Main Application Report (Variation) BAE Systems (Operations) Limited, Samlesbury, Balderstone, Lancashire, BB27LF, UK (Permit Ref. BV0414IV)

On behalf of:
BAE Systems (Operations) Limited

Project Reference:
023-1932

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Abbreviations

ASR	Application Site Report
AST	Above Ground Storage Tank
ATEX	Atmosphere Explosibles (fr.)
BAT	Best Available Technique
BGS	British Geological Survey
BREF	Best Available Techniques Reference Documents
CCA	Climate Change Agreement
COMAH	Control of Major Accident Hazards
CTF	Central Treatments Facility
dB(A)	Decibels (A-weighted)
DEFRA	Department for Environment Food and Rural Affairs
DSEAR	Dangerous Substances and Explosive Atmospheres Regulations
EA	Environment Agency
EAME	Earth and Marine Environmental Consultants Ltd
EMS	Environmental Management System
EnMS	Energy Management System
EPR	Environmental Permit
ELV	Emission Limit Value
ETP	Effluent Treatment Plant
FRA	Flood Risk Assessment
HAZID	Hazard Identification Analysis

IPPC	Integrated Pollution Prevention and Control
IBC	Intermediate Bulk Container
KVA	Kilovolt-ampere
kWe	Kilowatt-electric
LEV	Local Exhaust Ventilation
MDR	Maximum Deposition Rate
MoD	Ministry of Defence
mg/l	milligrams per litre
NGR	National Grid Reference
Opra	Operational Risk Appraisal
PC	Process Contribution
PEC	Predicted Environmental Concentration
PFD	Penetrant Flaw Detection
POCP	Photochemical Ozone Creation Potential
PPE	Personal Protective Equipment
PPM	Planned Preventative Maintenance
SCR	Site Condition Report
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
TCFD	Task Force on Climate-related Financial
TFSAA	Thin Film Sulphuric Acid Anodising
UF	Ultrafiltration

µg/l	micrograms per litre
WWTP	Wastewater Treatment Plant
WEL	Workplace Exposure Limit

References

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1 Introduction

1.1 Background

This document has been prepared by BAE Systems (Operations) Limited ("BAE Systems") and its environmental consultant Earth and Marine Environmental Limited ("EAME") in support of a Part A1 Environmental Permit variation as required under Regulation 20 of the *Environmental Permitting (England and Wales) Regulations 2016* (as amended).

An environmental permit application or variation is required where an operator carries out certain prescribed activities, namely installations that undertake Schedule 1 activities, a waste operation, or a mobile plant (carrying out either one of the Schedule 1 activity or a waste operation).

The status log (history) for the permit is outlined in **Table 1-1**.

Table 1-1: *BAE Systems Samlesbury permit log*

Description	Date	Comments
Application EPR/BV0414IV/A001	29/07/04	Application duly made
Additional information received	14/10/04	-
Permit EPR/BV0414IV determined	16/12/04	Permit issued to BAE Systems (Operations) Limited.
Variation application EPR/BV0414IV/V002 (Variation and consolidation)	17/03/17	Duly Made To replace the PFD line with other changes to the CTF, addition of CHP, and to update permit to modern conditions.
Schedule 5 Notice for further information sent 18/05/17, follow-up email sent 06/06/17	01/06/17	Received Non-technical summary, changes to permitted activities, and monitoring standard for stackemissions.
	16/06/17	Confirmation of ETP maximum daily capacity.
	03/07/17	H1 emission to sewer assessment andconfirmation of whether effluent is hazardous.

Description	Date	Comments
Variation determined EPR/BV0414IV/V002 (Billing Ref. HP3431DM)	01/08/17	Varied and consolidated permit issued in modern condition format.

This application is to vary an existing environmental permit in relation to operations and activities undertaken at BAE Systems (Operations) Limited, Samlesbury Aerodrome, Balderstone, Lancashire, BB27LF, UK.

The Authorised company contact is Mr. Seb Cuzzupé (BAE Systems, FM Engineering & Governance Lead – Environment, Facilities Management, BAE Systems - Air).

1.2 Proposed Variation

The current environmental permit is split between two areas on-site *i.e.* Central Treatment Facility (CTF) and 1-Shed. The variation application (as it relates to each of the areas) is outlined below.

1.2.1 Central Treatments Facility

The proposed changes to the CTF permitted installation are outlined below.

New (replacement) anodise process line with the virtual elimination of Chromium VI. Installation of a new (replacement) metal anodising process line located wholly within the Central Treatment Facility (CTF). The project will involve the use of pre-existing equipment (*i.e.* a previously installed (but not used) scrubber unit) located on the southern side of the CTF.

The switch from the historic use of Chromic acid (used within the current anodise process line) to a newer anodise process (Thin Film Sulphuric Acid Anodising) will virtually eliminate the use of Cr (VI) compounds within the anodise process with the overall aim of total removal (upon certification/ approval). A BAT abatement system to be used. This was previously installed during the earlier Penetrant Flaw Detection (PFD) permit variation. It has taken longer than expected to get the new non-Chromic acid anodise process approved for military aircraft applications.

Please refer to *Section 2*.

Removal of all decommissioned equipment associated with the current permitted Chromic acid anodising process line. Post-commissioning/productionisation acceptance, the removal of the current permitted chromic acid metal anodising process line located wholly within the CTF building.

This includes the removal of the two existing external scrubber units (AE1 and AE2) located on the western side of the CTF building. To ensure all potentially hazardous materials are removed. As this is located within the CTF building (permitted area) BAE Systems is not applying to surrender the area occupied by the current anodise process line.

Please refer to *Section 6*.

Update environmental permit to remove all references to the 'Clean and Pickle line' following decommissioning of the process line during 2022.

This includes the removal of air emission points AE3 and AE4 and all associated equipment. The clean and pickle line and emission points AE3 and AE4 have been fully removed. All equipment has been removed and the EA is aware of the process change (following a site inspection on 27/120/22 Ref. BV0414IV/0439888).

Please refer to *Section 6*.

Revised tanker/chemical delivery area on the western side of the CTF building. Process Improvement (in-line with BAT)

The external arrangements for the delivery and handling of chemicals (via tanker) were subject to improvement and re-engineering in-line with BAT requirements. These were discussed with the EA during a site inspection in 2021 (Ref. 09/03/21, BV0414IV/0388068). BAE Systems recognises that this change needs to be included within the permit (as a directly associated activity).

Please refer to *Section 4*.

Modifications and expansion of the current effluent treatment plant (ETP) located within the CTF. This will be used (in part) for the treatment of rinse waters from the new (replacement) metal anodising process line located within the CTF building. Increased storage and treatment capacity.

An extension of the existing ETP in-light of the anodise process line update. The changes will include:

- Installation of a mezzanine within the building
- Modification of the existing external concrete bund (BAT compliant)

- Replacement of 7 above ground storage tanks (ASTs) with 7 new ASTs

These changes are to reflect the volume change in rinse water due to the new anodise line, the increased demand for Deionised Water (DI) water and the ability to improve rinse water recycling.

There is no change in chemistry or discharge characteristics from the permit emission point TE1 and hence no changes to composition released via the final sewer point TE3.

Please refer to *Section 3*.

Revised permit boundary surrounding CTF

A minor permit boundary change to update permit boundary at CTF to include new chemical delivery area, surrounding service road and ETP extension.

Please refer to *Section 1.3*.

1.2.2 1-Shed

The proposed changes to the 1-Shed permitted installation are outlined below.

Update permit to remove reference to organic solvent degreasing using Neu-Tri E (Trichloroethylene). Replacement solvent is now Perchloroethylene.

Minor change in single material (listed in Table S3.1). Emission Limit Value (ELV) within permit remains valid. Less than a tonne of solvent is still used within the process. The process equipment still meets BAT.

Please refer to *Section 5*.

1.3 Permit Boundary

An extension to the current permit boundary is required to incorporate the proposed changes outlined in this variation.

1.3.1 Central Treatment Facility

The installation of the new tanker/chemical handling bay located on the western side of the CTF building will require the permit boundary to be extended. BAE Systems is requesting for the boundary to be extended up to and including the new security key entry gate located adjacent to the existing chemical store (which is already part of the permitted installation).

Given delivery vehicles use the surrounding service road (*i.e.* to access the tanker delivery bay, the ETP and the scrubbers at the southern end of the CTF building) BAE Systems would also like to include that area within the permit boundary. The proposed updated permit boundary is outlined in **Figure *1-1***.

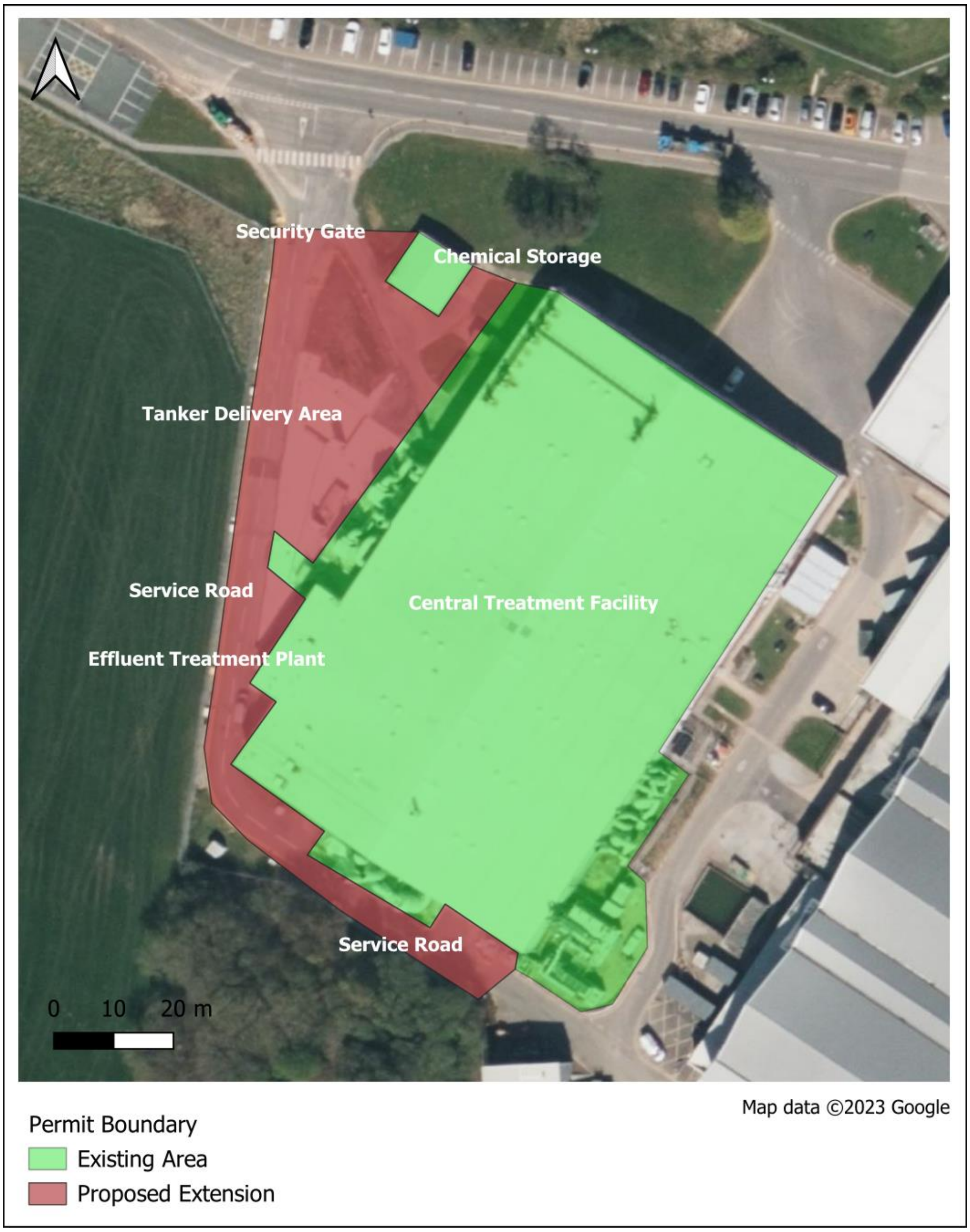


Figure 1-1: *CTF permit boundary (current and proposed)*

1.3.2 1-Shed

No extension or changes to the current 1-Shed permitted area are required.

1.4 Pre-Application Advice and Consultation

BAE Systems submitted a pre-application advice assessment (Ref. EPR/BV0414IV/V003).

The proposed variation has also been discussed with the local Environment Agency (EA) Regulatory Officer responsible for regulating and inspecting the site activities.

1.5 Technical Standards

The application has been produced in accordance with EA and Department for Environment, Food & Rural Affairs (Defra) current guidance. BAE Systems has applied the following Appropriate Measures as representing Best Available Techniques (BAT) for the sector and the proposed activity (**Table *1-2***).

Table 1-2: *Technical Standards and Guidance (Appropriate Measures)*

Type	Reference
EPR Guidance	UK Government (2023). Guidance A1 installations: environmental permits. https://www.gov.uk/guidance/a1-installations-environmental-permits UK Government (2023). Develop a management system: environmental permits. https://www.gov.uk/guidance/develop-a-management-system-environmental-permits

Type	Reference
Horizontal Guidance	UK Government (2016). Risk assessments for specific activities: environmental permits, https://www.gov.uk/government/collections/risk-assessments-for-specific-activities-environmental-permits UK Government (2019). Guidance Energy efficiency standards for industrial plants to get environmental permits. https://www.gov.uk/guidance/energy-efficiency-standards-for-industrial-plants-to-get-environmental-permits UK Government (2022). Guidance Noise and vibration management: environmental permits. https://www.gov.uk/government/publications/noise-and-vibration-management-environmental-permits UK Government (2011). Guidance Environmental permitting: H4 odour management. https://www.gov.uk/government/publications/environmental-permitting-h4-odour-management UK Government (2013). Environmental permitting: H5 Site condition report. https://www.gov.uk/government/publications/environmental-permitting-h5-site-condition-report
BREFs	**Surface Treatment of Metals and Plastics** European Commission (2006). Best Available Techniques (BAT) Reference Document for Surface Treatment of Metals and Plastics, August 2006. https://eippcb.jrc.ec.europa.eu/sites/default/files/2019-11/stm_bref_0806.pdf The BREF is currently under review. The kick-off meeting was held 30 May – 7 June 2022.
BATC	BAT Conclusion documents (BATC) are not currently available for the sector.
Monitoring	UK Government (2022). Guidance - Monitoring stack emissions: measurement locations. https://www.gov.uk/government/publications/monitoring-stack-emissions-measurement-locations UK Government (2021). Guidance - Monitoring stack emissions: guidance for selecting a monitoring approach. https://www.gov.uk/guidance/monitoring-stack-emissions-technical-guidance-for-selecting-a-monitoring-approach UK Government (2021). Guidance - Monitoring discharges to water: guidance on selecting a monitoring approach. https://www.gov.uk/guidance/monitoring-discharges-to-water-guidance-on-selecting-a-monitoring-approach UK Government (2020). Collection - Monitoring discharges to water: environmental permits. https://www.gov.uk/government/collections/monitoring-discharges-to-water-environmental-permits

Type	Reference
Sector Guidance	EA (2013). The Surface Treatmentof Metals and Plastics byElectrolytic and ChemicalProcesses (EPR 2.07), March 2009, GEHO0209BPIP-E-E.
UK BAT	Not available for the sector.

1.6 Application Package

The application package includes completed application forms that are cross-referenced to various technical documents, which are intended to address all the areas required by the variation application. The various documents included with this application package are outlined within **Table 1-3**. The main reports are highlighted in green.

Table 1-3: *Application Documents*

Folder	Document Reference
Air Model Files	BAE Samlesbury ADMS model files 18 July 2023
Application Forms	023-1932 BAE Systems EPR Form Part-A REV00 023-1932 BAE Systems EPR Form Part-C2 REV00 023-1932 BAE Systems EPR Form Part-C3 REV00 023-1932 BAE Systems EPR Form Part-F1 REV00
BAT and Impact Assessments	023-1932 ETP to Sewer Assessment H1-2.78 Rev00 023-1932 BAe Samlesbury AQ v1 023-1932 BAE Samlesbury CTF Chemical Handling - HAZID REV00 023-1932 BAE Samlesbury New Anodise Line - HAZID REV00 023-1932 BAE Systems Samlesbury EPR Variation - BAT Assessment REV00
Certification	BAE_Systems_Air_LRQ0770099_Samlesbury
Climate Change Agreement	ADST00011 Underlying Agreement v6
EA Consultation	Email from Local EA Inspector Installations pre-app basic advice
Figures and Plans	023-1932 Environmental Receptors - 1-Shed REV00 023-1932 Environmental Receptors - CTF REV00

Folder	Document Reference
Main Installation Report	023-1932 BAE Systems Samlesbury EPR Variation - Installation Report REV00
Miscellaneous Attachments	023-1932 BAE Systems Directors REV00 023-1932 BAE Systems Permission to Submit REV00_Redacted Letter to Environment Agency _BV0414IV Permit Variation application 230731
Noise Assessments	J003269-5623-RDC-1 BAE Samlesbury noise complaint - Validation measurement after remediation
Non-Technical Summary	023-1932 BAE Systems Samlesbury EPR Variation - NTS Report REV00
Operations - Anodise Line	**Subfolder – Anodise Line Civils** CTF-THOMC-01-ZZ-DR-S - 102_General Arrangement Sections_H CTF-THOMC-01-ZZ-DR-S - 103_General Arrangement Sections_E CTF-THOMC-01-ZZ-DR-S - 245_Service Trench Reinforcement Details_- CTF-THOMC-01-ZZ-DR-S - 246_Service Trench Reinforcement Details_- Lining System - 21K1154S Technical Document **Subfolder – Anodise Line Scrubber** 13 143 032_SCRUBBERS P & ID Rev C-Model colour 13 144 401 1 A Scrubber Body-Model 13 144 401 2 A Scrubber Internals-Model Anodise and PFD Scrubber D1 Calculation Anodise Scrubber Design Details DV 270 Mist Eliminator P11959 Scrubber Design **Subfolder – Anodise Line Schematics** 38 PDFs showing process baths, hot and cold water circuits, DI water circuits, air agitation, LEV, process line transporters and chemical storage and dosing.
Operations - ETP	ETP Upgrade - 21S0096DG_006 Rev A ETP External Areas - 21S0096DG_008 P1 Bund Coating 878-stonchem-product-data CTF-THOMC-05-ZZ-DR-S-203 - New Bund GA & Sections_Ver1

Folder	Document Reference
Operations - Tanker Unloading Bay	218069 - 04 - C2 - General Arrangement 218069 - 05 - C2 - Proposed Site Levels 218069 - 06 - C2 - Drainage Layout 218069 - 09 - C2 - Bund Area Layout & Details 218069 - 10 - C2 - Tank Area Layout & Details 218069 - 11 - C2 - Road Extension BAE Systems Chemical Delivery Process - Castell Key Redacted ACO Road Drain PD200F 30.3 Access Installation Detail Drawing 21881
Safety Data Sheets (SDSs)	All SDSs (#24) for all materials (by process bath number) to be used within the new anodise process line.
Site Condition Report	023-1932 BAE Systems Samlesbury EPR Variation - SCR REV00
Stack Monitoring and MCERTS	UKAS Schedule of Accreditation - 10706Testing-Multiple

The above items (**Table *1-3***) should be regarded as constituting the variation application.

It is important to note that in-line with EA guidance (Application Guidance Notes) this application to vary the existing permitted installation only includes details for the parts of the permit that will be affected through the installation of the new/revised activities. BAE Systems has not resent any information from the original permit application if it is not affected by the proposed changes.

In-line with the Form EPF1 Guidance (Version 16, April 2023) the various application sections and attachments have been submitted (via a filing sharing link) with confirmation sent to PSC@environment-agency.gov.uk

1.7 Application Fees

The fees (Ref. 1.12.7, Normal Variation) associated with this variation application have been calculated using the current EA Charging Scheme (Environment Agency, 2022) as outlined in ***Figure 1-2***.

Ref	Activity	Permit application	Minor variation	Normal variation	Substantial variation	Transfer application	Surrender application
1.12.3	Section 2.1 - ferrous metal handling.	£11,503	£3,451	£5,751	£10,353	£2,459	£6,902
1.12.4	Section 2.2 - non-ferrous metal production.	£16,001	£4,800	£8,000	£14,401	£2,459	£9,600
1.12.5	Section 2.2 - non-ferrous metal melting.	£13,984	£4,195	£6,992	£12,586	£2,459	£8,390
1.12.6	Section 2.2 - non-ferrous metal - cadmium/mercury production.	£11,813	£3,544	£5,906	£10,632	£2,459	£7,088
1.12.7	Section 2.3 - surface treatment.	£12,743	£3,823	£6,371	£11,468	£2,459	£7,645

Figure 1-2: *Variation fees*

BAE Systems has paid the application fee (£6,371) via BACS to the account stated on Form EPF1. Notification of payment has been sent (including reference number) to ea_fsc_ar@sscl.gse.gov.uk.

This document represents the Main Application Report (Variation) submitted as part of the variation package to the EA (EAME Ref. 023-1932).

2 Operations – Metal Anodising Process Line

2.1 Introduction

This Section outlines the proposed replacement of the existing chromic acid anodising process line with a new (BAT/REACH compliant) metal anodising process based on Thin Film Sulphuric Acid Anodising (TFSAA).

Hexavalent chromium or Cr (VI) has been used in many industries, such as automotive and aerospace, because it's relatively easy to produce and has excellent corrosion-resistant properties. However, due to its toxicity and carcinogenic properties, all Cr (VI) plating will be banned in the European Union in 2024.

It is also listed in the UK's Annex XIV of Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Authorization List. Where Companies want to continue using a substance included in the Authorisation List (after the sunset date) they need to prepare an application for authorisation, submit it before the latest application date and have a positive authorisation decision by the Health and Safety Executive (HSE). The latest application date and the sunset date are specified in the Authorisation List.

Currently the existing process line (within CTF) uses Chromic acid as an electrolyte. Due to the presence of Cr (VI) chromic acid anodising is gradually being phased out (wherever possible).

2.1.1 Justification for Change

The CTF provides capability and capacity to penetrant flaw detect (PFD), anodise, conversion coat and paint (both aluminium and titanium). These activities are intrinsically linked to the manufacturing process of the internal supply chain at Samlesbury, prior to subsequent assembly operations for the F-35 and Typhoon programmes and will be also used for any future aircraft programmes.

The current anodise line within CTF is now over 25 years old and has significant issues in terms of reliability due to wear and tear and obsolescence and a recurring need to repair the existing tanks because of leaks and structural weaknesses identified during the regular statutory tank inspections.

A new anodise line will ensure compliant process chemistry aligned to emerging UK legislation and provide more reliable and continued anodise capability and capacity aligned to the F-35 and BAE's UK Manufacturing Strategy and addresses imminent legislative changes required by 2024. In addition, this solution will ensure that BAE Systems has adequate capability and capacity to discharge current and future product requirements, minimising the risk of down time and reliability due to ageing/obsolescent equipment, thus protecting existing contractual commitments through close coupling on Samlesbury site. Furthermore, the solution addresses the company's commitment to providing more sustainable solutions as part of its Carbon net zero target.

2.1.2 Operational States

The new anodise line has been designed to process 128 flight bars within 96 hours of continuous running at 76% total availability (95% availability x 80% operational utilisation). Subject to any planned maintenance requirements this leaves up to 48 hours additional potential running time per week to provide some surge capacity based on current rota shift patterns in CTF.

In relation to the process line the following conditions shall apply:

- State 1 – The anodise process line is off. There is no heating or cooling of any process or rinse baths. During this state the LEV system would not be running. This would only occur during shutdown/maintenance periods.
- State 2 – The process line is in standby (ready to process). The process baths/rinse baths are heated and/or cooled. All process baths are lidded. The LEV is running (Lip Extraction only) at an extraction rate of 27,300 m^3/hr.
- State 3 – The process line is operational. Operation with one transporter moving down the line (opening process bath lids). LEV system (high-level canopy) is operating at an extraction rate of 42,030 m^3/hr.
- State 4 – The process line is operational. Operation with two transporters moving down the line (opening multiple process bath lids). Full LEV system (high-level canopy) is operating at an extraction rate of 50,850 m^3/hr.

Worst case emissions assume 52 weeks a year operation. This does not allow for maintenance and shut-down periods (which will occur).

2.1.3 Programme

The key milestones associated with the project are outlined below:

- March 2024 – New anodise line is scheduled to be commissioned and tested.
- September 2024 – Productionisation period when both new and existing anodise lines running in parallel is scheduled to be completed. This is to meet the REACH deadline.

- Q1/Q2 2025 – Following successful productionisation BAE Systems plan to remove chemistry from the existing anodise line in late 2024 to reduce risk and chemical inventory. All infrastructure will be removed by early 2025.

2.2 Process Bath Layout

The process line will be composed of 28 process stations. The stations are either related to loading/unloading, inspection, treatment, or rinsing.

The component working volume for each of the baths is 5000 x 1950 x 850 mm (*i.e.* the space available within an individual bath without interfering with internal structures such as heating soils, sparge pipes *etc.*).

Table 2-1: *Anodise process stations 1 to 4*

	Station 1	Station 2	Station 3	Station 4
Process	Loading	Alkaline Cleaner	DI Rinse	Water Break Free Inspection
Working Volume (litres)	-	15,714 litres	14,405 litres	-
Freeboard (mm)	-	175 mm	-	-
Temperature Range (°C)	-	40 – 60 °C 45 – 60 °C	<35 °C	-
LEV	-	Yes	No	No
Fugitive Controls	-	Lidded during operation	No	No
Bath Level Controls	-	Yes	Yes	-
Bath Lining Material	-	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel
Secondary Containment	-	Yes Sump/Bund 1	Yes Sump/Bund 1	Yes Sump/Bund 1

The water break test (Station 4) is a simple and quick to test for contaminants, oil, and other hydrophobic films. The test simply immerses the part in fresh, clean rinse water at a vertical or angle to look for complete “sheeting” or shedding of water. Any droplets that form rather than sheet can indicate oils or other residues.

Table 2-2: *Anodise process stations 5 to 8*

	Station 5	Station 6	Station 7	Station 8
Process	DI Rinse	Aluminium etch	Aluminium etch	DI Rinse
Working Volume (litres)	14,405 litres	15,714 litres	15,714 litres	14,405 litres
Freeboard (mm)	-	175 mm	175 mm	-
Temperature Range (°C)	<35 °C	Ambient	Ambient	<35 °C
LEV	No	Yes	Yes	No
Fugitive Controls	No	Lidded during operation	Lidded during operation	No
Bath Level Controls	Yes	Yes	Yes	Yes
Bath Lining Material	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel
Secondary Containment	Yes Sump/Bund 1	Yes Sump/Bund 1	Yes Sump/Bund 1	Yes Sump/Bund 1

Table 2-3: *Anodise process stations 9 to 12*

	Station 9	Station 10	Station 11	Station 12
Process	Aluminium pickle	TFSA Ti Etch/Pickle	Ti Pre-etch/Pickle	Desmut
Working Volume (litres)	15,714 litres	15,714 litres	15,714 litres	15,714 litres
Freeboard (mm)	175 mm	175 mm	175 mm	175 mm

	Station 9	Station 10	Station 11	Station 12
Temperature Range (°C)	40 – 60 °C Ambient	15 – 26 °C Ambient	15 – 26 °C Ambient	10 – 25 °C 30 – 40 °C Ambient
LEV	Yes	Yes	Yes	Yes
Fugitive Controls	Lidded during operation	Lidded during operation	Lidded during operation	Lidded during operation
Bath Level Controls	Yes	Yes	Yes	Yes
Bath Lining Material	Chlorinated polyvinyl chloride (CPVC)	Polyvinylidene Fluoride (PVDF)	PVDF	Polypropylene
Secondary Containment	Yes Sump/Bund 1	Yes Sump/Bund 2	Yes Sump/Bund 2	Yes Sump/Bund 2

Table 2-4: *Anodise process stations 13 to 16*

	Station 13	Station 14	Station 15	Station 16
Process	DI Rinse	Thin Film Anodise	Thin Film Anodise	DI Rinse
Working Volume (litres)	14,405 litres	17,487 litres	17,487 litres	14,405 litres
Freeboard (mm)	-	175 mm	175 mm	-
Temperature Range (°C)	<35 °C	24 – 27 °C Ambient	24 – 27 °C Ambient	Ambient
LEV	No	Yes	Yes	No
Fugitive Controls	No	Lidded during operation	Lidded during operation	No
Bath Level Controls	Yes	Yes	Yes	Yes
Bath Lining Material	Polypropylene	Polypropylene	Polypropylene	316 Stainless Steel

	Station 13	Station 14	Station 15	Station 16
Secondary Containment	Yes Sump/Bund 2	Yes Sump/Bund 2	Yes Sump/Bund 2	Yes Sump/Bund 3

Table 2-5: *Anodise process stations 17 to 20*

	Station 17	Station 18	Station 19	Station 20
Process	DI Rinse	Ti Conversion Coat	Anodise Seal	Anodise Seal
Working Volume (litres)	14,405 litres	15,714 litres	15,714 litres	15,714 litres
Freeboard (mm)	-	175 mm	175 mm	175 mm
Temperature (°C)	Ambient	21 – 33 °C Ambient	30 – 38 °C 35 – 45 °C	30 – 38 °C 35 – 45 °C
LEV	No	Yes	Yes	Yes
Fugitive Controls	No	Lidded during operation	Lidded during operation	Lidded during operation
Bath Level Controls	Yes	Yes	Yes	Yes
Bath Lining Material	316 Stainless Steel	PVDF	316 Stainless Steel	316 Stainless Steel
Secondary Containment	Yes Sump/Bund 3	Yes Sump/Bund 3	Yes Sump/Bund 4	Yes Sump/Bund 4

Table 2-6: *Anodise process stations 21 to 24*

	Station 21	Station 22	Station 23	Station 24
Process	DI Rinse	Warm DI Rinse	Hot Water Seal	DI Rinse
Working Volume (litres)	14,405 litres	15,714 litres	15,714 litres	15,714 litres
Freeboard (mm)	-	-	175 mm	175 mm
Temperature (°C)			88 – 93 °C 15 – 30 °C	32 – 38 °C 15 – 30 °C
LEV	No	No	Yes	No
Fugitive Controls	No	No	Lidded during operation	No
Bath Level Controls	Yes	Yes	Yes	Yes
Bath Lining Material	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
Secondary Containment	Yes Sump/Bund 4	Yes Sump/Bund 4	Yes Sump/Bund 4	Yes Sump/Bund 4

Table 2-7: *Anodise process stations 25 to 28*

	Station 25	Station 26	Station 27	Station 28
Process	DI Rinse	Hot Drying Oven	Hot Drying Oven	Unload
Working Volume (litres)	14,382 litres	-	-	-
Freeboard (mm)	-	-	-	-
Temperature (°C)	Ambient	<90 °C	<90 °C	-
LEV	No	-	-	-
Fugitive Controls	No	-	-	-

	Station 25	Station 26	Station 27	Station 28
Bath Level Controls	Yes	-	-	-
Bath Lining Material	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel	-
Secondary Containment	Yes Sump/Bund 4	-	-	-

The 'nominal' freeboard that that is included within the process line design is 175 mm (greater than the required BAT standard). This will vary slightly with cascade levels between some tanks and varying product volumes.

2.3 Chemical Storage and Dosing

The anodise line has been designed to work using chemical bath top up supplied from self-contained Safetainers located adjacent to the process baths. The proposed type and number of Safetainers is outlined in **Table *2-8***.

Table 2-8: *Safetainers associated with the new anodise process line*

Description	Safetainer 1	Safetainer 2	Safetainer 3
Bath 2 (Alkaline Clean)	Bonderite C-AK 4215 NC-LT Aero SURTEC 061	SURTEC 089	-
Bath 6 (Aluminium Etch) Bath 7 (Aluminium Etch)	Bonderite C-AK Alum Etch 2 Sodium glucoheptonate Sodium hydroxide	-	-
Bath 9 (Aluminium pickle)	SOCOSURF A1858 SURTEC 181 DP1002 RW-5562 DP1002 RW-7255	SOCOSURF A1806	-

Description	Safetainer 1	Safetainer 2	Safetainer 3
Bath 10 (TFSA Titanium Etch/Pickle) Bath 11 (Titanium Pre-etch/Pickle)	HF acid (40%)	Nitric acid (55%)	-
Bath 12 (Desmut)	ARDROX 295GD		-
Bath 14 (Thin film anodise) Bath 15 (Thin film anodise)	Sulphuric acid	-	-
Bath 18 (Titanium Conversion Coat)	Tribasic Sodium Phosphate	Potassium Fluoride	HF acid (40%)
Bath 19 (Anodise seal) Bath 20 (Anodise seal)	SOCOSURF TCS SURTEC 650V	-	-
Bath 23 (Hot water seal)	Sodium Dichromate	SOCOSURF PACS	Hydrogen peroxide
Bath 24 (Wait with capacity)	-		

All chemical additions shall be from the locally stored Safetainers via Grundfos dosing pumps controlled by the line programmable logic controller (PLC). All pipework is to be double contained from supply IBC/Safetainer through to process bath.

2.4 Primary Containment

The primary containment systems (process baths) have been designed in consideration of the process chemicals. There is a mild steel frame on all process baths with a Glass Reinforced Plastic (GRP) outer on all plastic lined tanks.

The specific process bath linings are:

- Stainless Steel 316L – Process baths 16, 17, 19, 20, 21 ,22, 23 and 24.
- Stainless Steel 304L – Process baths 2, 3, 4, 5, 6, 7, 8 and 25.
- Polypropylene – Process baths 12, 13, 14 and 15.

- Chlorinated polyvinyl chloride (CPVC) – Process baths 9, 10 and 11.
- Polyvinylidene Fluoride (PVDF) – Process baths 10, 11 and 18.

All tanks are to be raised off the floor of the secondary containment to allow inspection and cleaning.

All baths not fitted with LEV exhaust ducts will be fitted with suitable drip shields between adjoining baths to stop solution spillages into the secondary containment and to prevent/minimise drag-out.

Inspections of the baths will be necessary in accordance with the manufacturers recommended intervals to ensure on-going service integrity. The recommended periods between inspections are stated in the maintenance manual. These periods are based upon several relevant factors such as design and construction standards and the contents of specific vessels. If, however operational experience suggests that a shortened period between inspections is required then this will be agreed with the supplier.

All baths will be inspected externally on a regular basis (as recommended in the operating manual). This should be to note any leaks, damage, defects, or any other deterioration. If any defects are noted, they will be reviewed with the manufacturer to agree any remedial action. Baths manufactured with a chemically resistant liner will require internal inspection at regular intervals. These periods between inspections will be as recommended in the operating manual. Internal inspections will be undertaken by experienced personnel and will include both visual inspection and formal non-destructive testing (NDT) (where required).

The primary containment systems meet the minimum BAT requirements.

2.5 Secondary Containment

The new anodise line is located within a four-part divided secondary containment system with defined acid/alkali segregation although mixing is possible if very large volumes are released (HAZID System Description).

The secondary containment system has been designed in accordance with current CIRIA Guidance (CIRIA, 2014). The BAT requirement is:

Where a single bulk liquid tank is bunded, the recommended minimum bund capacity is 110 per cent of the capacity of the tank. Where two or more tanks are installed within the same bund, the recommended capacity of the bund is the greater of 110 per cent of the capacity of the largest tank within the bund or 25 per cent of the total capacity of all of the tanks within *the bund, except where tanks are hydraulically linked in which case they should be treated as if they were a single tank.*

The sizing of the secondary containment is outlined in **Table *2-9***.

Table 2-9: *Secondary containment assessment (CIRIA C736F)*

Tank Ref	Bund 1	Bund 2	Bund 3	Bund 4
Total capacity of the tanks (in bund)	114.2 m^3	106.4 m^3	46.8 m^3	120.2 m^3
Rule 1 – 25% of total volume of tanks	28.55 m^3	26.6 m^3	11.7 m^3	30.05 m^3
Rule 2 – 110% the volume of biggest tank	17.6 m^3	19.5 m^3	17.6 m^3	17.6 m^3
Bund Volume (m^3)	41.07 m^3	37.23 m^3	18.02 m^3	43.76 m^3
Conclusion	BAT	BAT	BAT	BAT
Notes: Bund volume calculated by supplier from CAD plans. Bund 1 contains the following baths – Bath 2 (17.6 m3), Bath 3 (14.6 m3). Bath 5 (14.6 m3)				

Level alarms are located on the bund sumps which initiate evacuation and are relayed to the gatehouse. All chemical tanks have an overflow into bund (rinse tanks have a weir to drain).

The anodising line (upon completion) is to have a chemically resistant lining system applied to the secondary containment, drainage troughs, all vertical and horizontal surfaces including sump-units located within the secondary containment. The proposed materials are supplied via Kemtile Ltd:

- STONCHEM 878 (lining to horizontal surfaces) – This is a highly cross-linked, vinyl ester lining system applied at a nominal thickness of 3.5mm. The mortar, engineering fabric, mortar coat, and mineral composite topcoat sequencing provides a smooth, heavy-duty, chemical barrier which is resistant to thermal shock, thermal cycling, static cracks, permeation and abrasion. The Stonchem 878 system has excellent resistance to a broad base of chemicals, including strong organic acids, alkalis, solvents and moderate to strong inorganic acids. Where the Stonchem 888 will be incorporated into the finished profile is through the Topcoat application due to its superior hydrofluoric acid & oxidizer resistance.
- STONCHEM 855 (lining to vertical surfaces) – Stonchem 855 is a highly cross-linked, vinyl ester lining system applied at a nominal thickness of 1 mm. The resin, engineering fabric

and mineral composite topcoat sequencing provides a light duty chemical barrier for occasional foot traffic which is resistant to static cracks and moderate thermal shock. The Stonchem 855 system has excellent resistance to a broad base of chemicals, including strong organic acids, alkalis, solvents and moderate to strong inorganic acids.

Full details are outlined within the technical specification provided within the application package (Ref. Lining System - 21K1154S Technical Document).

The secondary containment systems meet the minimum BAT requirements.

2.6 Tertiary Containment

All areas surrounding the anodise line are composed of good quality hardstanding. As these are deemed as traffic routes (under Regulation 12 of *The Workplace (Health, Safety and Welfare) Regulations 1992*) thy are subject to regular inspection and (where required) repair.

Where chemicals are stored, additional resistant industrial coatings shall be applied (supplied by Kemtile Ltd).

The tertiary containment systems meet the minimum BAT requirements.

2.7 Effluent Handling

All rinse water effluent will be handled and treated though the use of the existing permitted effluent treatment plant (ETP). The changes proposed to the current ETP are outlined in *Section 3*.

It is important to note that the introduction of the new anodise process line will not require any chemistry or treatment system changes. The current Emission Limit Values (ELVs) from point TE1 remain valid/unchanged. No changes to the final United Utilities discharge (point TE3) are required.

2.8 Abatement Systems

A single emission point to atmosphere is associated with the new anodise process line, emission point Ref. A10 (AE26). The fume scrubber is located on the southern side of the CTF building (***Figure 2-1***) adjacent to the permitted PFD scrubber Ref. A5 (AE5) (***Figure 2-2***).

The anodise scrubber was installed at the same time as the PFD line which was subject to a permit variation in 2016. It has taken longer than expected to get the new non-Chromic acid anodise process approved for military aircraft applications hence the scrubber remained unused.

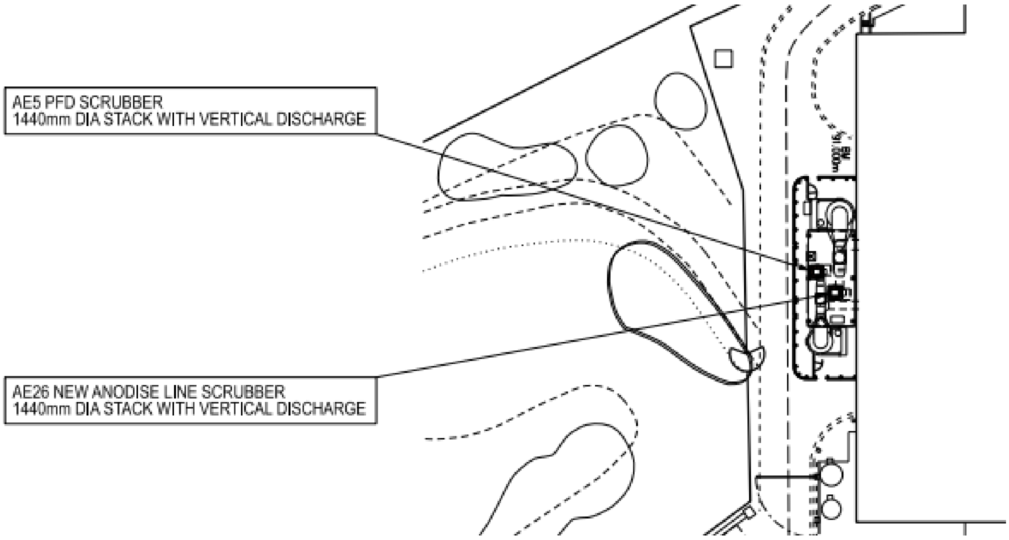


Figure 2-1: *Location of anodise scrubber*

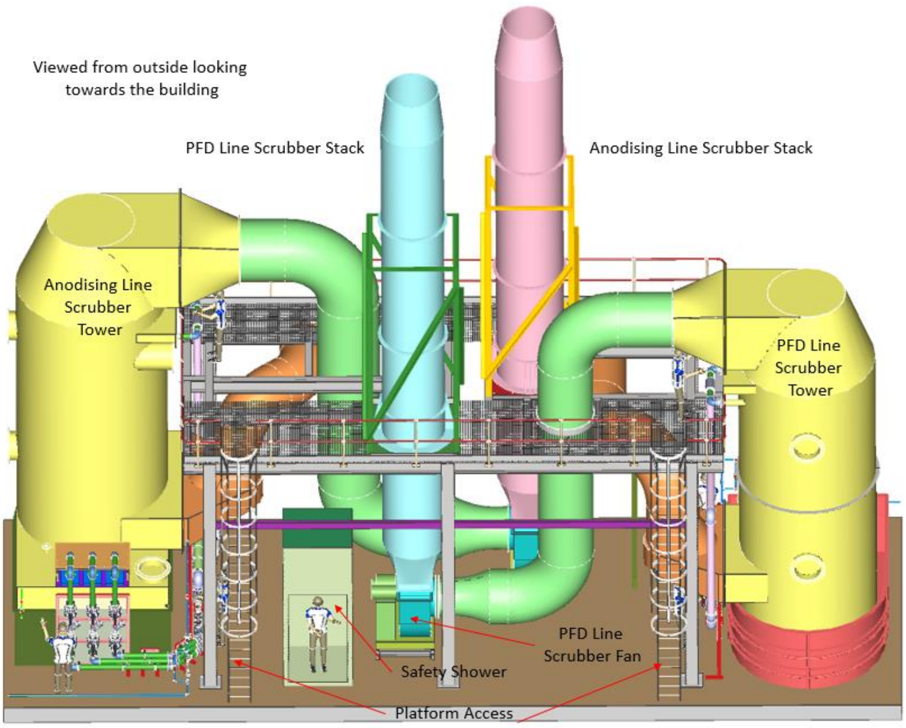


Figure 2-2: *External layout of the scrubber units*

The key features of the CTF building (including the scrubbers) are outlined in **Table *2-10***.

Table 2-10: *CTF and Scrubber Data*

Item	PFD (Ref. A5-AE5)	Anodise (Ref. A10-AE26)
Number of flues	1	1
Grid Ref	363603, 431120	363606, 431121
Release height (m)	15.00	15.00
Main body diameter (m)	1.3	1.4
HV cone diameter (m)	0.9	1.1
Peak building height (m)	11.85 m	11.85 m
Notes Both the PFD (A5-AE5) and Anodise (A10-AE26) are greater than 3 metres above the peak of the adjacent CTF building (meets minimum required).		

Photograph 2-1: *Installed scrubbers at rear of CTF building*

The anodise line fume scrubber system is capable of handling and treating between 27,300 m^3/hr (process line is in standby, ready to process) and 50,850 m^3/hr (when two transporters are operational on the process line).

The scrubber fan extracts process air from the low-level ducting (lip extraction) surrounding the process tanks and from the high-level ducting (above the process baths) which engages with the transporter dampers.

The scrubber consists of an exhaust fan, stack or chimney, a tower, spray delivery system and a bunded reservoir complete with instrumentation (**Figure *2-3***).

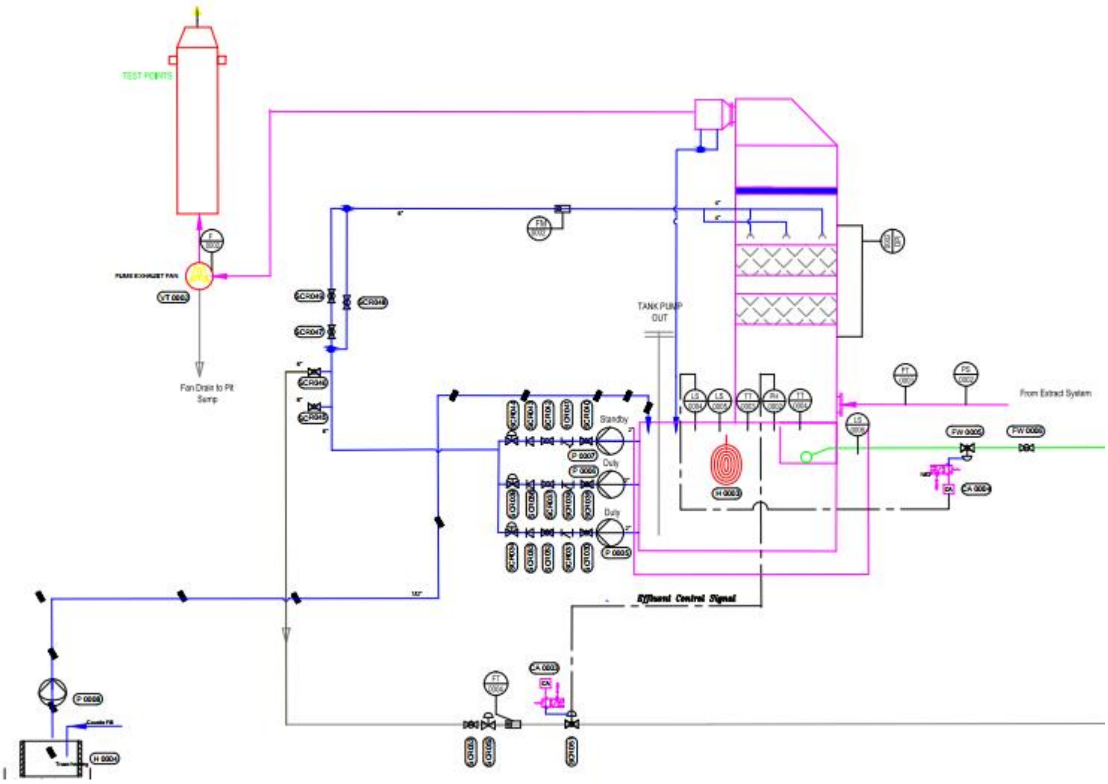


Figure 2-3: *Anodise scrubber system*

The exhaust fan draws the fumes from the lip extraction and the high-level ducting through the scrubber tower. There are three spray pumps in total, two duty pumps (always running whilst the process line is in standby or operating mode) and one standby pump. The spray pumps are continuously spraying water from the reservoir over the Pall Rings. The Pall Rings have an intricate honeycomb/snowflake structure that presents a large surface area to the exhaust gases which encourages their interaction with the spray water. The spray water rinses the particles from the fumes and the resulting solution is deposited into the reservoir below the tower. The remaining gas/clean air is then passed through a droplet separator/demister to remove any droplets before being exhausted through the scrubber stack.

2.8.1 Performance Monitoring Systems

The scrubber system is monitored for quality and performance by checking the incoming exhaust gas pressure and flow, the differential pressure across the Pall Rings or bed and the water flow through the spray system.

The incoming exhaust gas pressure must be above a pre-set level which is monitored by a digital pressure level detector/switch (PS-0002). The pressure switch point will be set during commissioning.

The incoming exhaust gas flow must be above a pre-set level which is measured by a flow meter. The flow switch point will be set during commissioning.

The differential pressure across the Pall Rings or bed will give an indication of the state of the bed (DPI-0002). A higher differential will mean that the bed is becoming exhausted and needs cleaning. Maintenance will then be undertaken in-line with the manufacturer's recommendations.

The flow through the spray line will be monitored by flow meter (FM-0002) to ensure that the required level of spray has been dispensed over the known flow rate of exhaust gases through the scrubber. These three parameters will be used to balance the complete system and ensure that the quality of the solution remains within the required ranges.

The base reservoir is initially filled with mains water and the level monitored by the PLC. The reservoir will be topped up automatically be means of a float valve. The level in the reservoir is monitored by two dual level switches. If the level drops too low the control system will actuate the mains water supply air valve by turning on air supply valve. If the level gets too high the control system will inhibit any further filling of the reservoir by closing the water supply air valve. The float valve acts as a secondary control valve. Should the reservoir overflow the level switch in the bund will detect this and stop the process.

The solution in the reservoir is also checked for temperature and PH. There are two temperature sensors (TT-0004 and TT-0003) and a single PH sensor (PH-0002). The temperature of the reservoir should be above 5°C and below around 7 to 8°C. If the reservoir temperature falls below 5°C the control system will switch on the heater in the reservoir. This operational temperature range will be set during commissioning.

The pH of the reservoir is monitored (PH-0002) to ensure the reservoir solution does not become too acidic or alkaline. The initial pH will be around 7.5 but can operate between 7 and 10. The pH value required for the process will be defined over time.

The emissions from the stack will be monitored over a period to determine how the process will affect the pH. Once this is known a dosing regime will have to be put in place to ensure that the pH stays within the required range during normal operation. Should it be required that the solution in the reservoir needs to be of a higher pH then the system can dose the reservoir with caustic (typically 20% Sodium hydroxide) to increase the pH. The system can be supplied with a dosing pump for this operation (if required).

The stack height, associated with the new installation, have been calculated by Norman Hay Engineering using Technical Guidance Note D1 (HMIP, 1993). The design calculations are provided as an attachment.

The proposed TFSAA process and associated abatement (scrubber with mist eliminator) meets the required BAT standard.

3 Operations – Effluent Treatment Plant

3.1 Introduction

There are two Effluent Treatment plant (ETPs) associated with the installation, one in 1-Shed and one in the CTF. The modifications to the CTF ETP are required due to the replacement of the current permitted Chromic acid anodise line. No modifications are proposed to the ETP located within 1-Shed.

The CTF effluent plant currently produces de-ionised (DI) water for the process line rinse tanks and the adjacent 3B machine shop. It also treats the rinse waters from the process lines, this is either recycled back into the DI system or treated so it can be discharged into the on-site effluent system prior to discharge to sewer (under United Utilities consent). The current DI water and effluent plant has insufficient capacity to cope with the requirements for the new anodise line. This variation will enable the DI water system to increase production from 15,000 litres/hr to 35,000 litres/hr with temporary storage within a new 60 m^3 above ground storage tanks (AST).

3.2 Proposed Changes

The current CTF external tank farm (which is part of the permitted area) contains a series of ASTs located within a bunded area (**Figure *3-1***).

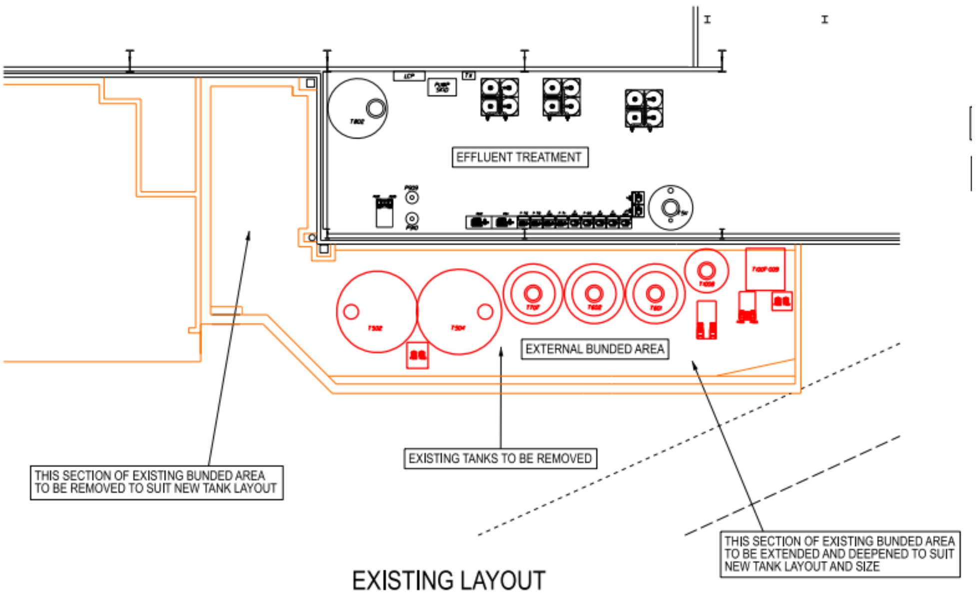


Figure 3-1: *Current external ETP layout*

The proposal is to undertake the following works:

- remove the existing ASTs and associated equipment located within the external bund;
- amend size and shape of secondary containment system to account for new ASTs;
- install a steel platform (mezzanine) to allow safe access to the new ASTs; and
- install new (replacement) softener and carbon reverse osmosis (RO) pre-treatment system;
- install six new (replacement) chemical storage ASTs and one deionised water AST.

The layout (post-completion) is outlined in **Figure *3-2***.

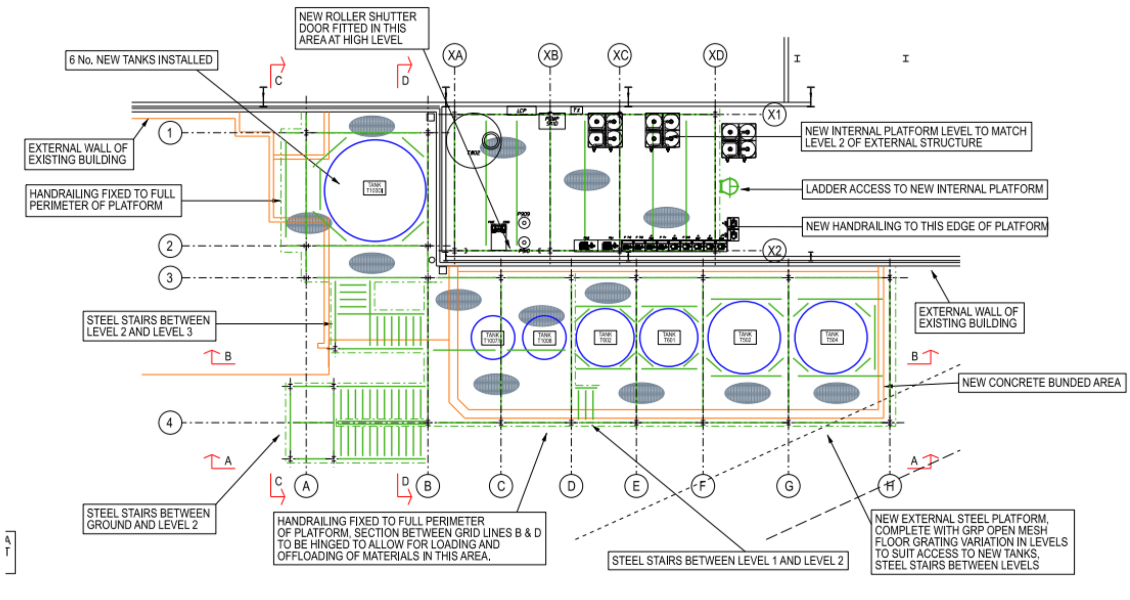


Figure 3-2: *Proposed external ETP layout*

The new ASTs that will be installed are outlined in **Table *3-1***.

Table 3-1: *ETP – new replacement ASTs*

Tank Ref	Tank Size (m^3)	Description
T103DI	60	De-ionised water storage tank. Secondary containment has not been provided as the tank only stores water. This was agreed with the local EA inspector.

Tank Ref	Tank Size (m^3)	Description
T1007/9	2.5	Waste waters, DI water with trace chemicals.
T1008	2.5	Recycle waste waters, DI water with trace chemicals.
T602	10.5	47% Sodium Hydroxide. Self-bunded tank due to space constraints.
T601	8.5	50% Sulphuric Acid Storage Tank. Self-bunded tank due to space constraints.
T502	20	Acidic waste from DI regeneration (low pH – weak acid).
T504	20	Alkali waste from DI regeneration (high pH – weak alkali).

3.3 Containment Systems

The chemical ASTs are wholly located within a re-engineered secondary containment system composed of a 300 mm foundation slab and concrete walls. The four largest tanks are located on 150 mm plinths located on the foundation slab. The secondary containment system has been designed in accordance with current CIRIA Guidance (CIRIA, 2014). The CIRIA assessment is outline in **Table *3-2***.

Table 3-2: *Secondary containment assessment (CIRIA C736F)*

Tank Ref	Description
Total capacity of the tanks (within bund)	64 m^3
Rule 1 – 25% of total volume of tanks Rule 2 – 110% the volume of biggest tank	16 m^3 22m^3 (Tank 502/T504 is 20m^3)
Overall bund volume (without tanks)	50 m^3
Volume of tanks within bund	16 m^3
Bund capacity (with tanks)	34 m^3
Conclusion	Using the 110% rule the bund capacity (with tanks) is more than the minimum required (meets BAT).

The finished floor level drains the secondary containment system to a blind sump located within the secondary containment. The secondary containment system and sump is to be lined with Stonchem 878 a highly cross-linked, vinyl ester lining system that has excellent chemical resistance to a broad range of acids, bases and solvents, engineered to resist cracking and (when the final topcoat is applied) significantly increased impermeability.

As of June 2023, the works to install the revised ETP layout are underway. The base of the new secondary containment and associated tanks are outlined in **Photograph *3-1***.

Photograph 3-1: *View of bund showing gravity feed tanks T1007 and T1008*

A high-level view of the installed tanks and the associated mezzanine structure is shown in **Photograph *3-2***.

Photograph 3-2: *New tanks located within revised secondary containment*

3.4 Rinse Water Volumes

The current ETP and storage tanks allow the CTF to recycle 65% of the waters (which are re-used within the process) with the remaining 35% subject to treatment and disposal to sewer (via point TE1). The proposed variation will allow the volume recycled to go from 9.75 m^3/hr to 22.75 m^3 with the treated discharge increasing from 5.25 m^3/hr (126 m^3/day) to 12.25 m^3/hr (294 m^3/day).

The effluent from CTF (TE1) is combined with the effluent from 1-Shed (TE2) at point TE3 where it is discharged to the United Utilities sewer (via the local pumping station). The current discharge limit to sewer is 1,300 m^3/day (within the environmental permit) and 1,100 m^3/day (within the discharge consent Ref. Blackburn WwTW 716T3-1-287). It is important to note that the release to sewer at point TE3 is also combined with rainwater.

The release volumes (from TE3) to sewer for 2022 are summarised in **Table *3-3***.

Table 3-3: *Discharge volumes to sewer (TE3), 2022*

Month	Daily Average (m3)	Max Daily Discharge (m3)	Rainfall (mm)
January	474	944	40.8
February	769	2998	120.8
March	416	810	25.6
April	378	717	30.6
May	422	950	64.2
June	349	901	43.4
July	326	514	43.6
August	452	810	42.8
September	500	865	22.4
October	654	1910	78.6
November	714	1325	81.6
December	496	1292	77.6

It can be seen in **Table *3-3*** that the daily limit is sometimes exceeded where this corresponds with increased rainfall (*i.e.* during the winter months). The EA is aware of this, and the annual discharge volumes are formally reported to the EA. It is not anticipated that the additional discharge volumes from TE1 will lead to significant additional volumes being discharge to sewer (*i.e.* the site will remain in compliance with the current limits). However, sporadic rainfall events (in the winter months) will lead to temporary (daily) exceedances.

3.5 Chrome Reduction

The current ETP within CTF utilises a Chrome reduction process to treat the rinse waters containing Cr(VI) generated from the current Chromic acid anodising process through addition of Sodium Bisulphate and Sulphuric acid. A mechanical agitator aids the mixture of the wastewater sources and sodium bisulphite or sulphuric acid reagent, dosed under pH and mV control, that enables the pH of the resultant solution to be adjusted to promote a hexavalent chromium reduction reaction *i.e.* Cr(VI) to Cr(III).

Once the replacement anodise process line comes on-line there should be no need for the Chrome reduction process within the ETP *i.e.* it will be removed. The new anodise process line does not include a rinse after the seal (containing potassium dichromate) has been applied in Bath 23 hence there is no potential transfer of Cr (VI) into the wastewater. If Bath 23 needs to be emptied this will be undertaken using a tanker with the resulting effluent being treated off-site.

The installation and operation of a ETP continues to meet the required BAT standard.

4 Operations – Tanker Loading Area

4.1 Introduction

As part of the ongoing improvements at the site (in-line with BAT) BAE Systems has redesigned and improved the tanker unloading area (**Figure *4-1***).

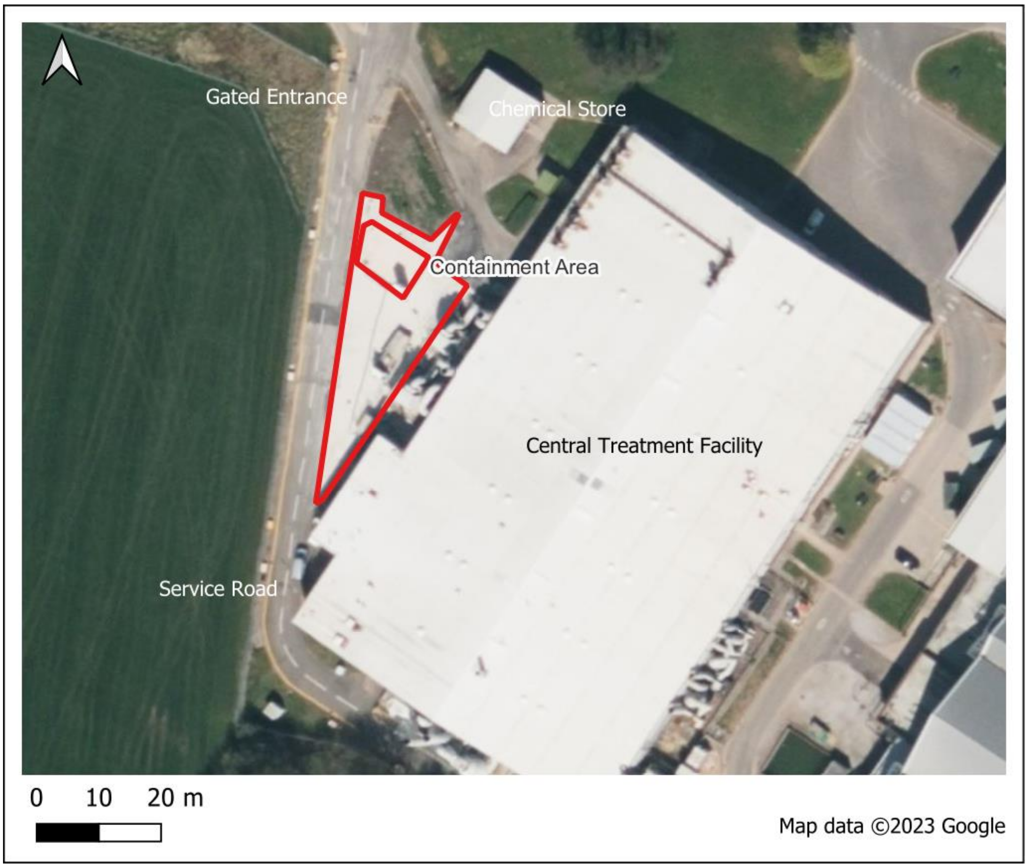


Figure 4-1: *Tanker unloading bay at CTF*

The previous procedure was for road tankers to park on the service road and the surrounding surface water drains to be sealed (during the delivery procedure) using drain covers. The primary issue with this approach was the limited containment capacity offered by the road kerbs in the event of a major loss of containment.

4.2 Process Improvements

The improvements undertaken have included:

- the installation of a new reinforced concrete hardstanding pad adjacent to the western edge of the CTF building falling to a centrally installed Arco Road drainage channel (PD 200 F 30.3);
- the installation of a purpose designed concrete containment area into which the Arco Road drainage channel discharges;
- the installation of a concrete sump within the base of the containment area which is then connected to the surface water drainage network via a 225 mm diameter outlet; and
- the installation of a castell key interlock system that requires the surface water isolation value to be closed before a delivery or chemical pump over can occur.

4.3 Containment Systems

The system has been designed to comply with current CIRIA Guidance on the design of tanker offloading and loading facilities (CIRIA, 2014). The design has considered the compartment volume(s) of the road tankers that attend the site and the maximum loading and/or unloading rate. The management of firewater and/or rainwater volumes has not been directly considered within the design due to the available space, risk profile of the materials being handled and the proposed operational procedures for the use of the facility (*i.e.* it is primarily a temporary containment facility for use during loading/unloading only).

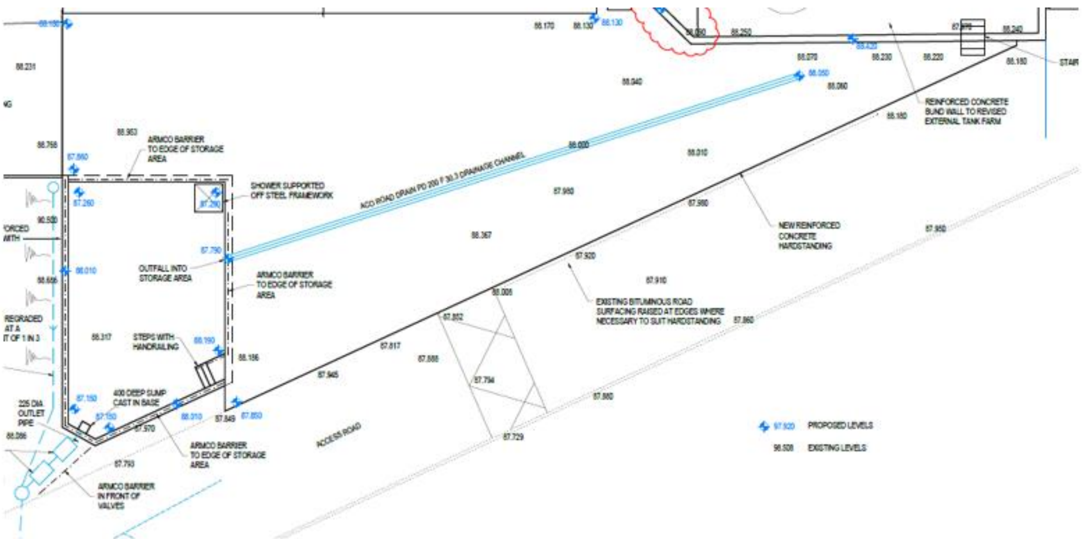


Figure 4-2: *Design of CTF tanker unloading bay*

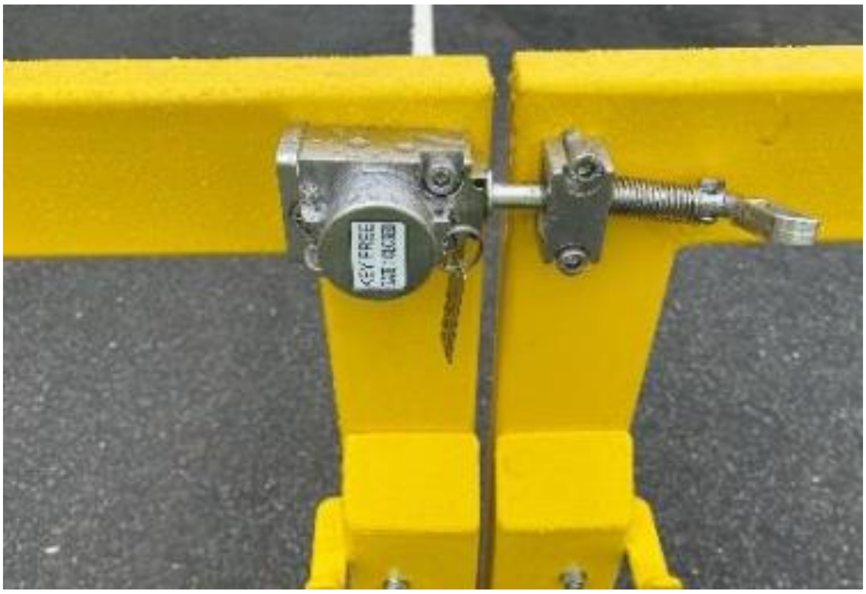
The concrete pad (where the tankers park during loading/unloading) has a containment capacity of 2.9 m^3 before the loss of containment into the adjacent service road. The concrete containment area has a design capacity of 36.894 m^3 given a total storage capacity of 39.794 m^3.

A typical articulated unit (assuming single compartment) can hold between 30,000 (30 m^3) and 37,500 litres (37.5 m^3) therefore, based on the design capacity the containment system containment should be achieved (assuming worst case).

The chemical delivery process has been defined within a written procedure. The procedure covers:

- isolation of the surface water valve to release the gate entry key (**Photograph *4-1***);
- entry of a driver into the delivery area (**Photograph *4-2***);
- normally delivery (*e.g.* waste store, paint store or chemical store);
- chemical pump over to ASTs (**Photograph *4-3***); and
- emergency procedures.

Photograph 4-1: *Isolation value fitted to surface water release (with Castell key interlock)*



Photograph 4-2: *Gate lock fitted with Castell key interlock*

Photograph 4-3: *Sulphuric acid pump over Castell ley interlock*

The installation of the tanker unloading bay is considered a significant improvement over the previous system. The new process meets the required BAT standard.

5 Operations – Solvent Degreasing

5.1 Introduction

The chemi-etch process line (stationary technical unit) located within 1-Shed has a direct technical connection to a solvent vapour degreasing unit. The unit, when it was initially installed, used Trichloroethylene (TCE).

The environmental permit is currently out of date as Perchloroethylene (PERC) is currently used as the degreasing solvent due to the implementation of the REACH Directive (now called UK-REACH).

5.2 Trichloroethylene

TCE was added to Annex XIV of REACH on April 21st, 2013. This included the confirmation of the sunset date after which TCE cannot be supplied or used except when an authorisation has been granted, or for uses which are exempt from authorisation.

REACH states: *"A manufacturer, importer or down-stream user shall not place a substance on the market after the sunset date for a use or use it himself if that substance is included in Annex XIV unless the use(s) of that substance has been authorised or the date referred to in article 58(1)(c)(i) [sunset date] has not been reached."*

The sunset date for TCE was 21st of April 2016 unless an authorisation is granted for a specific use/application under certain conditions.

5.3 Replacement Solvent

The replacement solvent chosen for the degreasing unit was Perchloroethylene (PERC), Chemical Abstract Service (CAS) Registry number 127-18-4. The substance (as of June 2023) has been pre-registered, registered, and subject to evaluation under REACH. The substance has not been added to either the Candidate (Annex XIV – Authorisation list) or Restricted list (Annex XVII – Restriction list).

The substance continues to be used within a fully enclosed degreaser (BAT compliant) fitted with an activated carbon filtration system. Due to the limited use of the degreaser and the performance of the system, on average, less than 0.5 tonne of solvent is used per annum (*i.e.* below the 1 tonne Part B permit threshold stated within the Solvent Emission Directive). The operation of the solvent degreasing operation continues to meet the required BAT standard.

6 Decommissioning of Equipment

6.1 Introduction

This variation includes the decommissioning and removal of certain (previously permitted) activities. They include:

- Post-commissioning/productionisation acceptance, the removal of the current permitted chromic acid metal anodising process line located wholly within the CTF building. This includes the removal of the two existing external scrubber units (AE1 and AE2) located on the western side of the CTF building.
- Update permit to remove all references to the 'Clean and Pickle line' following decommissioning of the process line during 2022. This includes the removal of air emission points AE3 and AE4 and all associated equipment.

The activities to be removed from the environmental permit (within CTF) are outlined in **Figure *6-1***.

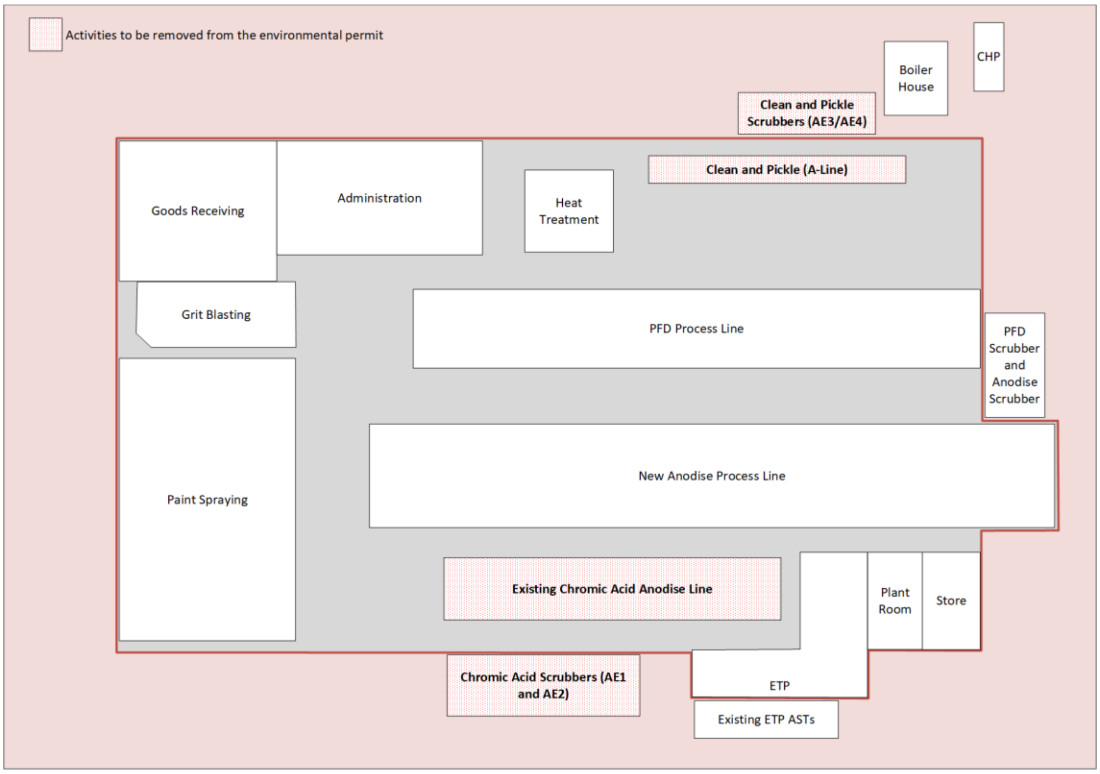


Figure 6-1: *Block diagram showing activities to be removed from permit within CTF*

The basic decommissioning process applied by BAE Systems is described in **Figure *6-2***.

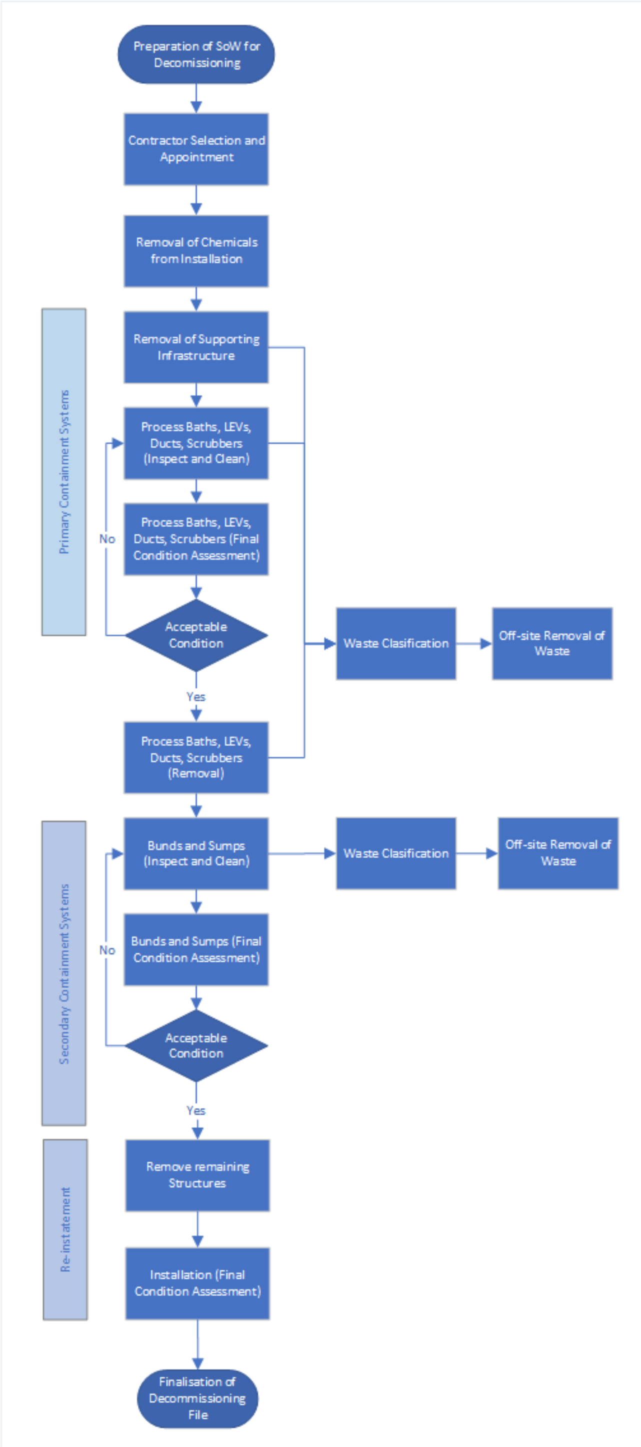


Figure 6-2: *Permitted installation decommissioning process*

6.2 Decommissioning Process

The information set out in this section represents the methodology and techniques by which BAE Systems will decommission its permitted installation (either partially or fully). The detailed procedures of how the plant will be decommissioned will be reviewed from time to time considering significant changes to the installation and will thus form part of the sites environmental management system.

The Site Closure Plan addresses the cessation of the activities described in the main application document, the decommissioning of the plant and clean-up of any contamination that may have occurred during the lifetime of the permitted operation. The principal objectives of the site closure plan are:

- removal of all potentially polluting materials from the site;
- re-assess the site condition and identify any remediation requirements (associated with the permitted operation);
- minimise the quantities of unused chemicals and feedstocks (unless they can be utilised elsewhere);
- define a drain down and clean in place (CIP) strategy, focusing on environmentally acceptable practices; and
- define a removal and reinstatement strategy, taking into consideration the former condition of the site.

6.2.1 Plant and Equipment

On cessation of activities associated with the installation, BAE Systems will ensure that all potentially contaminative materials are removed from the site. An audit of the site buildings and external areas will be undertaken to identify potentially polluting materials and likely problematic wastes or contaminated infrastructure that will need to be dealt with.

6.2.2 Building Infrastructure

BAE Systems will examine all areas where the permitted activity has occurred to evaluate whether there is a risk that the surrounding building infrastructure is contaminated. If potential issues of concern are identified, samples shall be obtained to quantify the levels present. BAE Systems will ensure that all waste materials are disposed of appropriately and in accordance with the Duty of Care and Hazardous Waste Regulations, where applicable.

6.2.3 Plant and Equipment

BAE Systems will endeavour to efficiently utilise plant and equipment and thus operate and manage the plant such that the lifecycle of plant and equipment is optimised *i.e.* they are maintained in a good state of repair and operational capability in-line with BAT requirements. Where operations cease on the site (partially or fully), it is anticipated that the plant and equipment associated with the installation, will be saleable and useable by others engaged in similar practices. If not, disposal will be the primary option. Plant and equipment would be fully cleaned before removal from the site.

6.2.4 Waste Containers and Materials

BAE Systems will ensure that all waste materials and empty drums, Intermediate Bulk Containers (IBCs), Safetainers *etc.* will be removed unless they can be utilised elsewhere on the site.

BAE Systems will ensure that as a final cleaning exercise, all areas where chemicals have been stored or used and where spillages may have occurred in the past will be cleaned down with either water, steam or other proprietary cleaning materials, depending upon circumstances. All effluent produced during this process will be contained and removed off-site by a specialist registered waste contractor. No discharge will occur to either the foul or stormwater systems. BAE Systems will ensure that all waste materials have been disposed of appropriately and in accordance with the Duty of Care and Hazardous Waste Regulations, where applicable.

6.2.5 Use of Third-Party Contractors

If the site clearance is assigned to contractors, they will be supervised by a representative of the company and as part of the contract be made fully aware, in writing, of their obligations and responsibilities with respects to the Duty of Care and other relevant environmental information such as discharges to storm water and wastewater.

6.2.6 Decommissioning File

Upon completion of the decommissioning works a file shall be maintained that includes:

- decommissioning photo log outlining the works undertaken;
- scope of works used to procure external contractors;
- contractor supplied method statements;
- waste transfer notes (WTNs) and consignment notes; and

- waste carrier and final disposal site permits (duty of care compliance).

6.3 Site Condition

The existing Chromic acid anodise line and the clean and pickle line are both within the current permitted area *i.e.* within the walls of the CTF building. There is no requirement, at this time, to surrender any part of the permitted area, hence, a formal assessment of site condition has not been undertaken.

All information collected during the decommissioning phase (as outlined within *Section 6.2.6*) will be maintained as a record within the EMS and will be provided (in the future) when the environmental permit is surrendered.

7 General Management Measures

7.1 Management System

BAE Systems Samlesbury has implemented and maintains an Environmental Management System (EMS) that is certified to ISO14001:2015. Certification was first gained, from LRQA (UKAS: 001), in November 2007. The current certificate (Ref. 10375614) is due to expire on 29th July 2024 upon which a full recertification will be undertaken.

The EMS continues to be maintained and is externally audited whilst delivering all indicative BAT requirements for an effective management system. The current management systems will be updated to include all the changes outlined within this variation application.

The site is also certified to ISO45001:2018 Occupational health and safety management systems - Requirements with guidance for use and ISO50001:2018 Energy management systems - Requirements with guidance for use.

The approval number(s) are ISO 14001 – 0002015-016, ISO 45001 – 0002014-016, ISO 50001 – 0009814-002.

7.2 Operations and Maintenance

The site uses a "risk" based approach for assessing the criticality of site equipment in terms of Health, Safety, Environment and Manufacturing. As well as the criticality of the plant the equipment is given a priority which determines how quickly an unplanned failure of said equipment is responded to.

Operator and maintenance manuals complete with facility drawings, hydraulic, pneumatic, electrical, and electronic circuit control diagrams are available alongside all service and maintenance schedules. Spares lists along with component fitting instructions are outlined in the maintenance manuals along with detailed instructions relating to the dismantling and subsequent re-assembly of any sub-assemblies. The documents identify all planned maintenance on a time-scale plan covering the first 5 years of the equipment’s life. The site will establish and will maintain a Planned Preventative Maintenance (PPM) schedule for the revised equipment in-line with manufacturer’s recommendations.

Process specifications (*i.e.* operational procedures) associated with the process line can be provided upon request to the EA or viewed on-site. It is important to note that as this is a defence related industry release of some documents and procedures is restricted.

7.3 Accidents

The site has established and maintains an emergency plan for the entire site (*i.e.* permitted and non-permitted areas) as part of its ISO14001 EMS. The plans are subject to regular review and update.

A detailed Hazard Identification Analysis (HAZID) has been undertaken for the new anodise process line and associated CTF chemical handling processes. This review considered the failure modes associated with the revised process line that could damage the environment. Where required the emergency plans will be revised to take in to account any identified deficiencies.

Appropriate spill kits and absorbents are available throughout the area. These will be subject to regular inspection to ensure stock levels are maintained.

7.4 Incidents and non-conformances

Incidents and non-conformances are to be handled through the existing processes that form part of the ISO 14001 EMS.

7.5 Site security

The site and permitted installation are subject to Ministry of Defence (MoD) security controls and procedures. All access to the site and buildings is strictly controlled using swipe cards. Monitored CCTV and other detection systems are utilised throughout the Site. All employees are subject to security clearance procedures and visitors are always accompanied.

7.6 Staff Competence

The installation contractor is to provide a comprehensive training exercise that demonstrates all the key features of the new process line including operation and emergency controls. This training will be provided to a team of operators.

Revised training programmes are to be created (where required) to take account of the required core competencies for the new process line.

7.7 Records that demonstrate your management system

Records relating to the operation of the permitted installation are to be handled through the existing processes that form part of the ISO 14001 EMS. All records relating to the operation of the installation will be maintained as per the stated procedures.

7.8 Access to your permit

Access to the permit will be through existing internal systems. Where contractors undertake work within a permitted area the requirements of the permit are actively brought to their attention.

7.9 Permit surrender and closure

The original IPPC application (*Section 2.11*) included a detailed site closure plan that outlines the required steps to decommission the installation at the end of life, they include:

- Disconnection of electrical supply and make safe.
- Drain all reagents, chemicals and wastewater from system. All such materials should be considered hazardous and will need to be removed from site by tanker off-haul.
- During chemical removal, full chemical resistance PPE should be worn, and all pipework and equipment should be thoroughly rinsed before dismantling commences.
- All equipment, pumps, pipework, and tanks must be treated as contaminated waste and should be disposed of off-site by a suitably qualified disposal contractor. Full implications of duty of care should be borne in mind by all parties associated with this exercise.
- Other more usual hazards to be considered during decommissioning are manual handling, working at height, confined space (although it should not be necessary to work inside any of the tanks themselves).
- Risk assessment and method statements for the proposed work should be prepared considering the materials likely to be encountered, *i.e.* strong alkali, acid and any unknown compositions.

Upon cessation of activities BAE Systems would propose to follow the site closure plan that was previously submitted to the EA.

8 Energy and Climate Change

8.1 Basic Energy Information

8.1.1 Anodise Process Line

The electrical start-up and running load for each process bath is outlined within **Table *8-1***. There is no direct gas use associated with the new process line.

Table 8-1: *Start-up and running load by bath*

Bath	Start-up Load (kW)	Running Load (kW)
2	73.2 kW	33.4 kW
9	83 kW	45.6 kW
10	30 kW	5.4 kW
11	30 kW	5.4 kW
12	57 kW	14.5 kW
14	20 kW	7.9 kW
15	20 kW	7.9 kW
18	29 kW	12.2 kW
19	37 kW	11.8 kW
20	53 kW	23.3 kW
21	33.4 kW	9 kW
22	39 kW	16.8 kW
23	170 kW	170 kW
24	23 kW	9.8 kW
26	33.4 kW	9 kW
27	33.4 kW	9 kW
Total	**764.4 kW**	**391 kW**

The rating of the individual components (by type) is outlined in **Table *8-2*Table *9-2***. All blowers and pumps are variable speed drives. Besides saving energy, variable speed drives also help reduce maintenance costs, waste, and ambient noise emissions.

Table 8-2: *Anodise process line main energy use (electrical)*

Type	Bath	Ref	Total Capacity (kW)	Total Flow Rate (kg/s)	Flow Rate (m^3/h)	Drive Type
Hot water heaters	2	202-HX1/202-HX2	83	2.06	-	N/A
Hot water heaters	9	209-HX1/209-HX2	41.5	2.57	-	N/A
Hot water heaters	9	209-HX3/209-HX4	41.5	2.57	-	N/A
Hot water heaters	10	210-HX1	30	1.04	-	N/A
Hot water heaters	11	211-HX1	30	1.04	-	N/A
Hot water heaters	12	212-HX1	57	0.72	-	N/A
Hot water heaters	14	214-HX1	20	0.26	-	N/A
Hot water heaters	15	215-HX1	20	0.26	-	N/A
Hot water heaters	18	218-HX1	29	1.01	-	N/A
Hot water heaters	19	219-HX1/219-HX2	53	1.84	-	N/A
Hot water heaters	20	220-HX1/220-HX2	53	1.84	-	N/A
Hot water heaters	22	222-HX1	39	0.49	-	N/A

Type	Bath	Ref	Total Capacity (kW)	Total Flow Rate (kg/s)	Flow Rate (m^3/h)	Drive Type
Hot water heaters	24	224-HX1	39	0.49	-	N/A
Blower	2	600-LP-F1	26	-	1050	VSD
Blower	25	600-LP-F2	26	-	1050	VSD
Pump	5	205-P1	7.5	-	60	VSD
Pump	9	209-P1	7.5	-	10.2	VSD
Pump	14	214-P1	7.5	-	10.2	VSD
Pump	15	215-P1	7.5	-	10.2	VSD
Pump	19	219-P1	7.5	-	10.2	VSD
Pump	20	220-P1	7.5	-	10.2	VSD
Pump	21	221-P1	4	-	10.2	VSD
Pump	22	222-P1	4	-	10.2	VSD
Pump	23	223-P1	7.5	-	10.2	VSD
Pump	25	225-P1	7.5	-	10.2	VSD
Pump	Chilled Water	550-P1	3		7.5	VSD
Pump	Chilled Water	550-P2	3		7.5	VSD
Notes VSD – Variable Speed Drives Heating coils using Low Pressure Hot Water (60'C). Cooling coil from chiller unit. Air agitation fed from common main Filtration pump and filter with eductor on end of return line to provide mixing.						

The steam requirements for the anodise line are 1,469 kg/h (on start-up) and 772 kg/h during steady state running. There is no direct gas use on the line (electric only).

The main electrical energy use associated with the anodise scrubber is outlined in **Table *8-3***.

Table 8-3: *Anodise process line scrubber*

Type	Reference	Total Capacity (kW)
Scrubber dosing pump	SDP-M01 (230 v, 1.2 A)	0.4 kW
Scrubber heater	415 v, 8.8 A	6 kW
Emergency shower	230 v, 12 A	3 kW
Anodise line extraction	EXT-A-M01 (415 v, 80 A)	45 kW
Anodise Line scrubber Pump A (duty pump)	SCP-A-M02 (415 v, 14 A)	7.5 kW
Anodise Line scrubber Pump B (duty pump)	SCP-A-M03 (415 v, 14 A)	7.5 kW
Anodise Line scrubber Pump C (standby pump)	SCP-A-M03 (415 v, 14 A)	7.5 kW
Note: Excludes supply to instruments and low meters.		

8.2 Energy Efficiency

The site is certified to ISO50001:2018 Energy management systems - Requirements with guidance for use. This specifies requirements for establishing, implementing, maintaining and improving an energy management system (EnMS). The intended outcome is to enable an organization to follow a systematic approach in achieving continual improvement of energy performance and the EnMS.

The energy usage within CTF is tracked and reported as part of the site-wide energy management system. There is no sub-metering applied to the individual process lines operating within the CTF.

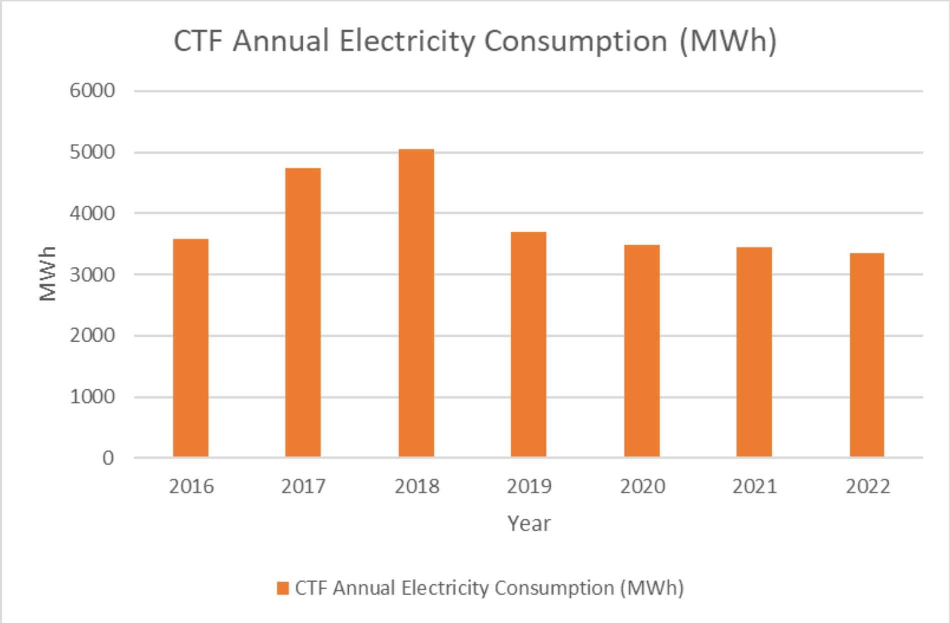


Figure 8-1: CTF gas use (2016 - 2022)

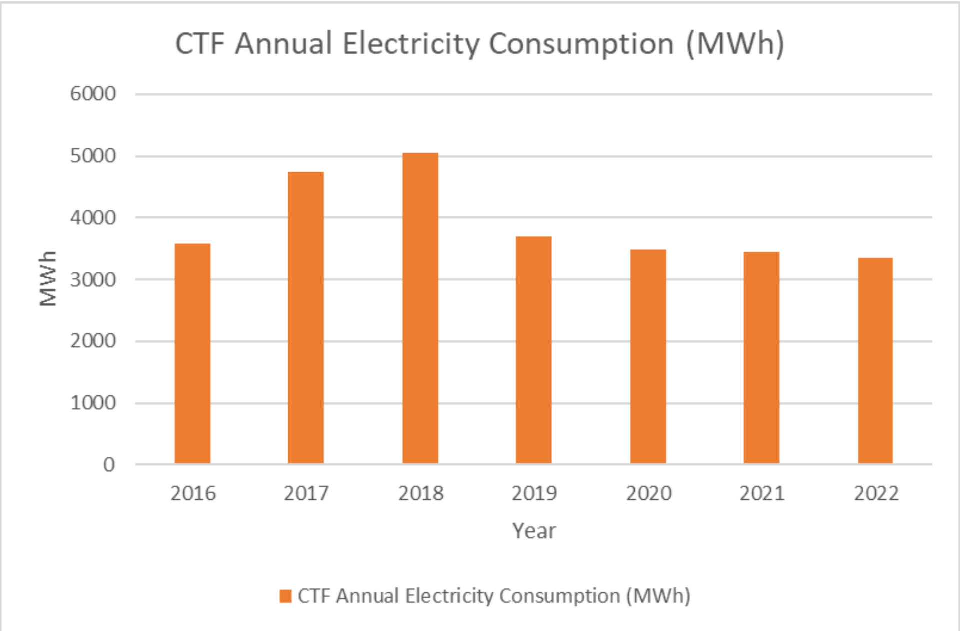


Figure 8-2: CTF electricity use (2016-2022)

The site has identified energy use as one of its significant environmental aspects as part of the aspects and impacts assessment process established and maintained as part of the ISO 14001

EMS. The achievement of energy reduction targets is thoroughly embedded within on-site systems.

It is important to note that these raw figures do not take into production rates (benchmarks) within the CTF business unit. Due to the nature and variability of the product lines (*i.e.* sizes, shapes *etc.*) it has historically been difficult to develop adequate specific energy ratios (SERs) for the business.

8.3 Energy Supply Techniques

Given the small-scale nature of the process line the use of electricity from the National Grid is considered BAT. However, BAE Systems has deployed a small Combined Heat and Power (CHP) unit adjacent to the CTF building. The CHP plant consists of one reciprocating gas engine driving a 400 V generator delivering a total of 500 kWe together with a single pass waste heat boiler. The electrical output of the generator is fed to a terminal point for connection to the main 400 V network (*i.e.* it is used to meet a proportion of the normal site base electrical demand).

The wider site has also been developed to include a large solar farm. Since its installation in mid-2015, nearly 9,000 solar panels (17,000 m^2) have been producing around 2,300 MWh of electricity every year. The panels provide around 4% of the sites total consumption and provides around a fifth of the sites peak electrical demand. The use of this solar energy prevented around 500 tonnes of carbon emissions during 2020, and over 4,500 tonnes of carbon emissions since its installation.

In addition to the electricity generated by the solar farm, all the electricity consumed on site is provided from renewable sources under the Renewable Energy Guarantees of Origin (REGOs) scheme operated by Ofgem.

8.4 Sector Specific Energy Requirements

The site is a member of the relevant Climate Change Agreement (CCA) for the aerospace sector - Agreement Ref. ADS/T00011 v6 (Facility id ADS/F00022, EU ETS Ref. GB-EA-ETCO2-1518).

As of October 2009, the Society of British Aerospace Companies (SBAC) merged with the Defence Manufacturers Association and the Association of Police and Public Security Suppliers to form the ADS Group (the Sector Association). A copy of the current CCA is provided in the application information.

8.5 Environment Social and Governance (ESG)

BAE Systems have set the target of:

- achieving net zero greenhouse gas emissions across our operations (Scope 1 and 2) by 2030 – we aim to do this by reducing our emissions as a minimum in line with the 1.5°C pathway; and
- working towards a net zero value chain by 2050.

This will be achieved by investing in renewable power, optimising energy efficiency across our operations and manufacturing processes, switching to lower carbon alternative fuels and reducing overall energy use. We are working to reduce eventual exposure to offsets but will develop a responsible strategy to use these where required.

The BAE Systems plc Annual Report 2022 outlines various energy and carbon related commitments in-line with their disclosures relating to the Task Force on Climate-related Financial Disclosures (TCFD).

9 Use of Raw Materials and Water

9.1 Raw Materials

Raw materials are sourced from a range of suppliers but in each case only after they have satisfied BAE Systems of their ability to supply products to an approved quality standard. BAE Systems applies an approved supplier framework.

The raw materials and principal auxiliary materials that are proposed to be used are generally in-line with that previously used. No significant raw material changes are proposed.

It should be noted that many of the techniques and therefore materials used by BAE Systems are specified within strict MOD Standardisation documents (*i.e.* Def Stan Series). The MOD has a long-established standardisation policy to make the maximum practicable use of standards in all its design and procurement activities. Thus, there is little and indeed no scope in some cases for selecting or considering alternative materials unless permitted by the relevant design standard and/or the final customer.

9.2 Anodise Process Line (CTF)

The range of materials that will be utilised within the process are outline in **Table *9-1***.

Table 9-1: *Raw materials associated with the new anodise process line*

Description	Primary Chemical	Secondary Chemical	Tertiary Chemical
Bath 2 (Alkaline Clean)	Bonderite C-AK 4215 NC-LT Aero	SURTEC 061 SURTEC 089	-
Bath 6 (Aluminium Etch) and Bath 7 (Aluminium Etch)	Bonderite C-AK Alum Etch 2	Sodium glucoheptonate Sodium hydroxide	-
Bath 9 (Aluminium pickle)	SOCOSURF A1858/1806	SURTEC 181	DP1002 RW-5562 DP1002 RW-7255
Bath 10 (TFSA Titanium Etch/Pickle) and Bath 11 (Titanium Pre-etch/Pickle)	HF (40%) Nitric Acid (55%)	-	-
Bath 12 (Desmut)	Nitric acid (55%)	ARDROX 295GD	-

Description	Primary Chemical	Secondary Chemical	Tertiary Chemical
Bath 14 (Thin film anodise) and Bath 15 (Thin film anodise)	Sulphuric acid (50%)	-	-
Bath 18 (Titanium Conversion Coat)	Fluoride phosphate	-	-
Bath 19 (Anodise seal) and Bath 20 (Anodise seal)	SOCOSURF TCS	SURTEC 650V	-
Bath 23 (Hot water seal)	Sodium Dichromate	SOCOSURF PACS Hydrogen peroxide	-
Bath 24 (Wait with capacity)	SOCOSURF PACS Hydrogen peroxide	-	-

Safety Data Sheets (SDSs) for each of the materials are provided within the variation package.

The initial chemical make-up for the process baths (volume and concentrations - primary, secondary, and tertiary) and the predicted routine top-up quantities have been estimated and are outlined in **Table *9-2***.

Table 9-2: *Anodise process line – Process Bath Initial Make-up*

Description	Chemical	Initial Make-up	Top-up (estimated)
Bath 2 (Alkaline Clean)	Bonderite C-AK 4215 NC-LT Aero	825 kg at 45-60 g/l	100 kg (6 months)
	SURTEC 061 (5 % v/v)	795 litres	150 litres (3 months)
	SURTEC 089 (0.5 % v/v)	80 litres	15 litres (3 months)
Bath 6 (Aluminium Etch) Bath 7 (Aluminium Etch)	Bonderite C-AK Alum Etch 2	605 kg	150 kg (3 months)
	Sodium glucoheptonate	159 kg	15 kg (3 months)
	Sodium hydroxide	640 kg	75 kg (3 months)
Bath 9 (Aluminium pickle)	SOCOSURF A1858	6,360 litres	800 litres (3 months)
	SOCOSURF A1806	1,590 litres	150 litres (3 months)

Description	Chemical	Initial Make-up	Top-up (estimated)
	SURTEC 181	795 litres	75 litres (3 months)
	DP1002 RW-5562	1,590 litres	150 litres (3 months)
	DP1002 RW-7255		
Bath 10 (TFSA Titanium Etch/Pickle)	HF (40%)	277 litres	30 litres (3 months)
	Nitric Acid (55%)	11,325 litres	400 litres (3 months)
Bath 11 (Titanium Pre-etch/Pickle)	HF (40%)	795 litres	150 litres (3 months)
	Nitric Acid (55%)	8,700 litres	300 litres (3 months)
Bath 12 (Desmut)	Nitric acid (55%)	10,785 litres	500 litres (6 months)
	ARDROX 295GD	3,575 litres	300 litres (3 months)
Bath 14 (Thin film anodise) Bath 15 (Thin film anodise)	Sulphuric acid (50%)	1,090 litres	55 litres (3 months)
Bath 18 (Titanium Conversion Coat)	Fluoride phosphate (as below)	-	Complete replacement every 12 months
	Trisodium Phosphate dodecahydrate	795 kg at 50g/l	
	Potassium Fluoride dihydrate	318 kg at 20g/l	
	Hydrofluoric acid (40%)	555 litres	
Bath 19 (Anodise seal) Bath 20 (Anodise seal)	SOCOSURF TCS	5,725 litres at 31-41%	TBC once operational
	SURTEC 650V	3,180 litres at 20%	500 litres (3 months)
Bath 23 (Hot water seal)	Sodium Dichromate	2 kg	Replacement every 6 weeks
	SOCOSURF PACS	1,590 litres	150 litres (2 months)
	Hydrogen peroxide (35%)	795 litres	50 litres (2 months)

Description	Chemical	Initial Make-up	Top-up (estimated)
Bath 24 (Wait with capacity)	SOCOSURF PACS	1,590 litres	150 litres (2 months)
	Hydrogen peroxide (35%)	795 litres	50 litres (2 months)
Notes Based on Version 5 (02/05/2023) chemical make-up.			

9.2.1 Use of Sodium Dichromate

The use of chromates throughout the entire Aerospace and Defence (A&D) industry are at risk impacting both users of the chromates and chromate-based formulations, as well as the manufacture of parts and components where this involves use of the chromates.

Under the EU REACH Regulation (now UK-REACH) such uses of the chromates require Authorisation, which is granted by the EU Commission (now HSE within the UK) for a specific period (the 'review period'). It is not possible to continue to use the chromates without an Authorisation. REACH Authorisations have now been granted to the Global Chromates Consortium for Aerospace (GCCA) consortium and the Miscellaneous Chromium VI Compounds for Surface Treatment REACH Authorization Consortium (CCST) providing between 7-year and 12-year review periods from the original Sunset Dates.

Table 9-3: *REACH applications for authorisation (AfA)*

Substance	Consortium	Applicant	Application No. and Authorisation
Sodium dichromate	GCCA	Boeing Distribution Inc. HAAS Group International SP (transferred from Wesco Aircraft EMEA Ltd)	**099-01** REACH/19/32/0 to REACH/19/32/1 **099-02** REACH/19/32/2 and REACH/19/32/3
Sodium dichromate	CCST	Brenntag UK Ltd Henkel AG & Co. JGaA AD International BV	**0043-01** REACH/20/5/0 to REACH/20/5/2 **0043-02** REACH/20/5/3 to REACH/20/5/5 24UKREACH/20/5/3

Substance	Consortium	Applicant	Application No. and Authorisation
Note: A public consultation on alternatives (REACH - Applications for authorisation AFA030-01 Sodium dichromate) closed on 19th May 2023 (HSE, 2023).			

In conclusion, BAE Systems and the wider aerospace community have identified a shortlist of potentially suitable alternatives. However, due to the complexity of design challenges, performance requirements, safety requirements and regulatory controls each alternative must be adequately tested and validated before approval for use is gained.

With respect to BAT the significant reduction and movement away from chromic acid anodising to Thin Film Sulphuric Acid Anodising (TFSAA) marks a significant reduction in the use and volume of Chrome VI compounds within the anodising process.

9.3 ETP Modifications (CTF)

No new materials are associated with the proposed changes to the ETP.

9.4 Solvent Degreasing (1-Shed)

Neu-Tri E (Trichloroethylene) was added to Annex XIV of REACH on April 21, 2013. This included the confirmation of the sunset date after which Trichloroethylene cannot be supplied or used except when an authorisation has been granted, or for uses which are exempt from authorisation (such as intermediate use or use for research and development). The sunset date was 21st of April 2016.

The degreasing unit has been switched over to using Perchloroethylene (PERC) also known as Tetrachloroethylene. PERC and Trichloroethylene are classified differently. Trichloroethylene is a class one carcinogen and listed on the authorisation list (Annex XIV of REACH) whilst PERC is classified as a class two carcinogen. There is currently no indication that this classification will be altered. PERC does not meet the criteria to be a Substance of Very High Concern (SVHC) based on its current classification, hence should not be included into the candidate list.

9.5 Water Use

9.5.1 Anodise Process Line (CTF)

Water is used within the anodise process line within the rinse baths (*i.e.* initial filling, topping up due to evaporative losses) and within the process bath make-up (*i.e.* initial filling, topping up due to drag out). However, the largest volume is associated with the rinse baths.

Adequate rinsing between process stages is essential to achieving a high quality of cleanliness to achieve the required surface finish to meet process specifications. Failure to adequately rinse a work piece could lead to increased scrap rates or re-processing further down the production process (*i.e.* increase waste, chemical usage and water use).

9.5.2 Rinse Bath Controls

The rinse baths associated with the anodise line are fitted with Temperature Sensors (TS), Level Sensors (LS), Level Visual Sensors (LVS) and Conductivity Sensors (CS) as outlined below. The in-process controls are designed and optimised to ensure that the rinse baths remain within specification whilst minimising water consumption (BAT compliant systems).

Table 9-4: *Anodise process – rinse baths 3 to 8*

	Station 3	Station 4	Station 5	Station 8
Process	DI Rinse	Water Break Free Inspection	DI Rinse	DI Rinse
Working Volume (litres)	14,405 litres	-	14,405 litres	14,405 litres
Temperature Range (°C)	<35 °C	-	<35 °C	<35 °C
Sensors and Controls	Temperature (1) Level (1) Level Visual (1) Conductivity (2)	Temperature (1)	Temperature (1) Level (1) Level Visual (1) Conductivity (2)	Temperature (1) Level (1) Level Visual (1) Conductivity (2)
Fugitive Controls	N/A	N/A	N/A	N/A
Bath Lining Material	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel	304 Stainless Steel

	Station 3	Station 4	Station 5	Station 8
Secondary Containment	Yes Sump/Bund 1	Yes Sump/Bund 1	Yes Sump/Bund 1	Yes Sump/Bund 1

Table 9-5: *Anodise process – rinse baths 13 to 21*

	Station 13	Station 16	Station 17	Station 21
Process	DI Rinse	DI Rinse	DI Rinse	DI Rinse
Working Volume (litres)	14,405 litres	14,405 litres	14,405 litres	14,405 litres
Temperature Range (°C)	<35 °C	Ambient	Ambient	Ambient
Sensors and Controls	Temperature (1) Level (1) Level Visual (1) Conductivity (2)	Level (1) Level Visual (1) Conductivity (2)	Level (1) Level Visual (1) Conductivity (2) pH (2)	Temperature (3) Level (1) Level Visual (1) Conductivity (2)
Fugitive Controls	N/A	N/A	N/A	Yes - Lidded
Bath Lining Material	Polypropylene	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
Secondary Containment	Yes Sump/Bund 2	Yes Sump/Bund 3	Yes Sump/Bund 3	Yes Sump/Bund 4

Table 9-6: *Anodise process – rinse baths 22 to 25*

	Station 22	Station 24	Station 25
Process	Warm DI Rinse	DI Rinse	DI Rinse
Working Volume (litres)	15,714 litres	15,714 litres	14,382 litres
Temperature (°C)	32 – 38 °C	32 – 38 °C 15 – 30 °C	Ambient

	Station 22	Station 24	Station 25
Sensors and Controls	Temperature (3) Level (1) Level Visual (1) Conductivity (2)	Temperature (3) Level (1) Level Visual (1) Conductivity (1)	Level (1) Level Visual (1) Conductivity (2
Fugitive Controls	Yes - Lidded	Yes – Lidded and extracted to LEV	No
Bath Lining Material	316 Stainless Steel	316 Stainless Steel	304 Stainless Steel
Secondary Containment	Yes Sump/Bund 4	Yes Sump/Bund 4	Yes Sump/Bund 4

9.5.3 Water Volumes

Significant changes (in-line with BAT requirements) were applied to the ETP in 2010 and were included within the PFD variation submitted in 2016. The resulting process changes (improvements) significantly reduced water consumption within the CTF (***Figure 9-1***). Since the ETP improvements various process changes have occurred within the CTF *e.g.* the removal and decommissioning of the clean and pickle line and the use of the installation of the PFD process line.

In recent years (post-2017) the water consumption volumes have been creeping back up primarily because of the ageing chromic acid anodise line. BAE Systems identified that quality impacts were occurring due to the age of the process line hence requiring increased water throughput through the rinse tanks to maintain the required quality standards. This, combined with the Chromic acid within the old anodise line is one of the primary drivers for the installation of the new TFSAA process.

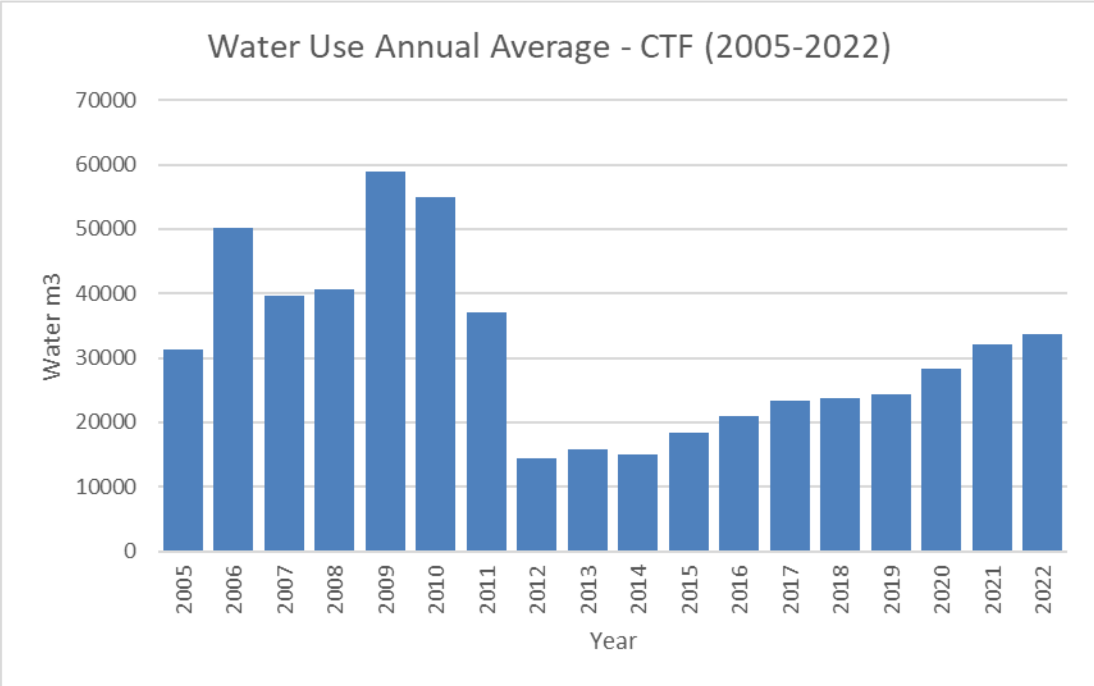


Figure 9-1: *Water use within CTF (2005-2022)*

Water use is a key business metric and is subject to continuous review and improvement in-line with the sites ISO 14001 system.

9.5.4 Other Activities

No other activities associated with this permit variation will involve a change in water use.

10 Waste Management

10.1 Waste Minimisation, Recovery and Disposal

The key objectives are to maximise process bath life and to minimise the contamination of the rinse waters thus reducing the number of cycles/treatments through ETP. In all cases the existing permitted operations are subject to continuous review and improvement in-line with the sites ISO 14001 system.

The following waste minimisation techniques will be employed within the installation to either reduce the quantity of waste produced or the volume of raw material inputs:

- Disturbance of the process tank surface will be minimised to prevent fugitive losses or entrainment with the LEV.
- Feed and bleed are used on all chemical tanks. BAE Systems employs a system where the bath conditions are maintained within process specification by the addition or removal of chemicals/water. With respect to the new anodise process line the chemicals will be fed from self-contained Safetainers.
- The site will minimise chemical drag-out by maximising the drainage time of the work piece over the chemical tank prior to rinsing.
- Run-off shields will be fitted on some tanks. This allows process chemicals and rinse waters to drain back into their respective tanks.
- Maximum/Minimum stock control process to reduce wastage due to shelf-life expiry.
- Just in Time (JIT) chemical supply minimises both environmental risk through stock minimisation and reduced wastage due to shelf-life expiry.
- The site has a well-defined waste stream structure to reduce cross contamination of waste materials. Waste materials are segregated at source to maximise the opportunity for recycling, recovery, or reuse.
- There are secondary checks of all waste streams prior to removal off-site. Feedback by contractor if waste streams have been contaminated.

10.1.1 Waste Management

There may be times when it is required to remove the contents of a Chemical Process tank on the chemical process lines within Central Treatments Facility. The majority of these will be as part of a planned activity such as scheduled tank inspections. Others may be due to an unplanned activity such as inspection and repair of a tank or its ancillary equipment such as heating coils or spurge pipes after an incident such as a component dropping off a flight bar into the tank. A formal documented procedure is in-place for the Emptying a chemical tank in Central Treatments Facility (3B03) (Ref. Document Number: OPS/PROD/CTF/3B03/CTEP/01, Document issue number: 01, Date of issue: 31/10/2022, Date of next review: 30/10/2023).

All contractors involved with chemical removals are listed within the AIR Sector Contractor management register. Only approved contractors will be used to undertake specified activities within the CTF.

All waste materials are currently removed via Veolia a leader in resource management, waste, water and energy management services designed to build The Circular Economy and protect the environment. Veolia is accredited to ISO9001 Quality Management System, ISO14001 Environmental Management System, ISO45001 Occupational H&S Management Systems and ISO5001 Energy Management.

10.1.2 Landfill Disposals

Since summer 2020, BAE Systems has sent zero waste to landfill across both Warton and Samlesbury sites.

For many years, BAE Systems stopped much of the waste produced at Samlesbury and Warton from going to landfill using methods such as recycling, treatment, and incineration. However, the final piece of the puzzle was removing cured carbon fibre from the landfill waste stream, which is difficult to recycle due to its heterogeneous hybrid structure. Incineration with energy generation was identified as a viable alternative.

The BAE Systems plc Annual Report 2022 states that *‘during 2023, we will be establishing Group targets for water use and waste management. These targets will be disclosed in 2024’* in-line with our disclosures relating to the Task Force on Climate-related Financial Disclosures (TCFD).

11 Emissions to Air, Water and Land

11.1 Point source emissions to air

The point source emissions associated with the revised installation are outlined in **Table 11-1**. The line items in red are to be removed from the permit whilst the items outlined in green are to be added.

Table 11-1: *Point source emissions to air (EPR/BV0414IV/V002)*

Emission point	Location	Source	Status
A1 (AE6 – AE14)	CTF	Paint spraying (CTF)	No change
A2 (AE1 – AE2)	CTF	Anodise/Alocrom scrubbers	To be removed from permit
A3 (AE3)	CTF	Clean and Pickle acid scrubber	To be removed from permit
A4 (AE4)	CTF	Clean and Pickle alkali scrubber	To be removed from permit
A5 (AE5)	CTF	PFD scrubber	No change
A7 (AE19)	1-Shed	Chemi-etch line scrubber	No change
A8 (AE20)	1-shed	Vapour degreaser	No change
A9 (AE22 – AE25)	CTF	CHP and associated boilers	No change
A10 (AE26)	CTF	Anodise process line scrubber	New emission point
Note: Table S3.1 within the permit will need to be updated to reflect the change in solvent (associated with the vapour degreaser, A8) from Trichloroethylene to Perchloroethylene.			

The location of the point source emissions to air are outlined within the provided figures and plans.

11.2 Point source emissions to surface water

There are no existing or new point source emissions to surface water.

11.3 Point source emissions to sewer

There are no new point source emissions to sewer.

11.4 Point source emissions to groundwater

There are no existing or new point source emissions to groundwater.

11.5 Point source emissions to land (via soakaway)

There are no existing or new point source emissions to land.

11.6 Fugitive emissions to air

11.6.1 Central Treatment Facility

No additional sources or types of fugitive emissions are predicted as the anodise line is being replaced on a like-for-like basis. Any fugitive emissions (from the heated process baths) shall be captured using local exhaust ventilation (LEV) and treated through the installed scrubber (*i.e.* will be emitted through the abated point source emission).

11.6.2 1-Shed

With respect to the permit update *i.e.* the switch from Trichloroethylene to Perchloroethylene associated with the vapour degreaser no new additional controls are required to minimise fugitive emissions *i.e.* existing management controls will remain operational.

11.7 Fugitive emissions to land

The Application Site Report (ASR) indicates that the installation is underlain by Made Ground which in turn is underlain by Glacial Till (soft to firm light brown Clay) up to 10.0 m below ground level (bgl). This stratum is underlain by Upper Bowland Shale Group (Millstone Grit). The site is (according to EA records) located on a Secondary A Aquifer.

In the area of the CTF Made Ground was encountered between 0.15 and 3.2 m bgl. Made Ground was found to be variable *e.g.* dark black and grey ash and clinker and fill with roots and topsoil and brick fragments and brown and grey slightly silty fine to coarse sand and angular find coarse gravel sized stone with cobble sized fragments of concrete.

In the area of 1-Shed Made Ground was encountered between 0.3 and 1.2 m bgl and is recorded as sand and gravel with ash and brick fragments.

All areas within the installation are provided with some form of tertiary containment (*i.e.* are hard surfaced). The controls to prevent fugitive emissions to land are as previously described (*i.e.* application of appropriate primary, secondary and tertiary containment systems combined with appropriate management controls).

11.8 Fugitive emissions to surface water

Across the site (including external to the permitted areas) there is a comprehensive network of surface water drains that capture and transfer roof and roadway derived surface water prior to off-site discharge. The area surrounding CTF discharges into Huntley Brook, a local tributary that discharges into the River Darwin and the area around 1-Shed discharges to either Huntley Brook or Mellor Brook that eventually discharges into the River Ribble.

No new potential sources have been identified as part of this variation and all management system controls remaining in place. The tanker unloading bay and associated containment system (as described in *Section 4*) significantly reduces the risk of an uncontained release to surface water from the CTF area.

BAE Systems procedures and emergency plans continue to recognise the presence of surface water systems on the site could act as pathway to surface water.

According to the UK Government flood risk information the Site is at Very Low Risk of flooding from rivers and the sea and from surface water. Flooding due to reservoirs and from groundwater is considered unlikely. BAE appreciates that surface water flooding is be difficult to predict as it depends on rainfall volume and location. Existing emergency plans would be deployed in the event of an abnormal/emergency event.

11.9 Fugitive emissions to sewer

There are no identified pathways (from the permitted installation) for fugitive emissions to sewer.

11.10 Fugitive emissions to groundwater

As was stated in the ASR both the CTF building, and 1-Shed are located on a Secondary A Aquifer (associated with the Millstone Grit Formation). Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

During previous site investigations perched waters were encountered within the glacial till. Groundwater ingress was recorded as ranging from slow to medium but fast where gravel layers were encountered within the glacial till. The perched water level was recorded as between 0.7-0.65 m bgl at CTF and 0.4 m bgl at 1-Shed.

The potential for fugitive emissions to groundwater are minimal. All areas within the installation are provided with some form of tertiary containment (*i.e.* are hard surfaced). The controls to prevent fugitive emissions to groundwater are as previously described (*i.e.* application of appropriate primary, secondary and tertiary containment systems combined with appropriate management controls).

11.11 Odour

Based upon the nature of the proposed operations and their location no significant odour issues are anticipated. Thus, an odour management plan has not been produced. The installation represents a very low risk as there has never been any recorded odour complaints associated with the existing installation. BAE Systems believe that the operations give no reasonable cause for offence or annoyance regarding odour.

11.12 Noise and Vibration

The original IPPC application identified the primary potential sources of noise and vibration as the fume and dust extraction units and associated ventilation systems. The noise sources (associated with these pieces of equipment) are mainly fans, motors, and air movement from the extraction ducts. The installation generally operates (apart from shut-down periods) 24 hours a day 6 days a week during which time the extraction equipment continues to work (*i.e.* the LEVs provide workplace protection).

The previous baseline monitoring undertaken by PDA Ltd for the IPPC application identified two high risk noise receptors (***Figure 11-1***):

- **Receptor No.1** – Detached farmhouse split into residential apartments approximately 285 metres south of the closest noise source within the CTF. The baseline survey showed that the dominant noise source (day and night) was the A677 Preston New Road located approximately 205 metres south of the property.

- **Receptor No.2** – Small terraced cottage, with a small workshop to the rear approximately 250 metres of the closest noise source within the CTF. The bassline survey showed that the dominant noise source was passing traffic (including HGVs) on the immediately adjacent Myerscough Smithy Road and the A59(T) approximately 100 metres north.

The assessment, undertaken in accordance with BS4142:1997 *'Method for rating industrial noise affecting mixed residential and industrial areas'*, found that the noise attributable to the

IPPC operations was of 'marginal significance or less'. The survey identified that the main potential source of noise (from BAE Systems) was emanating from outside the permitted installation (*i.e.* was associated with the 3B Machine Shop). Because of this noise attenuation equipment was installed on the 3B Machine Shop noise sources. BAE Systems appreciates that BS4142: 1997 was replaced in 2014 by BS4142:2014 *'Methods for rating and assessing industrial and commercial sound'* to take account of the advances in technology and improvements in the accuracy of final assessments.

Figure 11-1: *Noise receptors surrounding CTF (installation) and 3B*

The proposed changes associated with this variation that could affect the environmental noise footprint of the installation area is the operation of the new anodise scrubber and stack (BAE Ref. AE26 – EPR Ref. A10) on the southern side of the CTF building.

Indicative BAT requirements identify that an operator should employ good management practices for the control of noise, including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increased noise emissions (*e.g.* maintenance of bearings, air handling units *etc.*). As has been stated previously regular planned preventive maintenance is undertaken on all plant and equipment that has been identified as a potential noise source. Specific control (mitigation) measures, aligned to the hierarchy of control, include:

- **Acoustic enclosures** – These are designed to meet strict internal BAE Systems requirements of 42 dB(A) for all externally placed equipment. Acoustic enclosures will be fitted around all new equipment.

- **Placement of the scrubber units on the southern side of the CTF building** – The area is surrounded to the south and east by a 5-metre-high (heavily vegetated) screening mound. The mound is topped by mature trees (estimated height of around 10 metres). The combined height should be sufficient to visual screen the scrubbers from the south. To the east of the new scrubber unit is the 3B Machine Shop. The building is 16.006 metres high and screens the entire CTF building from Mellor Brook village (***Photograph 11-1*** and ***Photograph 11-2***).

Photograph 11-1: *View along southern edge of 3B (Machine Shop) towards scrubbers*

Photograph 11-2: *View between CTF (left) and 3B (right).*

Environmental noise surveys are undertaken on an *ad-hoc* basis as and when the need arises.

11.12.1 Noise Complaints

In 2021 there were complaints of a noise affecting residences on Branch Road, Mellor Brook.

An investigation into the complaints found a strong tonal source emitted from the stack of the PFD scrubber unit (AE5). Remedial works have subsequently been carried out on the fan to reduce the problem tone. The provided report from PDA Acoustic Consultants details follow-up measurements taken to validate the remediation works. No further complaints have been received. All information has previously been provided to the EA.

Given that the PFD scrubber and anodise scrubber were designed by the same installer and installed at the same time there was potential that the same issue would be present on anodise scrubber (Ref. AE26 – EPR Ref. A10). As result, BAE Systems is proactively replacing the fan on the new anodise scrubber as part of the ongoing works (*i.e.* prior to operation). In-light of the previous issue BAE System proposes the following improvement condition.

Proposed Improvement Programme

Following completion of the installation, the Operator shall undertake noise monitoring at the nearest sensitive receptors. This shall include a full noise monitoring survey and assessment meeting the BS4142:2014 standard including details of local conditions *e.g.* meteorological conditions (wind direction) including 1/3rd octave and narrow band (FFT) measurements to identify any tonal elements or low frequency noise.

Upon completion of the work, a written report shall be submitted to the Environment Agency. If rating levels likely to cause complaints or disturbance at sensitive receptors are detected as a result of the installation operation, the report shall include an assessment of the most suitable abatement techniques, an estimate of the cost and a proposed timetable for their installation.

Based upon the nature of the proposed operations and their location no significant noise or vibration issues are anticipated. Thus, a noise and vibration management plan has not been produced. BAE Systems believe that the installation (once operational) will give no reasonable cause for offence or annoyance regarding noise and/or vibration.

12 Emission Limits and Monitoring

12.1 Monitoring of emissions to air

12.1.1 Anodise Scrubber (CTF)

The current chromic acid anodise line includes two scrubber units (AE1 and AE2). Schedule 3 (Emissions and Monitoring) of the permit (Ref. EPR/BV0414IV/V002) does not currently include any Emission Limit Values (ELVs) for the release point or any monitoring requirements.

With respect to the current BAT Guidance (European-Commission, 2006) and S2.07 (Environment Agency, 2009) the current applicable ELVs are outlined in **Table *12-1***.

Table 12-1: *Indicative BAT standards for emissions to air*

Emission	Benchmark	BAT	Source
Chromium (VI) and its compounds as chromium	1 mg/m^3	None stated	Surface Treatment BREF
Hydrogen fluoride	2 mg/m^3	Scrubbers/Absorption columns	Surface Treatment BREF
Oxides of nitrogen (total acid forming as NO2)	200 mg/m^3	Scrubbers/Absorption columns	Surface Treatment BREF
Notes: The switch from Chromic acid anodising to the new TFSAA anodise process significantly reduces the volume of Chromium VI within the process line. The new process line now only contains one process bath (bath 23) with a Chromium VI compound (Sodium dichromate) at a concentration of (0.1-0.15 g/litre). BAE Systems is working to eliminate Chromium VI compounds from the anodise process upon certification/approval from customers. Once this transition has been completed there will be no Chromium VI compounds associated with the process line.			

It is important to note that the BREF (European-Commission, 2006) has not been revised since 2006 and the EU has not published a BAT conclusion (BATc) document, hence, there are no new relevant BAT associated emission levels (BAT-AELs) for the Sector.

BAE Systems is aware that the long-term Environmental Assessment Level (EAL) for Chromium VI was reduced from the 0.1 $\mu g/m^3$ (H1 Guidance, 2003 - 2008) to 0.0002 $\mu g/m^3$ (Air emissions risk assessment, 2018) due to work undertaken by the Air Quality Expert Group (Defra, 2009).

It is proposed that no ELVs or monitoring requirements are set for the proposed emission point A10 (AE26) in-line with the current environmental permit. However, in-line with previous permit applications BAE Systems would propose to conduct an initial assessment of the emissions from the new anodise abatement system Ref. A10 (AE26) once the process line becomes operational.

Proposed Improvement Programme
Following completion of the installation, the Operator shall undertake stack emission monitoring of emission point A10 (AE26) *i.e.* scrubber inlet and scrubber outlet for Oxides of Nitrogen (as NO_2), Hydrogen fluoride and Total Chromium, Chromium VI.
Upon completion of the work, a written report shall be submitted to the Environment Agency.

The new anodise scrubber and emission point was installed at the same time as the PFD scrubber which was previously assessed against the requirements BS EN 15259 (BSi, 2023) by Exova Catalyst. Application Form C3 requires an applicant to answer specific questions concerning the emission point. BAE Systems has consulted with its current preferred supplier Atesta Ltd (**Table 12-2**).

Table 12-2: Anodise scrubber – Monitoring point

Requirement	Status	Comments
4b1 - Has the sampling location been designed to meet BS EN 15259 clause 6.2 and 6.3?	Yes	-
4b2 - Are the sample ports large enough for monitoring equipment and positioned in accordance withsection 6 and appendix A of BS EN 15259?	Yes	-
4b3 - Is access adjacent to the ports large enough to provide sufficient working area, support and clearancefor a sample team to work safely with their equipment throughout the duration of the test?	Yes	-
4b4 - Are the sample location(s) at least 5 HD from the stack exit	Yes	-
4b5 - Are the sample location(s) at least 2 HD upstream from any bend or obstruction?	Yes	-

Requirement	Status	Comments
4b6 - Are the sample location(s) at least 5 HD downstream from any bend or obstruction?	Yes	Note: The final assessment has not been conducted but Atesta Ltd is confident that the stack will have a compliant sampling plane given that the PFD scrubber was also deemed compliant.
4b7 - Does the sample plane have a constant cross-sectional area?	Yes	
4b8 - If horizontal, is the duct square or rectangular (unless it is less than or equal to 0.35 m in diameter)	N/A	This does not apply to the emission point.

As the PFD scrubber was installed at the same time as the anodise scrubber an access assessment of the PFD emission point was previously performed by Exova Catalyst.

Table 12-3: Monitoring point – Platform assessment

EA Technical Guidance Note and EN 15259 Platform Requirements	Status
Sufficient working area to manipulate probe and operate the measuring instruments	Yes
Platform has 2 levels of handrails (approx. 0.5m and 1.0m high)	Yes
Platform has vertical base boards (approx. 0.25m high)	Yes
Platform has chains / self-closing gates at top of ladders	Yes
There are no obstructions present which hamper insertion of sampling equipment	Yes
Safe Access Available	Yes
Easy Access Available	Yes

The inspection undertaken by Exova in 2017 stated that the PFD sampling location met all the requirements specified in EA Guidance Note M1 (now referred to as Guidance - Monitoring stack emissions: measurement locations) and EN 15259.

12.1.2 Vapour Degreaser (1-Shed)

Emission point A8 (AE20) associated with the vapour degreaser already includes an ELV of 20 mg/m^3 (Trichloroethylene) to be monitored annually.

Within the EA published data (UK Government, 2023) the Environmental Assessment Level (EAL) for Trichloroethylene is 2 µg/m^3 (annual mean) and for Tetrachloroethylene it is 40 µg/m^3 (24-hour mean).

Given the change from Trichloroethylene to Perchloroethylene no change to the ELV or monitoring frequency is proposed.

It is important to note that the vapour degreaser throughout is less than 0.5 tonnes per annum (*i.e.* less than the Part B threshold of 1 tonne per annum for surface cleaning using substances or preparations which because of their content of volatile organic compounds classified as carcinogens, mutagens or toxic to reproduction under Directive 67/548/EEC as last amended by Commission Directive 98/98/EC) are assigned or need to carry one or more of the risk phrases R45, R46, R49, R60 or R61, or halogenated VOC's which are assigned or need to carry the risk phase R40.

12.1.3 Stack Emissions Monitoring

BAE Systems preferred supplier for stack monitoring assessments is Atesta Ltd (UKAS 10706). The Company is accredited to perform the (relevant) tests outlined in **Table 12-4**.

Table 12-4: Air emission monitoring standards

Stack	Test	Standard
A10 (AE26)	Hexavalent Chromium in Fine Particulate Matter <10 micron(PM_{10} and $PM_{2.5}$)	Sampling with subsequent analysis by an ISO 17025 Accredited Laboratory BS EN ISO 23210:2009 (TP-16)
A10 (AE26)	Hydrogen Fluoride	Sampling with subsequent analysis by an ISO 17025 Accredited Laboratory BS ISO 15713:2006 (TP-09a) PD CEN/TS 17340
A10 (AE26)	Sulphur Dioxide	Sampling with subsequent analysis by an ISO 17025 Accredited Laboratory BS EN 14791:2017 (TP-10)

Stack	Test	Standard
A10 (AE26)	Total Oxides of Nitrogen (NO, NO_2 and NitricAcid Vapour)	Sampling with subsequent analysis by an ISO 17025 Accredited Laboratory US EPA Method 7D (TP-19) BS EN 14792 PD CEN/TS 17337
A8 (AE20)	Total Gaseous Organic Carbon (TOC/VOC) (0 to 1000 mg/m³)	BS EN 12619:2013 (TP-21a/TP21b - FID Analyser) Monitoring Status MCERTS

12.2 Monitoring of emissions to surface water

As there are no releases to surface water no new or amended monitoring is required.

12.3 Monitoring of emissions to sewer

As there are no new substances planned for release to sewer the current permitted suite (outlined within Table S3.2 of the permit) remain valid. No change to the stated ELVs is required. The United Utilities consent also remains valid.

No changes to the required monitoring (characteristics and frequency) are proposed.

12.4 Monitoring of emissions to land

There are no releases to ground.

12.5 Monitoring of emissions to groundwater (via soakaway)

There are no releases to groundwater.

12.6 Monitoring of noise emissions

Environmental noise surveys have been undertaken (on average) every two to three years to assess general site environmental performance. This assessment process is to continue as an *ad hoc*, proactive, precautionary measure.

An initial assessment of the new anodise line (post initial operation) is proposed (as an improvement condition) as outlined in *Section 11.12*.

12.7 Monitoring of odorous emissions to air

The potential for the installation to emit an odorous emission has been assessed as very low. BAE Systems does propose to undertake any monitoring.

13 Environmental Risk and Impact Assessment

13.1 Introduction

The process for conducting a suitable and sufficient risk assessment is outlined within the current EA Guidance (UK Government, 2022). An applicant is required to follow these steps to do a risk assessment.

- Identify and consider risks for your site, and the sources of the risks.
- Identify the receptors (people, animals, property and anything else that could be affected by the hazard) at risk from your site.
- Identify the possible pathways from the sources of the risks to the receptors.
- Assess risks relevant to your specific activity and check they are acceptable and can be screened out.
- State what you will do to control risks if they are too high.
- Submit your risk assessment as part of your permit application.

13.2 Sources

The principal sources associated with the installation are outlined in the Sector Guidance (Environment Agency, 2009). With regards this installation they include:

- Point source emissions to air *i.e.* release of hydrogen fluoride, selected metals, Cr(III), Cr(VI) and oxides of nitrogen from the process stack.
- Point source emissions to sewer from the on-site effluent treatment plants (1-Shed and CTF).
- Emission of noise and vibration from plant and equipment associated with the installation.
- Emissions to surface water via the general site-wide surface water drainage systems.
- Leaks and spills associated with the handling, storage and use of materials and associated wastes.
- Third-party actions (*e.g.* arson and/or vandalism) leading to the release of polluting materials to air, water or land.

- Flooding (*e.g.* leading to the mobilisation of substances and wastes associated with the installation).
- Risk of fire and associated emissions (*e.g.* production of firewater, release of unplanned emission to air).

13.3 Pathways

13.3.1 Soils and Geology

The underlying soils and geology can act as both a pathway (and receptor) for Site derived pollution.

The geological sequence beneath both CTF and 1-Shed has been determined via published data and from previous site investigation data (as stated in the original IPPC application). In general, the geological profile is as follows:

- **Made Ground** – Made Ground was encountered in previous investigations across both areas of the Installation and in surrounding areas. In the area of the CTF Made Ground was entered at depths between 0.15 and 3.2 m below ground level (bgl). Made Ground was found to be variable with typical descriptions being as follows 'dark black and grey ash and clinker fill with roots and topsoil and brick fragments' and 'brown and grey slightly silty fine to coarse sand and angular fine to coarse gravel sized stone with cobble sized fragments of concrete'. In the area of No.1 Shed Made Ground was encountered between 0.3 and 1.2 m bgl and is recorded as 'sand and gravel with ash and brick fragments and gravel'.
- **Glacial Till** – Investigations record the presence of Glacial Till beneath both installation areas, confirming the published geological information. Glacial Till was encountered beneath the Made Ground and was proven to depths of up to 10.0 m bgl. The Glacial Till is typically described as 'soft to firm light brown CLAY with occasional small cobbles becoming firm to very stiff brown and occasionally grey mottled with depth. In one exploratory point a 0.5 m thick band of 'brown very Sandy very Clayey Fine to coarse sub angular GRAVEL',
- **Solid geology** – Boreholes sunk in the on or in the vicinity of the CTF and No.1 Shed did not encounter the solid geology. The geological mapping indicates that the majority of the CTF is mostly located on Pendleton Formation (mudstone, siltstone, and sandstone) and partially on Pendle Grit Member (Sandstone).

The Land Information System (LandIS) produced by Cranfield University and managed by the BGS reports that the site soils are slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils[1].

13.3.2 Atmosphere

The atmosphere can act as a pathway for Site derived pollution whilst also influencing the significance/severity of an impact on a receptor:

- **Temperature** – Higher temperatures can worsen local air quality problems as air is often stagnant, so pollution air is less likely to be dispersed. Increased sunlight and higher temperatures also encourage chemical reactions (in relation to certain pollutants). Cool temperatures can also make air pollution worse *e.g.* temperature inversions (*i.e.* where a warm layer traps a cooler layer near the ground).

- **Wind** – Increased higher wind speeds can aid dispersion, but the prevailing wind direction can dictate where pollution will travel.

- **Rain and humidity** – Cloud. fog, rain, and snow can be seen as beneficial as they can wash contaminants such as particulate matter out of the air and/or remove dissolvable pollutants.

- **Atmospheric pressure** – Typically, low pressure systems bring wet and windy weather whilst high pressure comes with stagnant air and increased pollutant concentrations.

According to simulated historical climate and weather data for Samlesbury[2] the predominant wind direction is blowing from the West, West Southwest to the East, East Northeast (**Figure *13-1***.

1 https://mapapps2.bgs.ac.uk/ukso/home.html

2 https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/samlesbury_united-kingdom_2638620

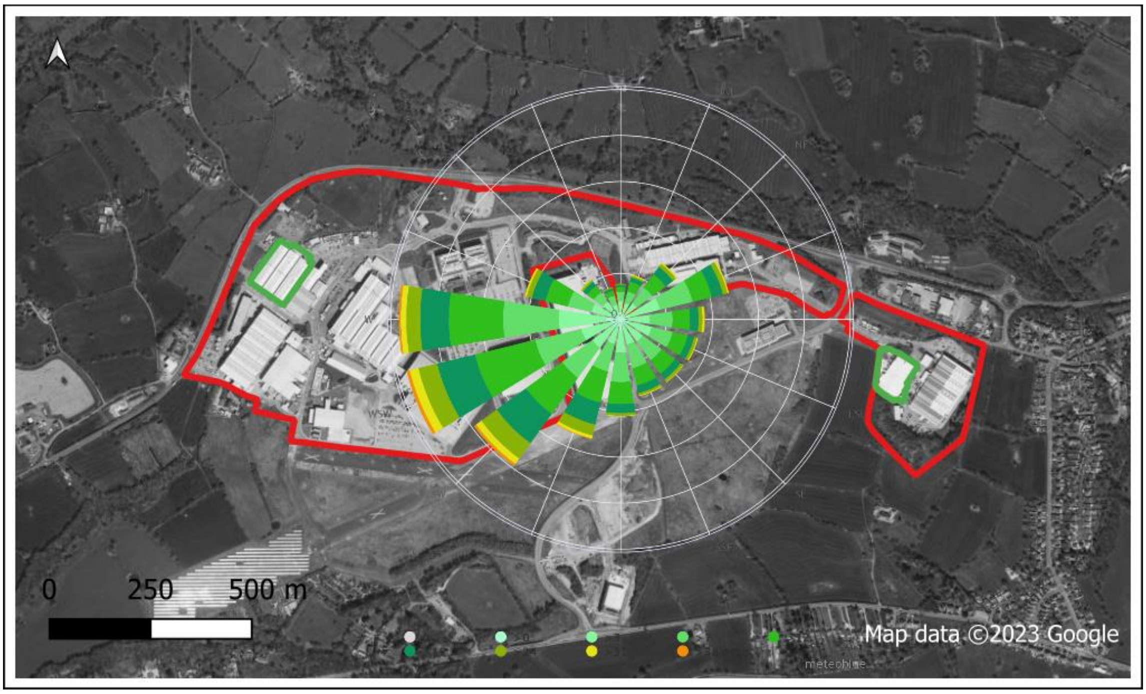


Figure 13-1: *Predominant wind direction*

13.4 Receptors

13.4.1 Residential and Human Receptors

The principal receptors (within 500 metres of the installation boundary) are outlined below.

Table 13-1: Residential and off-site human receptors (within 500 metres of CTF)

Distance	Location	Description
152 m north	431338.89, 363733.85	Light Industrial Users A small industrial estate access from Myerscough Smithy Road. Occupied by Nationwide Platforms, Monks Contractors Ltd, Mellor Plant UK Ltd and Clarendon Haulage Co Ltd.
240 m northeast	431202.98, 363926.20	Residential Property Single residential property located on the southern side of Myerscough Smithy Road (edge of Mellor Brook village).
250 m north	431471.09, 363654.15	Daniel Thwaites PLC Head Office and Brewery Brewery, stables, and head office located beyond the A59.

Distance	Location	Description
260 m north 330 m east	431112.27, 363990.35	Mellor Brook village The village has a reported population of 2,695 people (mid-2020) (Office for National Statistics, 2021). The village is a linear feature (north south) located along Branch Road and Myerscough Smithy Road.
290 m south	430814.58, 363602.89	Farmhouse Located south of the CTF building beyond the historic BAE Systems landfill that borders the south part of the site.
350 m north	431558.39, 363508.83	Residential property Located between Mammon Wood and Carter Fold Wood on the northern edge of Mellor Brook.
Notes: Multiple on-site receptors including BAE Training Academy (230 m west) and the 3B Machine shop (25 m east) and 3A-Shed (450 m west).		

Table 13-2: Residential and off-site human receptors (within 500 metres of 1-Shed)

Distance	Location	Description
250 m south	431229.90, 361857.17	Bluebird inn and commercial property (Stuart Taylor International)
260 m northwest	7128632.83, -287117.91	Multiple of residential properties
296 m south	431103.50, 361982.10	Residential property Located near the site boundary at the rear of 2-Shed.
385 m west	431555.70, 361693.41	Residential property
388 m north	431825.63, 362350.66	Residential property
390 m north	431886.35, 362180.64	Residential property
400 m northeast	431760.84, 362460.49	Residential property

Distance	Location	Description
405 m northwest	431841.22, 361882.67	Farm buildings
439 m south	431101.81, 361723.66	Farm buildings
478 m northeast	431797.68, 362533.79	Residential property
Notes: Multiple on-site receptors including 2-Shed (30 m south) and 60 m east (4-Shed).		

13.4.2 Surface Water

Surface water can act as both a pathway and receptor for Site derived pollution.

According to the UK Government flood risk information[3] the Site is at Very Low Risk of flooding from rivers and the sea and from surface water. Flooding due to reservoirs and from groundwater is considered unlikely. BAE Systems appreciates that surface water flooding is difficult to predict as it depends on rainfall volume and location. Existing emergency plans would be deployed in the event of an abnormal/emergency event.

Surface water discharges from the site are split with the northern area (including CTF) discharging to Mellor Brook whilst the southern area (including 1-Shed) discharging to Huntley brook (**Figure *13-2***).

3 https://www.gov.uk/check-long-term-flood-risk

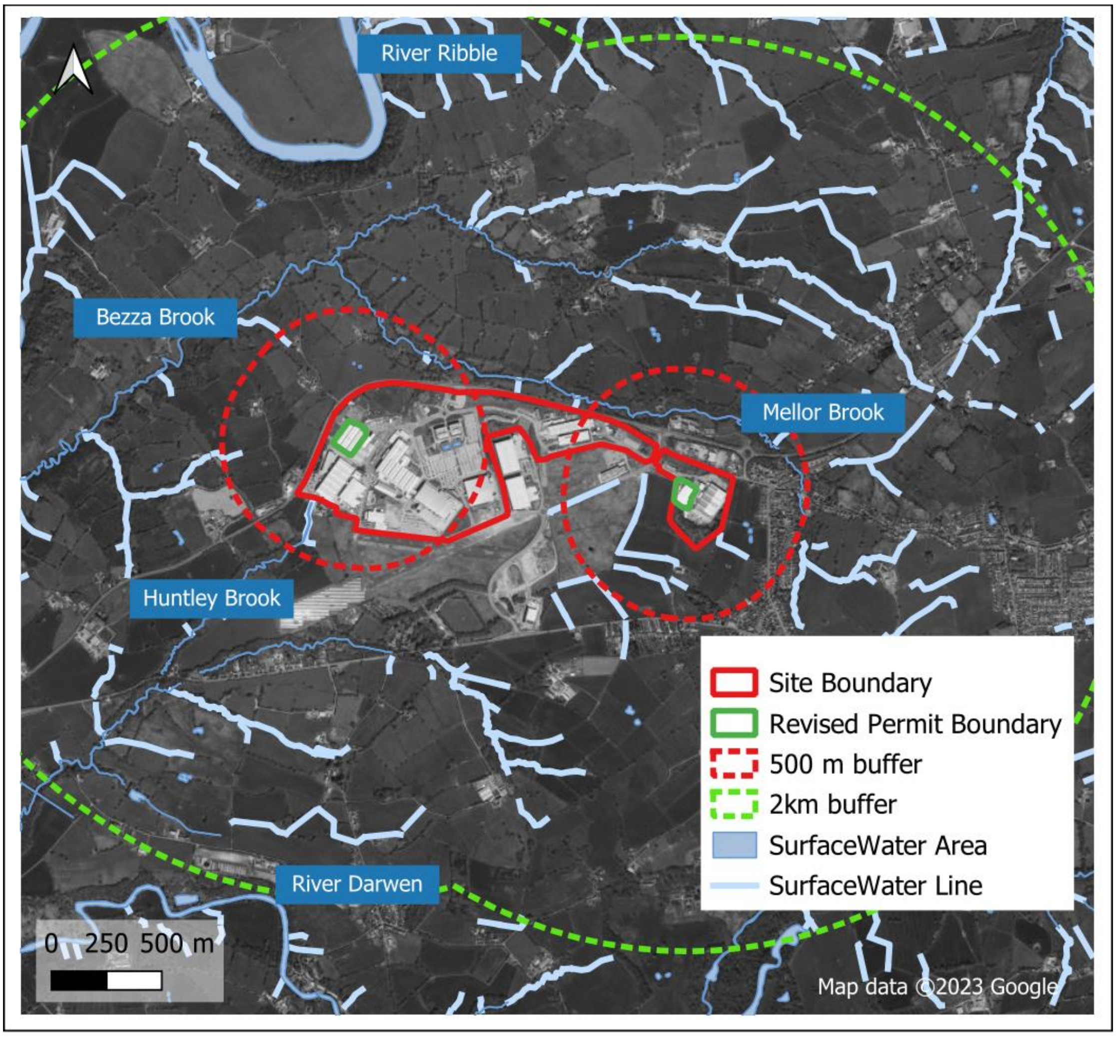


Figure 13-2: *Surface water receptors*

According to the EA Catchment Explorer the site is in the Northwest River Basin, Ribble Catchment, and the Big Ribble Operational area. The site is located within two different waterbodies *i.e.* CTF is in the 'Ribble - conf Calder to tidal water body' whilst 1-Shed area is in the 'Darwen – conf. Roddlesworth to tidal' water body. The status of these water bodies is outlined in **Table 13-3**.

Table 13-3: Water body quality classifications

EA Water body	Classification
Ribble - conf Calder to tidal Water Body	Ecological – Moderate Physico-chemical quality – Moderate Hydromorphological – Supports Good Specific pollutants – High Chemical – Fail Priority substances – Good
Darwen - conf Roddlesworth to tidal Water Body	Ecological – Moderate Physico-chemical quality – Moderate Hydromorphological – Supports Good Specific pollutants – High Chemical – Fail Priority substances – Good
Notes: All classifications from Cycle 3 (2019).	

13.4.3 Groundwater

Groundwater can act as both a pathway and receptor for Site derived pollution.

Both the CTF and No.1 Shed are located on a Secondary A aquifer (Millstone Grit Formation). Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These were formerly classified as minor aquifers.

Exploratory point records indicate that boreholes sunk in the vicinity of the CTF recorded standing groundwater levels between 0.7 and 6.5 m bgl within the Glacial Till. Groundwater ingress is recorded as ranging between slow and medium and increased to fast within a gravel layer within the Glacial Till. Exploratory point records sunk in the vicinity of the No.1 Shed record standing groundwater levels were at approximately 0.4 m bgl in the Glacial Till.

The British Geological Society (BGS) classify the Millstone Grit group as a moderately productive aquifer with virtually all flow through fractures and other discontinuities.

Regionally significant multi-layered aquifer up to 900 m thick with yields of 5-10 l/s, rarely 50 l/s, with many springs.

Although groundwater is likely to be present there is no evidence of any abstractions within 1-km of the site. The site is not within a Source Protection Zone (SPZ).

13.4.4 Habitats and protected conservation areas

Habitats and protected conservation areas can act as receptor for Site derived pollution.

Within the UK there are various protections based on the receptor value. The distance considered between the source and receptor depends on the emission type but, with respect to the information provided below in **Table 13-4**, it considers air emissions as the main potential source.

Table 13-4: Habitats and protected areas (England)

Area	Screening Distance Applied (km) [1, 2]	Assessment
National Parks	10 km	None present.
Area of Outstanding Natural Beauty (AONB)	10 km	None present.
Heritage Coast	10 km	None present.
World Heritage Site	10 km	None present.
Environmentally Sensitive Area (ESA) now Environmental Stewardship Scheme Area	10 km	None present.
Marine Nature Reserve (MNR)	10 km	None present.
Special Protection Areas (SPAs)	10 km	None present.
Special Areas of Conservation (SACs)	10 km	None present.
Ramsar sites	10 km	None present.
UNESCO Biosphere Reserves	10 km	None present.
Site of Special Scientific Interest (SSSI)	2 km	None present.
National Nature Reserve (NNR)	2 km	None present.

Area	Screening Distance Applied (km) [1, 2]	Assessment
Local Nature Reserves (LNR)	2 km	None present.
Local Wildlife Sites	2 km	Mammon Wood and Carter Fold Wood (Ref 63SW20)
Ancient Woodlands	2 km	Multiple (see below), closest is Mammon Wood

Notes:

1 Data provided from www.magic.go.uk

2 Screening distance (where available) taken from https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

3 Local Wildlife Sites are non-statutory sites. There are currently several different terms in use to describe Local Wildlife Sites, including Sites of Importance for Nature Conservation (SINCs), Sites of Nature Conservation Importance (SNCIs) and County Wildlife Sites. They are usually selected by the relevant Wildlife Trust, along with representatives of the local authority and other local wildlife conservation groups. Biological Heritage Sites are 'local wildlife sites' in Lancashire.

According to the Lancashire County Heritage Site Partnership the closest site to CTF (270 metres north) is Mammon Wood and Carter Fold Wood which comprises of a narrow band of semi-natural woodland adjoining Mellor Brook. It is listed in the Lancashire Inventory of Ancient Woodland (Provisional) (English Nature, 1994).

The canopy includes Oak, Ash, Wych Elm, Sycamore, Rowan, Beech, Lime and occasional conifers with Alder occurring along the banks of the brook. Holly, Crab Apple, Elder, Hazel, Hawthorn and Guelder-rose occur in the understorey. The ground flora includes Bluebell, Sanicle, Water Avens, Wood Anemone, Lords-and-Ladies, Wood Speedwell, Bugle, Broad-leaved Helleborine, Wood-sedge, Dog's Mercury, Common Dog-violet, Red Campion, Greater Stitchwort, Wood-sorrel, Enchanter's-nightshade, Opposite-leaved Golden-saxifrage and Wood Melick.

Other Ancient woodlands (within 2-km) include:

- CTF building – Mercyfield/Sandiford Wood (1.9 km north), Jackson Bank Wood (1.9 km north), Hoolster Wood (1.3 km south), Nightfield Wood (2-km north), Jeffery Wood (1.7 km south).

- 1-Shed – Jacksons Bank Wood (1.1 km north), Goose House Wood (600 metres west), Spring Wood (1.4 km west), Marsden Wood (1.3 km west), Nightfield Wood (1.6 km north), Mercyfield/Sandiford Wood (1.8 km north), Smith Fold Wood (570 metres southwest), Seed Park (1.8 km west). Hoolster Wood (1.3 km south) and Mammon Wood (1.3 km east).

13.4.5 Priority habitats

These are called 'habitats of principle importance for the conservation of wildlife in England'. The list of habitats and species of principal importance in England includes 56 habitats and 943 species first identified as priority habitats and species in the UK Biodiversity Action Plan (UK BAP).

A standalone plan is provided showing all priority habitats within 2-km of the installation Ref. 023-1932 BAE Systems - Priority Habitats REV00.

13.4.6 Historic buildings, listed buildings and archaeological sites

Specific geographic information system (GIS) datasets, namely Conservation Areas, Listed Buildings, Scheduled Monuments and World Heritage Sites, have been obtained from Historic England (July 2023). The results of the screening are outlined in **Table 13-5**.

Table 13-5: Heritage assets

Type	Screening Distance Applied (km)	Assessment
Scheduled Monuments	2 km	None
Conservation Areas	2 km	Preston. According to Preston City Council there are currently 11 designated conservation areas in the borough.
World Heritage Sites	2 km	None
Listed Buildings	2 km	20 listed buildings within 2-km of the permitted installation. None within 500 metres of 1-Shed. One (Grade II) listed building (1072063 - Sykes Holt Farmhouse) located 282 metres north of the CTF.

A standalone plan is provided showing all heritage assets within 2-km of the installation Ref. 023-1932 BAE Systems - Heritage Sites REV00.

13.5 Risk Assessment – Accidents

A detailed Hazard Identification (HAZID) was undertaken for the new CTF Anodise process line and was updated for the CTF chemical handling operations. The HAZID process identifies hazards to prevent and reduce any adverse impact that could cause injury (personnel), damage (environment or property) or loss (production). It has been used as a component of risk assessment and management to determine the adverse effects of exposure to hazards and plan necessary actions to mitigate such risks. Where required mitigation measures have been feed back into the design process.

At the outset, a hazard and operability study (HAZOP) was considered but after discussions with the Health and Safety Executive (HSE) a HAZID was deemed acceptable for this process.

Two assessments are provided within the application package:

- 023-1932 BAE Samlesbury CTF Chemical Handling - HAZID REV00
- 023-1932 BAE Samlesbury New Anodise Line - HAZID REV00

The facility is also operated as a Top Tier Control of Major Accident Hazard (COMAH) site. The Site takes all necessary measures to prevent major accidents involving dangerous substances whilst also limiting the consequences to people and the environment of any major accidents.

13.6 Risk Assessment – Emissions to Air

13.6.1 Introduction

As has been stated in **Table *9-1*** the anodise process will use (until removal has been approved) a low volume addition of Sodium dichromate. The switch from the current Chromic acid anodising process to the new Thin Film Sulphuric Acid Anodising (TFSAA) process will considerably reduce Chromium VI within the process line in accordance with UK-REACH requirements.

With respect to Chromium VI the Long-Term Environmental Assessment Level (EAL) has been reduced considerably since the Site was issued its original Integrated Pollution Prevention and Control (IPPC) permit:

- H1 Guidance (2003-2008) – Chromium VI Long-term EAL 0.1 µg/m^3; and

- Air emissions risk assessment (2018) - Chromium VI, oxidation state in the PM_{10} fraction – Long-term EAL 0.0002 µg/m^3 (Defra, 2009) and (UK Government, 2023).

It is important to note that the associated Emission Limit Value for Chromium VI as stated within Sector Guidance S2.07 (Environment Agency, 2009) remains as 1.0 mg/m^3 which are in turn derived from the Surface Treatment BREF (08.2006) (European-Commission, 2006). These were not subject to revision in 2010 post publication of the revised LT EAL.

The application has therefore considered current EA Guidance (UK Government, 2023) with respect to the risk assessment associated with air emissions. Given the low-level use of Sodium dichromate within Bath 23 and the revision of the EAL in relation to Chromium VI BAE Systems decided to proceed directly to detailed modelling. This has been undertaken by ADM Ltd in-line with current EA requirements (UK-Government, 2021).

The assessment has considered all relevant receptors including conservation areas. The Darwen River Site of Special Scientific Interest (SSSI) is more than 2 km from the installation boundary and therefore does not need to be assessed. However, there are several local wildlife sites (LWS) and Ancient Woodlands within 2 km of the installation. Mammon Wood and Carter Fold Wood local LWS and Mammon Wood ancient woodland are approximately 340 metres north of the emission point.

A standalone assessment is provided within the application package:

- 023-1932 BAe Samlesbury AQ v1

The conclusions of the modelling assessment are that:

- The impacts of emissions of the oxides of nitrogen (NOx), hydrogen fluoride (HF) and total chromium (Cr) are determined not to be of concern to human health or ecology.

- Conservatively assuming that 20% of total chromium (Cr) is chromium (VI), the process contribution (PC) is no more than 35% of the Air Quality Assessment level (AQAL) and locations where there is relevant exposure (*e.g.* residential properties). Given that the assumption of 20% has been suggested by the Environment Agency (EA) for screening purposes and that the process contribution is less than the assessment level, it is considered that the impact of emissions of chromium (VI) is not of concern to human health.

As required all air dispersion model files (ADMS 6) are within the application package.

13.7 Impact Assessment – Global Warming

Details concerning the use and source of energy within the installation are outlined in *Section 8*. A summary of energy use and greenhouse gas emissions associated with CTF (for 2022) is provided in ***Table 13-6***.

Table 13-6: *CTF Annual energy use and CO_2 equivalent (2022)*

Energy Source	Annual Energy Consumption		
	Delivered	Primary	Annual Emissions of CO_2 (tonnes) based on primary energy use
Electricity	3,352 MWh	8,045 MWh	1,335 tonnes[1]
Gas	10,947 MWh	-	2,080 tonnes
Total	**14,299 MWh**	**11,040.7 MWh**	**3,415 tonnes**

Notes:

Conversion factor from delivered to primary = 2.4

No specific energy consumption targets or benchmarks available.

Electricity assumes full National Grid supply.

Conversion Notes:

CO_2 factor for electricity is 0.166 per MWh

CO_2 factor for natural gas is 0.190 per MWh

[1] All the electricity consumed on site (including the CTF building) is provided from renewable sources under the Renewable Energy Guarantees of Origin (REGOs) scheme operated by Ofgem. Therefore, the reported CO_2 emissions (due to electricity use) can be discounted.

13.8 Risk Assessment – Emissions to Sewer

As has previously been stated (*Section 11.3*) there will be no change in composition with respect to the discharge to sewer (*i.e.* the previous assessments (submitted to the EA) undertaken using the current H1 screening tool (v2.78, January 2017) remains valid.

For the sake of completeness, the previous assessment is provided. Where required base data has been updated (as stated below).

13.8.1 Basis of Discharge

The releases to internal effluent networks (*i.e.* the installation) occurs from two places:

- CTF via point TE1; and
- 1-Shed via point TE2.

These treated effluent streams combine with surface water and other non-permitted effluent streams (*e.g.* boiler blow down and domestic sewage) before discharging to sewer at emission point TE3 (*i.e.* final site discharge point to sewer via the United Utilities pumping station). TE3 is the compliance point currently listed within the environmental permit (Ref. EPR/BV0414IV/V002).

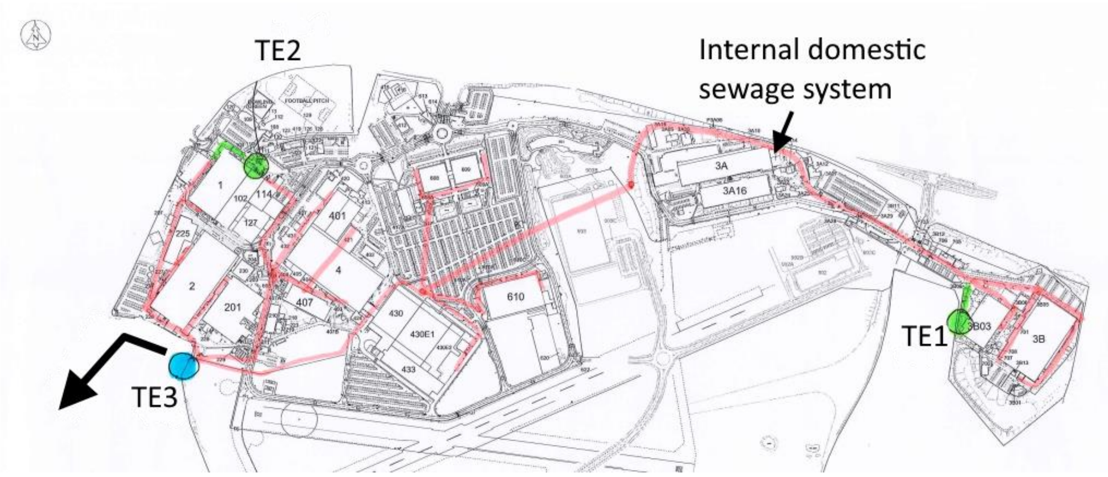


Figure 13-3: *Simplified effluent system*

13.8.2 Off-site Sewage Treatment

The trade effluent from the site operations is discharged to the nearby United Utilities run Blackburn Wastewater Treatment Works (Cuerdale Lane, Samlesbury, Preston, Lancashire, PR5 0UY).

Since the previous PFD variation United Utilities (UU) has spent £140 Million upgrading the Blackburn, Darwen and Nabs Head treatment works. In 2017, UU started work on a four-year improvement project at Blackburn and Darwen Wastewater Treatment Works (WwTW)[4]. The upgrades at the Blackburn WwTW have included:

4 https://waterprojectsonline.com/custom_case_study/blackburn-2021/

- Nereda process structure comprises 6 (No.) 12,000m^3 treatment cells, 2 (No.) 800m^3 sludge buffers, 1 (No.) 800m^3 water level correction buffer and associated aeration and pumping equipment;
- permanent ferric dosing;
- tertiary treatment using Mecana SF21 cloth filtration plant; and
- UV disinfection system designed to treat the final effluent prior to discharge.

These works were undertaken to meet the new river water quality and bathing water standards and improve the quality of used water that's returned to the environment.

13.8.3 Receiving Water Body

The effluent from the WWTP is discharged into Hole Brook before immediately entering the River Darwen. There is no flow percentile data for Hole Brook. The National River Flow Archive has been used to source a Q95 Flow Rate for the downstream River Darwen. The closest station is 71014 - Darwen at Blue Bridge (http://nrfa.ceh.ac.uk/data/station/info/71014). The daily flow (Q95) was previously 1.24 m^3/s (1976-2017) but has now been updated to 1.12 m^3/s (1976-2020). H1 has therefore been updated.

13.8.4 Water Release and Flow Data

The water discharge points from the installation and associated mean and maximum effluent flow rates (2021-2022) are outlined in **Figure *13-4***.

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		1		No	5	10
1	TE1	Discharge from CTF	Surface treatment	1	River Darwen	Yes	0.0005	0.0012
2	TE2	Discharge from 1-Shed	Surface treatment	1	River Darwen	Yes	0.0004	0.0005

Figure 13-4: *Water discharge, release data and flow data*

13.8.5 Water Release Concentrations

The annual average and maximum concentrations in the effluent has been updated using the latest available data (2021) provided from the internal BAE Systems sampling.

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	Nickel and its	Spot	100.0%	0.5	Annual Avg	17.6	Spot	0.007884	0.76	
2	Cadmium and	Spot	100.0%	0.1	Annual Avg	0.1	Spot	0.0015768	0.37	5
3	Zinc	Spot	100.0%	23.81	Annual Avg	258.3	Spot	0.37543608	0.33	
4	Chromium III (S	Spot	100.0%	66.31	Annual Avg	520.5	Spot	1.04557608	0.16	
5	Sulphate	Spot	100.0%	592941	Annual Avg	21110000	Spot	##########	1	
6	Copper	Spot	100.0%	7	Annual Avg	37	Spot	0.110376	0.58	

Figure 13-5: *Release concentrations from TE1*

The sewage treatment factors (STFs) have been updated using the current data (UK-Government, 2022). The Significant Load Limits (UK-Government, 2022) remain unchanged from the previous submission.

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	Copper	Spot	100.0%	10.017	Annual Avg	31.1	Spot	##########	0.58	
2	Nickel and its	Spot	100.0%	0.371	Annual Avg	6.6	Spot	##########	0.76	
3	Iron	Spot	100.0%	9.392	Annual Avg	84	Spot	##########	1	
4	Cadmium and	Spot	100.0%	4.446	Annual Avg	14.4	Spot	##########	0.37	5
5	Zinc	Spot	100.0%	44.958	Annual Avg	207.5	Spot	##########	0.33	
6	Sulphate	Spot	100.0%	121708	Annual Avg	214000	Spot	##########	1	
7	Chromium III (S	Spot	100.0%	106.129	Annual Avg	784	Spot	##########	0.16	

Figure 13-6: *Release concentrations from TE2*

The first step of the assessment is to calculate the process contribution (PC), which is the concentration of each effluent constituent in a surface water after dilution, and to carry out a simple screening assessment to identify insignificant (**Figure *13-7***).

Water Impacts - Fresh 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 Freshwater releases, 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 µg/l	Annual Avg EQS: Release conc < 10% EQS (Test 1)	MAC EQS: Release µg/l	MAC EQS: MAC µg/l	MAC EQS: Release conc < 10% EQS (Test 1)
e.g.						
[TE1] Cadmium and its compounds (50 - <100 mg/l CaCO3) (River Darwen)	0.1000	0.0900	Fail	0.1000	0.6	Fail
[TE1] Chromium III (95%ile) (dissolved) (River Darwen)	66.3100	4.7000	Fail	520.5000	32	Fail
[TE1] Copper (River Darwen)	7.0000	1.0000	Fail	37.0000		N/A
[TE1] Nickel and its compounds (River Darwen)	0.5000	4.0000	Fail	17.6000	34	Fail
[TE1] Sulphate (River Darwen)	#########	#########	Fail	#########		N/A
[TE1] Zinc (River Darwen)	23.8100	10.9000	Fail	258.3000		N/A
[TE2] Cadmium and its compounds (50 - <100 mg/l CaCO3) (River Darwen)	4.4460	0.0900	Fail	14.4000	0.6	Fail
[TE2] Chromium III (95%ile) (dissolved) (River Darwen)	106.1290	4.7000	Fail	784.0000	32	Fail
[TE2] Copper (River Darwen)	10.0170	1.0000	Fail	31.1000		N/A
[TE2] Iron (River Darwen)	9.3920	1000.0000	Pass	84.0000		N/A
[TE2] Nickel and its compounds (River Darwen)	0.3710	4.0000	Pass	6.6000	34	Fail
[TE2] Sulphate (River Darwen)	#########	#########	Fail	#########		N/A
[TE2] Zinc (River Darwen)	44.9580	10.9000	Fail	207.5000		N/A

Figure 13-7: *Test 1 freshwater impacts*

The second stage is to compare the PC as a proportion of the environmental quality standard (EQS). Emissions with PCs less than 4% of the EQS can be screened out from further assessment (**Figure *13-8***).

Water Impact Screening - Fresh Water Releases

Apply Test 2

This page applies Test 2 and displays the Process Contribution as a proportion of the EQS. Emissions with PCs that are less than 4% of the EQS can be screened from further assessment as they are likely to have an insignificant impact.

Substance	Annual Avg EQS: Annual Avg EQS µg/l	Annual Avg EQS: PC µg/l	Annual Avg EQS: Modelled PC	Annual Avg EQS: % PC of EQS %	Annual Avg EQS: PC < 4% of EQS? (Test 2)	MAC EQS: MAC EQS µg/l	MAC EQS: PC µg/l	MAC EQS: Modelled PC	MAC EQS: % PC of MAC %	MAC EQS: PC < 4% of MAC? (Test 2)
Cadmium and its compounds (50 - <100 mg/l CaCO3) (River	0.09	0.0006		0.67	Pass	0.6	0.0024		0.403	Pass
Chromium III (95%ile) (dissolved) (River Darwen)	4.7	0.0108		0.23	Pass	32	0.1450		0.454	Pass
Copper (River Darwen)	1	0.0039		0.39	Pass		0.0310		-	Pass
Nickel and its compounds (River Darwen)	4	0.0001		0.00	Pass	34	0.0022		0.00659	Pass
Sulphate (River Darwen)	400000	307.9255		0.08	Pass		#########		-	Pass
Zinc (River Darwen)	10.9	0.0088		0.08	Pass		0.1217		-	Pass

Figure 13-8: *Test 2 freshwater impacts*

The release of Cadmium to the River Darwin has been screened out *i.e.* the total annual release does not constitute a significant load.

No further assessment is deemed necessary.

13.9 Best Available Techniques (BAT) assessment

A BAT assessment has been undertaken against the current relevant standards (hierarchy) in-line with the recommendations outlined in the current EA Guidance (UK Government, 2016) (**Table *13-7***).

Table 13-7: *BAT Information*

BAT	Improvement Condition
EU BREF	European-Commission. (2006). BREF Surface Treatment of Metals and Plastics. European Commission.
EA Sector Guidance	Environment Agency. (2009). The Surface Treatment of Metals and Plastics by Electrolytic and Chemical Processes (EPR 2.07). As EPR 2.07 is still in use (available on www.gov.uk) and was written by the EA to comply with/meet the objectives of the BREF this guidance was used as the primary BAT source.
EU BATc	Not available for the sector.

A line-by-line assessment has been made including statements outlining how BAT is achieved. The results are summarised within a separate attachment Ref. 023-1932 BAE Systems Samlesbury EPR Variation - BAT Assessment REV00.

13.10 Improvement programme

The following items have been identified as potential areas for improvement (**Table *13-8***).

Table 13-8: *Proposed improvement programme*

Area	Improvement Condition
Noise emissions	Following completion of the installation, the Operator shall undertake noise monitoring at the nearest sensitive receptors. This shall include a full noise monitoring survey and assessment meeting the BS4142:2014 standard including details of local conditions *e.g.* meteorological conditions (wind direction) including 1/3rd octave and narrow band (FFT) measurements to identify any tonal elements or low frequency noise. Upon completion of the work, a written report shall be submitted to the Environment Agency. If rating levels likely to cause complaints or disturbance at sensitive receptors are detected as a result of the installation operation, the report shall include an assessment of the most suitable abatement techniques, an estimate of the cost and a proposed timetable for their installation.
Air emissions	Following completion of the installation, the Operator shall undertake stack emission monitoring of emission point A10 (AE26) *i.e.* scrubber inlet and scrubber outlet for Oxides of Nitrogen (as NO_2), Hydrogen fluoride and Total Chromium, Chromium VI. Upon completion of the work, a written report shall be submitted to the Environment Agency.

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