



## **Determination of an application for variation to an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016**

### **Decision document recording our decision-making process**

The Permit number is: EPR/BR7607IP  
The Operator is: EPC United Kingdom PLC  
The Installation is: Great Oakley Works  
This Variation Notice number is: EPR/BR7607IP/V006

Consultation commenced on: 20/12/2021  
Consultation ended on: 19/01/2022

### **What this document is about**

This application for a variation has been made to request a derogation for a time-limited delay in meeting the new Industrial Emissions Directive (IED) BAT Associated Emission Levels (BAT-AELs) for a direct discharge to water of Chemical Oxygen Demand, Chromium and Nickel.

In this decision document, we set out the reasoning for the consolidated variation notice that we issued.

#### **EPR/BR7607IP/V005 – the Large Volume Organic Chemical sector permit review**

The sector review variation was issued on 20/05/2020 following a review of conditions in the permit to deliver compliance with BAT conclusions.

Article 21(3) of the IED requires the Environment Agency to review conditions in permits that it has issued and to ensure that the permit delivers compliance with relevant standards, within four years of the publication of updated decisions on BAT conclusions.

We reviewed the permit for this installation by comparing the information received in response to a Regulation 61 notice with the revised BAT conclusions for the production of large volume organic chemicals (2017/2117/EU). These were published on 07/12/2017. This review of compliance against relevant BATc also included other relevant BATc published prior to this date but not previously included in a permit review for

the Installation; Common waste water and waste gas treatment/management systems in the chemical sector (CWW), published 09 June 2016.

We issued the variation to deliver compliance with the BAT standards and the BAT AELs by 07/12/2021, with an accompanying decision document explaining the reasoning for the consolidated variation notice that we issued.

Variation EPR/BR7607IP/V006 – purpose of this application for a derogation

This variation application (V006) has been made to make changes to the variation issued under the sector review (V005), in order to include a derogation supporting a time-limited delay to 31/12/2023 in meeting the IED BAT-AELs for the direct waste water discharge to receiving waters for Chemical Oxygen Demand, Chromium and Nickel

This decision document explains how we have reviewed and considered the application and why we have included the specific conditions in the permit we issue. It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position.

Throughout this document we will use a number of expressions. These are as referred to in the glossary and have the same meaning as described in “Schedule 6 Interpretation” of the permit.

## **How this document is structured**

### Glossary

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## Glossary of acronyms used in this document

(Not all of these acronyms are necessarily used in this document.)

BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BATc	BAT conclusion
BREF	Best available techniques reference document
CBA	Cost Benefit Analysis
CHP	Combined heat and power
COD	Chemical oxygen demand
Cr	Chromium, and its compounds expressed as chromium
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
CWW	Common waste water and waste gas treatment/management systems in the chemical sector BAT Conclusions or CWW means Commission Implementing Decision (EU) 2016/902 of 30 May 2016 establishing Best Available Techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for Common Waste Water And Waste Gas Treatment/ Management Systems in the Chemical Sector, as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016
DD	Decision document
Derogation	Deviation from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4) of IED where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs
EAL	Environmental assessment level
ELV	Emission limit value derived under BAT or an emission limit value set out in IED
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations SI 2016 No. 1154
EQS	Environmental quality standard
ETP	Effluent treatment plant
EU-EQS	European Union Environmental Quality Standard
IED	Industrial Emissions Directive (2010/75/EU)
LVOC	Large Volume Organic Chemicals BAT Conclusions or LVOC means The Commission Implementing Decision (EU) 2017/2117 of 21 November 2017 establishing Best Available Techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for the Production of Large Volume Organic Chemicals, as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016.
Ni	Nickel, and its compounds expressed as Nickel
NPV	Net Present Value
PC	Process Contribution
PEC	Predicted Environmental Concentration
SAC	Special Area of Conservation
SGN	Sector guidance note
SHPI(s)	Site(s) of High Public Interest
SSSI(s)	Site(s) of Special Scientific Interest
TGN	Technical guidance note
WFD	Water Framework Directive (2000/60/EC)

# 1 Our decision

We have issued the variation notice to the operator. This will allow them to continue to operate the installation, subject to the conditions in the consolidated variation notice.

As part of our decision we have decided to grant the operator's request for a derogation from the requirements for COD, Cr and Ni in Tables 1 and 3 as identified in the CWW BAT Conclusions document. The way we assessed the operator's request for a derogation and how we subsequently arrived at our conclusion is recorded in Annex 1 of this document.

We consider that, in reaching our decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

The consolidated variation notice contains many conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the notice, we have considered the techniques identified by the operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate.

## 2 How we reached our decision

### 2.1 Receipt of application

The application was submitted on 14/05/2021 and duly made on 21/06/2021. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination; see section 2.2.

The operator claimed that certain information was commercially confidential and should be withheld from the public register. We considered this request and determined that this was relevant to the following information:

- a) Original Derogation support document AECOM Report 60624409-TERP001 Titled BAT Derogation and Dated 5 May 2001, received 07/05/2021 and updated 04/06/2021.
- b) Derogation Cost Summary Appendix A received 14/09/2021
- c) CBA tools received with the original derogation applications and subsequently updated 08/09/2021.

- d) Response to request for further information Questions 9-11 received 08/09/2021.

Versions of the documents in a) and d) without the commercially confidential information have been made available on the public register.

The confidentiality claim relates to commercially sensitive information relating to investment, timing of investment and estimated operational costs.

## 2.2 Requests for further information

We identified a potential conflict between the supporting evidence document which included a request for a derogation from CWW Table 1 Total Suspended Solids BAT-AEL and the submitted summary of the derogation request which did not. We requested clarification of the scope on 06/07/2021 and received a response on 20/07/2021.

The applicant confirmed that they were not requesting a derogation for Total Suspended Solids and provided quarterly monitoring results of 2-3 mg/l from Q1 2020 to Q1 2021 to support this. An inaccurate analysis method in 2019 giving rise to erroneous results was the source of the claim in the supporting evidence document.

Although we were able to consider the application duly made, we needed more information in order to complete our determination, and requested this on 17/08/21.

We received the additional information by email on 08/09/2021:

- Confirmation that there is no mains sewer within 1 km of the installation.
- Confirmation that the dissolved and entrained organics (mostly residual product 2-Ethylhexylnitrate) are unstable to rapid decomposition if stored or transported in contact with strong acid, even at ambient temperatures.
- Confirmation that the original strong acid treatment process in 2018 relied on physical separation of acidic and organic streams without heat. This resulted in rapid decomposition and ignition of organics that remained.
- Explanation of why steam stripping, which just tends to volatilise the organics, is not a suitable option for consideration while evaporation, which destroys them as well, can be.
- Agreement that the ozone treatment process considered does not provide any technical advantage over the peroxide process.
- Further detail on the justification for screening out activate carbon treatment as an option for organics removal.
- Further detail on vent abatement scrubbing including the use of peroxide in some options and the feasibility of treating the fuel oil heater emissions.
- Updated Cost Benefit Analysis information including corrected costs for 96% sulphuric acid production, required costing of an option to meet BAT-AELs by 07/12/21 (by site closure) and clarification of the use of

Lang Factors for estimating total project costs from major equipment costs.

- Proposed emission limit values (ELVs) for discharge to water via W2 during the derogation period of COD 1400mg/l; Cr 650 µg/l; Ni 550 µg/l

On 15/10/2021 we made a further request for clarification of the estimated mass emissions of Cr and Ni after the derogation period and reconsideration of the derogation period proposed ELVs for Cr and Ni if the lower values are correct.

We received a clarifying response by e-mail on 20/10/2021 which proposed revised ELVs of Cr 250 µg/l; Ni 200 µg/l. We have assessed these proposed limits, with 1400mg/l for COD, as reasonable limit proposals for the derogation period based on the submitted monitoring analyses.

### 2.3 Summary of how we considered the responses from public consultation

The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement.

We have consulted on our draft decision from 20/12/21 to 19/01/2022. A summary of the consultation responses and how we have taken into account all relevant representations is shown in Annex 3.

## **3 The legal framework**

The consolidated variation notice will be issued under Regulation 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* as described by the IED;
- subject to aspects of other relevant legislation which also have to be addressed.

We consider that, in issuing the variation, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

We explain how we have addressed specific statutory requirements more fully in the rest of this document (Annex 1).

We have set the ELVs in line with the BAT Conclusions other than for those parameters for which a derogation was sought as detailed in Annex 1 of this document. If a tighter limit was previously imposed these limits have been carried forward on the basis of no backsliding. The emission limits and monitoring tables have been incorporated into Schedule 3 of the permit.

#### Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit variation.

Paragraph 1.3 of the guidance says:

“The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.”

We have addressed the legislative requirements and environmental standards to be set for this operation in this decision document. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.



## 4 Overview of the site and installation

EPC United Kingdom Plc's Great Oakley Works manufactures up to 30,000 tonnes per annum (tpa) of 2-ethylhexyl nitrate (2-EHN) by a simple high yield nitrification process using nitric and sulphuric acids. The product is used as a fuel additive to reduce emissions and improve fuel efficiency in diesel engines.

The process produces a 77% sulphuric acid (with some nitric acid) strong acid effluent stream. In 2018 the operator installed an acid recovery process to convert this effluent into a non-waste saleable product by removing dissolved organic material using unheated separator/coalescer technology. In early 2019 the plant was damaged by a fire and the investigation showed the effluent feedstock to be exothermically unstable under the conditions of the recovery so the replacement would have to be based on a process taking this instability into account. The operator expected this replacement to be in place before December 2021 so the Large Volume Organic Chemicals permit review for the installation was completed and issued in May 2020. It is now realised that the development of a safe replacement will not be possible by December 2021 so this derogation request was raised, as a separate variation, to continue currently permitted discharges to Bramble Creek until 31st December 2023.

Since the fire the strong acid effluent has been rapidly diluted with water (to ensure it is stable) and mixed with a weaker (5% sulphuric acid) product washing stream for discharge to Bramble Creek tidal estuary via release point W2. This discharge is limited by permit conditions to 280m<sup>3</sup>/day of up to 16.6% sulphuric acid at no more than 8 litres/second during 2 periods from 2 hours before until 3 hours after high water. The 280m<sup>3</sup>/day was a permit variation increase in 2019 from 200m<sup>3</sup>/day whilst the acid recovery plant is not available. For this variation the operator conducted, and submitted to the Environment Agency, modelling of pH dispersion in Bramble Creek and surveys of the benthic ecology in Bramble Creek and Oakley Creeks.

Currently this is the only production activity at the site. There is also a 2000 tpa metals recovery plant with a separate discharge to water (W1), which could potentially use some of the waste acid from the 2-EHN plant. But this has been mothballed for several years and would probably need modifications to meet BAT-AELs itself in order to restart.

The installation is located on Bramble Island (TM2135326512) approximately 5km SW of Harwich, on the Essex coast. There are no residential receptors within 1km of the installation, which, as a former explosives manufacturing site (still some storage), is relatively remote, with no mains gas or sewer and a limited electrical power supply.

The installation and all the islands and creeks to the north, east and south are within Hamford Water Special Protection Area/Ramsar site/Site of Special Scientific Interest The northern bank of Bramble Creek is also part of Hamford

Water Special Area of Conservation. The creeks and islands (except for the installation) are additionally part of a National Nature Reserve.



## **5 Key Issues**

The key issues for the determination of this application are set out in Annex 1 under the following sections:

- 6) Options
- 7) Costs and benefits consideration
- 8) Environmental consequences of allowing a derogation and other considerations
- 9) Summary of the predicted impact of derogating from the BAT-AEL on any long term or short term Environmental Quality Standards / Environmental Assessment Levels.
- 10) Other potential environmental impacts.
- 11) Permit conditions

## **Annex 1: Review and assessment of derogation request made by the operator in relation to BAT Conclusions which include an associated emission level (AEL) value.**

### 1) Article 15(4)

The IED enables a competent authority to allow derogations from BAT AELs stated in BAT Conclusions under specific circumstances as detailed under Article 15(4):

*By way of derogation from paragraph 3, and without prejudice to Article 18, the competent authority may, in specific cases, set less strict emission limit values. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to:*

*(a) the geographical location or the local environmental conditions of the installation concerned; or*

*(b) the technical characteristics of the installation concerned.*

Where a derogation is to be granted, the decision and the reasons for granting a derogation and justification for the conditions imposed must be clearly stated. This information must also be included in an Annex to the permit itself, as required by IED Article 15(4).

### 2) Cost Benefit Analysis

If a derogation is applicable under Article 15(4) of the IED, then Cost Benefit Analysis (CBA) is undertaken. The CBA allows calculation to indicate whether the costs of compliance are greater or less than the environmental benefits.

It essentially groups all the costs on one side, with all the benefits, as far as possible, on the other side. It then includes the effect of time on the value of those costs and benefits in order to produce a Net Present Value (NPV).

This gives an indication of whether those costs are disproportionate or not, but there are many sensitivities in the analysis and many aspects of the environment that cannot yet be monetised so the actual decision on disproportionality rests with the Environment Agency.

Where the NPV is positive, this indicates that the cost of compliance with the BAT AEL(s) does not outweigh the environmental benefits.

Where the NPV is negative, this indicates that the costs of compliance with the BAT AEL(s) outweigh the environmental benefits.

### 3) Derogation request

The operator has requested a derogation from compliance with the AEL values as detailed below:

a) From BAT-AEL for Chemical Oxygen Demand in Table 1 of CWW

Table 1

**BAT-AELs for direct emissions of TOC, COD and TSS to a receiving water body**

Parameter	BAT-AEL (yearly average)	Conditions
Total organic carbon (TOC) <sup>(1)</sup> <sup>(2)</sup>	10-33 mg/l <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup> <sup>(6)</sup>	The BAT-AEL applies if the emission exceeds 3,3 t/yr.
Chemical oxygen demand (COD) <sup>(1)</sup> <sup>(2)</sup>	30-100 mg/l <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup> <sup>(6)</sup>	The BAT-AEL applies if the emission exceeds 10 t/yr.
Total suspended solids (TSS)	5,0-35 mg/l <sup>(7)</sup> <sup>(8)</sup>	The BAT-AEL applies if the emission exceeds 3,5 t/yr.

- <sup>(1)</sup> No BAT-AEL applies for Biochemical oxygen demand (BOD). As an indication, the yearly average BOD<sub>5</sub> level in the effluent from a biological waste water treatment plant will generally be ≤ 20 mg/l.
- <sup>(2)</sup> Either the BAT-AEL for TOC or the BAT-AEL for COD applies. TOC is the preferred option because its monitoring does not rely on the use of very toxic compounds.
- <sup>(3)</sup> The lower end of the range is typically achieved when few tributary waste water streams contain organic compounds and/or the waste water mostly contains easily biodegradable organic compounds.
- <sup>(4)</sup> The upper end of the range may be up to 100 mg/l for TOC or up to 300 mg/l for COD, both as yearly averages, if both of the following conditions are fulfilled:
- Condition A: Abatement efficiency ≥ 90 % as a yearly average (including both pretreatment and final treatment).
  - Condition B: If a biological treatment is used, at least one of the following criteria is met:
    - A low-loaded biological treatment step is used (i.e. ≤ 0,25 kg COD/kg of organic dry matter of sludge). This implies that the BOD<sub>5</sub> level in the effluent is ≤ 20 mg/l.
    - Nitrification is used.
- <sup>(5)</sup> The upper end of the range may not apply if all of the following conditions are fulfilled:
- Condition A: Abatement efficiency ≥ 95 % as a yearly average (including both pretreatment and final treatment).
  - Condition B: same as Condition B in footnote <sup>(4)</sup>.
  - Condition C: The influent to the final waste water treatment shows the following characteristics: TOC > 2 g/l (or COD > 6 g/l) as a yearly average and a high proportion of refractory organic compounds.
- <sup>(6)</sup> The upper end of the range may not apply when the main pollutant load originates from the production of methylcellulose.
- <sup>(7)</sup> The lower end of the range is typically achieved when using filtration (e.g. sand filtration, microfiltration, ultrafiltration, membrane bioreactor), while the upper end of the range is typically achieved when using sedimentation only.
- <sup>(8)</sup> This BAT-AEL may not apply when the main pollutant load originates from the production of soda ash via the Solvay process or from the production of titanium dioxide.

The operator has proposed an emission limit value of 1400mg/l until 31/12/23 based on analysis of their current emissions.

b) From BAT-AELs for Chromium and Nickel in Table 3 of CWW

Table 3

**BAT-AELs for direct emission of AOX and metals to a receiving water body**

Parameter	BAT-AEL (yearly average)	Conditions
Adsorbable organically bound halogens (AOX)	0,20-1,0 mg/l <sup>(1)</sup> <sup>(2)</sup>	The BAT-AEL applies if the emission exceeds 100 kg/yr.
Chromium (expressed as Cr)	5,0-25 µg/l <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup> <sup>(6)</sup>	The BAT-AEL applies if the emission exceeds 2,5 kg/yr.
Copper (expressed as Cu)	5,0-50 µg/l <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup> <sup>(7)</sup>	The BAT-AEL applies if the emission exceeds 5,0 kg/yr.
Nickel (expressed as Ni)	5,0-50 µg/l <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup>	The BAT-AEL applies if the emission exceeds 5,0 kg/yr.
Zinc (expressed as Zn)	20-300 µg/l <sup>(3)</sup> <sup>(4)</sup> <sup>(5)</sup> <sup>(8)</sup>	The BAT-AEL applies if the emission exceeds 30 kg/yr.

- (1) The lower end of the range is typically achieved when few halogenated organic compounds are used or produced by the installation.
  - (2) This BAT-AEL may not apply when the main pollutant load originates from the production of iodinated X-ray contrast agents due to the high refractory loads. This BAT-AEL may also not apply when the main pollutant load originates from the production of propylene oxide or epichlorohydrin via the chlorohydrin process due to the high loads.
  - (3) The lower end of the range is typically achieved when few of the corresponding metal (compounds) are used or produced by the installation.
  - (4) This BAT-AEL may not apply to inorganic effluents when the main pollutant load originates from the production of inorganic heavy metal compounds.
  - (5) This BAT-AEL may not apply when the main pollutant load originates from the processing of large volumes of solid inorganic raw materials that are contaminated with metals (e.g. soda ash from the Solvay process, titanium dioxide).
  - (6) This BAT-AEL may not apply when the main pollutant load originates from the production of chromium-organic compounds.
  - (7) This BAT-AEL may not apply when the main pollutant load originates from the production of copper-organic compounds or the production of vinyl chloride monomer/ethylene dichloride via the oxychlorination process.
  - (8) This BAT-AEL may not apply when the main pollutant load originates from the production of viscose fibres.
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The operator has proposed emission limit values of Cr 250 µg/l and Ni 200 µg/l until 31/12/23 based on analysis of their current emissions.

The basis for this derogation request is due to the technical characteristics of the installation.

On review and assessment of this information we have decided to grant the derogation requested by the operator in respect to the AEL values described, but have included ELVs in the variation that will ensure suitable protection of the environment during and after the derogation period.

The way in which we have considered, assessed and determined the derogation request is detailed in the sections below.

#### 4) Description of BAT

The BAT-AELs relevant to this derogation application are found in Tables 1 and 3 under BAT Conclusions 10-12 of CWW. The requirements of BAT Conclusions 10-12 in summary are:

BAT 10. In order to reduce emissions to water, BAT is to use an integrated waste water management and treatment strategy that includes an appropriate combination of the techniques in the priority order given below:

- a) Process-integrated techniques
- b) Recovery of pollutants at source
- c) Waste water pretreatment
- d) Final waste water treatment

BAT 11. In order to reduce emissions to water, BAT is to pretreat waste water that contains pollutants that cannot be dealt with adequately during final waste water treatment by using appropriate techniques to:

- protect the final waste water treatment plant
- remove compounds that are insufficiently abated during final treatment
- remove compounds that are otherwise stripped to air from the collection system or during final treatment
- remove compounds that have other negative effects

BAT 12. In order to reduce emissions to water, BAT is to use an appropriate combination of final waste water treatment techniques.

- Preliminary and primary treatment – Equalisation; Neutralisation; Physical separation
- Biological treatment (secondary treatment) - e.g. Activated sludge process; Membrane bioreactor
- Nitrogen removal – Nitrification/denitrification
- Phosphorus removal – Chemical Precipitation
- Final solids removal – Coagulation and flocculation; Sedimentation; Filtration; Flotation

The operator has considered all these BAT Conclusions and stated that only neutralisation would be technically applicable for treating their 77% sulphuric acid strong acid effluent stream and this would not be technically feasible within the constraints of the installation. All the options taken forward for detailed consideration in the derogation application are therefore based on redirecting the strong acid stream away from the discharge under BAT Conclusion 10 a).

The 2020 permit review variation was issued on the basis that all BAT conclusions and BAT-AELs would be met by 07/12/2021 and improvement conditions were included to ensure this.

In carrying out the improvement conditions, the operator has established that the installation will not meet the new Industrial Emissions Directive (IED) BAT Associated Emission Levels (AELs) in CWW Tables 1 and 3 after BATc 12, for Chemical Oxygen Demand, Chromium and Nickel in direct discharge to receiving waters.

This variation permits a time-limited delay to 31 December 2023 in meeting these BAT-AELs through the introduction of temporary emission limits (Table S3.2 of the permit), with an improvement condition (IC40) to address reporting progress on development of a ferric sulphate production plant.

After 31/12/2023 the operator asserts that this approach will achieve compliance with the BAT-AELs for the remaining W2 discharge to water. Therefore, the time-limited derogation will not extend beyond the next BREF cycle.

#### 5) Derogation criteria - technical characteristics

The derogation was sought in relation to technical constraints (with secondary geographical characteristics) at the installation, based on an interlinked combination of:

- The configuration of the plant on a given site, making it more technically difficult and costly to comply.
- Recent history of pollution control investment in the installation in respect of the pollutant for which the derogation is sought.
- The safety of the installation would be affected by compliance with the BAT-AEL (other than ceasing production).

- The effect of reducing the excess emissions upon other pollutant emissions, energy efficiency, water use or waste arising from the installation as a whole.

The very strongly acidic nature of the effluent precludes the use of a biological effluent treatment process unless an impractically large, costly and environmentally disadvantageous neutralisation is carried out first. Other European 2-EHN manufacturers' plants are close to energy supplies and integrated users of spent acid solution, but the EPC Fuel Additive Plant is standalone on a remote site with no network gas supply and limited grid electrical connection.

The acid recovery options for EPC, and their relative merits, are therefore bespoke to their process. One option has already been developed, but this was unexpectedly found to be unsuitable on safety grounds. This means that, in addition to the unplanned additional cost, the new option must also be fully tested for safety before implementation.

The operator has stated that even at ambient temperature the 2-EHN product can separate as a layer on top of the strong acid. If re-agitated a runaway reaction can result in ignition. Therefore, in the meantime the spent acid cannot be treated elsewhere because it is thermally unstable to store or transport, so continuing the current rapid dilution and discharge is considered to be the most appropriate action.

## 6) Options

The operator has considered 13 options to meet the BAT-AELs although none would achieve this by 07/12/2021. We therefore also requested that they consider and cost an option of meeting the BAT-AELs by 07/12/2021, which they have done by costing temporarily closing the site for two years. In reality the operator considers this option would most likely lead to permanent site closure.

<b>Review of possible techniques to achieve BAT AEL not progressed to full cost benefit analysis</b>	
<b>Type of techniques considered</b>	<b>Technique description</b>
Stabilisation with Urea	Generate a urea / sulphuric acid product by reaction that can be sold as a novel agricultural plant food product.
Conversion to Ammonium Sulphate	Conversion to ammonium sulphate by reaction
Neutralisation and Disposal	Neutralise effluent to pH7 for treatment and disposal via existing Discharge Point W2.
Steam Stripping	Recovery of strong acid for export off-site as a saleable by-product.



Review of possible techniques to achieve BAT AEL not progressed to full cost benefit analysis	
Type of techniques considered	Technique description
Filtration through a Hydrophobic Absorbent Material	Generate a saleable strong acid product (@77%) by removal of organic impurities.
Treatment with Ozone	Generate a saleable strong acid product (@77%) by destroying the soluble organic material in situ.
Activated Carbon	Generate a saleable strong acid product (@77%) by removal of organic impurities
Centrifugation	Generate a saleable strong acid product (@77%) by removal of organic impurities
Offsite Shipment for Processing	Third party would generate a saleable strong acid product (@77%)
Novel Processing	Other more novel treatment options for the strong spent acid were preliminarily investigated in the laboratory by EPC. These included the use of microwaves and also ultrasound for the degradation of the soluble / entrained organic components.

The application reviews each option and provides justification for not considering them further. The remaining three options, which have been taken forward to the CBA in addition to 'business as usual' and 'meeting BAT-AELs' all have the same 07/12/2021 to 31/12/2023 derogation period and are:

Option name	Short description of the option	Timescales for completion	Details
Business As Usual (BAU)	Current Operations – the baseline	N/A	This option demonstrates the existing operation of the installation (although with ELVs tightened to currently achievable levels) and would be applicable if the installation operations were to continue without any changes being made. This would not achieve the BAT-AELs mentioned above.
Proposed derogation	Ferric Sulphate Production	31/12/2023	Manufacturing ferric sulphate solution by-product through the reaction of the spent strong acid with imported magnetite (iron oxide) generating a saleable chemical, e.g. for use in wastewater treatment for phosphorus removal (the impurity profile rules it out of potable water treatment).

Option name	Short description of the option	Timescales for completion	Details
Meeting BAT-AELs	Temporary closure of the installation	07/12/2021	In response to the request for further information the operator has submitted an additional option for ceasing operation at 07 December 2021 until December 2023 as this would be the only way to meet BAT-AELs. There is not sufficient current capacity elsewhere in European 2-EHN manufacture to allow EPC to purchase the material to meet contracts and the most likely outcome is that reaction from other suppliers to meet the demand would render the future Bramble Island operation commercially unviable.
Operator Option 2	Evaporation to 77% Acid for export	31/12/2023	Use of an evaporator, which thermally degrades the organic content of the strong acid, whilst also evaporating and removing nitric acid contaminant, generating a saleable sulphuric acid for transport offsite (77% strength). It is believed possible to design this to avoid the known unsafe operating conditions envelope.
Operator Option 3	Hydrogen Peroxide Treatment to 77% Acid for export	31/12/2023	chemical treatment with hydrogen peroxide, for the destruction of the remaining soluble organic material and nitric acid within the spent strong acid, generating a saleable sulphuric acid for transport offsite (77% strength).
Operator Option 2a	Evaporation to 96% Acid for reuse on site	31/12/2023	It is possible that a second thermal stage could be applied (later) to the recovered 77% sulphuric acid, so as to generate a strong acid capable of being recycled within the process on site.

We have challenged the operator regarding their timescales for compliance with the BAT-AEL in light of any potential delays due to the impacts from the COVID-19 pandemic and they have confirmed that the project will still deliver by 01/01/2024.

#### 7) Costs and benefits consideration

We have reviewed the Cost Benefit Analysis (CBA) and consider it to support the derogation request. Section 2 above explains the principles of CBA and the key points from the CBA results are summarised below.

The CBA considers the options in the table above. The operator has included upfront investment costs. For the ferric sulphate preferred option these were detailed cost breakdowns but for other options they were derived using the Lang factor method used widely in industry to estimate total project costs from major equipment item costs. We are satisfied with the figures but recalculated

the costing for the ferric sulphate option using the Lang factor method to ensure comparability. There are also operating costs as relevant to each option.

Within the CBA, the net present value (NPV) for the proposed derogation (ferric sulphate production in this case) is set as zero and the analyses look at whether the environmental benefits of meeting the BAT-AELs (or other options) are higher than the costs of doing so in comparison to the proposed derogation. If the benefits outweighed the costs for any of the other options, the NPVs would be positive values. The summary results are:

<b>Summary of NPV analysis</b>					
<b>Option</b>	<b>Proposed derogation</b>	<b>BAT AEL</b>	<b>Evaporator 77% Acid</b>	<b>Peroxide 77% Acid</b>	<b>Evaporator 96% Acid</b>
<b>Central (£millions)</b>	0.00	-47.47	-106.18	-105.71	-93.18
<b>Sensitivity analysis</b>					
Lowest NPV – High operating costs (£millions)	0.00	-76.37	-136.00	-136.21	-117.52
Highest NPV – Low operating costs (£millions)	0.00	-18.57	-76.37	-75.20	-68.83
<b>Scenario analysis</b>					
Lowest NPV – High costs, Low benefits (£millions)	0.00	-76.37	-133.19	-136.20	-112.95
Highest NPV – Low costs, high benefits (£millions)	0.00	-18.57	-85.29	-79.66	-81.28

The NPV is significantly negative for all options, including under the sensitivity and scenario analyses. This means that in comparison with the proposed derogation, the cost of compliance with the BAT-AELs (additional cost of around £47.5 million as NPV) is disproportionate compared to the environmental benefit achieved, as are the costs of the other options considered.

The CBA tool explores a number of variations in the inputs by running sensitivity analyses. Under all scenarios, the cost of compliance (at best NPV -£18.57m) remains disproportionate compared to the environmental benefit achieved.

We also carried out further manual sensitivity checks on specific parameters.

<b>Summary of NPV analysis - Central (£millions)</b>					
<b>Option</b>	<b>Proposed derogation</b>	<b>BAT AEL</b>	<b>Evaporator 77% Acid</b>	<b>Peroxide 77% Acid</b>	<b>Evaporator 96% Acid</b>
<b>Setting Weighted average cost of capital to 12% rather than submitted 2%</b>	0.00	-47.47	-106.38	-109.06	-93.93
<b>Including operating costs for the BAU part of options</b>	0.00	-47.34	-106.38	-109.06	-93.93
<b>Including ecosystem damage costs from National Water Environmental Benefits Survey</b>	0.00	-46.96	-105.90	-105.71	-93.18
<b>Including costs/savings for diesel costs in changes in road transport use</b>	0.00	-47.47	-106.18	-105.71	-92.66

In all cases there was only a small change to the Net Present Values.

Although the exact figures for the NPVs may change under various different scenarios, the overall conclusion will not. The outcome of the CBA supports the choice of the proposed derogation project to manufacture ferric sulphate solution through the reaction of the spent strong acid with imported magnetite (iron oxide) generating a saleable chemical, e.g. for use in wastewater treatment for phosphorus removal.

#### 8) Environmental consequences of allowing a derogation and other considerations

The BAT-AELs for COD, Cr and Ni are yearly average limits for the discharge of the pollutants. The following table summarises the estimated discharges for the period of derogation at the current analysed emissions and at the proposed ELVs.

Annual emissions	Maximum Emission when meeting BAT-AELs per year	Current estimated emission per year	Expected emission over BAT-AEL during period of derogation	Maximum emission at proposed derogation ELVs per year	Maximum emission over BAT-AEL during period of derogation
Chemical Oxygen Demand (Tonne)	10.2	66.2	115.8	143.1	274.8
Chromium (kg)	0.51	13.8	27.5	25.5	51.8
Nickel (kg)	0.51	11.0	21.8	20.4	41.2

The Operator's preferred proposal will mean that a likely additional 115.8t,COD, 27.5kg Cr and 21.8kg Ni being discharged to Bramble Creek up to 01/01/24 compared to the cessation of production under the option of meeting BAT-AELs in December 2021.

A benthic ecology survey was undertaken in March 2019 when the strong and weak combined effluent was being discharged to Bramble Creek (BAU) as proposed for the derogation period. Overall numbers of individuals recorded did not differ from previous surveys in 2013 across Bramble Creek, however, there were notable differences in the abundance of some taxa at specific stations. Infaunal Quality Index (IQI) values were indicative of good to high ecological status at most sampling stations and across Bramble Creek as a whole, although the IQI at the discharge site was only moderate in 2019 (high in 2013).

With the caveat that there is a degree of uncertainty from natural temporal and spatial variation with seasons, overall the results suggest little evidence of a significant impact of the discharge on the sediments and the associated benthic communities.

9) Summary of the predicted impact of derogating from the BAT-AEL on any long term or short term Environmental Quality Standards / Environmental Assessment Levels.

Considering the 2 year duration of the derogation with continuation of current discharges the predicted impact of derogating from the BAT AEL on any long term or short Environmental Quality Standards (EQS) / Environmental Assessment Levels (EAL) is not believed to be significant.

10) Other potential environmental impacts.

Hamford Water SPA/Ramsar/SSSI is a large, shallow estuarine basin comprising tidal creeks and islands, intertidal mud and sand flats, and saltmarsh supporting rare plants |(including hogs fennel) and internationally important species/populations of migratory waterfowl such as breeding little terns and wintering dark-bellied geese. There is also a SAC, parts of which adjoin the installation and Bramble Creek, that is cited for Fisher's estuarine

moth that feeds on the hogs fennel.

The concentrations of COD, Cr and Ni during the 2 year period of derogation are a betterment on the current discharges that have been the situation for many years. They are unlikely to have a significant adverse effect on the conservation site species.

There have recently been some reports of skin lesions being observed on seals in the area but investigations have not attributed these to the acidic discharge.

Under the preferred option, after the derogation period from 01/01/24 the Installation would also meet BAT for point discharges to water in accordance with Annex 1 of the Convention for the Protection of the Marine Environment of the North East Atlantic (OSPARCOM).

### 11) Permit conditions

Any permit variation issued will include an improvement condition to regularly report progress with the works required for the proposed derogation option and achieving the BAT-AELs.

The Emission Limit Values for COD, Cr and Ni will be amended to reflect currently achievable concentrations for 07/12/21 to 31/12/23 and monitoring to ensure emissions remain below the thresholds for BAT-AELs thereafter.

### 12) Conclusion

The derogation request meets the technical characteristic criteria of IED Article 15(4) with an appropriate range of options reviewed and taken forward for CBA. The operator has demonstrated that the costs of achieving the BAT-AEL by 07/12/2021 are disproportionate to the environmental benefits.

Evidence from surveys of the macrobenthic communities in Bramble and Oakley Creeks under the current discharge supports the conclusion that there will not be a significant environmental impact from the derogation proposal.

We are satisfied that the operator has demonstrated that the proposed derogation option achieves the best overall environmental outcome and we have no concerns regarding the ongoing BAU impact on the receiving waters for the duration of the time-limited derogation. The BAT-AELs for COD, Cr and Ni will be achieved, albeit at a later date than required by the CWW BREF. Allowing the proposed derogation would not cause significant pollution or prevent a high level of protection of the environment as a whole to be achieved.

## Annex 2: Improvement Conditions

Based on our assessment of the proposals in the derogation application, we consider that we need to set improvement conditions so that the desired outcomes are achieved by the installation. These additional improvement conditions are set out below.

If the consolidated permit contains existing improvement conditions that are not yet complete or the opportunity has been taken to delete completed improvement conditions then the numbering in the table below will not be consecutive as these are only the improvement conditions arising from this permit variation.

Ref	Improvement Condition	Date
IC40	<p>The operator shall submit to the Environment Agency for approval reports on progress in implementing the preferred Ferric Sulphate production proposal described in application EPR/BR7607IP/V006 for a derogation from BAT-AELs for COD, Cr and Ni direct discharge to receiving waters until 31 December 2023.</p> <p>The reports shall include, but not be limited to, progress against targets / timelines for reaching compliance by 31/12/23 and any alterations to the initial plans.</p> <p>Approval of reports under this Improvement Condition does not preclude the need for permit variation application to operate the developed process.</p>	<p>Progress reports by:</p> <p>30/06/22</p> <p>31/12/22</p> <p>30/06/23</p> <p>31/12/23</p>

In addition, we have

- a) Marked IC31, IC32, IC37, IC38 and IC39 as 'Superseded by derogation for ferric sulphate plant' as the need for them is superseded by the terms of the derogation. IC39 is specifically superseded by IC40.
- b) Marked IC33, IC35, IC36 as complete as the required submissions have been made and any further information will be requested as part of compliance activity.
- c) IC34 remains as a response is still awaited by 07/12/21.

### Annex 3: Consultation on the draft decision

This section reports on the outcome of the public consultation on our draft decision carried out between 20/12/2021 and 19/01/2022.

The draft decision record and associated draft consolidated variation notice were published and made available to view on gov.uk website between the dates detailed above. We also sent the consultation to the local authority Environmental Health Department, UK Health Security Agency (formerly Public Health England), Local Director of Public Health and the Health and Safety Executive.

Summary of responses to consultation and the way in which we have taken these into account in the determination process:

Response received from
UK Health Security Agency
Brief summary of issues raised
Based on the information contained in the application supplied to us, UKHSA has no significant concerns regarding the risk to the health of the local population from the installation.
Summary of actions taken or show how this has been covered
No action required.

No responses were received through the gov.uk website or from other specific consultees.