia.

		Temperature (°C)							
		12.5	13	13.5	14	14.5	15	15.5	16
pH	6.5	1413.54	1361.82	1311.99	1263.99	1217.75	1173.2	1130.28	1088.93
	6.6	1123.02	1081.94	1042.36	1004.23	967.496	932.108	898.016	865.172
	6.7	892.251	859.618	828.18	797.893	768.715	740.605	713.525	687.436
	6.8	708.946	683.025	658.052	633.995	610.818	588.489	566.979	546.255
	6.9	563.341	542.751	522.915	503.805	485.395	467.659	450.573	434.112
	7	447.684	431.328	415.572	400.393	385.769	371.681	358.108	345.033
	7.1	355.813	342.822	330.306	318.249	306.633	295.442	284.661	274.275
	7.2	282.838	272.519	262.577	253	243.773	234.884	226.32	218.07
	7.3	224.872	216.675	208.778	201.17	193.841	186.78	179.978	173.425
	7.4	178.828	172.317	166.044	160.001	154.179	148.571	143.167	137.962
	7.5	142.254	137.082	132.099	127.299	122.675	118.22	113.928	109.793
	7.6	113.202	109.094	105.136	101.323	97.6496	94.1108	90.7016	87.4172
	7.7	90.1251	86.8618	83.718	80.6893	77.7715	74.9605	72.2525	69.6436
	7.8	71.7946	69.2025	66.7052	64.2995	61.9818	59.7489	57.5979	55.5255
	7.9	57.2341	55.1751	53.1915	51.2805	49.4395	47.6659	45.9573	44.3112
	8	45.6684	44.0328	42.4572	40.9393	39.4769	38.0681	36.7108	35.4033

Table 5-2 – Conversion of 1 mg/l of unionised ammonia to total ammonia

Therefore, 21 µg/l of unionised ammonia (at 12 °C and pH 7.5) is equivalent to 2987 µg/l total ammonia. This approach was previously utilised by the site and agreed with the EA.

There are no EQSs in place for BOD, COD or suspended solids for emissions to saline estuaries.

As the discharges are to the foul sewer, they will go to the sewage treatment works before being discharged to surface water (an indirect discharge). Processes at the sewage treatment works may remove a proportion of the hazardous chemicals and elements in the discharge. To account for this, sewage treatment reduction factors (STRFs) have been utilised[2].

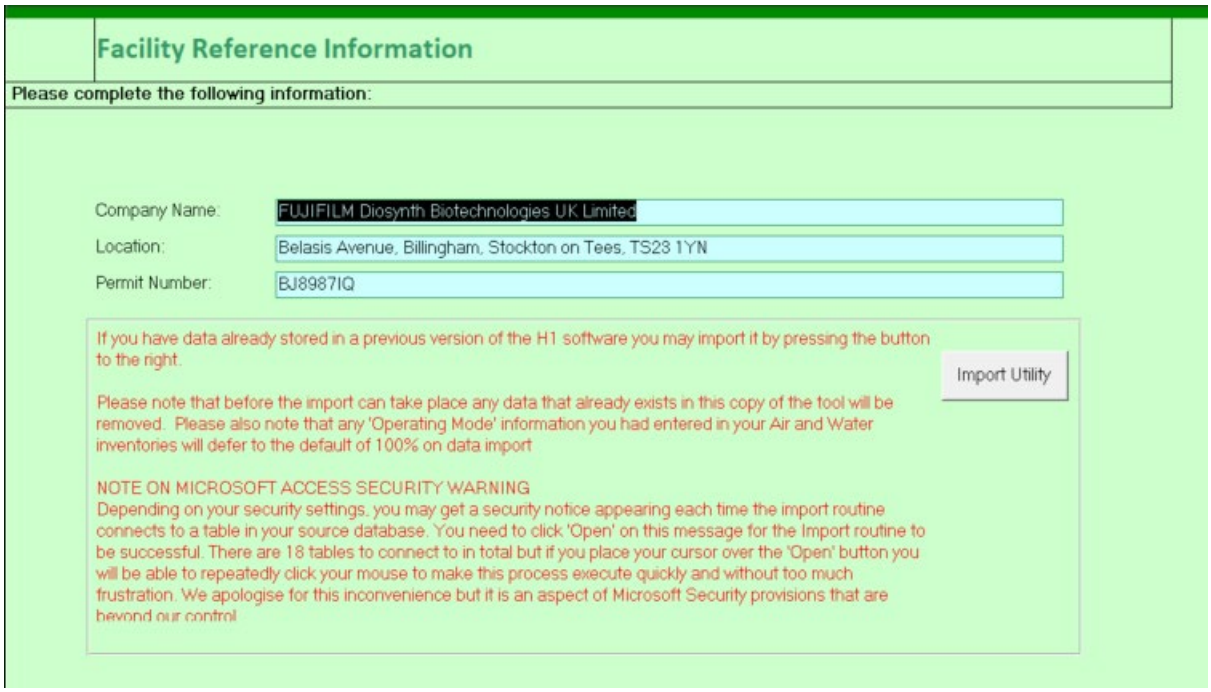
An applicant is required to evaluate and assess any hazardous chemicals and elements that are to be released into surface water (Environment Agency, 2026). An applicant must then carry out screening tests on the pollutants to check if they're a risk to the environment. This is called a specific substance assessment. There are three stages to the screening:

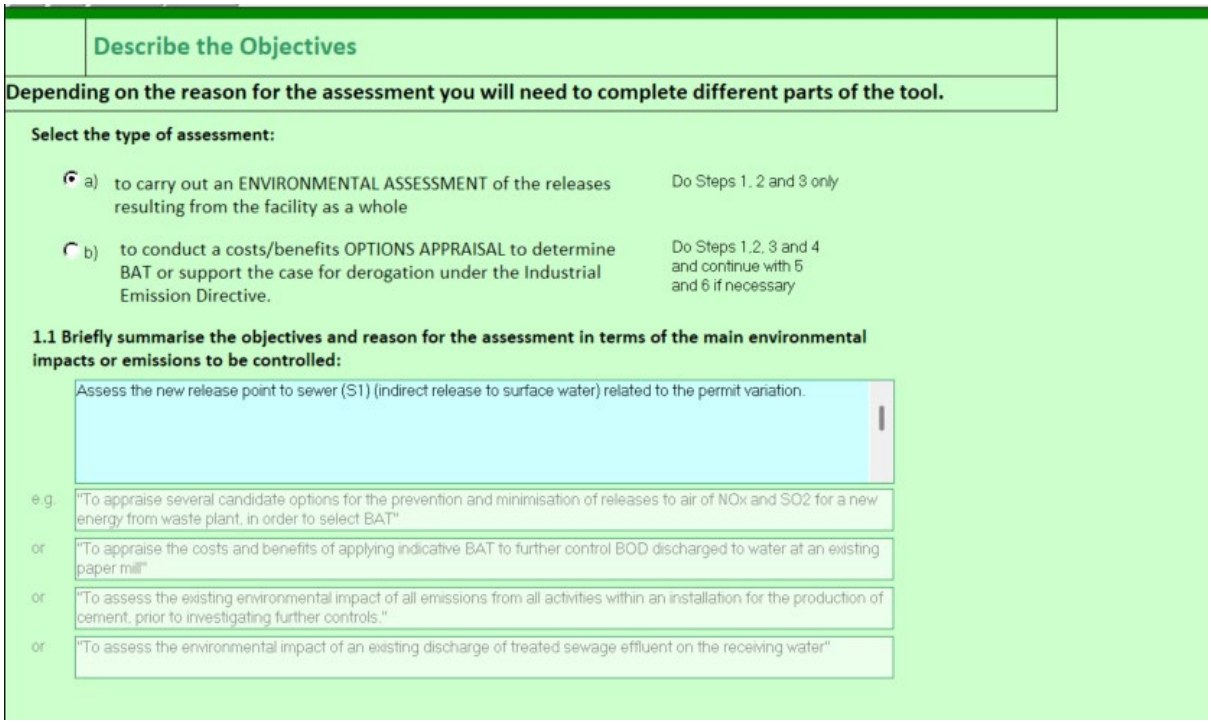
- Identify Pollutants – The relevant pollutants were identified and assessed during the original permit application.
- Gather data on the pollutants – Information has been collected by the facility since 2013. There are no substance changes proposed.
- Carry out a screening test.

The assessment has been undertaken using the current H1 assessment tool (Version 2.7.8 – January 2017). The screenshots from the H1 assessment tool are outlined below and are provided as an attachment.

[2] https://assets.publishing.service.gov.uk/media/698b3d1d46be5092a1cfd84f/Sewage_treatment_reduction_factors.ods

5.2 H1 Input Parameters





Scope of Environmental Assessment

List the activities included in the assessment

Number	Activity
e.g.	Standalone water discharge activity, raw materials handling, pre-treatment, charging, conversion, purification, waste treatment, effluent treatment, gas cleaning.

Use the 'Add' button at the bottom left to create a new activity

1	Project Borealis

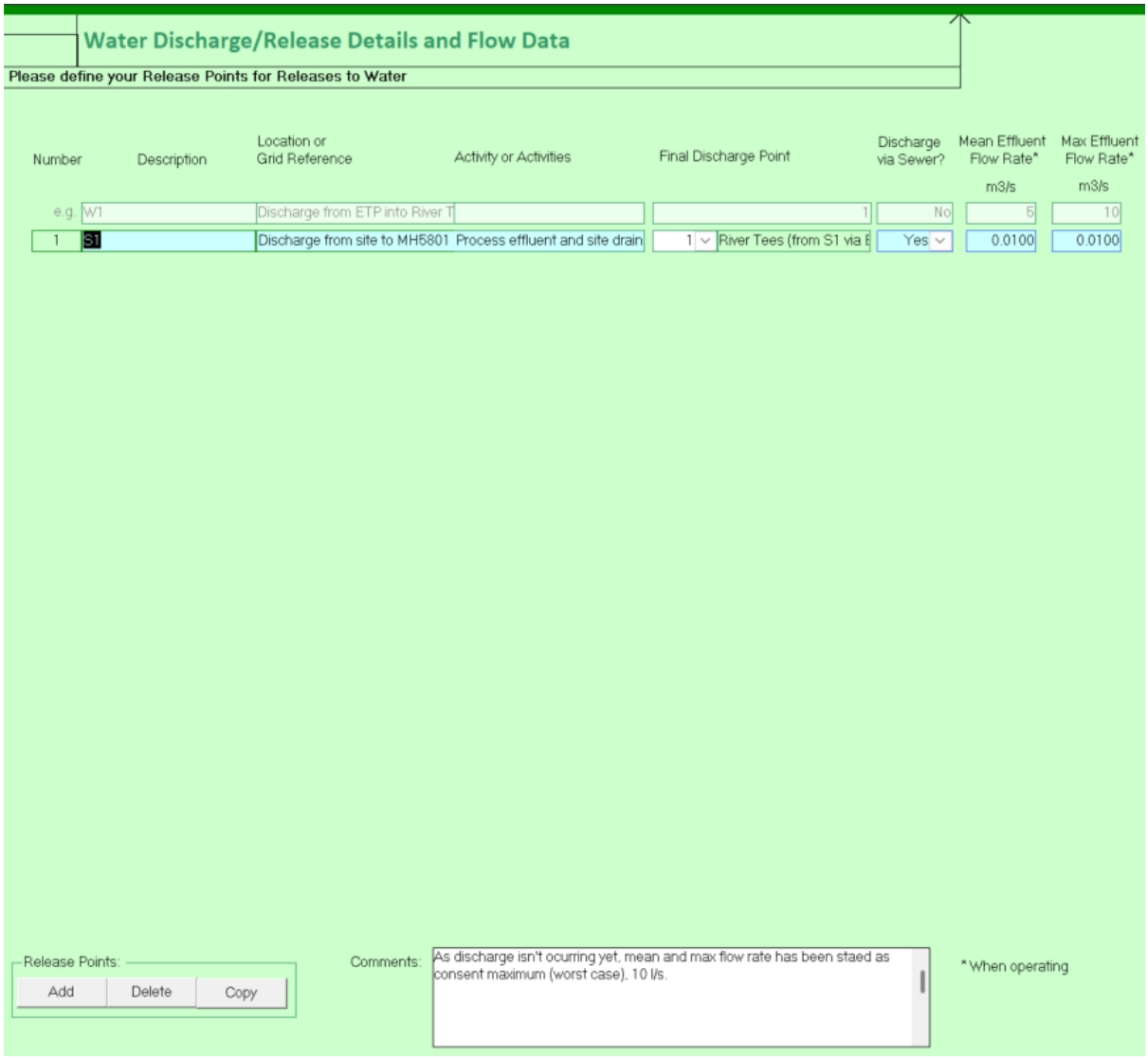
Receiving Water Body(s)

Please define the Final Discharge Locations for Releases to Water

Are there any discharges to surface waters? Yes Click the Add button below

Use the 'Add' button below to list all final discharge points.
For discharges to sewer, this should be the point where the sewage works discharges to a surface water
N.B. For Riverine discharges (River, Upper Estuary) you only need enter the River description and flow once. Further details of individual releases can be entered on the next page. For discharges to TRaC waters, seperate Discharge Locations must be added for each release point that has a different mixing zone

Number	Description	Final Discharge Category	Freshwater Q95 flow rate
e.g.	River Trent at Derby	R	1.5
1	River Tees (from S1 via Bran Sands)	T	Not Applicable



Water Discharge/Release Details and Flow Data

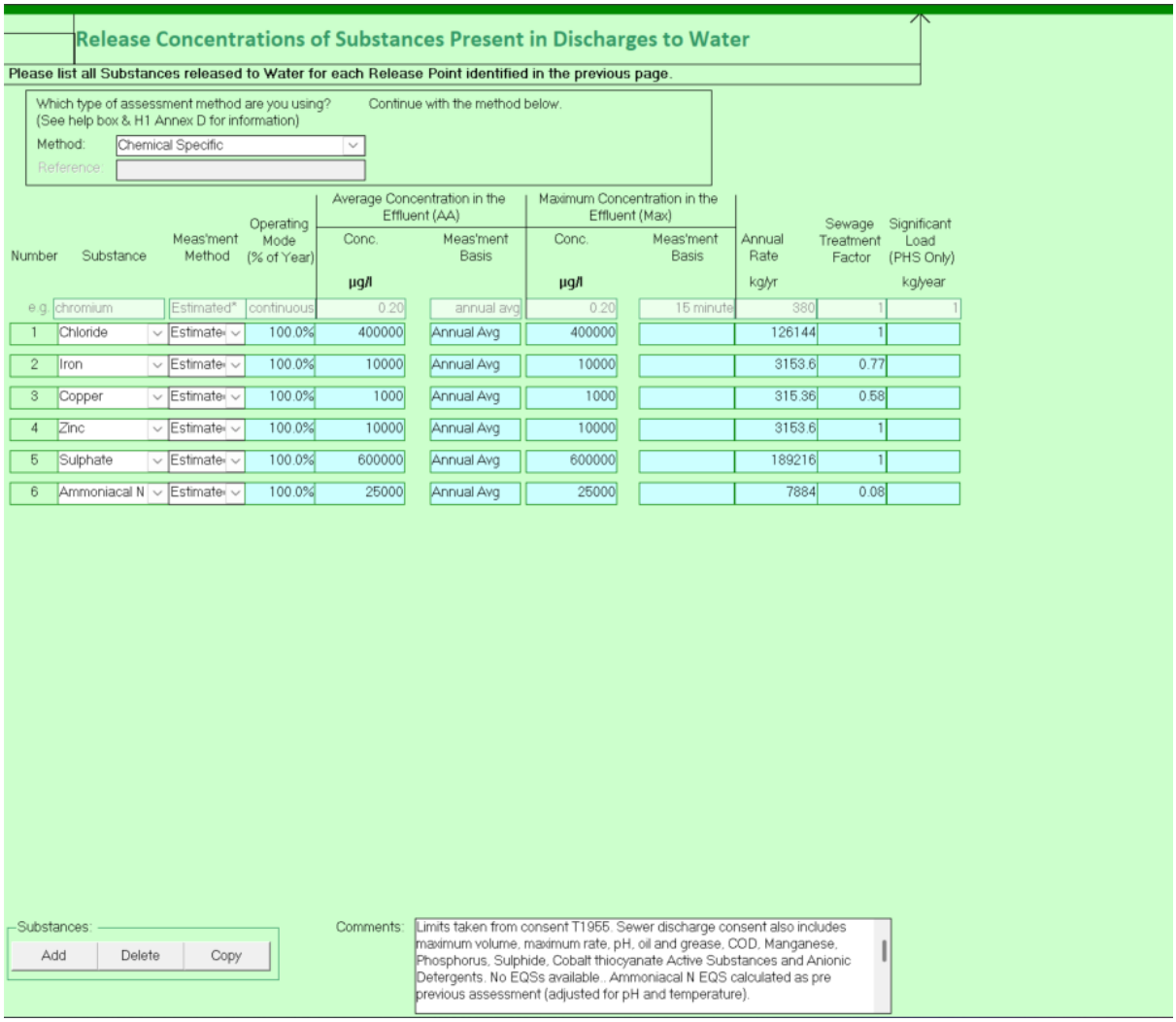
Please define your Release Points for Releases to Water

Number	Description	Location or Grid Reference	Activity or Activities	Final Discharge Point	Discharge via Sewer?	Mean Effluent Flow Rate* m3/s	Max Effluent Flow Rate* m3/s
e.g.	W1	Discharge from ETP into River T		1	No	5	10
1	S1	Discharge from site to MH5801	Process effluent and site drain	1 River Tees (from S1 via E	Yes	0.0100	0.0100

Release Points: Add | Delete | Copy

Comments: As discharge isn't ocurring yet, mean and max flow rate has been staed as consent maximum (worst case), 10 l/s.

*When operating



Release Concentrations of Substances Present in Discharges to Water

Please list all Substances released to Water for each Release Point identified in the previous page.

Which type of assessment method are you using? (See help box & H1 Annex D for information) Continue with the method below.

Method: Chemical Specific

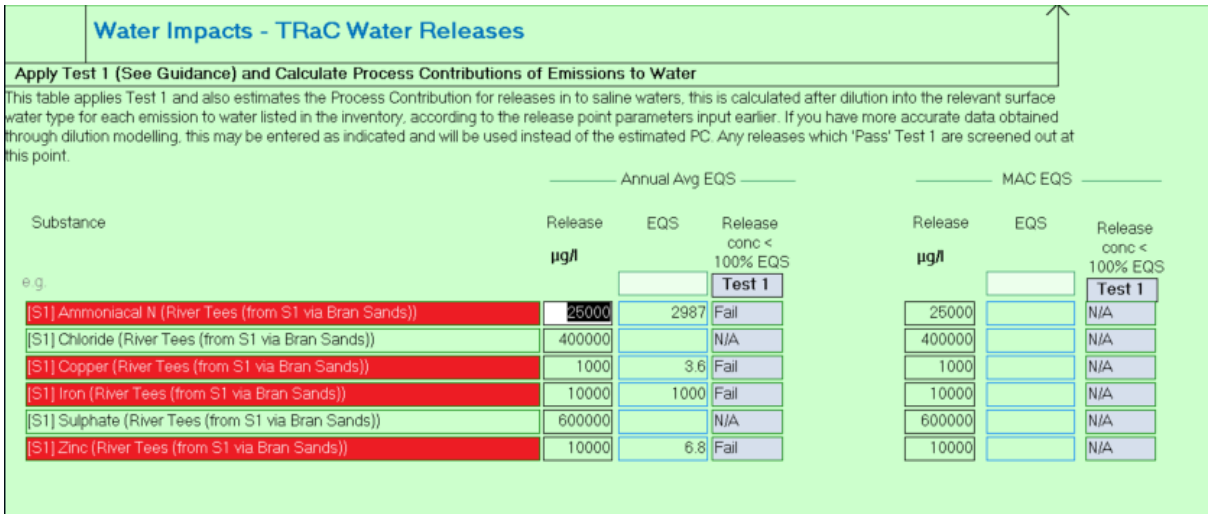
Reference:

Number	Substance	Meas'ment Method	Operating Mode (% of Year)	Average Concentration in the Effluent (AA) Conc. µg/l	Average Concentration in the Effluent (AA) Meas'ment Basis	Maximum Concentration in the Effluent (Max) Conc. µg/l	Maximum Concentration in the Effluent (Max) Meas'ment Basis	Annual Rate kg/yr	Sewage Treatment Factor	Significant Load (PHS Only) kg/year
e.g.	chromium	Estimated*	continuous	0.20	annual avg	0.20	15 minute	380	1	1
1	Chloride	Estimate	100.0%	400000	Annual Avg	400000		126144	1	
2	Iron	Estimate	100.0%	10000	Annual Avg	10000		3153.6	0.77	
3	Copper	Estimate	100.0%	1000	Annual Avg	1000		315.36	0.58	
4	Zinc	Estimate	100.0%	10000	Annual Avg	10000		3153.6	1	
5	Sulphate	Estimate	100.0%	600000	Annual Avg	600000		189216	1	
6	Ammoniacal N	Estimate	100.0%	25000	Annual Avg	25000		7884	0.08	

Substances: Add Delete Copy

Comments: Limits taken from consent T1955. Sewer discharge consent also includes maximum volume, maximum rate, pH, oil and grease, COD, Manganese, Phosphorus, Sulphide, Cobalt thiocyanate Active Substances and Anionic Detergents. No EQSs available.. Ammoniacal N EQS calculated as pre previous assessment (adjusted for pH and temperature).

5.3 TRaC Test 1 – Calculate Process Contributions of Emissions to Water



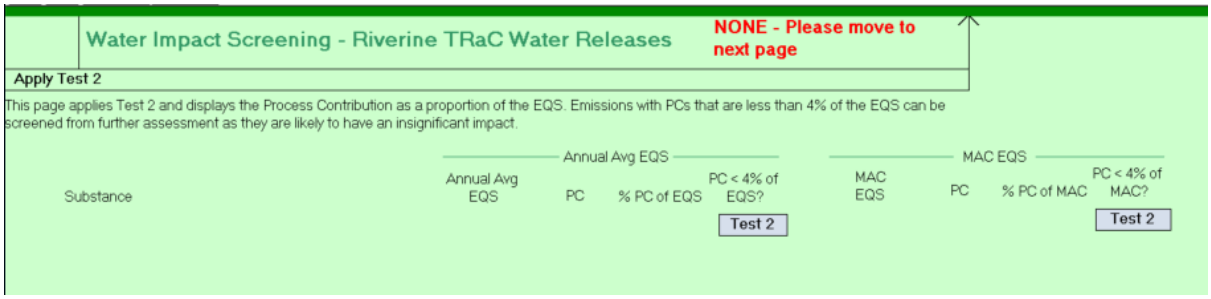
Water Impacts - TRaC Water Releases

Apply Test 1 (See Guidance) and Calculate Process Contributions of Emissions to Water

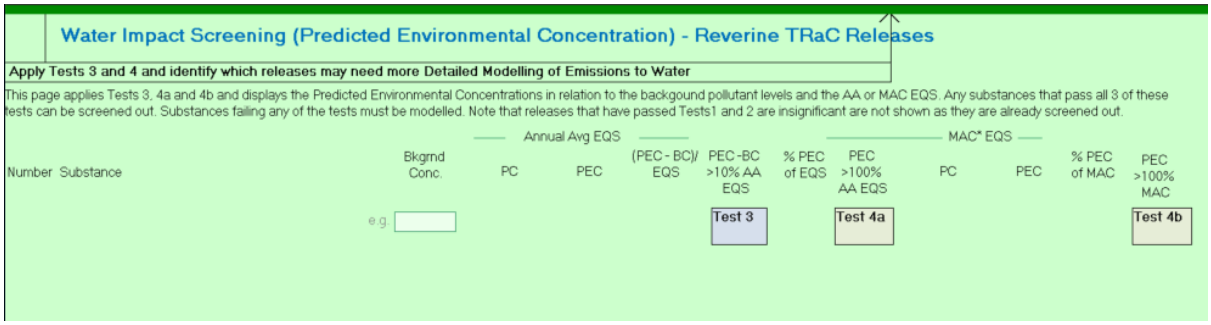
This table applies Test 1 and also estimates the Process Contribution for releases in to saline waters, this is calculated after dilution into the relevant surface water type for each emission to water listed in the inventory, according to the release point parameters input earlier. If you have more accurate data obtained through dilution modelling, this may be entered as indicated and will be used instead of the estimated PC. Any releases which 'Pass' Test 1 are screened out at this point.

Substance	Annual Avg EQS Release µg/l	Annual Avg EQS EQS	Annual Avg EQS Release conc < 100% EQS Test 1	MAC EQS Release µg/l	MAC EQS EQS	MAC EQS Release conc < 100% EQS Test 1
e.g.						
[S1] Ammoniacal N (River Tees (from S1 via Bran Sands))	25000	2987	Fail	25000		N/A
[S1] Chloride (River Tees (from S1 via Bran Sands))	400000		N/A	400000		N/A
[S1] Copper (River Tees (from S1 via Bran Sands))	1000	3.6	Fail	1000		N/A
[S1] Iron (River Tees (from S1 via Bran Sands))	10000	1000	Fail	10000		N/A
[S1] Sulphate (River Tees (from S1 via Bran Sands))	600000		N/A	600000		N/A
[S1] Zinc (River Tees (from S1 via Bran Sands))	10000	6.8	Fail	10000		N/A

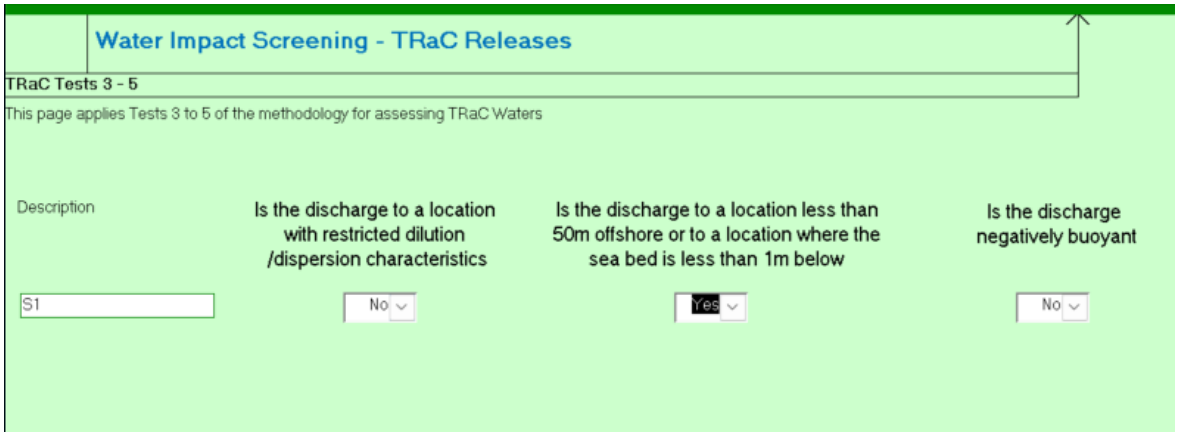
5.4 TRaC Test 2 – Process Contribution as a Proportion of the EQS



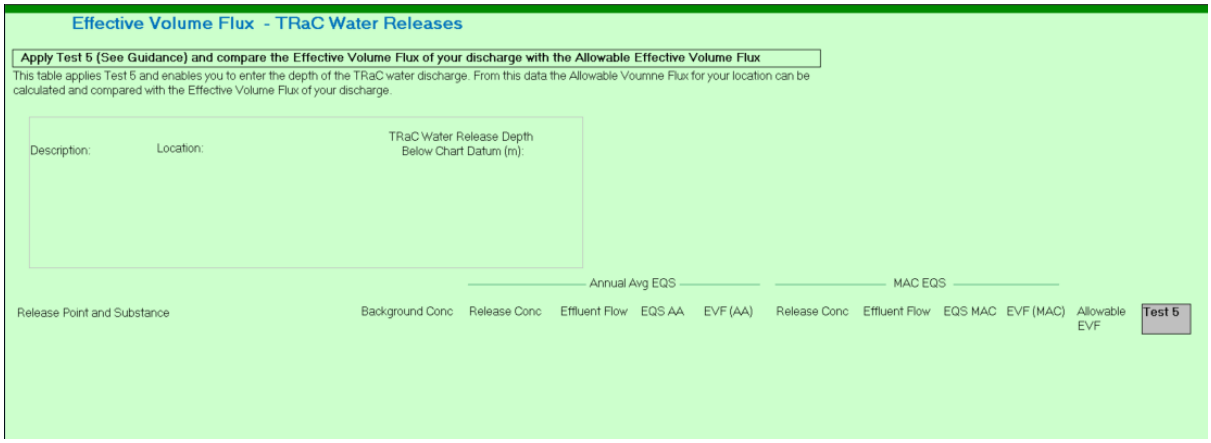
5.5 TRaC Tests 3 and 4 – Predicted Environmental Concentration



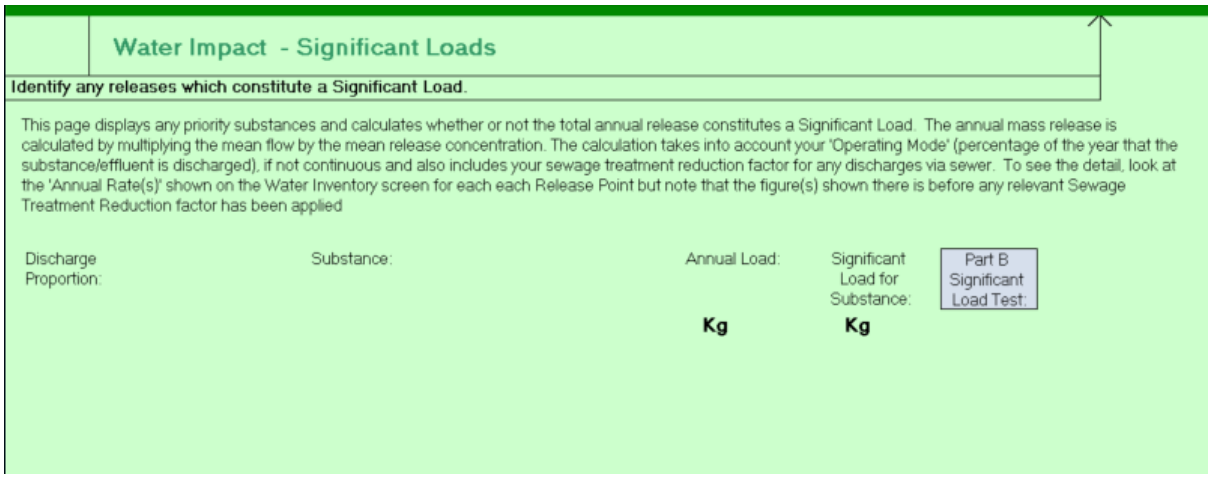
5.6 TRaC Tests 3 to 5



5.7 TraC Test 5 Effective Volume Flux



5.8 Significant Loads



Water Impact - Significant Loads

Identify any releases which constitute a Significant Load.

This page displays any priority substances and calculates whether or not the total annual release constitutes a Significant Load. The annual mass release is calculated by multiplying the mean flow by the mean release concentration. The calculation takes into account your 'Operating Mode' (percentage of the year that the substance/effluent is discharged), if not continuous and also includes your sewage treatment reduction factor for any discharges via sewer. To see the detail, look at the 'Annual Rate(s)' shown on the Water Inventory screen for each each Release Point but note that the figure(s) shown there is before any relevant Sewage Treatment Reduction factor has been applied

Discharge Proportion:	Substance:	Annual Load:	Significant Load for Substance:	Part B Significant Load Test:
		Kg	**Kg**	

6. CONCLUSIONS

A surface water risk assessment (H1 Assessment) was undertaken on the discharge of effluent from the current permitted emission point W1 and the proposed emission point S1.

The results of the screening assessment demonstrate that the indirect discharges (via the sewer) do not pose a significant risk of EQS exceedance in the receiving water body and therefore have passed the H1 assessment.