

Notice of variation and consolidation with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Esso Petroleum Company, Limited

Esso Refinery
Marsh Lane
Fawley
Southampton
Hampshire
SO45 1TX

Variation application number

EPR/BR6996IC/V008

Permit number

EPR/BR6996IC

Esso Refinery

Permit number EPR/BR6996IC

Introductory note

This introductory note does not form a part of the notice

Under the Environmental Permitting (England & Wales) Regulations 2016 (schedule 5, part 1, paragraph 19) a variation may comprise a consolidated permit reflecting the variations and a notice specifying the variations included in that consolidated permit.

Schedule 1 of the notice specifies the conditions that have been varied and schedule 2 comprises a consolidated permit which reflects the variations being made. All the conditions of the permit have been varied and are subject to the right of appeal.

This variation authorises the following changes;

- The installation of a new steam methane reforming hydrogen plant and a new high pressure diesel hydrofiner unit.
- The installation of a low sulphur jet hydrofining reactor replacing the existing reactor.

This is a new scheduled activity within the permit;

S4.2 Part A(1) (a) (i) Producing inorganic chemicals such as gases (for example ammonia, hydrogen chloride, hydrogen fluoride, hydrogen cyanide, hydrogen sulphide, oxides of carbon, sulphur compounds, oxides of nitrogen, hydrogen, oxides of sulphur, phosgene).

The rest of the installation is unchanged and continues to be operated as follows:

Esso Petroleum Company, Limited (EPCo) is a UK based company, which is part of the ExxonMobil group of companies. The Fawley Refinery installation boundary includes the EPCo oil refinery, and the ExxonMobil Chemical Limited (EMCL) petrochemical plant. Nalco Manufacturing Limited (EPR permit number PP3432HA) operate within the outer perimeter of the installation but are not included as part of the installation.

The Fawley Refinery installation is located in Fawley, Hampshire, approximately 7.5km south-east of Southampton. The installation covers an area of 613 ha and the entire site is centred at National Grid Reference SU 455043.

The installation is bounded to the east and north-east by mudflats, saltmarsh and Southampton Water. To the west and south the site is bounded by Fawley Road, the A326 and Long Lane. Beyond Fawley Road to the south is Fawley Village and undeveloped marshland. The village of Holbury is located to the west. To the north the site is bounded by Cadland Road, beyond which are a number of industrial properties.

The first oil refinery was constructed at the site in 1921 and was subsequently expanded in 1951, with commissioning of refining and early petrochemical plants, to the area it occupies today. The refining and associated combustion activities have been authorised under Integrated Pollution Control (IPC) since 1992.

The primary activity authorised by this permit is under Section 1.2 A(1)(d); the refining of mineral oil. Other specified activities relating to the refinery include combustion, handling and thermal treatment of crude oil, odourising liquefied petroleum gas, producing inorganic chemicals (sulphur by-product) and disposal of hazardous and non-hazardous waste. The primary activity authorised by the EMCL permit ZP3839MG is under Section 4.1 A(1) (a) (i); producing organic chemicals such as hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic).

The oil refining section of the installation regulated under this Permit, receives crude oil and other petroleum feedstocks, primarily by sea transport, which is then stored in bulk tanks before it is refined to form products such as liquefied petroleum gas (LPG), automotive and aviation fuels, distillates, lubricant oils, fuel oils and feed streams for the EMCL petrochemicals plants.

The generic processes operated at the refinery include:

- Separation – for example, the initial stage of the refining process involves fractional distillation (atmospheric and vacuum) of the crude oil to produce product and intermediate streams for further refining into finished products.
- Reforming – changing the molecular structure to increase the value of the products (for example increasing octane number)
- Treating – improving the quality of the oil by reducing the concentration of sulphur, nitrogen and other impurities; sulphur is eventually recovered in its solid form using the Claus process
- Upgrading – for example catalytic cracking of a heavy oil material to increase production of the more valuable gasoline.

There are also a number of support activities including boilers, gas turbines for steam and electricity generation including two Combined Heat and Power (CHP) Plants, furnaces for heating hydrocarbons, cooling water systems, transfer of waste sludges for biopile treatment and reuse, raw water treatment for steam raising, waste water treatment prior to release and the flare system.

The refinery also provides fuel gas for EMCL and accepts waste water and other materials for treatment from EMCL.

The main environmental impacts associated with releases to air are from sulphur dioxide from the incomplete recovery of sulphur from the Sulphur Recovery Plant, from the burning off of sulphur from the catalytic cracker catalyst and from the combustion of fuel oil. The air quality management area (AQMA) declared by New Forest District Council in 2005, was revoked in 2013 due to reductions in the release of sulphur dioxide emissions to air from the permitted activities.

Other releases to air include nitrogen dioxide and dust from combustion and catalytic cracking activities and fugitive volatile organic compounds. None of these releases are significant in terms of the ambient air quality. Many of the combustion plant fall under the Large Combustion Plant Directive as existing plant.

Process, cooling and surface waters are discharged, following treatment, via three outfalls onto intertidal mudflats close to high water within the Solent and Southampton Water SPA. Other European Habitats designated sites that could be affected by releases from the installation include Solent Maritime SAC, River Itchen SAC, Portsmouth Harbour SPA/Ramsar and Chichester and Langstone Harbours. Clean and dirty waters are treated separately using oil separators, dual media filtration and dissolved air flotation.

Noise has been an issue at the installation, dealt with under previous legislation by New Forest District Council. The surrounding communities about the installation perimeter fences and the concerns have been addressed in this Permit through the noise management plan.

The site has an Environmental Management System that is regularly audited externally and has been attested to meet the requirements of ISO 14001, although not certified to this standard.

Variation EPR/BR6996IC/V002, issued 24/08/10, incorporated a number of changes including the re-commissioning of the ENSR lubes hydrofiner (emission point A28 added), modification of the spent caustic neutralisation process from batch to continuous operation, use of effluent from the sour water stripper in the desalter wash water tank to reduced emissions of phenol to Southampton Water via W1 and addition of analyser vents associated with the refinery fuel gas (RFG) analysers omitted from the list of vents in the permit.

Variation EPR/BR6996IC/V003 was issued 28/5/13 to reflect the authorised activities in line with the Industrial Emissions Directive (IED).

Variation EPR/BR6996IC/V004 was issued to add an improvement condition to ensure the regulated facility complies with the Eels (England and Wales) Regulations 2009.

Variation V005, which took effect from 1 April 2017, implemented the special provisions for Large Combustion Plant (LCP) under the Industrial Emissions Directive (IED). Emission Limit Values (ELVs) were set for each LCP and the plant are operated under ELV compliance route. The operation of the Cogen CHP LCP was consolidated into the permit as part of this Variation.

Variation V006 was issued 18/07/18 and authorised the addition of a fourth reactor to the existing residfiner unit and plant and equipment to enable the export of hot coker feed.

Variation V007 was issued 25/09/18 reviewed the permit for this installation against the revised BAT Conclusions for the refining of mineral oil and gas industry sector published on 28th October 2014.

The schedules specify the changes made to the permit.

The status log of a permit sets out the permitting history, including any changes to the permit reference number.

Status log of the permit EPR/BR6996IC		
Description	Date	Comments
Application BR6996IC	Duly made 5/10/06	
Additional Information Received		02, 26/02/07
Additional Information Received		21/03/07
Additional Information Received		02, 14, 22, 25/05/07
Additional information Received		13/08/07
Additional information Received		04, 14, 18, 26/09/07
Additional information Received		08, 24, 31/10/07
Additional information Received		01, 06, 08/11/07
Permit determined	20/12/2007	
Application EPR/BR6996IC/V002	Duly made 10/2/10	
Additional information received		25/5/10
Variation issued	24/8/10	
Agency variation determined EPR/BR6996IC/V003	28/5/13	Agency variation to implement the changes introduced by IED
Agency variation determined EPR/BR6996IC/V004 PAS/billing reference WP3530WN	2/10/14	Agency variation to clarify the position of WML 19877 and to ensure that the regulated facility will comply with the Eels (England and Wales) Regulations 2009.
Regulation 60 Notice sent to the Operator	05/08/15	Issue of a Notice under Regulation 60(1) of the EPR. Environment Agency Initiated review and variation to vary the permit under IED to implement the special provisions for LCP under Chapter III, introducing new Emission Limit Values (ELVs) applicable to LCP, referred to in Article 30(2) and set out in Annex V.
Regulation 60 Notice sent to the Operator	05/08/15	Issue of a Notice under Regulation 60(1) of the EPR. Environment Agency initiated review and variation to vary the permit under IED to implement Chapter II following the publication of the revised Best Available Techniques (BAT) Reference Document for the Refining of Mineral Oil and Gas.
Regulation 60 Notice response (variation and consolidation)	30/09/15	Response received from the Operator with reference to IED Chapter III for LCP.

Status log of the permit EPR/BR6996IC		
Description	Date	Comments
Additional information received. Fawley Refinery Large Combustion Plant (>50MW). DAJD/LCPD10. Correct LCP list and ratings.		19/10/15.
Additional information received – revised site plan incorporating the Cogen plant.		9/12/15
Regulation 60 Notice response	05/02/16	Response received from the Operator with reference to IED Chapter II BAT Conclusions.
Additional information received - email confirming minor change to the name of the registered office.		23/11/2016
Additional information received - updated site plan following the issue of permit ZP3133RH to Biogenie Site Remediation Limited which forms part of the installation.		10/01/17
Variation determined EPR/BR6996IC/V008 (PAS Billing ref: AP3530RF)	03/03/2017	Varied and consolidated permit issued. Effective from 01/04/2017
Additional information received	28/12/17 and 08/02/18	Update to derogation request in relation to BAT 12.
Application EPR/BR6996IC/V006	Duly made 21/02/18	Application to vary the permit to increase Residfiner capacity and allow export of hot coker feed.
Additional information received	15/05/18	Confirmation of storage tank details for the hot coker feed.
Additional information received	26/6/18	Confirmation biopile activities are no longer required in the permit, Integrated Emissions Management Technique document for setting the bubble limits and approach to emission factors for discharges to water.
Additional information received	13/07/18	Details of vapour recovery in place for road loading activities.
Variation determined EPR/BR6996IC PAS/billing ref: AP3034JB	18//07/18	Varied permit issued
Draft decision EPR/BR6996IC/V007	30/07/18	Statutory review of permit – BAT Conclusions published 28 October 2014 Varied and consolidated permit Consultation 13/08/2018 to 11/09/2018
Final decision Variation determined EPR/BR6996IC/V007 (Pas billing ref: EP3234JT)	25/09/18	Statutory review of permit – BAT Conclusions published 28 October 2014 Varied and consolidated permit issued
Application EPR/BR6996IC/V008 (variation and consolidation)	Duly made 17/09/18	Application to authorise the installation of a new steam methane reforming hydrogen plant, new high pressure diesel hydrofiner unit and a low sulphur jet hydrofining reactor.

Status log of the permit EPR/BR6996IC		
Description	Date	Comments
Additional information received	17/01/19	Conformation of inclusion of the new Hydrogen plant and the new Hydrofiner into the Integrated Emissions Management Technique and revised site plan detailing the installation boundary.
Variation determined EPR/BR6996IC (PAS Billing ref: MP3236JY)	04/03/19	Varied permit issued.

Status log of the permit EPR/JP3631KW (consolidated into permit EPR/BR6996IC from 1/4/2017)		
Description	Date	Comments
Application QP3536LT	Duly made 5/10/06	Application from Npower Cogen Trading Limited
Application site report	Received 8/02/07	
Information received during site meeting	5/03/07	
Information relating to leak detection measures in place, instrumentation installed to the interceptor, details of oil storage tank and bund and fuel oil tank filling procedure	Received 10/04/07	
Site drawing detailing main emission points from permitted area	Received 10/04/07	
Confirmation of air quality modelling scenarios	Received 18/04/07	
Details of chemical storage bund capacities and revised proposed fuel oil tank filling procedure. Email from Npower Cogen Trading Limited (P Trott)	Received 24/04/07	
SO ₂ monitoring data for quarter 1 2007, firing on fuel oil and MEDAL gas	Received 22/05/07	
Calculation of estimated SO ₂ emission levels. Copy of email from Npower Cogen Trading Limited (R Smith) dated 19/9/06	Received 22/05/07	
Details of treatment undertaken to gas supplied from Esso Petroleum Company Limited. Email from Npower Cogen Trading Limited (P Trott)	Received 30/07/07	
Concentration of sulphur in MEDAL gas and LPRFG as mg/m ³ . Email from Npower Cogen Trading Limited (P Trott)	Received 30/07/07	
Details of calculations undertaken to estimate the levels of particulate matter and SO ₂ in emissions to air for gas and fuel oil firing. Email from Npower Cogen Trading Limited (P Trott)	Received 30/07/07	
Confirmation that fuel oil supply will comply with the Sulphur Content in Liquid Fuels Regulations. Email from Npower Cogen Trading Limited (P Trott)	Received 30/07/07	

Status log of the permit EPR/JP3631KW (consolidated into permit EPR/BR6996IC from 1/4/2017)		
Description	Date	Comments
Confirmation of gas supply interruption period. Details of constraints on refinery fuel composition received by the CHP plant. Email from Npower Cogen Trading Limited (P Trott)	Received 30/07/07	
Definition of start up and shut down. Email from Npower Cogen Trading Limited (P Trott)	Received 30/07/07	
Draft protocol for switch to fuel oil for commercial purposes. Email from Npower Cogen Trading Limited (P Trott)	Received 04/09/07	
Details of SO ₂ measurements for gas firing. Email from Npower Cogen Trading Limited (P Trott)	Received 01/11/07	
Permit determined	20/12/07	Permit issued to Npower Cogen Trading Limited
Application EPR/JP3631KW/T001	Duly made 21/12/09	Application for full transfer of permit QP3536LT
Transfer effective EPR/JP3631KW	04/03/10	Permit issued to Esso Petroleum Company Limited
Variation application EPR/JP3631KW/V002	Duly made 31/10/13	Application to vary sulphur dioxide limit and consolidate with permit
Variation issued EPR/JP3631KW/V002	13/01/14	Varied and consolidated permit issued
Regulation 60 Notice sent to the Operator	05/08/15	Issue of a Notice under Regulation 60(1) of the EPR. Environment Agency Initiated review and variation to vary the permit under IED to implement the special provisions for LCP under Chapter III, introducing new Emission Limit Values (ELVs) applicable to LCP, referred to in Article 30(2) and set out in Annex V.
Regulation 60 Notice response (variation and consolidation)	30/09/15	Response received from the Operator.
Variation determined EPR/BR6996IC/V008 (PAS Billing ref: AP3230RU)	03/03/17	Varied and consolidated permit issued. Effective from 01/04/17

Other Part A installation permits relating to this installation		
Operator	Permit number	Date of issue
Exxon Mobil Chemical Limited	EPR/ZP3839MG	20/12/2007
Biogenie Site Remediation Limited	EPR/ZP3133RH	04/11/2016

Other existing Licences/Authorisations relating to this site		
Holder	Reference Number	Date of issue
Esso Petroleum Company Ltd	WML19872	23/08/1985
Esso Petroleum Company Ltd	WML19878	29/08/1986
Esso Petroleum Company Ltd	GB-EA-ETCO2-0073	25/02/2004
Esso Petroleum Company Ltd	AC3124/BF7074	27/07/2002
Esso Petroleum Company Ltd	AC2586/BV6536	18/09/2003
Esso Petroleum Company Ltd	D01543-1 to 11	16/12/1994

Superseded or Partially Superseded Licences/Authorisations/Consents relating to this installation			
Holder	Reference Number	Date of Issue	Fully or Partially Superseded
Esso Petroleum Company Ltd	AF8009/CA6610	31/08/1993	Fully superseded
Esso Petroleum Company Ltd	WML19877	29/08/1984	Fully superseded by EAWML 10237
Esso Petroleum Company Ltd	EAWML10237	11/05/04	Fully superseded by EPR/BR6996IC
Npower Cogen Trading Limited	JP3631KW	20/12/2007	Fully superseded

End of introductory note

Notice of variation and consolidation

The Environmental Permitting (England and Wales) Regulations 2016

The Environment Agency in exercise of its powers under regulation 20 of the Environmental Permitting (England and Wales) Regulations 2016 varies

Permit number

EPR/BR6996IC

Issued to

Esso Petroleum Company, Limited (“the operator”)

whose registered office is

Ermyn House

Ermyn Way

Leatherhead

Surrey

KT22 8UX

company registration number **00026538**

to operate a regulated facility at

Esso Refinery

Marsh Lane

Fawley

Southampton

Hampshire

SO45 1TX

to the extent set out in the schedules.

The notice shall take effect from 04/03/2019

Name	Date
M Bischer	04/03/2019

Authorised on behalf of the Environment Agency

Schedule 1

All conditions have been varied by the consolidated permit as a result of the application made by the operator.

Schedule 2 – consolidated permit

Consolidated permit issued as a separate document.

Permit

The Environmental Permitting (England and Wales) Regulations 2016

Permit number

EPR/BR6996IC

This is the consolidated permit referred to in the variation and consolidation notice for application EPR/BR6996IC/V008 authorising,

Esso Petroleum Company, Limited (“the operator”),

whose registered office is

Ermyn House

Ermyn Way

Leatherhead

Surrey

KT22 8UX

company registration number **00026538**

to operate part of an installation at

Esso Refinery

Marsh Lane

Fawley

Southampton

Hampshire

SO45 1TX

to the extent authorised by and subject to the conditions of this permit.

Name	Date
M Bischer	04/03/2019

Authorised on behalf of the Environment Agency

Conditions

1 Management

1.1 General management

- 1.1.1 The operator shall manage and operate the activities:
- (a) in accordance with a written management system that identifies and minimises risks of pollution, including those arising from operations, maintenance, accidents, incidents, non-conformances, closure and those drawn to the attention of the operator as a result of complaints; and
 - (b) using sufficient competent persons and resources.
- 1.1.2 Records demonstrating compliance with condition 1.1.1 shall be maintained.
- 1.1.3 Any person having duties that are or may be affected by the matters set out in this permit shall have convenient access to a copy of it kept at or near the place where those duties are carried out.

1.2 Energy efficiency

- 1.2.1 The operator shall:
- (a) take appropriate measures to ensure that energy is used efficiently in the activities;
 - (b) review and record at least every four years whether there are suitable opportunities to improve the energy efficiency of the activities; and
 - (c) take any further appropriate measures identified by a review.

1.3 Efficient use of raw materials

- 1.3.1 The operator shall:
- (a) take appropriate measures to ensure that raw materials and water are used efficiently in the activities;
 - (b) maintain records of raw materials and water used in the activities;
 - (c) review and record at least every four years whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of raw material and water use; and
 - (d) take any further appropriate measures identified by a review.

1.4 Avoidance, recovery and disposal of wastes produced by the activities

- 1.4.1 The operator shall take appropriate measures to ensure that:
- (a) the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste by the activities; and
 - (b) any waste generated by the activities is treated in accordance with the waste hierarchy referred to in Article 4 of the Waste Framework Directive; and
 - (c) where disposal is necessary, this is undertaken in a manner which minimises its impact on the environment.
- 1.4.2 The operator shall review and record at least every four years whether changes to those measures should be made and take any further appropriate measures identified by a review.

1.5 Multiple operator installations

- 1.5.1 Where the operator notifies the Environment Agency under condition 4.3.1 (a) or 4.3.1 (c), the operator shall also notify without delay the other operator(s) of the installation of the same information.

2 Permitted activities

- 2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the “activities”).
- 2.1.2 Waste authorised by this permit shall be clearly distinguished from any other waste on the site.

2.2 The site

- 2.2.1 The activities shall not extend beyond the site, being the land shown edged in green on the site plan at schedule 7 to this permit that represents the extent of the installation covered by this permit and the permits of the other operators of the installation. This excludes land shaded in yellow and blue, which forms part of the installation and the land shaded in red which does not form part of the installation.

2.3 Operating techniques

- 2.3.1 The activities shall, subject to the conditions of this permit, be operated using the techniques and in the manner described in the documentation specified in schedule 1, table S1.2, unless otherwise agreed in writing by the Environment Agency.
- 2.3.2 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.
- 2.3.3 Waste shall only be accepted if:
 - (a) it is of a type and quantity listed in schedule 2 tables S2.2 and S2.3; and
 - (b) it conforms to the description in the documentation supplied by the producer and holder.
- 2.3.4 The operator shall ensure that where waste produced by the activities is sent to a relevant waste operation, that operation is provided with the following information, prior to the receipt of the waste:
 - (a) the nature of the process producing the waste;
 - (b) the composition of the waste;
 - (c) the handling requirements of the waste;
 - (d) the hazardous property associated with the waste, if applicable; and
 - (e) the waste code of the waste.
- 2.3.5 The operator shall ensure that where waste produced by the activities is sent to a landfill site, it meets the waste acceptance criteria for that landfill.
- 2.3.6 For the following activities referenced in Schedule 3, table S3.1a LCP 144, 145, 146, 147, 148, 150, 151 and 152. The end of the start-up period and the start of the shutdown period shall conform to the specifications set out in Schedule 1 table S1.2
- 2.3.7 The operator shall treat process offgas streams which are to be used as refinery fuel gas (RFG), to remove acid gases such that the relevant BAT-AEL is achieved or ensure equivalence is met through the Integrated Emissions Management Technique.

2.4 Improvement programme

- 2.4.1 The operator shall complete the improvements specified in schedule 1 table S1.3 by the date specified in that table unless otherwise agreed in writing by the Environment Agency.
- 2.4.2 Except in the case of an improvement which consists only of a submission to the Environment Agency, the operator shall notify the Environment Agency within 14 days of completion of each improvement.

3 Emissions and monitoring

3.1 Emissions to water, air or land

- 3.1.1 There shall be no point source emissions to water, air or land except from the sources and emission points listed in schedule 3 tables S3.1a, S3.1b and S3.2.
- 3.1.2 The limits given in schedule 3 shall not be exceeded.
- 3.1.3 Total annual emissions from the emission point(s) set out in schedule 3 tables S3.1 and S3.2 of a substance listed in schedule 3 table S3.3 shall not exceed the relevant limit in table S3.3.
- 3.1.4 Periodic monitoring shall be carried out at least once every 5 years for groundwater and 10 years for soil, unless such monitoring is based on a systematic appraisal of the risk of contamination.

3.2 Emissions of substances not controlled by emission limits

- 3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.
- 3.2.2 The operator shall:
 - (a) if notified by the Environment Agency that the activities are giving rise to pollution, submit to the Environment Agency for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits; and
 - (b) implement the approved emissions management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.
- 3.2.3 All liquids in containers, whose emission to water or land could cause pollution, shall be provided with secondary containment, unless the operator has used other appropriate measures to prevent or where that is not practicable, to minimise, leakage and spillage from the primary container.

3.3 Odour

- 3.3.1 Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in schedule 1 table S3.4, to prevent or where that is not practicable to minimise the odour.

3.4 Noise and vibration

- 3.4.1 Emissions from the activities shall be free from noise and vibration at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in schedule 1 table S3.5, to prevent or where that is not practicable to minimise the noise and vibration.

3.5 Monitoring

- 3.5.1 The operator shall, unless otherwise agreed in writing by the Environment Agency, undertake the monitoring specified in the following tables in schedule 3 to this permit:
 - (a) point source emissions specified in tables S3.1a, S3.1b and S3.2;
 - (b) process monitoring specified in table S3.6;

- 3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.
- 3.5.3 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Environment Agency.
- 3.5.4 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1 and S3.2 unless otherwise agreed in writing by the Environment Agency.
- 3.5.5 The operator shall monitor and record the following parameters for flaring events when the rate of gas flared exceeds 1.6 tonnes/hr as a daily mean value:
- (a) Duration of event;
 - (b) Total mass of gas flared;
 - (c) Mass of SO₂ released; and
 - (d) Calorific value of the gas flared.

The operator shall identify the root cause of the flaring event and consider ways to prevent or reduce the frequency and duration of recurrences.

3.6 Monitoring for the purposes of Chapter III of the Industrial Emissions Directive

- 3.6.1 All monitoring required by this permit shall be carried out in accordance with the provisions of Annex V of the Industrial Emissions Directive, unless otherwise agreed in writing.
- 3.6.2 If the monitoring results for more than 10 days a year are invalidated within the meaning set out in condition 3.6.7, the Operator shall:
- (a) within 28 days of becoming aware of this fact, review the causes of the invalidations and submit to the Environment Agency for approval, proposals for measures to improve the reliability of the continuous measurement systems, including a timetable for the implementation of those measures; and
 - (b) implement the approved proposals.
- 3.6.3 Continuous measurement systems on emission points from the LCP shall be subject to quality control by means of parallel measurements with reference methods at least once every calendar year.
- 3.6.4 Unless otherwise agreed in writing by the Agency in accordance with condition 3.6.5 below, the operator shall carry out the methods, including the reference measurement methods, to use and calibrate continuous measurement systems in accordance with the appropriate CEN standards.
- 3.6.5 If CEN standards are not available, ISO standards, national or international standards which will ensure the provision of data of an equivalent scientific quality shall be used, as agreed in writing with the Agency.
- 3.6.6 Where required by a condition of this permit to check the measurement equipment the operator shall submit a report to the Agency in writing, within 28 days of the completion of the check.
- 3.6.7 Where Continuous Emission Monitors are installed to comply with the monitoring requirements in schedule 4, table S4.1, the Continuous Emissions Monitors shall be such that:
- (a) for the continuous measurement systems fitted to the LCP release points defined in Table S3.1 the validated hourly, monthly and daily averages shall be determined from the measured valid hourly average values after having subtracted the value of the 95% confidence interval;

- (b) the 95% confidence interval for nitrogen oxides and sulphur dioxide of a single measured result shall be taken to be 20%;
- (c) the 95% confidence interval for dust releases of a single measured result shall be taken to be 30%;
- (d) the 95% confidence interval for carbon monoxide releases of a single measured result shall be taken to be 10%;
- (e) an invalid hourly average means an hourly average period invalidated due to malfunction of, or maintenance work being carried out on, the continuous measurement system. However, to allow some discretion for zero and span gas checking, or cleaning (by flushing), an hourly average period will count as valid as long as data has been accumulated for at least two thirds of the period (40 minutes). Such discretionary periods are not to exceed more than 5 in any one 24-hour period unless agreed in writing. Where plant may be operating for less than the 24-hour period, such discretionary periods are not to exceed more than one quarter of the overall valid hourly average periods unless agreed in writing; and
- (f) any day, in which more than three hourly average values are invalid shall be invalidated.

3.7 Integrated air emissions management

3.7.1 In order to demonstrate compliance with the integrated emissions management limit for oxides of nitrogen, specified in Table S3.1b:

- (a) The operator shall undertake the monitoring and calculations described in their response: Integrated Emissions Management Technique – Methodology and agreed in writing by the Environment Agency, for all units covered by the bubble limit.
- (b) During a period of abnormal operation of one of these units, the operator shall use the 'standard contribution value' (as specified in the Integrated Emissions Management Technique – Methodology) when assessing compliance with the bubble emission limit value. The operator shall record the start of and conclusion periods of abnormal operation and record the emissions for the affected unit(s) during that period.

3.7.2 In order to demonstrate compliance with the integrated emissions management limit for sulphur dioxide, specified in Table S3.1b:

- (a) The operator shall undertake the monitoring and calculations described in their response: Integrated Emissions Management Technique – Methodology and agreed in writing by the Environment Agency, for all units covered by the bubble limit.
- (b) During a period of abnormal operation of one of these units, the operator shall use the 'standard contribution value' (as specified in the Integrated Emissions Management Technique – Methodology) when assessing compliance with the bubble emission limit value. The operator shall record the start of and conclusion periods of abnormal operation and record the emissions for the affected unit(s) during that period.

4 Information

4.1 Records

4.1.1 All records required to be made by this permit shall:

- (a) be legible;
- (b) be made as soon as reasonably practicable;
- (c) if amended, be amended in such a way that the original and any subsequent amendments remain legible, or are capable of retrieval; and
- (d) be retained, unless otherwise agreed in writing by the Environment Agency, for at least 6 years from the date when the records were made, or in the case of the following records until permit surrender:
 - (i) off-site environmental effects; and
 - (ii) matters which affect the condition of the land and groundwater.

4.1.2 The operator shall keep on site all records, plans and the management system required to be maintained by this permit, unless otherwise agreed in writing by the Environment Agency.

4.2 Reporting

4.2.1 The operator shall send all reports and notifications required by the permit to the Environment Agency using the contact details supplied in writing by the Environment Agency.

4.2.2 A report or reports on the performance of the activities over the previous year shall be submitted to the Environment Agency by 31 January (or other date agreed in writing by the Environment Agency) each year. The report(s) shall include as a minimum:

- (a) a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;
- (b) the annual production /treatment data set out in schedule 4 table S4.2; and
- (c) the performance parameters set out in schedule 4 table S4.3 using the forms specified in table S4.4 of that schedule.

4.2.3 Within 28 days of the end of the reporting period the operator shall, unless otherwise agreed in writing by the Environment Agency, submit reports of the monitoring and assessment carried out in accordance with the conditions of this permit, as follows:

- (a) in respect of the parameters and emission points specified in schedule 4 table S4.1;
- (b) for the reporting periods specified in schedule 4 table S4.1 and using the forms specified in schedule 4 table S4.4 ; and
- (c) giving the information from such results and assessments as may be required by the forms specified in those tables.

4.2.4 The operator shall, unless notice under this condition has been served within the preceding four years, submit to the Environment Agency, within six months of receipt of a written notice, a report assessing whether there are other appropriate measures that could be taken to prevent, or where that is not practicable, to minimise pollution.

4.2.5 A summary report of non-hazardous and hazardous ballast water accepted onto the site for treatment and disposal shall be made annually. It shall be submitted to the Environment Agency within one month of the end of the year and shall be in the format required by the Environment Agency.

4.3 Notifications

4.3.1 In the event:

- (a) that the operation of the activities gives rise to an incident or accident which significantly affects or may significantly affect the environment, the operator must immediately—
 - (i) inform the Environment Agency,
 - (ii) take the measures necessary to limit the environmental consequences of such an incident or accident, and
 - (iii) take the measures necessary to prevent further possible incidents or accidents;
- (b) of a breach of any permit condition the operator must immediately—
 - (i) inform the Environment Agency, and
 - (ii) take the measures necessary to ensure that compliance is restored within the shortest possible time;
- (c) of a breach of permit condition which poses an immediate danger to human health or threatens to cause an immediate significant adverse effect on the environment, the operator must suspend the operation of the activities or the relevant part of it in a safe and controlled manner until compliance with the permit conditions has been restored.

4.3.2 Any information provided under condition 4.3.1 (a)(i), or 4.3.1 (b)(i) where the information relates to the breach of a limit specified in the permit, shall be confirmed by sending the information listed in schedule 5 to this permit within the time period specified in that schedule.

4.3.3 Where the Environment Agency has requested in writing that it shall be notified when the operator is to undertake monitoring and/or spot sampling, the operator shall inform the Environment Agency when the relevant monitoring and/or spot sampling is to take place. The operator shall provide this information to the Environment Agency at least 14 days before the date the monitoring is to be undertaken.

4.3.4 The Environment Agency shall be notified within 14 days of the occurrence of the following matters, except where such disclosure is prohibited by Stock Exchange rules:

Where the operator is a registered company:

- (a) any change in the operator's trading name, registered name or registered office address; and
- (b) any steps taken with a view to the operator going into administration, entering into a company voluntary arrangement or being wound up.

Where the operator is a corporate body other than a registered company:

- (c) any change in the operator's name or address; and
- (d) any steps taken with a view to the dissolution of the operator.

In any other case:

- (e) the death of any of the named operators (where the operator consists of more than one named individual);
- (f) any change in the operator's name(s) or address(es); and
- (g) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.

4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:

- (a) the Environment Agency shall be notified at least 14 days before making the change; and

- (b) the notification shall contain a description of the proposed change in operation.
- 4.3.6 The Environment Agency shall be given at least 14 days notice before implementation of any part of the site closure plan.
- 4.3.7 Where the operator has entered into a climate change agreement with the Government, the Environment Agency shall be notified within one month of:
 - (a) a decision by the Secretary of State not to re-certify the agreement;
 - (b) a decision by either the operator or the Secretary of State to terminate the agreement; and
 - (c) any subsequent decision by the Secretary of State to re-certify such an agreement.
- 4.3.8 In the event that more than 2 tonnes of sulphur dioxide from sour/acid gas flaring has or is likely to be emitted in a 24 hour period from emission points A24, A25, A26 and A27, the operator shall provide notification in accordance with condition 4.3.1, providing details of:
 - (a) The quantity of sulphur dioxide emitted within 24 hours;
 - (b) The likely duration of the flaring event;
 - (c) The cause of the flaring event;
 - (d) Remedial actions being taken; and
 - (e) Any potential impact of local air quality.
- 4.3.9 In the event that the operator wishes to make a change to the design or operation of the integrated emission management technique, for nitrous oxides and sulphur dioxide:
 - (a) The operator shall notify the Environment Agency at least 14 days before making the change;
 - (b) The notification shall contain details of the change in operation or design, such as the addition or removal of process units from the emissions bubble and an assessment of the impact this change will have on the monthly emission limit specified in Table S3.1b; and
 - (c) The operator shall not implement the change until the changes have been approved in writing by the Environment Agency.

4.4 Interpretation

- 4.4.1 In this permit the expressions listed in schedule 6 shall have the meaning given in that schedule.
- 4.4.2 In this permit references to reports and notifications mean written reports and notifications, except where reference is made to notification being made “without delay” in which case it may be provided by telephone.

Schedule 1 – Operations

Table S1.1 activities		
Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity and waste types
S1.2 A1 (d)	Refining mineral oils.	<p>From feed to refining unit to use, intermediate or product storage, or export including each of the following units:</p> <ul style="list-style-type: none"> • distillation units: PS/PV1 (LCP 150), PS/PV3 (LCP 151), • Light ends unit: LESR • reformer units: PH1 (LCP 147), PH2 (LCP 148), PH1-F4 • hydrotreatment units: SCAN, HD3, 4, 5, 6, 7, 8 and 10 RESID, ENSR (LCP 145). • isomeriser unit : ISOM • wax isomeriser unit: WISR • catalytic cracker unit: FCCU • Oil refining units are taken to include their process heaters and energy supply systems, as well as any unit-specific abatement system.
S1.2 A1 (e)	The loading, unloading or other handling of, the storage of, or the physical, chemical or thermal treatment of (i) crude oil; (ii) stabilised crude petroleum. (Secondary operations – oil movements and blending)	<p>From receipt of feed, through blending (where necessary) to feed, intermediate and product storages including:</p> <ul style="list-style-type: none"> • liquified petroleum gases, • white oils, gas oils/ black oils, • crude oil/ slops.
S1.2 A1 (e)	The loading, unloading or other handling of, the storage of, or the physical, chemical or thermal treatment of (i) crude oil; (ii) stabilised crude petroleum.	<p>From receipt of crude to operation of crude distillation unit including:</p> <ul style="list-style-type: none"> • PS1 (annual throughput 3600Kte) • PS3 (annual throughput 8600Kte) • marine terminal • offsites operation

Table S1.1 activities		
Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity and waste types
S1.1 A(1) (a)	Boiler Plant and CHP	<p>Receipt of fuel oil and storage of fuel oil. Fuel oil and refinery fuel gas supply systems to combustion units and any associated activities necessary to maintain the operation of the plant and fuel supplies through to the discharge of exhaust gases from the stacks, ash removal from the combustion process and the export of steam to the steam systems, including:</p> <ul style="list-style-type: none"> • 2 x 400 MWth boilers with software interlock installed to limit combined capacity to <500MW in accordance with Environment Agency Regulatory Guidance Note 2 and subject to provisions set out in Section 4 of the MFF Protocol: SP4 Unit 1 & SP4 Unit 2 (LCP 152). <p>From gas feed to electricity and steam generation via gas turbine (GT) with associated HRSG:</p> <ul style="list-style-type: none"> • 1 x 196 MWth: SP4 Unit 3 (GTG/WHB) (LCP 146) • 1 x 451 MWth: Unit 5 Cogen (GTG/WHB) (LCP 144) • 1 x 130 MWth (Hydrogen production furnace/heater)
S4.2 A(1) (a) (i)	Producing inorganic chemicals such as gases (for example ammonia, hydrogen chloride, hydrogen fluoride, hydrogen cyanide, hydrogen sulphide, oxides of carbon, sulphur compounds, oxides of nitrogen, hydrogen, oxides of sulphur, phosgene).	<p>From gas feed to production of hydrogen including pressure swing reactor and sulphur removal units.</p> <ul style="list-style-type: none"> • HY
S4.2 A(1) (a)(v)	Producing inorganic chemicals such as non-metals, metal oxides, metal carbonyls or other inorganic compounds such as calcium carbide, silicon, silicon carbide, titanium dioxide.	<p>Including amine systems, amine recovery unit, sour water stripper units and sulphur recovery unit plant including:</p> <ul style="list-style-type: none"> • SRU train SU3 • SRU train SU4 • tail-gas unit • tail-gas incinerator • sulphur storage prior to export
S5.3 A1 (a) (ii)	Disposal or recovery of hazardous waste in a facility with a capacity exceeding 10 tonnes per day involving physico-chemical treatment.	From collection and neutralisation of spent caustic to disposal off site, SWS.
S5.3 A1 (a) (ii)	Disposal or recovery of hazardous waste in a facility with a capacity exceeding 10 tonnes per day involving physico-chemical treatment.	From receipt of ballast water, through treatment (oil recovery operations) to disposal of treated water.
S5.4 A(1) (a)(ii)	Disposal of non-hazardous waste in a facility with a capacity of more than 50 tonnes per day by physico-chemical treatment.	Including oil separators, dissolved air flotation units, clarifiers (sedimentation plant), general filtration plant, reverse osmosis plant and sludge tanker loading.

Table S1.1 activities		
Activity listed in Schedule 1 of the EP Regulations	Description of specified activity and WFD Annex I and II operations	Limits of specified activity and waste types
S1.2 B (a)	Odourising natural gas or liquefied petroleum gas where that activity is related to a Part A activity	From feed to unit to discharge for storage or export C3, C4 stenching.

Table S1.1 activities		
Directly Associated Activity		
Flaring of gases	Burning of sour and sweet gases at flares	Hydrocarbon gas recovery compressor, flare headers, knock-out pots and flare stacks and any ancillary equipment.
Cooling water systems, provision of utilities	Systems used for cooling.	All cooling water systems including storage, pipelines and equipment, to discharge to ETP or directly to river or sea.
Surface water drainage.	Collection and handling of surface waters within installation	Handling and storage of site drainage until discharge to the site wastewater treatment system or to discharge off-site.
Water treatment	All water treatment activities	From receipt of raw materials to dispatch of effluents to sewer or site waste water treatment system and export of demineralised water to the refinery for use in processes.
Steam and electrical power supply.	The generation and export of electricity	The receipt of steam at the steam turbine to the export of electricity to the refinery installation or the national grid and the direct generation of electricity from the gas turbines. Includes fuel receipt and storage, any boiler or gas turbine and its associated plant and release points.
Waste handling	Handling and storage of wastes arising	From waste generation, storage and monitoring to waste dispatch.
Oily wastes suitable for biopiling	Handling and transfer of waste arising	From collection of biopile material sourced from the refinery (BR6996IC) and chemical manufacture (ZP3839MG) sites to the transfer to permit ZP3133RH for treatment and reuse

Table S1.2 Operating techniques permit EPR/BR6996IC		
Description	Parts	Date Received
Application	The response to section 2.1 and 2.2 in the application.	05/10/06
Response to Schedule 4 Notice dated 08/12/06	Response to question 1 detailing process releases.	02/02/07
Additional Information	Vents and raw material data	26/02/07
Additional Information	Refinery fuel gas data	14/05/07
Additional information	Water quality data	26/09/07
Additional information	Air release data	24/10/07
Variation Application EPR/BR6996IC/V002	The response to section 2 – Form EPC in the application	10/02/10
Additional Information	Response to question 2	25/05/10
Response to regulation 60(1) Notices – request for information dated 05/08/2015	Compliance route and operating techniques identified in response to questions 1 (ELV and monitoring requirements), 2c (LCP configuration, layout, fuel options available and flue configuration), 2d (method for assessing which ELVs apply in accordance with Articles 40(2) and 40(3) of IED), 2e (methodology for assessing compliance with relevant ELVs for NO _x , SO ₂ and dust by reference to parts 3 and 4 of Annex V of Chapter III of IED) and 2f (methodology for assigning periods of start-up and shutdown) provided in Table 7 of the response.	30/09/15
Variation application EPR/BR6996IC/V006	Parts C2 and C3 and the supplementary information supplied with these parts.	Duly made 21/02/18
Additional information received	Confirmation of storage tank details for the hot coker feed.	15/05/18
Additional information received	Integrated Emissions Management Technique document setting out calculation of bubble ELVs for NO _x and SO ₂ Water emissions factors document	26/06/18
Variation application EPR/BR6996IC/V008	Parts C2 and C3 and the supplementary information supplied with these parts.	Duly made 17/09/18
Additional information received	Confirmation of inclusion of the new Hydrogen plant and the new Hydrofiner into the Integrated Emissions Management Technique and revised site plan detailing the installation boundary.	17/01/19
Operating techniques permit EPR/JP3631KW (consolidated into permit EPR/BR6996IC from 1/4/2017)		
Application QP3536LT	The response to section 2.1 (parts B2.1 and B2.2) in the application	02/08/06
Response to regulation 60(1) Notices – request for information dated 05/08/2015	Compliance route and operating techniques identified in response to questions 1 (ELV and monitoring requirements), 2c (LCP configuration, layout, fuel options available and flue configuration), 2d (method for assessing which ELVs apply in accordance with Articles 40(2) and 40(3) of IED), 2e (methodology for assessing compliance with relevant ELVs for NO _x , SO ₂ and dust by reference to parts 3 and 4 of Annex V of Chapter III of IED) and 2f (methodology for assigning periods of start-up and shutdown) provided in Table 7 of the response.	30/09/15

Table S1.3 Improvement programme requirements		
Improvement Conditions IC1 – IC36 have been completed and reference removed from this table as part of the variation EPR/BR6996IC/V007.		
Reference	Requirement	Date
IC37	<p>The Operator shall undertake a review of the existing screening measures at the intakes and outfalls which provide and discharge water to and from the Installation. The review shall be undertaken with reference to the Eels (England and Wales) Regulations 2009 (SI 2009/3344) and the Environment Agency "Safe Passage for Eel" Regulatory Position Statement dated February 2013.</p> <p>The Operator shall submit details of the arrangement suitable to meet the requirements for the safe passage of eels [of the Eels (England and Wales) Regulations 2009 (SI 2009/3344)] by either:-</p> <ul style="list-style-type: none"> • Providing a written proposal for the installation of an eel screen. • Providing a written proposal to the modification of existing screening arrangements. • Providing a written response with an explanation and description of how the existing screening arrangements can be regarded to meet the requirements for the safe passage of eels [of SI 2009/3344] either without change or with mitigation measures. • Providing a written response setting out a case for an exemption <p>In all cases, the proposal shall be submitted in writing for the approval of the Environment Agency. Where appropriate, each proposal shall contain an assessment of alternative options considered including impacts on other fish species and an explanation of why the proposed option has been chosen. Where installation of eel screen; modification of existing arrangements; or mitigation measures are proposed, the submission shall contain relevant timescales for installation in accordance with the Safe Passage for Eel Regulatory Position Statement dated February 2013.</p> <p>The proposals shall be implemented in accordance with the Environment Agency's written approval.</p>	30/06/2019
IC38	<p>A review shall be carried out of soot blowing and dust monitoring on SP4 (LCP 152, emission point A1). The review shall include, but not be limited to:</p> <ul style="list-style-type: none"> • an assessment of the conditions under which soot blowing is required; • the frequency and duration of soot blowing events; • an estimation of the level of dust released during soot blowing activities; and • the performance and capability of the current dust analyser and details of any proposed improvements with indicative timescales for completion. <p>A written report shall be submitted to the Environment Agency detailing the findings following the review. The report shall identify any measures to be taken to reduce soot blowing activities, a methodology to estimate the quantity of dust releases (for the purposes of annual mass release reporting) during these periods and any proposed improvements to the current dust analyser. The measures, methodology and improvements shall be implemented by the operator from the date of approval by the Agency.</p>	Completed, subject to completion of agreed improvements
IC39	<p>The Operator shall submit a VOC monitoring plan to the Environment Agency for written approval. This shall include but not be limited to:</p> <ul style="list-style-type: none"> • The nature of the material handled; • The sources of emissions, including point source and fugitive emissions from the storage of liquid hydrocarbons and road loading; • Justification of the monitoring techniques selected; • How the monitoring data will be recorded, assessed and reviewed; and • Identification of actions/improvements, including a timescales to implement these. <p>The plan shall take into account the appropriate techniques for VOC monitoring specified in BAT conclusion 6 for the Refining of Mineral Oil and Gas and Environment Agency M2 and M16 Guidance Notes.</p> <p>The Operator shall implement the approved plan and produce and submit an annual report on the results of the monitoring undertaken under the plan.</p>	30/09/2019

Table S1.3 Improvement programme requirements		
Improvement Conditions IC1 – IC36 have been completed and reference removed from this table as part of the variation EPR/BR6996IC/V007.		
Reference	Requirement	Date
IC40	<p>The operator shall submit a plan to review monitored TOC emissions from emission point W2 (outfall2) to the Environment Agency for written approval. This shall include but not be limited to:</p> <ul style="list-style-type: none"> • A requirement to regularly review monitoring data taking into account key milestones for the implementation of the planned improvement programme; • Assessment of trends across the planned improvement programme; and • Identification of whether a compliance at a lower ELV can be achieved. <p>The Operator shall implement the plan from the date of approval by the Environment Agency.</p>	30/06/2019
IC41	<p>The Operator shall develop a plan to review monitored dust emissions from emission point A22 (FCCU) during normal operation. The plan shall include but not be limited to:</p> <ul style="list-style-type: none"> • A requirement to regularly review dust levels against data trends; • Assessment of the impacts from changes to DeSO_x catalyst addition rates; • Assessment of trends and impacts from maintenance cycles; • Identification of when further investigation to determine the cause(s) is required: and • Identification of actions to be taken with appropriate timescales. <p>The plan shall be implemented by the operator from the date of approval by the Environment Agency.</p>	30/06/2019
IC42	<p>The Operator shall review all secondary containment measures, provided for liquid hydrocarbons that are stored or held on site (excluding those bunds in scope of the COMAH Containment Policy). The review shall verify whether all storage tanks and areas designed for the storage of drums/IBCs and other portable liquid containers, covered by this permit are sited on an impermeable base and with sufficient bunding as specified in the CIRIA C736 Guidance. Where containment provisions do not meet this standard, the operator shall identify improvements or alternative measures (such as additional primary or tertiary containment measures) to an equivalent level of protection.</p> <p>The Operator shall provide the Environment Agency with a written report of the review and shall implement identified improvements to a timescale agreed with the Environment Agency.</p>	31/05/2020
IC43	<p>The Operator shall carry out a study of their flaring system and flare sources for the purpose of reducing baseline flaring. The study shall include:</p> <ul style="list-style-type: none"> • Options to improve the determination of individual flare sources; • Identification of actions to be taken to eliminate or reduce flaring with appropriate timescales. <p>The Operator shall submit a written report, for approval by the Environment Agency providing details of the findings of the study and a timetable for implementation of any improvements identified.</p>	31/03/2020

Table S1.3 Improvement programme requirements		
Improvement Conditions IC1 – IC36 have been completed and reference removed from this table as part of the variation EPR/BR6996IC/V007.		
Reference	Requirement	Date
IC44	<p>The Operator shall submit, for approval by the Environment Agency, monitoring programme for the fixed NO_x and SO₂ emissions bubble for the installation. The bubble monitoring programme shall be in accordance with the principals described in the IEMT Protocol.</p> <p>The monitoring protocol shall include but not be limited to:</p> <ul style="list-style-type: none"> • A description of the monitoring provision, or surrogate measure, for each unit included in the bubble. • A description of the methodology used to calculate the monthly average compliance value for SO₂. • Identification of the abnormal operating conditions for each unit, and a description of how compliance with the bubble emission limit will be assessed during a period of abnormal operation. Specification of any surrogate values to be employed during periods of abnormal operation. 	Completed
IC45	<p>The operator shall submit a plan detailing further assessment to be undertaken in respect of mercury from Outfall 1.</p> <p>The plan shall include as a minimum:</p> <ul style="list-style-type: none"> • Proposals with timescales to carry out detailed modelling; and • Timetable to provide a written report detailing the findings; <p>The report should include proposals for appropriate measures to mitigate the impact of any emissions where the assessment determines they are liable to cause pollution, including timescales for implementation of individual measures.</p>	30/09/2020
IC46	<p>The operator shall submit a plan to monitor and assess levels of Adsorbable organically bound halogens (AOX) within the effluent discharged at Outfall 2. The plan shall include as a minimum:</p> <ul style="list-style-type: none"> • A detailed sampling and monitoring schedule; • A timetable to review monitoring data and assesses results against the relevant threshold in the Common Waste Water Bref, taking into account the contribution(s) from the relevant clean/process streams; and • A timetable to provide a written report detailing results and findings and identifying any changes required to the effluent monitoring regime. <p>The plan shall be implemented by the operator from the date of approval by the Environment Agency.</p>	31/12/2019

Schedule 2 – Waste types, raw materials and fuels

Table S2.1 Raw materials and fuels	
Raw materials and fuel description	Specification
Benzene heart cut vapour and propane support fuel	Less than 0.5mg/m ³ hydrogen sulphide
For release points A2, A3, A5, A7 and A8 where the fuel fired is a mixture of natural gas and refinery fuel gas	The fraction of natural gas must be less than 50%
For release point A29	No liquid fuel shall be fired

Table S2.2 Permitted waste types and quantities for treatment of ballast water	
Maximum quantity	No limit
Waste code	Description
16 07 08*	Wastes containing oil (ballast water)

Table S2.3 Permitted waste types and quantities for treatment of spent caustic from EMCL (ZP3839MG)	
Maximum quantity	No limit
Waste code	Description
06 02 04*	Sodium and potassium hydroxide (spent caustic)

Schedule 3 – Emissions and monitoring

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
A1 on Authorised stack locations drawing (SP4 units 1 and 2)	LCP No 152 2 x 400MWth Boiler Plant fired on gaseous and liquid fuels Note 1	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	300 mg/m ³ Note 3 (424 mg/m ³) Note 3a Note 4	Monthly average (Calendar monthly mean of validated hourly averages)	Continuous	BS EN 14181
			466 mg/m ³ Note 4	Daily mean of validated hourly averages	Continuous	BS EN 14181
			848 mg/m ³ Note 4	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Carbon monoxide	100 mg/m ³	Monthly average	Continuous	BS EN 14181
		Sulphur dioxide	351 mg/m ³ Note 3 Note 4 (1000 mg/m ³) Note 3a	Monthly average (Calendar monthly mean of validated hourly averages)	Continuous	BS EN 14181
	1000 mg/m ³ Note 4		Daily mean of validated hourly averages	Continuous	BS EN 14181	
	1000 mg/m ³ Note 4		95% of validated hourly averages within a calendar year	Continuous	BS EN 14181	
		Dust	30 mg/m ³ Note 4	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
			33 mg/m ³ Note 4	Daily mean of validated hourly averages	Continuous	BS EN 14181
			60 mg/m ³ Note 4	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Nickel (Ni) and Vanadium (V)	-	Average over sampling period	At least every 6 months	BS EN 14385 Or as agreed in writing with the Environment Agency
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
A2 (PS/V3)	LCP No 151 1 x 125 and 1 x 38.7 MWth Distillation fired on incompressible and different types of gaseous fuels	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	200 mg/m ³ Note 3 (300 mg/m ³) Note 3a	Monthly average (Calendar monthly mean of validated hourly averages)	Continuous	BS EN 14181
			330 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			600 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

Table S3.1a Point source emissions to air – emission limits and monitoring requirements							
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method	
		Carbon monoxide	100 mg/m ³	Monthly average	Continuous	BS EN 14181	
		Sulphur dioxide	35 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181	
			(1000 mg/m ³) Note 3a	(Calendar monthly mean of validated hourly averages)			
			1000 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181	
				1000 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5	
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5	
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5	
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5	
		Dust	5 mg/m ³	Average over sampling period	At least every 6 months	BS EN 13284-1	
A3 (PH-1)	LCP No 147 1 x 21.5 and 1 x 43.7 MWth Additional non-LCP inputs: 1 x	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	200 mg/m ³ (300 mg/m ³) Note 3	Monthly average	Continuous – indirect monitoring.	6 monthly monitoring using BS EN 14792 As agreed in writing with the Environment Agency	

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
	10.5 and 1 x 7.1 MWth Cyclic power-former fired on different types of gaseous fuel	Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ (1000 mg/m ³) Note 3	Monthly average	Continuous – indirect monitoring.	6 monthly monitoring. As agreed in writing with the Environment Agency
		Dust	5 mg/m ³	Average over sampling period	At least every 6 months	BS EN 13284-1
		Polychlorinated dibenzodioxins/ furans (PCDD/F) emissions	No limit set	Periodic over minimum 6 hours, maximum 8 hour period	Once a year or once per regeneration, whichever is longer	Isokinetic sampling , extraction, then GC-MS analysis BS EN 1948: Parts 1,2 and 31 and MID
A4 (PH1-F4)	7 MWth Power-former fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	100 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
A5 (PH2)	LCP No 148 1 x 16, 1 x 70, 1 x 17, 1 x 27 and 1 x 35 MWth Semi re-generative power-former fired on different types of	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181
			(300 mg/m ³) Note 3a	(Calendar monthly mean of validated hourly averages)		
			330 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
	gaseous fuel Note 6		600 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Carbon monoxide	100 mg/m ³	Monthly average	Continuous	BS EN 14181
		Sulphur dioxide	35 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181
			(1000 mg/m ³) Note 3a	(Calendar monthly mean of validated hourly averages)		
			1000 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			1000 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Dust	5 mg/m ³	Average over sampling period	At least every 6 months	BS EN 13284-1
		Polychlorinated dibenzodioxins/ furans (PCDD/F) emissions	No limit set	Periodic over minimum 6 hours, maximum 8 hour period	Once a year or once per regeneration, whichever is longer	Isokinetic sampling , extraction, then GC-MS analysis BS EN 1948: Parts 1,2 and 31 and MID
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5		

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
A6 (PS2) Note 13	Crude distillation fired on liquid and gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	Note 13	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	Note 13	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	Note 13	Average over sampling period	At least every 6 months	BS EN 14791
A7 (ENSR)	LCP No 145 1 x 50 and 1 x 19 MWth Exxol-N-Finer fired on different types of gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	200 mg/m ³ (300 mg/m ³) Note 3	Monthly average	Continuous – indirect monitoring.	6 monthly monitoring using BS EN 14792 As agreed in writing with the Environment Agency
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ (1000 mg/m ³) Note 3	Monthly average	Continuous – indirect monitoring	6 monthly monitoring. As agreed in writing with the Environment Agency
		Dust	5 mg/m ³	Average over sampling period	At least every 6 months	BS EN 13284-1
A8 (PS/V1)	LCP No 150 1 x 37.9 and 1 x 23.9 MWth	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ (300 mg/m ³) Note 3	Monthly average	Continuous – indirect monitoring.	6 monthly monitoring using BS EN 14792 As agreed in writing with the Environment Agency
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
	Distillation fired on different types of gaseous fuel and incondensables	Sulphur dioxide	35 mg/m ³ (1000 mg/m ³) Note 3	Monthly average	Continuous – indirect monitoring	6 monthly monitoring. As agreed in writing with the Environment Agency
		Dust	5 mg/m ³	Average over sampling period	At least every 6 months	BS EN 13284-1
A9 (PV2) Note 13	Vacuum Distillation fired on gaseous fuel and incondensables	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	Note 13	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	Note 13	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	Note 13	Average over sampling period	At least every 6 months	As agreed in writing with the Environment Agency BS EN 14791
A10 (HD5/6/7)	21.4 MWth Hydrofiner fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A11 (ISOM)	1 x 18 and 1 x 25 MWth Isomeriser fired on gaseous fuels	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
A12 (LESR)	14 MWth Light Ends Unit fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A13 (HD3)	12 MWth Hydrofiner fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A14 (HD4)	12 MWth Hydrofiner fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A15 (RESID)	10 MWth Hydrofiner fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
A16 (SP4 Unit 3)	LCP No 146 1 x 196 MWth Gas Turbine and Heat Recovery Steam Generation plant fired on refinery fuel gas only. Note 7	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	120 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181
			(120 mg/m ³) Note 3a	(Calendar monthly mean of validated hourly averages)		
			132 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			240 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Carbon monoxide	100 mg/m ³	Monthly average	Continuous	BS EN 14181
		Dust	-	-	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
	Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5	
A16 (SP 4 Unit 3 - GTG/WHB)	LCP No 146 1 x 196 MWth Gas Turbine and Heat Recovery Steam Generation plant fired on a mixture of	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	120 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181
			(90 mg/m ³) Note 3a	(Calendar monthly mean of validated hourly averages)		
		99 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181	

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
	liquid fuel and refinery fuel gas. Note 7		180 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Carbon monoxide	100 mg/m ³	Monthly average	Continuous	BS EN 14181
		Dust	-	-	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
A17 (BIT1) Note 14	Bitumen Plant 1 fired on liquid fuel	-	-	-	-	-
A18 (BIT2) Note 14	Bitumen Plant 1 fired on gaseous fuel	-	-	-	-	-
A19 (MVEC)	Combustion of recovered vapour from ships loading	Sulphur dioxide	-	Average over sampling period	At least every 6 months	BS EN 14791
		Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	700 mg/m ³	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	50 mg/m ³	Average over sampling period	At least every 6 months	ISO 12039

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
		Benzene	1 mg/m ³	Average over sampling period	At least every 6 months	As agreed in writing with the Environment Agency
		NMVOC Note 8	35 mg/m ³	Average over sampling period	At least every 6 months	
A20 (WISR)	1 x 1.8, 1 x 1.9 and 1 x 1.5 MWth Wax isomeriser fired on gaseous fuels	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	-	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A21 (SCAN)	6.1 MWth Scanfiner fired on gaseous fuels	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A22 (FCC)	FCCU	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	300 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181
		Sulphur dioxide	800 mg/m ³ Note 3 Note 9	Monthly average	Continuous	BS EN 14181
		Dust	130 mg/m ³ Note 9a	Monthly average	Continuous	BS EN 14181
		Nickel (Ni), Antimony (Sb) and Vanadium (V)	-	Average over sampling period	At least every 6 months	BS EN 14385 Or as agreed in writing with the Environment Agency
		Carbon monoxide	1000 mg/m ³	Daily average	Continuous	ISO 12039

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
			130 mg/m ³	Calendar monthly average		
A23 (SU3/4)	SRU	Sulphur dioxide	66,900 mg/m ³	Hourly average	Continuous	BS EN 14181
			38,000 mg/m ³ Note 10	Daily average		
A24, A25, A26, A27	Flares	Total gas flared	No limit set	Calendar monthly	Continuous	As agreed in writing with the Environment Agency
		Sulphur dioxide	Tonnes			
A28 (HD8)	5.9 MWth Hydrofiner Furnace fired on gaseous fuel	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	150 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
		Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
A29 (Unit 5 Cogen)	LCP No 144 1 x 451 MWth Gas turbine and Heat Recovery Steam Generation Plant fired on different types of gaseous fuel. Note 7	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	77 mg/m ³ Note 3	Monthly average	Continuous	BS EN 14181
			(77 mg/m ³) Note 3a	(Calendar monthly mean of validated hourly averages)		
			85 mg/m ³	Daily mean of validated hourly averages		
	154 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181		
		Carbon monoxide	25 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
			30 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Sulphur dioxide	95 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			95 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
A29 (Unit 5 Cogen)	LCP No 144 1 x 176 MWth Auxiliary firing on the Heat Recovery Steam Generation Plant only fired on natural gas. Note 11 Note 12	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	100 mg/m ³ Note 3 (100 mg/m ³) Note 3a	Monthly average (Calendar monthly mean of validated hourly averages)	Continuous	BS EN 14181
			110 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			200 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
		Carbon monoxide	100 mg/m ³	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			110 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			200 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Sulphur dioxide	35 mg/m ³	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			38.5 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			70 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
		A30 Cogen Plant	GTG by pass stack 45 m	-	-	-

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
A31	Hydrogen plant heater /furnace 1 x 130 MWth pressure swing adsorption unit firing on purge gas and natural gas make up.	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	100 mg/m ³ Note 3 (100 mg/m ³) Note 3a	Monthly average (Calendar monthly mean of validated hourly averages)	Continuous	BS EN 14181
			110 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			200 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Carbon monoxide	100 mg/m ³	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			110 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			200 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Sulphur dioxide	35 mg/m ³ Note 3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			38.5 mg/m ³	Daily mean of validated hourly averages	Continuous	BS EN 14181
			70 mg/m ³	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

Table S3.1a Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
A31	Hydrogen plant heater /furnace	Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
	1 x 130 MWth pressure swing adsorption unit firing on purge gas and natural gas make up.	Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181 Note 5
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 5
A32 (HD10)	High pressure diesel hydrofiner unit	Oxides of nitrogen (NO and NO ₂ expressed as NO ₂)	100 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14792
	1 x 12 MWth firing on gaseous fuel.	Carbon monoxide	100 mg/m ³	Average over sampling period	At least every 6 months	BS EN 15058
		Sulphur dioxide	35 mg/m ³ Note 3	Average over sampling period	At least every 6 months	BS EN 14791
Process vents	Bulk storage tanks	VOCs (Class B)	No limit set	Annually	Continuous	Based on API method. Permanent access not required
Bulk loading vents	Ship, rail and tanker loading	VOCs	No limit set	-	-	Permanent access not required
Relief valves	Process units	VOCs Class A	No release permitted	-	-	Permanent access not required
		Benzene				
Diesel fire pumps	Diesel fire pumps	Combustion products	No limit set	-	-	-
Gas Vents and Steam and pressure release valves on Unit 5 Cogen	Process areas	No parameters set	No limits set	-	-	Permanent access not required
Note 1 Capacity limited to <500MW by application of software interlock in accordance with RGN2 and guidance provided in the MFF Protocol						

- Note 3 Compliance achieved through integrated emissions management technique based on monthly average data.
- Note 3a The emission concentration from the individual emission point shall not exceed the Chapter III IED value, effective from 1/4/2017, specified in brackets where applicable and based on the calendar monthly mean of validated averages.
- Note 4 Based on representative fuel split which shall be subject to annual review or within 28 days if there are significant changes to the fuel split in accordance with section 6 of the MFF Protocol.
- Note 5 Equivalent monitoring conditions, as specified in the response to the Regulation 60 Notice of 05/08/2015, are agreed.
- Note 6 Emission Limit Values exclude regens that occur approximately once a year.
- Note 7 These Emission Limit values apply above 70% load.
- Note 8 Excluding benzene.
- Note 9 A limit of 600 mg/m³ applies where sulphur content of feed is <0.5% w/w (as reported).
- Note 9a i) FCC regenerator releases during start-up, after oil into the unit, during catalyst addition and during catalyst re-circulation to be agreed in writing with the Environment Agency; ii) Limit of 160 mg/m³ applies when there is no residue feed to the FCC for more than seven days.
- Note 10 Limit of 55,000mg/m³ applies when there is insufficient acid gas to sustain normal operation; "normal operation" to be agreed in writing with the Environment Agency.
- Note 11 These Emission Limit Values apply only when the HRSG is operating in auxiliary mode (also known as Cold Air Firing) under emergency conditions where there is a credible plan to recover the operation of the Gas Turbine.
- Note 12 The use of other gaseous fuels and associated ELVs shall be agreed in writing with the Environment Agency.
- Note 13 Unit mothballed. Emission Limit Values to be agreed before unit returned to service.
- Note 14 Unit decommissioned.

Table S3.1b Point source emissions to air – Integrated Emissions Management limits and monitoring requirements

Emission point ref. & location	Parameter	Sources	Integrated emissions management limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A20, A21, A22, A23, A28, A31, A32.	Sulphur dioxide	Stacks releasing sulphur dioxide as a combustion product, FCC Regenerator and Sulphur Recovery Units	1290 mg/m ³	Hourly average	Continuous	As agreed in writing with the Environment Agency.
The points specified in the Integrated Emissions Management Technique document or subsequently notified in accordance with condition 4.3.9 and agreed in writing by the Environment Agency	Oxides of Nitrogen (NO and NO ₂ expressed as NO ₂)	Combustion units Note 1 FCCU	Limit as calculated in accordance with approved Integrated Emissions Management Document	Monthly average	Continuous	Calculation using the method agreed in writing by the Environment Agency in accordance with agreed Integrated Emissions Management Technique document
The points specified in the Integrated Emissions Management Technique document or subsequently notified in accordance with condition 4.3.9 and agreed in writing by the Environment Agency	Sulphur dioxide	Combustion units excluding gas turbines Note 1 FCCU	Limit as calculated in accordance with approved Integrated Emissions Management Document	Monthly average	Continuous	Calculation using the method agreed in writing by the Environment Agency in accordance with agreed Integrated Emissions Management Technique document
Note 1. Includes combustion units permitted under ZP3839MG covering activities carried out at the integrated chemical plant.						

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method
W1 - Outfall 1 emission to Southampton Water	SEPS 1 & Sanitary effluent treatment	pH	6 – 9	24 hour composite average	Daily	FAW 370.07A
		Hydrocarbon oil index	2.5 mg/l Note 1	Annual average		BS EN ISO 9377-2
		Oil	5 mg/l Note 3	24 hour composite average		FAW 370.02/IP426
		Total Nitrogen expressed as N	25 mg/l Note 1	Annual average		As agreed in writing with the Environment Agency
		Ammoniacal Nitrogen (as N)	5 mg/l Note 3	24 hour composite average		BS 1427/ FAW370.14
		Total mono phenols	1 mg/l	24 hour composite average		CHEMets (EPA method 376.2)
		TOC	20 mg/l	24 hour composite average		As agreed in writing with the Environment Agency
		COD	125 mg/l Note 1 Note 4	Annual average		UKAS accredited method
		Total suspended solids	25 mg/l Note 1	Annual average		BS EN 872:2005 BS EN 6068-2:2005
		Phenol Index	-	Annual average based on spot sample	Monthly	BS EN ISO 14402
		Benzene, toluene, ethyl benzene, xylene (BTEX)	0.05 mg/l Benzene Note 1	Annual average based on spot sample		UKAS accredited method
		Dissolved Copper (as Cu)	10 µg/l	24 hour composite average	Quarterly	ISO/IEC 17025:2005
		Total Zinc (as Zn)	40 µg/l			ISO/IEC 17025:2005

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Dissolved Copper (as Cu)	5 µg/l	Annual average	Quarterly	ISO/IEC 17025:2005
		Total Lead (as Pb)	0.03 mg/l			BS 6068-2.29:1987, ISO 8288-1986
		Total Cadmium (as Cd)	0.008 mg/l			ISO/IEC 17025:2005
		Total Nickel (as Ni)	0.1 mg/l			ISO/IEC 17025:2005
		Total Mercury (as Hg)	0.001 mg/l			ISO/IEC 17025:2005
		Vanadium	-	-		BS EN ISO 11885 or BS EN ISO 17294
		Temperature	40° C	Hour	Continuous	Standard calibrated temperature probe
		Flow under dry weather conditions	12,800m ³ /hr	Hour	Continuous	Radar level indication with flow calculation
		Flow under dry weather conditions	307,200 m ³ /24 hours	Daily		
W2 - Outfall 2 emission to Southampton Water	SEPS 2, SEPS3 & Quay Cottage effluent treatment	pH	6 – 9	24 hour composite average	Daily	FAW 370.07A
		Hydrocarbon Oil Index	2.5 mg/l Note 1	Annual average		BS EN ISO 9377-2 Note 1
		Oil	5 mg/l Note 3	24 hour composite average		FAW 370.02/IP426
		Total Nitrogen expressed as N	25 mg/l Note 1	Annual average		As agreed in writing with the Environment Agency
		Ammoniacal Nitrogen (as N)	3 mg/l Note 3	24 hour composite average		BS 1427 / FAW370.14
		Total mono phenols	0.5 mg/l	24 hour composite average		CHEMets (EPA method 376.2)

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		TOC	30 mg/l	24 hour composite average		As agreed in writing with the Environment Agency
		COD	261 mg/l Note 1 Note 4	Annual average		UKAS accredited method
		Total suspended solids	25 mg/l Note 1	Annual average		BS EN 872:2005 BS EN 6068-2:2005
		Phenol Index	-	Annual average based on spot sample	Monthly	BS EN ISO 14402
		Benzene, toluene, ethyl benzene, xylene (BTEX)	0.050 mg/l Benzene Note 1	Annual average based on spot sample		UKAS accredited method
		Dissolved Copper (as Cu)	15 µg/l	24 hour composite average	Quarterly	ISO/IEC 17025:2005
		Total Zinc (as Zn)	50 µg/l			ISO/IEC 17025:2005
		Total Chromium (as Cr)	10 µg/l			ISO/IEC 17025:2005
		Dissolved Copper (as Cu)	5 µg/l	Annual average	Quarterly	ISO/IEC 17025:2005
		Total Lead (as Pb)	0.030 mg/l			BS 6068-2.29:1987, ISO 8288-1986
		Total Cadmium (as Cd)	0.008 mg/l			ISO/IEC 17025:2005
		Total Nickel (as Ni)	0.1 mg/l			ISO/IEC 17025:2005
		Total Mercury (as Hg)	0.001 mg/l			ISO/IEC 17025:2005
		Temperature	40° C	Hour	Continuous	Standard calibrated temperature probe

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Flow under dry weather conditions	9,500m ³ /hr	Hour	Continuous	Level gauge with flow calculation from depth
		Flow under dry weather conditions	228,000 m ³ /24 hours	Daily		
W3 - Outfall 3 emission to Southampton Water	SEPS 4	pH	6 – 9	24 hour composite average	Daily	FAW 370.07A
		Oil Note 3	10 mg/l			FAW 370.02 / IP 426
		Ammoniacal Nitrogen (as N) Note 3	2 mg/l			BS 1427 / FAW370.14
		Total mono phenols	0.5 mg/l			CHEMets (ASTM D1783)
		TOC	20 mg/l			As agreed in writing with the Environment Agency
		COD	No limit set Note 4			As agreed in writing with the Environment Agency
		Suspended solids	No limit set	24 hour composite average	Weekly	BS EN 872:2005 BS EN 6068-2:2005
		Dissolved Copper (as Cu)	5 µg/l	24 hour composite average	Quarterly	ISO/IEC 17025:2005
		Total Zinc (as Zn)	130 µg/l	24 hour composite average		ISO/IEC 17025:2005
			40 µg/l	Annual average		
		Total Nickel (as Ni)	20 µg/l	24 hour composite average		ISO/IEC 17025:2005
		Total Lead (as Pb)	25 µg/l			BS 6068-2:29:1987, ISO 8288-1986
		Total Cadmium (as Cd)	2.5 µg/l			ISO/IEC 17025:2005

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Total Mercury (as Hg)	0.3 µg/l			ISO/IEC 17025:2005
		Temperature	40° C	Hour	Continuous	Standard calibrated temperature probe
		Flow under dry weather conditions	350 m³/hr	Hour	Continuous	Magnetic flow meter
		Flow under dry weather conditions	8,400 m³/24 hours	Daily		
<p>Note 1 Compliance assessed in accordance with agreed methodology, taking into account process effluent flow-proportionate limit and net emission calculation as appropriate.</p> <p>Note 3 Applies until requirement 3b for Regulatory Position Statement RPS/BR6996IC/30/07/2018 is completed.</p> <p>Note 4 Measured as Total Organic Carbon as a surrogate for COD using agreed correlation factor of 1:3</p>						

Table S3.3 Annual Permit limits

Substance	Medium	Limit (including unit)
Sulphur dioxide 2016 onwards	Air	8,600 tonnes
Oxides of nitrogen 2017 onwards from emission point A1	Air	913 tonnes
Oxides of nitrogen 2017 onwards from emission point A29	Air	700 tonnes
Ammoniacal nitrogen	Water	193 tonnes
Oil	Water	205 tonnes
Oil per tonne feedstock	Water	3g/t feedstock
Mono phenols	Water	45.5 tonnes
Total Zinc (as Zn)	Water	6 tonnes
Total Nickel (as Ni)	Water	1 tonne
Total Lead (as Pb)	Water	1 tonne
Total Chromium (as Cr)	Water	2 tonnes
Total Cadmium (as Cd)	Water	0.4 tonnes
Total Mercury (as Hg)	Water	0.06 tonnes

Table S3.4 Appropriate measures for odour

Measure	Date

<p>The operator shall maintain the odour management plan as described in submission dated November 2009.</p> <p>The operator shall review the plan annually and record at least once a year or as soon as practicable after a complaint (whichever is the earlier), whether changes to the plan should be made and make any appropriate changes to the plan identified by a review.</p>	<p>From date of approval by Environment Agency.</p>
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Table S3.5 Appropriate measures for noise	
Measure	Date
<p>The operator shall maintain the noise management plan as described in submission dated 16 December 2008.</p> <p>The operator shall review the plan annually and record at least once a year or as soon as practicable after a complaint (whichever is the earlier), whether changes to the plan should be made and make any appropriate changes to the plan identified by a review.</p>	<p>From date of approval by Environment Agency.</p>

Table S3.6 Process monitoring requirements				
Emission point reference or source or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Fugitive emissions of VOCs from permitted activities following approval of IC39	VOCs	-	LDAR programme in accordance with BAT conclusion 6 and with regard to the Institute of Petroleum [Energy Institute] protocol) for testing potential sources of fugitive emissions of VOCs.	The operator shall complete repairs and/or carry out other actions to prevent, or where that is not possible, minimise continued emissions from those sources.
Refinery Fuel Gas Monitoring	Sulphur content	Continuously, or as agreed in writing with the Environment Agency	Continuously sampling chromatographic S gas analyser or Electrochemical cell Or as agreed in writing with the Environment Agency	Sampling to be undertaken at locations within the RFG system that are representative of the RFG composition burnt in major combustion units. Monthly average, maximum and minimum values to be recorded from data collected.
Refinery Sulphur Balance	Sulphur	Monthly	Calculation by method to be agreed in writing with the Environment Agency that identifies the sources of the data used.	A mass balance shall be undertaken of incoming sources of sulphur to the refinery vs sulphur outputs.

Table S3.6 Process monitoring requirements				
Emission point reference or source or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
Sulphur Recovery Plants, SU3 and SU4	SRU availability and recovery efficiency	Continuous	Calculation by method to be agreed in writing with the Environment Agency that identifies the sources of the data used.	Sulphur recovery efficiency must be >98.5% monthly average
Sulphur Recovery Plants, SU3 and SU4	Efficiency optimisation survey	Two yearly	Not applicable	To include review of analytical results and plant operating data; overall and interstage material and heat balances; overall and interstage efficiencies, evaluation of ammonia destruction efficiency, evaluation against stack emission analyser; recommendations on potential performance monitoring procedures and use of SRU modelling techniques.

Schedule 4 – Reporting

Parameters, for which reports shall be made, in accordance with conditions of this permit, are listed below.

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point/reference	Reporting period	Period begins
LCP			
Emissions to air – sulphur dioxide Parameters as required by condition 3.5.1.	A1, A2, A3, A5, A7, A8, A16 and A29, as listed in Table S3.1	Every 3 months for continuous monitoring	From permit issue
		Every 6 months for periodic monitoring	
Emissions to air – oxides of nitrogen Parameters as required by condition 3.5.1.	A1, A2, A3, A5, A7, A8, A16 and A29, as listed in Table S3.1	Every 3 months for continuous monitoring	From permit issue
		Every 6 months for periodic monitoring	
Emissions to air – carbon monoxide Parameters as required by condition 3.5.1.	A1, A2, A3, A5, A7, A8, A16 and A29, as listed in Table S3.1	Every 3 months for continuous monitoring	From permit issue
		Every 6 months for periodic monitoring	
Emissions to air – dust Parameters as required by condition 3.5.1.	A1, A2, A3, A5, A7, A8 and A16 as listed in Table S3.1	Every 3 months for continuous monitoring	From permit issue
		Every 6 months for periodic monitoring	
Emissions to air – Nickel and Vanadium Parameters as required by condition 3.5.1.	A1	Every 12 months	28/10/18
Invalid data	A1, A2, A5, A16 and A29 as listed in Table S3.1	Every 3 months	From permit issue
Non-LCP			
Emissions to air – sulphur dioxide Parameters as required by condition 3.5.1.	A22	Every 12 months	From permit issue
Emissions to air – oxides of nitrogen Parameters as required by condition 3.5.1.	A22	Every 12 months	From permit issue
Emissions to air – sulphur dioxide Parameters as required by condition 3.5.1.	A31 and A32	Every 3 months for continuous monitoring	01/04/19
		Every 6 months for periodic monitoring	
Emissions to air – oxides of nitrogen Parameters as required by condition 3.5.1.	A31 and A32	Every 3 months for continuous monitoring	01/04/19
		Every 6 months for periodic monitoring	
Emissions to air – carbon monoxide Parameters as required by condition 3.5.1.	A31 and A32	Every 3 months for continuous monitoring	01/04/19
		Every 6 months for periodic monitoring	
Emissions to air – dust	A22	Every 12 months	From permit issue

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point/reference	Reporting period	Period begins
Parameters as required by condition 3.5.1.			
Emissions to air - Nickel, Antimony and Vanadium Parameters as required by condition 3.5.1.	A22	Every 12 months	28/10/18
Emissions to air – carbon monoxide Parameters as required by condition 3.5.1.	A22	Every 12 months	From permit issue
Emissions to air – carbon monoxide Parameters as required by condition 3.5.1.	A4, A9, A10, A11, A12, A13, A14, A15, A20, A21 and A28	Every 12 months	28/10/18
Emissions to air – benzene, other VOCs	A19	Every 12 months	From permit issue
Emissions to air - polychlorinated dibenzodioxins/ furans (PCDD/F) emissions	A3, A4	Every 12 months	28/10/18
Total flaring	A24, A25, A26, A27	Every 3 months	From permit issue
Emissions to air (hourly bubble) – sulphur dioxide Parameters as required by condition 3.5.1.	A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A20, A21, A22, A23, A28, A31 and A32.	Every 12 months	1/1/19
Emissions to air (monthly bubble) – sulphur dioxide Parameters as required by condition 3.5.1.	The points specified in the agreed Integrated Emissions Management Technique document	Every 12 months	1/1/19
Emissions to air (monthly bubble) – oxides of nitrogen Parameters as required by condition 3.5.1.	The points specified in the agreed Integrated Emissions Management Technique document	Every 12 months	1/1/19
Fugitive VOC releases	-	Every 12 months	From completion of IC39
Average sulphur content of FCCU feed	-	Every 12 months	From 1/1/19
Emissions to water – temperature Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – pH Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – flow Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – oil Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point/reference	Reporting period	Period begins
Emissions to water – hydrocarbon oil index Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – ammoniacal nitrogen Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total nitrogen Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – total mono phenols Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – phenol index Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – TOC Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – COD Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	1/1/19
Emissions to water – suspended solids Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	1/1/19
Emissions to water – dissolved copper Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total zinc Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total nickel Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total nickel Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – total lead Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total lead Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – total chromium	W2	Every 12 months	From permit issue

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point/reference	Reporting period	Period begins
Parameters as required by condition 3.5.1			
Emissions to water – total mercury Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total mercury Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – total cadmium Parameters as required by condition 3.5.1	W1, W2, W3	Every 12 months	From permit issue
Emissions to water – total cadmium Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – benzene Parameters as required by condition 3.5.1	W1, W2	Every 12 months	1/1/19
Emissions to water – vanadium Parameters as required by condition 3.5.1	W1	Every 12 months	1/1/19

Table S4.2 Annual production/treatment	
Parameter	Units
Road and other transport fuels	tonnes
Non-transport/heating fuels	tonnes
Chemical/petrochemical feedstocks	tonnes

Table S4.3 IED Chapter III Performance parameters for reporting to Defra and other Performance parameters		
Parameter	Frequency of assessment	Units
Crude oil and other oil import (feedstock)	Annually	tonnes
Water usage	Annually	tonnes/tonne feedstock
Energy usage (electrical)	Annually	MWh/tonne feedstock
Energy usage (all fuels)	Annually	MJ/tonne feedstock
Total release of oil to water per tonne of feedstock (net)	Annually	g oil/tonne feedstock
Non-hazardous and hazardous ballast water	Annually	tonnes
Thermal input capacity for each LCP	Annually	MW
Annual fuel usage for each LCP	Annually	tJ

Total emission to air of NO _x for each LCP	Annually	tonnes
Total emission to air of SO ₂ for each LCP	Annually	tonnes
Total emission to air of CO for each LCP	Annually	tonnes
Total emission to air of dust for each LCP	Annually	tonnes
Operating hours for each LCP	Annually	hr

Table S4.4 Reporting forms		
Media/parameter	Reporting format	Date of form
Air and Energy - LCP	Form IED AR1 – energy usage and emissions for the year	01/12/2017
Air - LCP	Form IED CON 1 – monthly mean, maximum daily and annual percentile concentrations for boilers with continuous monitoring	30/07/2018
Air - LCP	Form IED CON 2 - monthly mean, maximum daily and annual percentile concentrations for gas turbines with continuous monitoring	30/07/2018
Air - LCP	Form IED PM1 – discontinuous monitoring results	30/07/2018
CEMs - LCP	Form IED CEM – continuous measurement systems invalidation log	30/07/2018
Air – non-LCP	Form Air – 1 – discontinuous monitoring - non LCPs	22/02/2019
Air – MVEC CO, Benzene, other VOCs	Form Air – 2 discontinuous monitoring of MVEC	30/07/2018
Air – A1, A3 and A5	Form Air 3 – discontinuous monitoring of nickel & vanadium and polychlorinated dibenzodioxins/furans (PCDD/F) emissions	30/07/2018
Air - non-LCPD SO ₂	Form Air – 4 continuous monitoring and measurement hourly ELV – SU and refinery bubble.	22/02/2019
Air – Fuels	Form Air – 7 Refinery fuel analyses (daily average data – RFG)	30/07/2018
Air – Sulphur balance	Form Air – 9 Refinery Sulphur Balance, SRU availability and efficiency	30/07/2018
Air – FCCU SO ₂ , NO _x , CO, Dust	Form Air – 10 continuous monitoring or emission to air and annual feed composition	30/07/2018
Air – Flares	Form Air – 12 Report of total flaring (rate, energy loss and SO ₂) for all flares	30/07/2018
Air – Flares Sour gas flaring/combustion	Form Air 13 – Report of non-routine flaring of acid gases	30/07/2018
Air – VOCs	Form Air 14 - Report of fugitive VOC emissions	30/07/2018
Air – NO _x IEM	Form Air 15 - Reporting of compliance with monthly bubble ELV	30/07/2018

Table S4.4 Reporting forms		
Media/parameter	Reporting format	Date of form
Air – SO ₂ IEM	Form AIR 16 - Reporting of compliance with monthly bubble ELV	30/07/2018
Air - non-LCPD SO ₂ , NO _x and CO	Form Air – 17 monthly mean, maximum daily and annual percentile concentrations for boilers with continuous monitoring	22/02/2019
Water - Outfall 1	Form water OF1 - Reporting of Maximum and average values appropriate to reference period of specified parameters from Outfall 1.	30/07/2018
Water – Outfall 2	Form water OF2 - Reporting of Maximum and average values appropriate to reference period of specified parameters from Outfall 2.	30/07/2018
Water – Outfall 3	Form Water OF3 - Reporting of Maximum and average values appropriate to reference period of specified parameters from Outfall 3.	30/07/2018
Annual production and performance	Form Performance 1 or other form as agreed in writing by the Agency	30/07/2018

Schedule 5 – Notification

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

If any information is considered commercially confidential, it should be separated from non-confidential information, supplied on a separate sheet and accompanied by an application for commercial confidentiality under the provisions of the EP Regulations.

Part A

Permit Number	EPR/BR6996IC
Name of operator	Esso Petroleum Company, Limited
Location of Facility	Esso Refinery, Marsh Lane, Fawley, Southampton, Hampshire SO45 1TX
Time and date of the detection	

(a) Notification requirements for any malfunction, breakdown or failure of equipment or techniques, accident, or emission of a substance not controlled by an emission limit which has caused, is causing or may cause significant pollution	
To be notified within 24 hours of detection	
Date and time of the event	
Reference or description of the location of the event	
Description of where any release into the environment took place	
Substances(s) potentially released	
Best estimate of the quantity or rate of release of substances	
Measures taken, or intended to be taken, to stop any emission	
Description of the failure or accident.	

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Emission point reference/ source	
Parameter(s)	
Limit	
Measured value and uncertainty	
Date and time of monitoring	

(b) Notification requirements for the breach of a limit	
To be notified within 24 hours of detection unless otherwise specified below	
Measures taken, or intended to be taken, to stop the emission	

Time periods for notification following detection of a breach of a limit	
Parameter	Notification period

(c) Notification requirements for the detection of any significant adverse environmental effect	
To be notified within 24 hours of detection	
Description of where the effect on the environment was detected	
Substances(s) detected	
Concentrations of substances detected	
Date of monitoring/sampling	

Part B – to be submitted as soon as practicable

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission	
The dates of any unauthorised emissions from the facility in the preceding 24 months.	

Name*	
Post	
Signature	
Date	

* authorised to sign on behalf of the operator

Schedule 6 – Interpretation

“accident” means an accident that may result in pollution.

“Acid Gas” means a gas that contains sulphurous compounds.

“acid gas removal system”, means separation of acid gas (mainly hydrogen sulphide) from the fuel gases, e.g. by amine treatment

“Annual average” means average of all daily averages within a calendar year.

“application” means the application for this permit, together with any additional information supplied by the operator as part of the application and any response to a notice served under Schedule 5 to the EP Regulations.

“authorised officer” means any person authorised by the Environment Agency under section 108(1) of The Environment Act 1995 to exercise, in accordance with the terms of any such authorisation, any power specified in section 108(4) of that Act.

“BAT” means Best available techniques, as defined in Article 3 of the Industrial Emissions Directive

“BAT-AEL” means the achievable emission level associated with application of the best available techniques.

“Bref” means the BAT Reference Document for the Refining of Mineral Oil and Gas published by the European commission 2014/738/EU

“BS EN 14181” will include the requirements of BS EN 15267-3 through QAL1. MCERTS certification for the appropriate ranges and determinands is a way of demonstrating of compliance with the requirements of BS EN 15267-3.

“Bubble emission limit” means a single aggregated emission limit, expressed as a mean monthly concentration, which when complied with will result in equivalent emission levels to those that would have been released when complying with each BREF BATAEL separately.

“Calendar monthly mean of validated hourly averages” means monthly mean determined from the measured valid hourly average values after having subtracted the value of the 95% confidence interval.

“CEM” Continuous emission monitor

“Daily” means 24 hours commencing 00.01 hrs.

“diffuse VOC emission” means Non-channelled VOC emissions that are not released via specific emission points such as stacks. They can result from 'area' sources (e.g. tanks) or 'point' sources (e.g. pipe flanges)

“emissions to land” includes emissions to groundwater.

“EP Regulations” means The Environmental Permitting (England and Wales) Regulations SI 2016 No.1154 and words and expressions used in this permit which are also used in the Regulations have the same meanings as in those Regulations.

“emissions of substances not controlled by emission limits” means emissions of substances to air, water or land from the activities, either from the emission points specified in schedule 3 or from other localised or diffuse sources, which are not controlled by an emission or background concentration limit.

“Flaring event” means a large scale temporary operation of a flare system, caused by a process disruption.

“groundwater” means all water, which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.

“Hazardous waste” has the meaning given in the Hazardous Waste (England and Wales) Regulations 2005 (as amended).

“Hourly average” means average of each hour starting each day at 00.01 hours

“Industrial Emissions Directive” means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions

“Integrated Emissions Management Technique” means the principal of delivering compliance with a number of BREF BATAELs for the same pollutant, by setting a single overarching bubble emission limit which means a single aggregated emission limit, expressed as a mean monthly concentration, which when complied with will result in equivalent emission levels to those that would have been released when complying with each BREF BATAEL separately.

“IEMT Protocol” means the protocol developed by UK BREF Working Group.

“Large Combustion Plant Directive” means Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants.

“List of Wastes” means the list of wastes established by Commission Decision 2000/532/EC replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste, as amended from time to time.

“MCERTS” means the Environment Agency’s Monitoring Certification Scheme.

“MFF Protocol” means IED Chapter III Protocol for Multi-fuel Firing Refinery Combustion Plants granted a Permit prior to 7 January 2013, version 5.

“Monthly average” means average over a calendar month.

Multi-fuel firing” means the capability of burning more than one type of fuel.

“NMVOC” means VOC excluding methane

“Normal Operation” means the range of process conditions that can occur when a process unit is performing its intended duty.

“Offgas” means a waste gas stream from a refinery process

“Other than normal operating conditions” means process conditions that would not occur during the normal operation of a process unit.

“quarter” means a calendar year quarter commencing on 1 January, 1 April, 1 July or 1 October.

“Refinery Fuel Gas” means off-gases from distillation or conversion units used as a fuel.

“Sulphur recovery efficiency” is calculated over the whole treatment chain (including SRU and TGTU) as the fraction of sulphur in the feed that is recovered in the sulphur stream routed to the collection pits. When the applied technique does not include a recovery of sulphur (e.g. seawater scrubber), it refers to the sulphur removal efficiency, as the % of sulphur removed by the whole treatment chain.

“SRU” means Sulphur Recovery Unit

“Standard contribution value” means the typical flue gas flowrate produced by a unit during normal operation, which is specified for the purpose of defining the contribution of that unit to the “bubble emission limit”.

“Waste code” means the six digit code referable to a type of waste in accordance with the List of Wastes and in relation to hazardous waste, includes the asterisk.

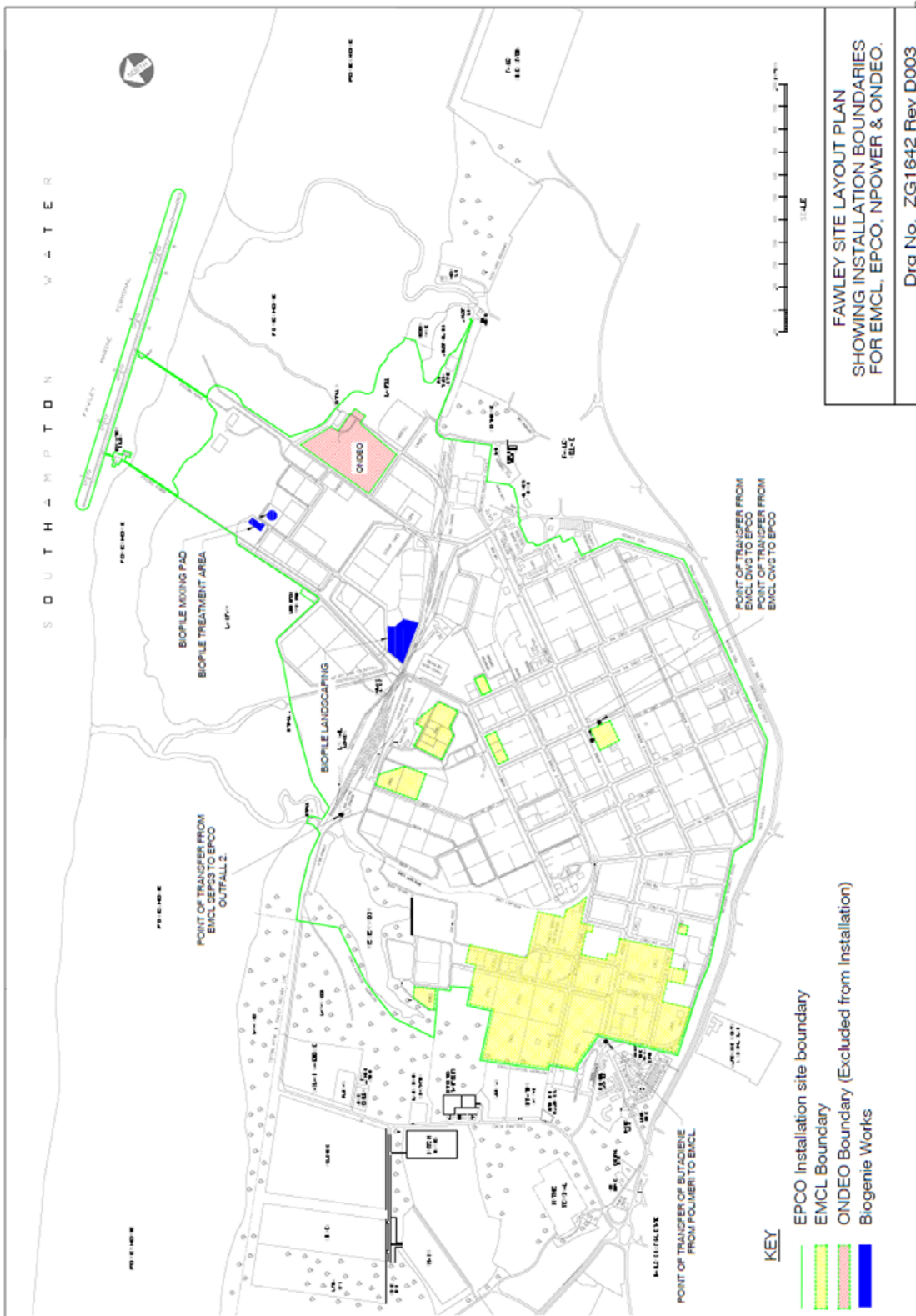
Unless otherwise stated, any references in this permit to concentrations of substances in emissions into air means:

- in relation to emissions from combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 3% dry for liquid and gaseous fuels, 6% dry for solid fuels; and/or
- in relation to emissions from gas turbine and compression ignition engine combustion processes, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 15% dry for liquid and gaseous fuels; and/or
- in relation to emissions from non-combustion sources, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.

“VOC” means Volatile organic compounds as defined in Article 3(45) of Directive 2010/75/EU - ‘volatile organic compound’ means any organic compounds well as the fraction of creosote, having at 293,15 K a vapour pressure of 0,01 kPa or more, or having a corresponding volatility under the particular conditions of use;

“year” means calendar year ending 31 December.

Schedule 7 – Site plan



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END OF PERMIT

Annex to conditions – Derogation under Industrial Emissions Directive

Derogation under Article 15(4) of Industrial Emissions Directive

DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions

Management Techniques

We have considered the Operator's proposed techniques and its comparison against other relevant techniques as described in the BAT Conclusions in the Commission Implementing Decision 2014/738/EU for the refining of mineral oil and gas, published 9 October 2014. Our full reasoning is given in our decision document that accompanies the permit determination. Esso Petroleum Company Limited requested a derogation from BAT C 12, BAT C 25 and BAT C 52.

BAT C 12

BAT C 12 refers to the BAT-AEL for Chemical Oxygen Demand (COD) for emissions to water, specifically in relation to Outfall 2. The BAT-AEL is in the range of 30 – 125 mg/l with the operator requesting a derogation from this until next permit review of 261 mg/l. The basis for the request was the grounds of technical characteristics, specifically the integrated nature of the site operations and sewer systems.

Esso Petroleum Company Limited has supplied a valid derogation request against the BAT C 12. The derogation request is based on technical characteristics, specifically the integrated nature of the site with the downstream chemicals plant, configuration of existing sewer system and composition of the effluent streams makes it more technically difficult and costly to comply. The operator has described six relevant options for achieving the BAT-AEL and justified the screening out of one option. We believe that all possible options have been considered. Three options were taken forward to conduct a cost benefit analysis. The proposed derogation is to permanently implement the gas stripper reconfiguration (as trialled) to treat additional high TOC waste streams. An ELV of 261 mg/l is proposed, based on historical monitoring data. In order to verify the estimated reductions, monitoring results following completion of the improvement project will be assessed to determine whether the ELV can be further reduced towards the BAT AEL. An Improvement Condition will be set in the permit that requires the operator to review and assess monitoring results to verify the level of reductions achieved.

Esso Petroleum Company Limited has provided suitable evidence to support the increased site-specific costs of achieving BAT, taking account of the integrated nature of the site. Compliance with the BAT-AEL can be demonstrated as disproportionately costly compared to environmental benefits in relation to the BiOx. The cost of compliance in relation to the stripper reconfiguration is close to zero (-£1.1M). The operator has initiated a project to evaluate the technical feasibility of the permanent use of this routing which, subject to successful development, is scheduled for completion by end 2020.

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved. There will be no increase in emissions, and impacts on sensitive receptors. Releases at current levels have already been assessed as part of the permitting process. Emissions will start to reduce, as will the subsequent impact, from 2021 when the on-site improvements are completed. In addition to the proposed derogation, a number of other improvements are either planned for completion or being trialled.

All suitable abatement options have been considered and taken forward for Cost Benefit Analysis (CBA) where appropriate. Robust CBAs have been completed to support the derogation application. There will be no increase in emissions and therefore impact on sensitive receptors. In conclusion, the operator has demonstrated that the costs of achieving the BAT-AEL through the installation of a BiOx Plant are higher than the environmental benefits. However, in the case of the

stripper reconfiguration, this is marginal and the operator has committed to pursue a permanent routing change as the proposed derogation.

The Environment Agency has reviewed the application and agreed to grant the derogation. An improvement Condition has been included that requires Esso Petroleum Company Limited to review monitoring data, taking into account key milestones for the various improvement projects and identify whether compliance at a lower ELV can be achieved.

BAT C 25

BAT C 25 refers to the BAT-AEL for emissions of dust from the Fluidised Catalytic Cracking Unit (FCCU). The BAT-AEL is in the range of 10 – 50 mg/m³ with the operator requesting derogation from this to 130 mg/m³ until the next permit review. The basis for the request was the grounds of technical characteristics, specifically the congested nature of the site which would require bespoke abatement equipment design resulting in higher than usual costs.

Esso Petroleum Company Limited has supplied a valid derogation request against the BAT C 25. The derogation request is based on technical characteristics, specifically plant configuration and lack of space for replacement abatement equipment. The operator has described four relevant options for achieving the BAT-AEL and justified the screening out of one option. Three options were taken forward to conduct a cost benefit analysis. The proposed derogation is to continue with the existing multistage cyclones and the operator proposed the retention of the existing ELV of 130 mg/Nm³ until the next permit review. As dust emissions may increase due to additional DeSO_x catalyst used upstream to reduce sulphur dioxide, an Improvement Condition will be set in the permit that requires the operator to implement a plan to regularly review monitoring data and trends.

Esso Petroleum Company Limited has provided suitable evidence to support the increased site-specific costs of achieving BAT, taking account the limited space availability. Compliance with the BAT-AEL can be demonstrated as disproportionately costly compared to environmental benefits.

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved. Maximum monthly average dust emissions are reported quarterly. In addition, the operator has provided information in relation to dispersion modelling completed in support of the derogation application. The model outputs predict the emissions from the FCCU to account for 0.6% of the AQO for PM₁₀, or 1.5% of the existing background levels, and therefore not considered to be significant. This is supported by the conclusions drawn when determining the original permit application that the process contribution (for all sources of dust emissions from the refinery) is low compared to the Environmental Assessment Level and is not therefore likely to threaten air quality standards. A number of improvements have subsequently been implemented which further reduce dust emissions.

All suitable abatement options have been considered and taken forward for CBA where appropriate. Robust CBAs have been completed to support the derogation application. There is not scope to reduce the current dust ELV but continued compliance with this is expected and therefore there will be no deterioration. In conclusion, the operator has demonstrated that the costs of achieving the BAT-AEL are disproportionate to the environmental benefits.

The Environment Agency has reviewed the application and agreed to grant the derogation. An Improvement Condition has been included that requires Esso Petroleum Company Limited to review compliance data at a suitable period following stabilisation of the new DeSO_x dosing regime upstream of the TCV to ensure current performance is maintained or improved.

BAT C 52

BAT C 52 refers to the BAT-AEL for Volatile Organic Compounds (VOCs) from vapour recovery units specifically at marine loading terminals. The BAT-AEL is in the range of 0.15 – 10 g/m³ for non-methane VOCs and <1mg/m³ for benzene with the operator requesting a derogation from this until next permit review, but implement the BAT-AELs for the existing Vapour Destruction Unit (VDU) . The basis for the request was the grounds of technical characteristics, specifically the

congested nature of the marine terminal which would require locating abatement equipment away from the jetty resulting in higher than usual costs.

Esso Petroleum Company Limited has supplied a valid derogation request against the BAT C 52. The derogation request is based on technical characteristics, specifically plant consideration and lack of space for the components required for the abatement equipment. The operator has described five relevant options and justified the screening out of two. Three options (including the proposed derogation) were taken forward to conduct a cost benefit analysis. The proposed derogation is to continue with the existing VDU and the operator proposed the retention of the existing ELVs of 35 mg/Nm³ for non-methane VOCs and 5 mg/Nm³ for benzene until the next permit review.

Esso Petroleum Company Limited has provided suitable evidence to support the increased site-specific costs of achieving BAT, taking account the limited space availability. Compliance with the BAT-AEL by October 2018 can be demonstrated as disproportionately costly compared to environmental benefits. Assessments were also carried out using EEA damage cost data, the results for which show a slightly less negative net present value and does not change the conclusion.

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved. Results of periodic emissions monitoring of the existing VDU are reported quarterly. In addition, the operator has provided information in relation to dispersion modelling completed in support of the derogation application. The model outputs predict worst case process contributions from loading operations are less than 0.5% of the Environmental Assessment Level and therefore considered to be insignificant. Furthermore, the location of the marine terminal within the Southampton Water channel means that sensitive receptors are not located in close proximity. The modelling report has been subject to our own screening tool and we have found that the results concur with the statements made by the operator in support of the derogation application – impacts from all VOCs are insignificant.

All suitable abatement options have been considered and taken forward for CBA where appropriate. Robust CBAs have been completed to support the derogation application. The existing ELV for non-methane VOCs from the VDU is lower than the BAT-AEL and will therefore be retained to ensure no deterioration. The operator has demonstrated that benzene emissions from the VDU can comply with the BAT-AEL. As this is lower than the current ELV, this will be reduced in the permit. In conclusion, the operator has demonstrated that the costs of achieving the BAT-AEL are disproportionate to the environmental benefits.

The Environment Agency has reviewed the application and agreed to grant the derogation. The ELV for benzene from the VDU has been reduced in line with the BAT-AEL.