Notice of variation and consolidation with introductory note

The Environmental Permitting (England & Wales) Regulations 2016

Phillips 66 Limited

Humber Refinery
Eastfield Road
South Killingholme
North Lincolnshire
DN40 3DW

Variation application number

EPR/UP3230LR/V021

Permit number

EPR/UP3230LR

Humber Refinery
Permit number EPR/UP3230LR

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. Only the variations specified in schedule 1 are subject to a right of appeal.

This variation is to permit a new post-combustion carbon capture (PCC) plant retrofitted to the Fluid Catalytic Cracking Unit (FCCU) of the Humber Refinery, in order to remove the carbon dioxide (CO_2) from the flue gas emitted from the unit.

The captured CO_2 is then conditioned before it is exported offsite for offshore geological storage through an external transport and storage network beyond the boundaries of the permitted installation. There are two potential transport and storage (T&S) networks that the Humber Refinery PCC Plant could be connected to: either the Viking CCS CO_2 gathering network or the East Coast Cluster Humber Low Carbon Pipelines, also known as Zero Carbon Humber, for transport to storage sites under the North Sea. These are not part of the permitted installation.

The new post-combustion carbon capture plant will consist of a new EPR regulated activity, introduced in the permit by this variation:

- Section 6.10 Part A(1)(a) - Capture of carbon dioxide for geological storage: Post-combustion carbon capture of emissions from the FCCU Regenerator

A new effluent treatment plant, referred to as Purge Treatment Unit (PTU), treating the wastewater effluent generated from the flue-gas desulphurisation process introduced by this variation, will also consist of a new EPR regulated activity:

- Section 5.4 Part 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: Purge Treatment Unit

The FCCU operations are changed as a result of this variation, in that additional abatement units are retrofitted to treat the flue gas from the FCCU Regenerator, in order to meet the inlet specification for the post-combustion carbon capture plant. This consists of a substantial variation to the existing regulated activity, of which the Fluid catalytic cracking unit (FCCU) is part:

- Section 1.2 Part A(1) (d) - Refining mineral oil (Primary operations)

In the process configuration permitted prior to this variation, the flue gas from the FCCU passes through cyclones for the removal of entrained catalyst dust, then through either a restriction orifice chamber or a turbo-expander and a waste heat boiler. The flue gas is then routed through an electrostatic precipitator (ESP) to remove any remaining catalyst before entering the existing 115m tall stack (emission point A6b). In addition, emissions from the FCCU Feed Heater (H3401) and the Isostripper Reboiler (H3631) are also routed directly to the exiting 115m tall stack (Emission Point A6a). Start-up Heater H3402 also vents to Emission Point A6a, however this is only used once every 6 years for 1-2 days. This process configuration will remain until the activities permitted in the scope of this variation are fully constructed and commissioned into operation.

The new PCC Plant permitted by this variation will take the flue gas from the FCCU Regenerator only.

The flue gases emitted from the FCCU Feed Heater and the Isostripper Reboiler will not go to the PCC Plant as the pressure from these sources is too low and therefore would need numerous fans to drive the flue gas to the PCC Plant. As such, these emission sources will continue to be released from the existing FCCU stack via Emission Point A6a.

The hot FCCU Regenerator flue gas will continue to be treated in the existing cyclones but will then pass through a number of new pre-treatment stages prior to entering the PCC Plant, in order to reduce the concentrations of oxides of nitrogen (NOx), oxides of sulphur (SOx) and particulates and also reduce the temperature of the flue gas. This is required to ensure the PCC Plant operates effectively and to reduce the potential for solvent degradation to occur. As such, the existing waste heat boiler and ESP will no longer be required and therefore will be removed.

The new flue gas pre-treatment stages will include a waste heat exchanger to lower the flue gas temperature for treatment, a Selective Catalytic Reduction (SCR) unit to reduce NOx, a Wet Gas Scrubber (WGS) to reduce SO_2 and particulates with an integrated Wet Electrostatic Precipitator (Wet ESP) to further reduce fine particulates and aerosols in the FCCU Regenerator flue gas. A waste heat exchanger will recover energy to be used in the PCC Plant.

The flue gas will then pass into the PCC Plant where it will travel up through a counter-flow, packed absorption column against a falling amine-based solvent (CANSOLV DC-103) into which the majority of the CO_2 content will be absorbed.

The treated flue gases (CO_2-abated flue gas) will then pass through abatement stages consisting of water wash and mist eliminator and will subsequently be released to atmosphere via a stack on top of the PCC Plant CO_2 Absorber Column (new emission point A6c).

The CO_2-rich solvent will leave the bottom of the CO_2 Absorber Column and, after being heated in a crossflow heat-exchanger, will be routed to the top of a CO_2 Stripper where it will pass down a packed column, in counter-current to hot rising vapour from the reboiler at the CO_2 Stripper base, releasing the absorbed CO_2. The CO_2-lean solvent at the bottom of the CO_2 Stripper will then return to the solvent system via the cross-flow heat-exchanger, and the CO_2 from the top of the CO_2 Stripper will pass to the CO_2 compression plant.

The water-saturated CO_2 gas from the PCC Plant will undergo staged compression to dense phase, with oxygen and water removal, to achieve the pipeline CO_2 specification. The dense phase CO_2 stream will then be transported off-site into the CO_2 T&S Network.

The PCC Plant will be designed to operate 24 hours a day, 7 days a week as per the existing Installation and will be designed for 95% CO_2 capture during steady state operation, capturing up to 0.5 million tonnes per year of abated CO_2.

In addition to the changes associated with the new PCC plant, we have also updated Table S1.1 of the permit to include a list of existing Directly Associated Activities (DAAs). These DAAs were already undertaken at the installation and regulated by the Environment Agency, but were not clearly stated in the permit prior to this variation.

The schedules specify the changes made to the permit.

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

The Humber Refinery is located at South Killingholme in North Lincolnshire and is operated by Phillips 66 Limited. The refinery processes crude oil for the production of fuels and petroleum coke.

The main environmental releases from the site are sulphur dioxide, oxides of nitrogen, dust matter and volatile organic compounds, including amines and their degradation products in the new process configuration consisting of post-combustion carbon capture. Conditions within the permit have been set to ensure the permitted operation can comply with environmental standards relating to local receptors.

The permit also includes standard rules SR2024 No 1 which allows the operator to undertake research and development at a Part A (1) installation (where not otherwise exempt from regulation), on a time-limited basis.

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

Status log of the permit		
Description	**Date**	**Comments**
Original Application UP3230LR - Issued	14/12/2007	
Variation Application JP3431XS - Issued	20/06/2008	
Variation EPR/UP3230LR/V003 – Issued (YP3337GH)	11/09/2009	
Administrative variation EPR/UP3230LR/V004 – Issued (NP3430TP)	29/04/2010	
Variation Application EPR/UP3230LR/V005 submitted		Variation V006 applied for prior to V005 being duly made.
Variation Application EPR/UP3230LR/V006 Duly Made	18/01/2012	
Variation EPR/UP3230LR/V006 issued	01/05/2012	Varied and consolidated permit issued.
Variation Application EPR/UP3230LR/V007 Duly Made	03/08/2012	Administrative variation to change company name
Variation EPR/UP3230LR/V007	16/08/2012	Varied permit issued
Application EPR/UP3230LR/V008 (variation and consolidation) Duly made	31/01/2013	Application to vary and update the permit
Schedule 5 notice	11/03/2013	Questions relating to air modelling checklist, background concentration levels, assessment of critical load predictions and clarification on normalised flow rates used for calculating modelled emissions.
Further Information	26/07/2013	This includes a request for a time limited derogation to the FCC Dust limit in case there is a failure of the ammonia injection equipment.
Variation determined EPR/UP3230LR/V008	07/02/2014	Varied and consolidated permit issued in modern condition format.
Application EPR/UP3230LR/V009 (variation and consolidation)	Duly made 13/02/2015	Application to vary and consolidate the permit. Variation modifies release limits for emission points A6b, A8, A9 and A11.
Variation determined EPR/UP3230LR/V009 (PAS Billing Ref SP3837WX)	14/04/2015	Varied and consolidated permit issued in modern condition format.
Variation Application EPR/UP3230LR/V010	Duly made 10/06/2015	Application to extend commissioning period of TGTU and temporary SO2 emission limits.
Variation determined EPR/UP3230LR/V010	07/07/2015	Variation Notice issued.
Variation Application EPR/UP3230LR/V011	Duly made 16/11/2015	Application to reduce the reduction required from 01/01/2016 in the sulphur dioxide annual mass emission limit.
Variation determined EPR/UP3230LR/V011	23/12/2015	Variation Notice issued.

Status log of the permit		
Description	**Date**	**Comments**
Regulation 60 Notice sent to the Operator	05/08/2015	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	05/08/2015	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	30/10/2015	Response received from the Operator (Chapter III).
Additional information received	14/12/2015	Response to request for further information (RFI) dated 16/11/2015. Compliance route and operating technique identified in response to questions 2f (methodology for assigning periods of start up and shutdown).
Variation determined EPR/UP3230LR/V012 (PAS Billing ref: HP3334RJ)	16/05/2017	Varied and consolidated permit issued Variation effective from 16/05/2017.
Variation Application EPR/UP3230LR/V013	Duly made 02/11/2017	Application to allow the processing of waste feedstocks through the catalytic cracker and to allow planned single unit Sulphur Recovery Unit start-ups and shutdowns bypassing the Tail Gas Treatment Unit.
Variation determined EPR/UP3230LR/V013 (PAS Billing ref: QP3439JF)	25/01/2018	Variation Notice issued.
Regulation 60 Notice response	05/02/2016	Compliance and operating techniques identified in response to the BAT Conclusions for the refining of mineral oil and gas industry sector published on 28th October 2014.
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	03/07/2017	Compliance and operating techniques identified in response to the BAT Conclusions 20,22,25,45,47 and 54.
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	06/10/2017	Compliance and operating techniques identified in response to the BAT Conclusions 3,15,29,49 and 56.
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	16/11/2017	Compliance and operating techniques identified in response to the BAT Conclusions 32,44,46 and 52.
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	13/02/2018	Compliance and operating techniques identified in response to BAT Conclusion 19.

Status log of the permit		
Description	**Date**	**Comments**
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	09/10/2018	Approved Integrated Emissions Management Protocol
Variation determined EPR/UP3230LR/V014 (PAS Billing ref: EP3432QV)	23/10/2018	Varied and consolidated permit issued Variation effective from 28/10/2018.
Variation Application EPR/UP3230LR/V015	Duly made 07/12/2018	Application to remove the hourly concentration limits on sulphur dioxide emissions from the calciners (emission points A9 and A11) and increase the sulphur dioxide mass emission limits
Variation determined EPR/UP3230LR/V015 (PAS Billing ref PP3337QF)	16/07/2019	Varied and consolidated permit issued
Variation Application EPR/UP3230LR/V016	Duly made 21/04/2021	Application to allow the processing of tyre pyrolysis oil in crude topping units.
Variation determined EPR/UP3230LR/V016 (PAS Billing ref UP3230LR)	12/05/2021	Varied and consolidated permit issued
Variation Application EPR/UP3230LR/V017	-	Variation number not used.
Variation Application EPR/UP3230LR/V018	Non-duly made 14/06/2023	Application for a new post-combustion carbon capture plant retrofitted to the Fluid Catalytic Cracking Unit. Returned as non-duly made.
Variation Application EPR/UP3230LR/V019	-	Variation number not used.
Variation Application EPR/UP3230LR/V020	Non-duly made 19/02/2024	Application to allow the use of additional renewable feedstocks. Returned as non-duly made.
Variation Application EPR/UP3230LR/V021	Duly made 18/03/2024	Application for a new post-combustion carbon capture (PCC) plant (for geological storage) to be retrofitted to the Fluid Catalytic Cracking Unit.
Variation Application EPR/UP3230LR/V022	Duly made 26/06/2024	Application for new Low Sulphur Gasoline (LSG) plant.
Schedule 5 Notice request for additional information EPR/UP3230LR/V021	16/07/2024	Schedule 5 Notice requesting additional information on the proposed operating techniques for the PCC plant and associated environmental impacts.
Additional information reflecting changes and in response to request for information of 14/06/2024 EPR/UP3230LR/V022	Received 15/07/2024	Additional information reflecting changes to proposed fired heater in the scope of LSG plant and assessment of operating. techniques against BAT in response to request for information.
Variation Application EPR/UP3230LR/V023 (variation and consolidation)	Duly made 16/09/2024	Application to permit substitution of up to 5% Tyre Pyrolysis Oil (TPO) in the feedstock to the FCC unit.

Status log of the permit		
Description	**Date**	**Comments**
Additional information received in response to Schedule 5 notice dated 16/07/2024 EPR/UP3230LR/V021	Received 02/10/2024	Schedule 5 Notice responses Part 1, including additional information on operating techniques for the PCC plant and associated air emissions risk assessment.
Additional information in response to request for information of 07/10/2024 EPR/UP3230LR/V022	Received 10/10/2024	Additional information on noise modelling assumptions for fin fans coolers.
Additional information in response to request for information of 02/10/2024 EPR/UP3230LR/V022	Received 21/10/2024	Additional information on reduced noise levels attainable by fin fans units and updated Noise Management Plan.
Additional information received in response to Schedule 5 notice dated 16/07/2024 EPR/UP3230LR/V021	Received 31/10/2024	Additional information and technical note on ammoniacal nitrogen and total nitrogen in the ETP effluent.
Additional information in response to request for information of 05/11/2024 EPR/UP3230LR/V022	Received 05/11/2024	Updated Noise Management Plan superseding previous version.
Additional information received in response to Schedule 5 notice dated 16/07/2024 EPR/UP3230LR/V021	Received 29/11/2024	Schedule 5 Notice responses Part 2, including additional information on OTNOC scenarios, emission limits, flue gas desulphurisation and use of DeSOx additive, monitoring standards, effluent treatment, water quality assessment and Noise Management Plan.
Additional information provided by applicant EPR/UP3230LR/V022	Received 04/12/2024	Additional information on increased thermal input for HDS fired heater.
Variation determined EPR/UP3230LR/V022	12/12/2024	Varied and consolidated permit issued.
Additional information received in response to Schedule 5 notice dated 06/12/2024	19/12/2024	Additional information regarding air quality assessment, calculation of FCC feed rates, FAME storage.
Variation determined and consolidation issued EPR/UP3230LR/V023	25/02/2025	Varied and consolidated permit issued in modern format.
Schedule 5 Notice request for additional information EPR/UP3230LR/V021	26/02/2025	Request for additional information on air emissions risk assessment for emissions of PCC solvent degradation products and request for updated Noise Management Plan.
Additional information received in response to Schedule 5 notice dated 26/02/2025	Received 20/03/2025	Additional information on air emissions risk assessment for emissions of PCC solvent degradation products and updated Noise Management Plan.
Additional information received in response to Schedule 5 notice dated 26/02/2025	Received 24/03/2025	Updated Noise Management Plan.
Additional information received in response to Schedule 5 notice dated 26/02/2025	Received 31/03/2025	Additional information on air emissions risk assessment for emissions of PCC solvent degradation products.

Status log of the permit		
Description	**Date**	**Comments**
Application EPR/UP3230LR/V024	Duly made 29/07/2025	Application to add standard rule set SR2024 No 1 to permit
Variation determined EPR/UP3230LR/V024	31/07/2025	Notice of variation issued Standard rule set SR2024 No 1 added to permit
Variation determined and consolidation issued EPR/UP3230LR/V021	31/10/2025	Varied and consolidated permit issued.

Other Part A installation permits relating to this installation		
Operator	**Permit number**	**Date of issue**
VPI Immingham LLP	EPR/BJ8022IZ	16/08/2001

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/UP3230LR

Issued to

Phillips 66 Limited (“the operator”)

whose registered office is

7th Floor
200-202 Aldersgate Street
London
EC1A 4HD

company registration number 00529086

to operate a regulated facility at

Humber Refinery
Eastfield Road
South Killingholme
North Lincolnshire
DN40 3DW

to the extent set out in the schedules.

The notice shall take effect from 31/10/2025

Name	Date
Sandra Cavill	**31/10/2025**

Authorised on behalf of the Environment Agency

Schedule 1

The following conditions were varied as a result of the application made by the operator:

- Condition 4.2.2
- Table S1.1 Activities, as referred to by condition 2.1.1, activity references AR2, AR10 to AR13
- Table S1.2 Operating techniques, as referred to by conditions 2.3.1 and 2.3.2
- Table S1.3 Improvement programme requirements, as referred to by condition 2.4.1
- Table S1.6 Pre-operational measures for future development, as referred to by condition 2.5.1
- Table S2.1 Raw materials and fuels, as referred to by condition 2.3.3
- Table S3.1 Point source emissions to air – emission limits and monitoring requirements, as referred to by conditions 3.1.1, 3.1.3, 3.3.1, 3.3.4, 3.3.5, 3.6.7 and 4.2.2
- Table S3.1a Point Source emissions to air – bubble emission limit and monitoring requirements, as referred to by conditions 3.1.1, 3.1.3, 3.3.1, and 3.3.5
- Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements, as referred to by conditions 3.1.1, 3.1.3, 3.3.1, and 3.3.5
- Table S3.3 Annual limits, as referred to by conditions 3.1.3 and 3.3.1
- Table S3.4 Process monitoring requirements, as referred to by conditions 3.3.1 and 4.2.2
- Table S4.1 Reporting of monitoring data, as referred to by condition 4.2.3
- Table S4.3 Chapter III Performance parameters for reporting to DEFRA and other Performance parameters, as referred to by condition 4.2.2
- Table S4.4 Reporting forms, as referred to by conditions 4.2.2 and 4.2.3
- Schedule 6 - Interpretation, as referred to by condition 4.4.1

The following conditions were varied as a result of an Environment Agency initiated variation:

- Table S1.1 Activities, as referred to by condition 2.1.1, activity references AR14 to AR27, pre-existing Directly Associated Activities previously not listed in the permit

Schedule 2 – consolidated permit

Consolidated permit issued as a separate document.

Permit

The Environmental Permitting (England and Wales) Regulations 2016

Permit number

EPR/UP3230LR

This is the consolidated permit referred to in the variation and consolidation notice for application EPR/UP3230LR/V021 authorising,

Phillips 66 Limited ("the operator"),

whose registered office is

7th Floor
200-202 Aldersgate Street
London
EC1A 4HD

company registration number 00529086

to operate an installation at

Humber Refinery
Eastfield Road
South Killingholme
North Lincolnshire
DN40 3DW

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

Under regulation 27(2) of the Regulations, standard rules 'SR2024 No 1: research and development at a Part A(1) installation' are conditions of this permit.

Name	Date
Sandra Cavill	**31/10/2025**

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.

2 Operations

2.1 Permitted activities

2.1.1 The operator is only authorised to carry out the activities specified in schedule 1 table S1.1 (the "activities").

2.2 The site

2.2.1 The activities shall not extend beyond the site, being the land shown edged in red on the installation boundary plans (A and B) at schedule 7 to this permit.

2.3 Operating techniques

2.3.1 (a) 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.

(b) If notified by the Environment Agency that the activities are giving rise to pollution, the operator shall submit to the Environment Agency for approval within the period specified, a revision of any plan or other documentation ("plan") specified in schedule 1, table S1.2 or otherwise required under this permit which identifies and minimises the risks of pollution relevant to that plan , and shall implement the approved revised plan in place of the original from the date of approval, unless otherwise agreed in writing by the Environment Agency.

2.3.2 For the following activities referenced in schedule 1, table S1.1: LCP 64, LCP 259, LCP 260, LCP 261, LCP 262 and LCP 263 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.

2.3.3 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.

2.3.4 Waste shall only be accepted if:

(a) it is of a type and quantity listed in schedule 2 table S2.2 and S2.3; and

(b) it conforms to the description in the documentation supplied by the producer and holder.

2.3.5 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.

2.3.6 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.

2.3.7 (a) The Operator shall implement measures to ensure that periods when the acid gas removal systems are not available are minimised and that they operate with sufficient capacity to treat the acid gases produced.

(b) These measures shall include procedures for minimising the impact of periods of other than normal operation of the acid gas removal systems.

(c) The operator shall record periods when sufficient capacity is not available in the acid gas removal systems, to treat the sour gases produced. The Operator shall record the duration of the period of loss of capacity, the cause of the event and measures taken to reinstate the system's availability.

2.3.8 The operator shall, wherever practicable, 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.

2.5 Pre-operational conditions

2.5.1 The operations specified in schedule 1 table S1.6 shall not commence until the measures specified in that table have been completed.

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 S3.1, S3.1a 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 tables schedule 3 S3.1, S3.1a 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 schedule 1 table S1.4, 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;

(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 Monitoring

3.3.1 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 S3.1, S3.1a, S3.1b, S3.2 and S3.3;

(b) process monitoring specified in table S3.4.

3.3.2 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.

3.3.3 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.3.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate), where available, unless otherwise agreed in writing by the Environment Agency.

3.3.4 Newly installed Continuous Emission Monitors (CEMs), or CEMs replacing existing CEMs, shall have MCERTS certification and have an MCERTS certified range which is not greater than 2.5 times the daily emission limit value (ELV) specified in schedule 3 table S3.1. The CEM shall also be able to measure instantaneous values over the ranges which are to be expected during all operating

conditions. If it is necessary to use more than one range setting of the CEM to achieve this requirement, the CEM shall be verified for monitoring supplementary, higher ranges.

3.3.5 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, S3.1a, and S3.2 unless otherwise agreed in writing by the Environment Agency.

3.3.6 The operator shall monitor and record the following parameters for flaring events when the rate of gas flared exceeds 4 million standard cubic feet per day (MMSCFD) on emission point A21 (No.1 Flare) as a 15-min mean value; and/or 9 million standard cubic feet per day (MMSCFD) on emission point A22 (No.3 Flare) as a 15-min mean value:

(a) Duration of event;

(b) Total mass of gas flared;

(c) Mass of SO_2 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.

3.4 Odour

3.4.1 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 S1.4, to prevent or where that is not practicable to minimise the odour.

3.4.2 The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan which identifies and minimises the risks of pollution from odour;

(b) implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

3.5 Noise and vibration

3.5.1 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 S1.5, to prevent or where that is not practicable to minimise the noise and vibration.

3.5.2 The operator shall:

(a) if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to noise and vibration, submit to the Environment Agency for approval within the period specified, a noise and vibration management plan which identifies and minimises the risks of pollution from noise and vibration;

(b) implement the approved noise and vibration management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

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

3.6.1 All LCP monitoring required by this permit shall be carried out in accordance with the provisions of Annex V of the Industrial Emissions Directive.

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 measures.

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 Environment 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 Environment 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 Environment 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 3, table S3.1; the Continuous Emission Monitors shall be used such that:

- 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;
- the 95% confidence interval for nitrogen oxides and sulphur dioxide of a single measured result shall be taken to be 20%;
- the 95% confidence interval for dust releases of a single measured result shall be taken to be 30%;
- the 95% confidence interval for carbon monoxide releases of a single measured result shall be taken to be 10%;
- 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
- 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 assess compliance with the integrated emissions management limit for oxides of nitrogen (NOx), specified in Table S3.1b:

(a) the operator shall undertake the monitoring and calculations described in the Integrated Emissions Management Technique Protocol as approved by the Environment Agency, for all units covered by the bubble limit.

(b) during a period of other than normal operation of one of these units, the operator shall use the 'standard contribution value' (as specified in the approved Integrated Emissions Management Technique Protocol) when assessing compliance with the bubble emission limit value. The Operator will record the start and conclusion of periods of 'other than normal operating conditions' and record the emissions from the affected unit(s) during that period.

3.7.2 In order to assess compliance with the integrated emissions management limit for sulphur dioxide (SO_2), specified in Table S3.1b:

(a) the operator shall undertake the monitoring and calculations described in the Integrated Emissions Management Technique Protocol as approved by the Environment Agency, for all units covered by the bubble limit.

(b) during a period of other than normal operation of one of these units, the operator shall use the 'standard contribution value' (as specified in the approved Integrated Emissions Management Technique Protocol) when assessing compliance with the bubble emission limit value. The Operator will record the start and conclusion of periods of 'other than normal operating conditions' and record the emissions from the affected unit 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.

(d) details of any contamination or decontamination of the site which has occurred.

(e) the function and monitoring of the carbon capture plant in a format agreed with the Environment Agency. The report shall, as a minimum requirement give an account of the running of the process (including a summary of records of process monitoring requirements of table S3.4 of this permit), the emissions into air compared with the emission limits in table S3.1 and details of the waste generated.

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 Within 1 month of the end of each quarter, the operator shall submit to the Environment Agency using the form made available for the purpose, the information specified on the form relating to the site and the waste accepted and removed from it during the previous quarter, if during that quarter the total amount accepted exceeds 100 tonnes of non-hazardous waste or 10 tonnes of hazardous waste.

4.3 Notifications

4.3.1 (a) In the event 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) in the event 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) in the event 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 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:

(a) any change in the operator's name or address; and

(b) any steps taken with a view to the dissolution of the operator.

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 The operator shall inform the Environment Agency in writing of the closure of any LCP within 28 days of the date of closure.

4.3.8 In the event that more than 2 tonnes of sulphur dioxide has been, or is likely to be is emitted in a 24 hour period from the flaring of acid gases (emission points A21 and A22), the operator must immediately inform the Environment Agency, providing details of:

(a) The likely duration of the flaring event;

(b) The cause of the flaring event;

(c) Any remedial actions being taken.

The operator shall confirm:

(d) The quantity of sulphur dioxide emitted and the duration of the flaring event;

(e) Whether the event had a negative impact on 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 "immediately", in which case it may be provided by telephone.

Schedule 1 - Operations

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
AR1	S1.1 A(1) (a)	Burning any fuel in an appliance with a rated thermal input of 50MW or more	Refinery fuel gas (including the cryogenic unit) and natural gas supply systems to combustion units identified in Table S3.1 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, abatement plant and the export of steam to the steam systems.
AR2	S1.2 A(1) (d)	Refining mineral oil (Primary operations)	From feed to oil refining unit to use, including each of the following units: (i) #1 vacuum distillation unit (#1 VDU), including process heater (ii) #2 vacuum distillation unit (#2 VDU), including process heater (iii) #3 vacuum distillation unit (#3 VDU), including process heater (iv) Gas oil hydrodesulphurisation unit (GOHDS), including process heater (v) Heavy oil filtration unit (vi) #1 Calciner including coke handling, storage and rail/road loading, and petroleum coke unloading, handling, storage and loading area (including flare pad) (vii) #2 Calciner including coke handling, storage and rail/road loading, and petroleum coke unloading, handling, storage and loading area (including flare pad) (viii) #3 Calciner including coke handling, storage and rail/road loading, and petroleum coke unloading, handling, storage and loading area (including flare pad) (ix) Virgin hydrodesulphurisation unit (VHDS), including process heaters (x) Cracked hydrodesulphurisation unit (CHDS), including process heaters (xi) Diesel hydrodesulphurisation unit (DHDS), including process heaters (xii) Gasoline hydrodesulphurisation unit (GHDS), including process heater (xiii) Penex unit, including process heater (xiv) Saturated gas plant (SGP) (xv) Cracked gas plant (CGP) including CPU Merox, Selective Hydrogenation Process (SHP-2), and flare gas recovery compressors (xvi) Catalytic reforming unit #2 (CRU-2), including process heaters and hydrogen system (xvii) Catalytic reforming unit #3 (CRU-3), including process heaters and hydrogen system (xviii) Pressure swing adsorber (PSA) (xix) Aromatics extraction unit (AEU) (xx) Fluid catalytic cracking unit (FCCU), process heaters, FCCU gasoline heart-cut treatment (Minalk system) and selective hydrogenation unit. Including (R9 Oil re-refining or other

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
			reuses of oil: used cooking oil and tyre pyrolysis oil). Used cooking oil substitution up to a maximum 20% by volume of FCCU feed rate. Tyre pyrolysis oil substitution up to maximum 5% by volume of FCCU feed rate subject to discharge of pre-operational measures PO2-PO7 specified in table S1.6. From completion of pre-operational condition PO9, the FCCU regenerator flue gas treatment includes waste heat recovery in HRSG and abatement consisting of Selective Catalytic Reduction (SCR), Wet Gas Scrubbing (WGS) and Wet Electrostatic Precipitator (WESP), prior to post-combustion carbon capture (activity AR11) and emission of decarbonised flue gas through emission point A6c (or emission through PCC by-pass emission point A6d). (xxi) Propylene recovery unit (PRU) including PRU Merox and selective hydrogenation process (SHP-1) (xxii) Vapour recovery unit (VRU) including VRU Merox (Minalk) (xxiii) Alkylation Unit including process heater and Butamer unit (xxiv) Thermal cracking unit (TCU) including process heater (xxv) GTA 706 (xxvi) Low Sulphur Gasoline (LSG) plant consisting of Selective Hydrogenation Unit (SHU) and Hydrodesulphurisation unit (HDS)
AR3	S1.2 A(1) (d)	Refining mineral oil (Secondary operations – oil movements and blending)	From receipt of feed, through blending (where necessary) to feed, intermediate and product storages and export including: liquefied petroleum gases, white oils (including rail loading of petrol/diesel and petrol vapour recovery unit), heavy gas oils and other black oils, slops, etc. in support of the above primary operations.
AR4	S1.2 A(1) (e) (i)	The handling, storage and physical/ thermal treatment of crude oil and tyre pyrolysis oil (maximum 5% of feed rate).	From receipt and storage of crude (including unloading from road tankers and blending of slops) and tyre pyrolysis oil to operation of crude distillation units, including: (i) #1 Crude topping unit (#1 CTU), process heater and associated feed and product system for this activity (ii) #2 Crude topping unit (#2 CTU), process heater, kerosene treatment and associated feed and product system for this activity
AR5	S1.2 A(1) (f) (v)	Activities involving the pyrolysis, carbonisation, distillation, partial oxidation or other heat treatment of mixtures of	From feed to unit to discharge to further processing including: (i) #1 Coker, process heaters and green coke storage pit (ii) #2 Coker, process heaters and green coke storage

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
		carbonaceous materials and oil.	
AR6	S4.1 A(1)(a) (i)	Producing organic chemicals, such as aromatic hydrocarbons	Hydro de-alkylation unit (HDA), for the manufacture of benzene, process heaters and associated feed and product storage/export system for this activity
AR7	S4.2 A(1) (a) (v)	Producing inorganic chemicals such as non-metals (e.g. sulphur)	Sulphur recovery unit plant (with associated amine systems, amine recovery unit, sour water stripper units), including: (i) #1 Sulphur recovery unit (#1 SRU) utilising Claus technology (ii) #2 Sulphur recovery unit (#2 SRU) utilising Claus technology (iii) Tail Gas Treatment Unit (TGTU) utilising the Beavon sulphur removal process (iv) Incineration of remaining tail gas, storage/loading of products
AR8	S5.3 A(1) (a) (i)	Disposal of hazardous waste in a facility with a capacity of more than 10 tonnes per day (by biological treatment)	The receipt and treatment of liquid waste for disposal in the main biological effluent treatment plant (ETP), including oil water separators, IAF units, activated sludge unit, #1, #2, #3 and Alkylation holding ponds, storage of sludge and waste receipt detailed in table S2.2.
AR9	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.	Physical treatment of South tank farm (STF) surface waters in oil-water separator, including bund/surface water collection systems and holding pond.
AR10	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: Purge Treatment Unit.	From the receipt of the purge effluent from the WSG abatement treating the flue gas from the FCCU Regenerator (part of activity AR2) to the final disposal of the treated effluent through emission point W2a/b. Including sludge handling and dewatering.
AR11	S6.10 A(1)(a)	Capture of carbon dioxide for geological storage: Post-combustion carbon capture of emissions from the FCCU Regenerator in one carbon capture plant (PCC plant).	From the receipt of flue gases from the FCCU Regenerator, pre-treated in SCR, WSG and WESP (part of activity AR2), to export of carbon dioxide outside of the installation boundaries for geological storage, and release of decarbonised exhaust flue gas through emission point A6c. Included within the limits of this activity are: 1. carbon dioxide absorption in amine-based solvent, 2. solvent regeneration and thermal reclaiming, 3. first stage (low pressure) carbon dioxide compression, 4. oxygen removal from carbon dioxide by hydrogenation, 5. dehydration of carbon dioxide. Venting of CO_2 during other than normal operating conditions through emission points A39.

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
			Only solvent specified in Table S2.1 shall be used to capture CO_2.
Directly Associated Activities			
AR12	Directly associated activity	High pressure compression to compress CO_2 prior to exporting it to an offshore storage facility	From receipt of treated CO_2 to compression of CO_2 to dispatch from site.
AR13	Directly associated activity	PCC plant closed solvent drain system	From drainage of amine solvent from the process equipment of the PCC plant to its return to process units or solvent storage tank for reuse, or to its offsite disposal as a waste.
AR14	Directly associated activity	Closed blowdown system (CBD)	From drainage of liquid and condensable hydrocarbons to their recovery to the refinery slop system.
AR15	Directly associated activity	Drainage systems: - Oily Water Sewer - Surface Water Sewer - Fire Water Sewer	From the drainage of process/maintenance wastewater effluents, surface water runoff and fire water runoff to the appropriate drainage systems, according to the installation's effluent segregation philosophy, to their dispatch to the relevant effluent treatment activities.
AR16	Directly associated activity	Flares: - Flare No.3 including flare gas recovery system - Flare No. 1	From venting of flammable off-gases from pressure release valves and equipment depressurisation to their safe disposal through combustion in two flares (emission points A21 and A22).
AR17	Directly associated activity	Natural gas supply and distribution system	From receipt of natural gas to its distribution to process users.
AR18	Directly associated activity	Refinery fuel gas distribution system	From collection of refinery fuel gas to its distribution to onsite process users and dispatchment to the Immingham CHP Power Plant.
AR19	Directly associated activity	Hydrogen distribution system	From collection of hydrogen produced by the catalytic reformer units to its distribution to users.
AR20	Directly associated activity	Plant and instrument air system	From the intake of air to its compression and distribution to plant air users, and instrument air users after drying and filtration.
AR21	Directly associated activity	Demineralised water plant and supply system	From receipt of water supply to its demineralisation and distribution to process users.
AR22	Directly associated activity	Storage of process chemicals, solvents and additives	From receipt of chemicals, solvents and additives to their storage and dispatch to process users.
AR23	Directly associated activity	Waste storage and handling	Storage and handling of waste associated with the activities undertaken at the installation.
AR24	Directly associated activity	Cooling systems	Cooling of process streams by heat exchange with cooling media either cooled in evaporative cooling towers, or in fin-fans air coolers.
AR25	Directly associated activity	Steam distribution system	From the production of steam raised in the process units of the refinery or imported from the Immingham CHP Power Plant to its distribution to process users.

Table S1.1 activities			
Activity reference	**Activity listed in Schedule 1 of the EP Regulations**	**Description of specified activity**	**Limits of specified activity**
AR26	Directly associated activity	Electrical power distribution system	From on-site production of electrical power or its import from external supply to its distribution to onsite users.
AR27	Directly associated activity	Warehousing, workshops and laydown areas	Warehousing, workshops and laydown activities associated with the operation and the maintenance of the installation.

Table S1.2 Operating techniques		
Description	**Parts**	**Date Received**
Application	The response to section 2.1 to 2.2.	24/08/06
Response to Schedule 4 Notice dated 08/12/06	Response to Q1 – 2 subject to the limits set in Schedule 4.1 Response to Q3 – 5 subject to the conditions in schedule 1.3	09/02/07 09/02/07
Response to Schedule 4 Notice dated 03/04/07	Response to FCCU Regenerative Scrubbing BAT review.	15/05/07
Additional information	Application Resubmission – The revised response to sections 2.1 to 2.2, and consolidation of the Schedule 4 responses.	24/08/07
Application	The response to C2.1 – C2.12 in the variation request JP3431XS	19/05/08
Additional information	App. 9 Section a) of Supplementary Information to Calciner Stack Limit variation associated with the operation of the sulphur degassing facility for SRU1.	29/12/11
	App. 9 Section c) of Supplementary Information to Calciner Stack Limit variation associated with the operation of the mercury trap on the Alkylation Unit.	29/12/11
	App. 9 Section f) of Supplementary Information to Calciner Stack Limit variation associated with the Common Pumping Station surface water connection to South tank farm effluent discharge.	29/12/11
	Supplementary Information regarding installation of Tail gas Treatment Unit.	04/11/11
Application	HOR VAR DEC2012 Section1, 2, 4, annex 1, section A and B (assessment of Ammonia emissions)	20/12/13
Response to Schedule 5 Notice dated 22/02/13	Response to Q1-Q5 regarding report format, background concentrations, assessing non-statutory sites, ecological critical loads and emission rates used in the air modelling.	11/03/13
Additional information	Further information for ammonia injection tests.	30/04/13
Additional information	Information relating to air modelling of dust emissions and a request for a five day per calendar year raised limit when the ammonia injection system is not operational	26/07/13
Application EPR/UP3230LR/V009	Parts C2 and C3 of the application together with supplementary information supplied with these parts and further information received by email on 03/02/15 and 13/02/15.	13/02/15
Response to regulation 60(1) Notice – request for information dated 05/08/15	Compliance route and operating techniques identified in response to questions 1 (ELV and monitoring requirements) and 2c (LCP configuration, layout, fuel options available and flue configuration), 2d (methodology 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 NOx, SO_2 and dust by reference to parts 3 and 4 of Annex V of Chapter III of IED).	30/10/15
Receipt of additional information to the regulation 60(1) Notice.	Compliance route and operating technique identified in response to questions 2f (methodology for assigning periods of start up and shutdown).	14/12/15

Table S1.2 Operating techniques		
requested by letter dated 16/11/15		
Application EPR/UP3230LR/V013	Parts C2 and C3 of the application together with supplementary information supplied with these parts.	27/10/17
Response to regulation 60(1) Notice – request for information dated 05/11/15 EPR/UP3230LR/V014	Compliance and operating techniques identified in response to the BAT Conclusions for the refining of mineral oil and gas industry sector published on 28th October 2014.	05/02/16
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	Compliance and operating techniques identified in response to BAT Conclusions 20,22,25,45,47 and 54.	03/07/17
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	Compliance and operating techniques identified in response to BAT Conclusions 3,15,29,49 and 56.	06/10/17
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	Compliance and operating techniques identified in response to BAT Conclusions 32,44,46 and 52.	16/11/17
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	Compliance and operating techniques identified in response to BAT Conclusion 19.	13/02/18
Additional information in response to regulation 60(1) Notice EPR/UP3230LR/V014	Approved Integrated Emissions Management Protocol	09/10/18
Application EPR/UP3230LR/V015	Parts C2 and C3 of the application together with supplementary information supplied with these parts.	07/12/18
Application EPR/UP3230LR/V016	Parts C2 and C3 of the application together with supplementary information supplied with these parts.	25/03/21 and 21/04/21
Application EPR/UP3230LR/V022	'Low Sulphur Gasoline Environmental Permit Variation - Main Supporting Document' (V1 dated 13/05/24), as amended by 'Low Sulphur Gasoline Environmental Permit Variation - Supplementary Information' (dated 15/07/24).	13/05/24
Application EPR/UP3230LR/V022	'Low Sulphur Gasoline Environmental Permit Variation - Supplementary Information' (dated 15/07/24).	15/07/24
Application EPR/UP3230LR/V022	Additional information on increased thermal input and associated increased emissions to air from the LSG HDS fired heater – Document titled 'LSG Project Update', received on 04/12/2024, excluding additional information on noise presented in the same document.	04/12/24
Application EPR/UP3230LR/V023	'Development Fuels Environmental Permit Variation - Main Supporting Document' (version 1, reference: 296344-01-EP-DF-0001, dated 15/08/2024'	16/0/2024
Application EPR/UP3230LR/V023	Memorandum: 'Additional Information on the Dewatering Sludge Press', reference 296344-03 dated 11/09/2024.	11/09/2024
Application EPR/UP3230LR/V021	Sections 3 and 4 of Application Form Part C3, received on 30/01/2024, including the referred application document titled 'Environmental Permit Variation Application Main Supporting Document - Phillips 66 Limited,	Duly made 18/03/2024

Table S1.2 Operating techniques		
	Project number: 296344' received on 30/01/2024, as amended by subsequent responses to Schedule 5 Notices and requests for information listed in the following.	
Application EPR/UP3230LR/V021	Application document titled 'Environmental Permit Variation Application Appendix D - Air Impact Assessment', received on 30/01/2024, as amended by subsequent responses to Schedule 5 Notices and requests for information listed in the following.	Duly made 18/03/2024
Application EPR/UP3230LR/V021	Application document titled 'PHILLIPS 66 – HUMBER ZERO CO_2 Venting & Dispersion Report', Document no. 215005-00857-00-PM-REP-00001 dated 15th December 2023.	Duly made 18/03/2024
Response to Schedule 5 Notice dated 16/07/2024	Schedule 5 Notice responses Part 1, dated 02/10/2024, providing additional information on the operating techniques for FCC waste gas heat recovery, Selective Catalytic Reduction, carbon capture solvent selection, carbon capture absorber abatement, Mechanical Vapour Recompression system, carbon capture performance, storage of raw materials and drainage systems.	02/10/2024
Response to Schedule 5 Notice dated 16/07/2024	Schedule 5 Responses - Part 2, dated 28/11/2024, including 'Appendix A - Summary of OTNOC Scenarios', but excluding the 'Noise Management Plan', version 2, dated October 2024. Document providing additional information on operating techniques for Other Than Normal Operating Conditions (OTNOC), Integrated Emissions Management Technique, FCCU flue gas desulphurisation, use of DeSOx additive, monitoring of emissions to air, process control and safety, effluents and their treatment.	29/11/2024
Response to Schedule 5 Notice dated 26/02/2025	Email response on updated assessment of the impacts from total amides.	20/03/2025
Response to Schedule 5 Notice dated 26/02/2025	Noise control measures and sound levels relevant to equipment in the scope of the Low Sulphur Gasoline (LSG) project and the Post-Combustion Carbon Capture (PCC) plant on the Fluidised Catalytic Cracker (FCC) Unit project, stated in the Noise Management Plan, version number R05, revision 5, March 2025.	24/03/2025
Response to Schedule 5 Notice dated 26/02/2025	Schedule 5 Notice Response, dated 31/03/2025, on impact assessment for nitrosamines.	31/03/2025

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC1	A written procedure shall be submitted to the Agency detailing the measures to be used so that monitoring equipment, personnel and organisations employed for the emissions to air monitoring programme shall have either MCERTS certification or accreditation in accordance with condition 3.3.3. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the procedure. The procedure shall be implemented by the operator from the date of approval by the Agency	Completed
IC2	A written plan shall be submitted to the Agency for approval detailing the results of a survey of hard-standing, kerbing and secondary containment for raw material, intermediate, product and waste storage areas and the measures to comply with the requirements of section 2.2.5 of TGN S 1.02. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan.	Completed

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	The plan shall be implemented by the operator from the date of approval by the Agency.	
IC3	A written plan shall be submitted to the Agency for approval detailing the results of a survey of bunding and other secondary containment measures for raw materials, intermediates, products and waste storage areas and the measures to meet the requirements of section 2.2.2 and 2.2.3 of Sector Guidance Note S 1.02. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC4	A written plan shall be submitted to the Agency for approval detailing the measures to be taken to achieve a sulphur recovery efficiency of 99.5% in accordance with the Sector Guidance Note S 1.02. The plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC5	A written plan shall be submitted to the Agency for approval detailing the measures to be taken to achieve a reduction in the sulphur dioxide emission concentration from the FCCU regenerator. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC6	A written plan shall be submitted to the Agency for approval detailing the work to be undertaken to carry out Leak Detection and Repair across all plant and pipework at the refinery installation. The plan shall include work necessary to bring the LDAR monitoring status at the installation to Tier 1, Tier 2 and Tier 3 versus the USEPA Method 21, all within 4 years. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC7	A written procedure shall be submitted to the Agency detailing the measures to be used so that monitoring equipment and sampling for the emissions to water monitoring programme shall have either MCERTS certification or accreditation in accordance with condition 3.6.3. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the procedure. The procedure shall be implemented by the operator from the date of approval by the Agency	Completed
IC8	A written plan shall be submitted to the Agency for approval detailing the measures to be taken to reduce oxides of nitrogen (NOx) emissions from the refinery installation. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC9	A written plan shall be submitted to the Agency for approval detailing the implementation programme for continuous monitoring of SO_2 and NO_x for release points A9 and A11. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC10	A written evaluation shall be submitted to the Agency for approval detailing the technical and economic feasibility of installing liquid ring pumps on VDU1 and VDU2. Where appropriate the plan shall contain dates for the implementation of various measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC11	A written report shall be submitted to the Agency for approval detailing the findings of a water use audit. Where appropriate the report shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC12	A written report shall be submitted to the Agency giving details of any hydrocarbon-containing wastes that are currently disposed of. The report shall include a proposed plan and programme, for approval by the Agency, for the introduction of any techniques necessary to ensure the following in relation to the above wastes: (a) prevention or reduction of waste arisings, (b) recovery and/or recycling of any wastes that do arise, and (c) disposal of any wastes for which recovery is technically and economically impossible is carried out in a way that avoids or reduces any impact on the environment. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Completed
IC13	A written evaluation shall be submitted to the Agency for approval detailing the potential for reuse or recovery for the following waste streams; (a) Sodium hydroxide containing sodium naphthenate (b) Spent potassium hydroxide solution. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency	Completed
IC14	A written report shall be submitted to the Agency for approval detailing the ambient benzene levels around the installation, and an evaluation made of the technical and economic feasibility of options to reduce emissions. Where appropriate the report shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of an implementation plan.	Completed

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	The plan shall be implemented by the operator from the date of approval by the Agency	
IC15	A written report shall be submitted to the Agency for approval detailing the ambient VOC levels other than benzene around the installation for VOCs considered significant in the application H1 assessment, and an evaluation made of the technical and economic feasibility of options to reduce emissions. Where appropriate the report shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of an implementation plan The plan shall be implemented by the operator from the date of approval by the Agency	Completed
IC16	A written evaluation shall be submitted to the Agency for approval detailing the technical and economic feasibility of improving the dispersion of releases to air from release point A11. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency	Completed
IC17	A written plan shall be submitted to the Agency for approval detailing the installation of continuous SO2 and NOx monitors for release points A1, A3 and A5 at the refinery installation. The plan shall contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency	Completed
IC18	A written plan shall be submitted to the Agency for approval detailing the technical and economic feasibility of returning a FCCU expander back into service. Where appropriate the plan shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency	Completed
IC19	A written report shall be submitted to the Agency for approval detailing the measures proposed to improve the hourly estimation of normalised flue gas volumes from release points A6, A8, A9 and A11. Where appropriate the report shall contain dates for the implementation of individual measures. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of an implementation plan. The plan shall be implemented by the operator from the date of approval by the Agency	Completed
IC20	A written report shall be submitted to the Agency for approval detailing the findings of a refinery effluent heat load balance identifying major sources.	Completed

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	Where appropriate the report shall contain dates for the implementation of individual measures to minimise effluent discharge temperature. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency	
IC21	A written plan shall be submitted to the Agency for approval detailing the measures to be taken to reduce oxides of nitrogen (NOx) emissions from the refinery calciners. An initial plan detailing proposed measures to optimise and minimise current releases shall be submitted. A further plan shall then be submitted based on a review of available abatement techniques and applicable guidance. Where appropriate the plan shall contain dates for the implementation of technically and economically feasible individual measures. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Agency.	Written plan completed, implementation requirement withdrawn
IC22	A written report shall be submitted to the Agency for approval detailing the measures proposed to improve the hourly estimation of normalised flue gas volumes from release points A8 from the TGTU based on the detailed process design. The notification requirements of 2.4.2 shall be deemed to have been complied with on submission of a report.	Completed
IC23	A written report shall be submitted to the Environment Agency for approval detailing the findings of an FCC ammonia injection rate optimisation study. Monitoring shall be undertaken for a range of ammonia injection rates to show how the concentration of Dusts released from emission point A6b (ST3401) changes with the rate of ammonia injection. The report should include details of the optimum ammonia injection rate(s) for the different FCC operating regimes and how they will be implemented. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan.	Completed
IC24	A written report shall be submitted to the Environment Agency for approval to review the monitoring regime for the emissions of ammonia from release point A6b (ST3401). The report shall take account of Technical guidance Note M2 (Monitoring of stack emissions to air) and include an assessment of continuous and non-continuous monitoring techniques, monitoring methods, and a justification for each of the proposed measures selected. The report shall also include a written plan containing dates for the implementation of individual measures identified in the report. The notification requirements of condition 2.4.2 shall be deemed to have been complied with on submission of the plan. The plan shall be implemented by the operator from the date of approval by the Environment Agency.	Completed
IC25	The Operator shall submit a diffuse VOC monitoring plan to the Environment Agency for written approval. This shall include but not be limited to: • The nature of the material handled; • The sources of emissions; • Justification of the monitoring techniques selected • How the monitoring data will be recorded and reviewed	Completed

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	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. The Operator shall implement the approved plan and produce and submit an annual report on the results of the monitoring undertaken under the plan.	
IC26	The Operator shall develop and implement a monitoring programme for measuring point source emissions of non-methane volatile organic compounds and benzene from the loading and unloading of liquid hydrocarbons as specified in BAT conclusion 52 for the Refining of Mineral Oil and Gas. The monitoring programme and associated methodologies shall be agreed in writing with the Agency having regard to the Agency M2 and M16 Guidance Notes. Routine benzene monitoring is not required where it can be demonstrated that benzene emissions are consistently less than 1mg/m^3 from a point source.	Completed
IC27	The Operator shall undertake an assessment of measures to reduce point source and fugitive emissions of VOCs from the loading and unloading of liquid hydrocarbons at road and rail terminals. The assessment shall, as a minimum consider: • Whether the existing recovery rate of VOC's is at least 95% (for sites that have a recovery system in place) • What combination of abatement technology can be used to achieve a VOC recovery rate of at least 95% • If vapour recovery is not practicable, for safety or technical reasons, an explanation of those reasons shall be provided and alternative VOC control measures such as a vapour destruction unit considered. The assessment will take into account the techniques identified in BAT conclusion 52 for the Refining of Mineral Oil and Gas. A written report of the assessment shall be submitted to the Agency, along with a timetable for implementing improvements. The Operator shall implement the improvements identified to the timetable agreed with the Agency.	Completed
IC28	The operator shall submit a written monitoring plan to the Environment Agency for approval that includes: (a) proposals to undertake representative monitoring of hazardous pollutants (as set out in the Environment Agency's Surface Water Pollution Risk Assessment guidance) in the discharge to surface water from points W2a/W2b including the parameters to be monitored, frequencies of monitoring and methods to be used. The operator shall carry out the monitoring in accordance with the Environment Agency's written approval.	Completed
IC29	The operator shall submit a written report to the Environment Agency for approval that includes: the results of an assessment of the impact of the emissions to surface water from the site in accordance with the Environment Agency's Surface Water Pollution Risk Assessment Guidance available on our website. The report shall: (a) be based on the parameters monitored in IC28 above; and 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.	31/12/21 Submitted and under assessment by Environment Agency
IC30	Monitoring of new LSG HDS heater – emission point A14 The operator shall submit a written report to the Environment Agency for assessment and written approval. The report must contain: 1. The results of tests carried out during commissioning to assess whether the air monitoring location A14 meets the requirements of BS EN 15259 and supporting Method Implementation Document (MID). 2. Analysis of the results and conclusions of the assessment 3. Where necessary proposals for improvements to meet the requirements and timescale of implementation	Within 3 months from commissioning of LSG HDS fired heater permitted by variation V022 (emission point A14)

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals or further proposals for rectifying this in accordance with the timescale in the notification. The operator must implement the proposals in the report in line with the timescales agreed with the Environment Agency.	
IC31	Confirmation of environmental performance of PCC Plant The operator shall submit a written report to the Environment Agency for assessment and written approval, confirming that, upon completion of the commissioning and performance testing, the environmental performance of the PCC Plant and other activities permitted by variation V021 meet all the specifications stated in the permit application for variation V021 and that the activities are capable of operating in compliance with the permit and within the risk envelope assessed in the application for variation V021 and the relevant pre-operational conditions, as approved by the Environment Agency. In particular, the report shall address, but not be limited to, the following: 1. Provide evidence that the performance of the FCCU flue gas treatment units, including Selective Catalytic Reduction, Wet Gas Scrubber and Wet Electrostatic Precipitator have been optimised to attain the abatement specification for emissions of oxides of nitrogen, sulphur oxides, aerosols and particulates; evidence that the Selective Catalytic Reduction has been designed and optimised to prevent and minimise emissions of ammonia due to ammonia slip and emissions of nitrous oxide. 2. Confirm that the overall plant meets the emission limits to air and water, energy efficiency and carbon capture efficiency specifications stated in the application documents for variation V021. 3. Provide noise testing results demonstrating that the noise performance of the plant is consistent with the conclusions of the Noise Impact Assessment submitted with the application for variation V021 (document titled 'Noise Impact Assessment, Phillips 66 Ltd, Permit Number: EPR/UP3230LR Humber Refinery, Project number: 60712174 v1' and dated January 2024). Where deviations from the specified environmental performance are identified, the Operator shall propose for approval by the Environment Agency any applicable remedial measures to make the operations compliant and implement them in accordance with the Environment Agency's written approval and within the approved timescales.	Within 6 months from completion of commissioning of the activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment (activity AR10) • PCC Plant (activity AR11)
IC32	Carbon capture performance The operator shall submit a written report to the Environment Agency for assessment and written approval detailing the carbon capture efficiency of the post-combustion carbon capture plant (activity reference AR11 in Table S1.1) under normal operating conditions (calculated using the methodology as approved in accordance with PO08 in table S1.6 of this permit) averaged over one year of operation as specified in table S3.4 of this permit. Should the carbon capture efficiency during normal operating conditions be reported to be less than the design capture performance specification of 95%, the operator shall carry out an analysis of the issues affecting the performance of the plant with respect to achievement of the 95% carbon capture rate and either: • submit written proposals for remedial actions designed to improve capture efficiency to the Environment Agency for approval; or • provide an acceptable written justification to the Environment Agency that a 95% capture rate is not reasonably achievable, and that no further remedial action is to be taken. The operator shall implement any proposals identified within the report in accordance with the Environment Agency's written approval and within the approved timescales.	Within 15 months from the start-up of the PCC Plant (activity AR11) permitted by variation V021

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC33	Solvent degradation The operator shall submit a written report to the Environment Agency for assessment and written approval on the degradation of PCC absorber solvent quality. The report shall review the findings from the monitoring of absorber solvent quality over 12 months of operation, including but not limited to the monitoring carried out in accordance with table S3.4 of this permit. The report shall include: • an investigation into the reasons for solvent degradation and how degradation affects the performance of the plant over time; • a review of the options for reducing the rate of solvent degradation; and • proposals for the implementation of any measures identified from the review. The proposals shall be implemented in accordance with the Environment Agency's written approval.	Within 15 months from the start-up of the PCC Plant (activity AR11) permitted by variation V021
IC34	Review of risk assessment of PTU effluent and combined discharge The operator shall submit a written report to the Environment Agency for assessment and written approval. The report shall include: 1. A review of the monitoring results for pH, particulates, Sulphates, Sulphites, Ammoniacal Nitrogen, Total Nitrogen, Nickel, Vanadium, Copper and Iron, plus any additional pollutants that might be identified in the effluent, or that might have been identified in response to pre-operational condition PO13, for the effluent leaving the Purge Treatment Unit (in its final process configuration, as approved by the Environment Agency in response to pre-operational condition PO13); the monitoring dataset shall consist of a sufficient number of samples (minimum 12 samples), collected over a 12 month period to take into account potential variability of the treatment performance and effluent composition; and sampled and tested according to the Environment Agency's guidance 'MCERTS standard for organisations undertaking sampling and chemical testing of water, May 2024 LIT 3997' (or more recent version). 2. A review of the monitoring results for the same pollutants listed in item 1, plus Dissolved Organic Carbon (DOC), for the combined effluent leaving the installation at emission point W2; the monitoring dataset shall consist of a sufficient number of samples (minimum 12 samples), collected over a 12 month timeframe to take into account potential variability of the treatment performance; and sampled and tested according to our guidance 'MCERTS standard for organisations undertaking sampling and chemical testing of water, May 2024 LIT 3997' (or more recent version). 3. Updated environmental background data including: o Dissolved Organic Carbon (DOC) of the water of the South Killingholme Drain upstream of the discharge point W2; o pH and Calcium of water of the South Killingholme Drain downstream of the discharge point. This dataset shall consist of a sufficient number of samples (minimum 12 samples), collected over a 12 month timeframe to take into account seasonal variability. 4. An updated environmental risk assessment of the impacts on the receiving water body (South Killingholme Drain) according to the most recent version of the guidance Surface water pollution risk assessment for your environmental permit - GOV.UK and H1 annex D2: assessment of sanitary and other pollutants in surface water discharges - GOV.UK, informed by the data gathered according to items 1. to 3. Where the updated environmental risk assessment shows a risk of causing exceedances of the environmental quality standards or further deterioration of the recipient water body, due to any pollutants in the WGS purge stream, the operator shall propose additional treatment to reduce the concentrations of these pollutants in	Within 18 months from the start-up of the SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 - and PCC Plant (activity AR11) permitted by variation V021

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	the final discharge to acceptable levels agreed in writing with the Environment Agency. The operator must implement the proposals in the report in line with the timescales agreed with the Environment Agency's written approval.	
IC35	Monitoring of new emission points A6c and A6d The operator shall submit a written report to the Environment Agency for assessment and written approval. The report must contain: 1. The results of tests carried out during commissioning to assess whether the air monitoring locations meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID). 2. Analysis of the results and conclusions of the assessment 3. Where necessary, proposals for improvements to meet the requirements and timescale of implementation Where notified in writing by the Environment Agency that the requirements are not met, the operator shall submit proposals or further proposals for rectifying this in accordance with the timescale in the notification. The operator must implement the proposals in the report in line with the timescales agreed with the Environment Agency.	Within 3 months from the completion of the start-up of the SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 - and PCC Plant (activity AR11) permitted by variation V021
IC36	Integrated Management Emissions Technique Emission Limits The operator shall submit a written report to the Environment Agency for assessment and written approval, providing an assessment of the Refinery Integrated Management Emissions Technique (refinery bubbles) for oxides of nitrogen (expressed as NO_2) and sulphur dioxide (SO_2), informed by monitoring data gathered from the first 18 months of operation of the FCCU regenerator in the new process configuration, including the abatement of oxides of nitrogen and sulphur dioxide introduced by the Selective Catalytic Reduction (SCR) and Wet Gas Scrubbing (WGS) systems. According to the outcomes of the review, the operator shall propose, for written approval by the Environment Agency, reduced monthly emission limits for the calculation of the NOx and SO_2 refinery bubbles to be applied to emission point A6d, along with the new flue gas volumetric flow rate associated with this emission point for the purpose of calculating the bubble inputs associated with this emission point. The reduced emission limits shall be based on the principle that the headroom for emissions of NOx and SO_2 available for other combustion equipment included in the calculation of the refinery's bubbles should not increase due to the reduced emissions of these pollutants attained by the SCR and WGS abatement systems, compared to the previous unabated operations of the same emission source (FCCU regenerator flue gases previously emitted through emission point A6b). The operator must comply with the reduced emission limits in accordance with the Environment Agency's written approval and within the approved timescales.	Within 21 months from the start-up of the SCR and WGS systems installed to the FCCU Regenerator process - part of activity AR2 permitted by variation V021
IC37	Salinity of discharge effluent and impacts on Rosper Road Pools Local Wildlife Site The operator shall submit a written report to the Environment Agency for assessment and written approval, providing proposals for monitoring of the effluent discharged at emission point W2, during normal operation of the carbon capture plant, for the parameter 'salinity', expressed in Practical Salinity Units (PSU). The monitoring proposal shall consist of a suitable number of samples taking into account the seasonal variability of the salinity of the effluent. The operator shall implement the monitoring as agreed and provide a report to the Environment Agency for assessment and written approval. The report shall include, but not necessarily be limited to: • the monitoring results • with reference to the baseline monitoring collected under PO15, an appraisal and/or assessment of the results including justification that the salinity of the	Within 15 months from the start-up of the SCR, WGS and WESP systems installed to the FCCU Regenerator process – and PTU effluent treatment permitted by variation V021

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	effluent does not significantly increase the salinity of/ impact the ecological functioning of the Rosper Road Pools Local Wildlife Site. The operator must implement the proposals in the report in line with the timescales agreed with the Environment Agency.	
IC38	Review of PCC plant air emissions risk assessment The operator shall submit a written report to the Environment Agency for assessment and written approval. The report shall contain: 1. A comparison of the actual emission monitoring data obtained from emission point A6c during the first year of operation of the PCC Plant with those assumed in the air emissions risk assessment submitted with permit application EPR/UP3230LR/V021. 2. An updated air emissions risk assessment for the emissions to air from emission point A6c (PCC Plant Absorber Stack), carried out in line with the Environment Agency's guidance the 'Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)' where any parameters detected were not included in the original risk assessment, or the monitored concentrations are higher than those assumed in the risk assessment. Where Environmental Assessment Levels (EALs) for emitted substances are not available on the current published EAL list on gov.uk, the operator shall propose a new EAL. To derive a new EAL, the operator should follow the Environment Agency's published guidance on air emissions risk assessments. Where the updated environmental risk assessment shows a risk of causing exceedances of the Environmental Assessment Levels, the operator shall propose remedial actions to reduce the emissions of these pollutants to acceptable levels agreed in writing with the Environment Agency. The operator must implement the proposals in the report in line with the timescales agreed with the Environment Agency's written approval.	Within 15 months from the completion of the start-up of the SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 - and PCC Plant (activity AR11) permitted by variation V021
IC39	Optimisation of DeSOx additive dosing The operator shall submit a written report to the Environment Agency for assessment and written approval. The report shall provide a review and optimisation of the dosing rate of the DeSOx additive to FCCU process, informed by data gathered over the first year of operation of the SCR, WGS and WESP systems installed to the FCCU Regenerator as pretreatment for the flue gas fed to carbon capture plant. The report shall give evidence that the DeSOx additive dosing rate has been optimised, to investigate and achieve an increase in the SOx removal rate from the FCCU Regenerator flue gas, above the baseline 50% stated in the application documents for variation V021, and attain as a consequence a reduction in the concentrations of sulphates in the PTU waste water effluent, where this is technically and economically feasible. Where applicable, the assessment shall be supported by a cost-benefit analysis to justify the optimum dosing rate of DeSOx additive. The operator must implement any proposals identified within the report in accordance with the Environment Agency's written approval and within the approved timescales.	Within 15 months from the start-up of the SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 - and PCC Plant (activity AR11) permitted by variation V021

Table S1.4 Appropriate measures for odour	
Measure	**Dates**
The operator shall maintain the odour management plan as described in section 2.2.6 of the application. 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.	From date of permit issue.

Table S1.5 Appropriate measures for noise	
Measure	**Dates**
The operator shall maintain the noise management plan as described in section 2.9 of the application. 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.	From date of permit issue.

Table S1.6 Pre-operational measures for future development		
Reference	**Operation**	**Pre-operational measures**
PO1	Operation of Low Sulphur Gasoline (LSG) plant – **Acoustic design and noise management plan**	Following the completion of the detailed engineering design for the LSG plant, and at least six months prior to the commencement of commissioning operations of this plant, the operator shall submit for assessment and written approval by the Environment Agency detailed design manufacturer's noise data for all equipment proposed as part of this plant (equipment in the scope of variation application V022), demonstrating that the detailed acoustic design and procurement of equipment is as a minimum compliant with the measures and noise levels stated in the approved Noise Management Plan referred to in Table S1.2 (revision 4, received 05/11/2024), or incorporates further reductions in sound levels compared to those identified in this document.
PO2	Co-processing TPO in the FCC unit	**Establish baseline emissions data** Prior to co-processing TPO in the feedstock to the FCC unit, the operator shall submit, for written agreement with the Environment Agency, proposals for three separate monitoring campaigns to gather additional baseline emissions data for the following parameters from emission point A6b under normal operation: mercury, cadmium, thallium, antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium, polychlorinated dibenzodioxins/furans (PCDD/F), sulphur dioxide, oxides of nitrogen, carbon monoxide and particulates. Note 1 The operator shall undertake the monitoring as agreed and provide a report that includes the monitoring results to the Environment Agency for written approval. No co-processing of TPO shall be undertaken prior to gathering this additional data and without the written agreement of the Environment Agency.
PO3	Co-processing of TPO in the FCC unit feedstock	**1% TPO substitution rate** Prior to the routine operational co-processing of more than 1% by volume TPO in the feedstock to the FCC unit, the operator shall submit for written agreement by the Environment Agency proposals for a trial of TPO co-processing at substitution rates as close to this figure as possible. The trial shall include three separate monitoring campaigns to gather emissions data for the following parameters from emission point A6b: mercury, cadmium, thallium, antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium, polychlorinated dibenzodioxins/furans (PCDD/F), sulphur dioxide, oxides of nitrogen, carbon monoxide and particulates. Note 1

Table S1.6 Pre-operational measures for future development		
		The operator shall carry out the trial as agreed and submit a report to the Environment Agency for written approval that includes: • the monitoring data obtained during the three campaigns. • a comparison of the monitored trial emissions with the baseline data collected under PO2. • a comparison of the monitored trial emissions with those presented in the impact assessment submitted with application EPR/UP3230LR/V023 to validate the assumptions and the conclusions made in the application. • an assessment of the impact of the monitored emissions in accordance with Environment Agency guidance: Air Emissions Risk Assessment for your environmental permit, (link) published 01 February 2016, last updated 07 January 2025 (or subsequent update). • an appraisal of the assessments undertaken. In the event that the assessment shows that an environmental standard can be exceeded, the report shall include proposals for further investigative work and remedial actions to reduce impacts to acceptable levels prior to increasing the co-processing rate of TPO. The operator shall implement the actions as agreed with the Environment Agency and shall not increase the co-processing rate of TPO without written approval by the Environment Agency.
PO4	Co-processing of TPO in the FCC unit feedstock	**2% TPO substitution rate** Prior to the routine operational co-processing of more than 2% by volume TPO in the feedstock to the FCC unit, the operator shall submit for written agreement by the Environment Agency proposals for a trial of TPO co-processing at substitution rates as close to this figure as possible. The trial shall include three separate monitoring campaigns to gather emissions data for the following parameters from emission point A6b: mercury, cadmium, thallium, antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium, polychlorinated dibenzodioxins/furans (PCDD/F), sulphur dioxide, oxides of nitrogen, carbon monoxide and particulates. Note 1 The operator shall carry out the trial as agreed and submit a report to the Environment Agency for written approval that includes: • the monitoring data obtained during the three campaigns. • a comparison of the monitored trial emissions with the baseline data collected under PO2. • a comparison of the monitored trial emissions with those presented in the impact assessment submitted with application EPR/UP3230LR/V023 to validate the assumptions and the conclusions made in the application. • an assessment of the impact of the monitored emissions in accordance with Environment Agency guidance: Air Emissions Risk Assessment for your environmental permit, (link) published 01 February 2016, last updated 07 January 2025 (or subsequent update). • an appraisal of the assessments undertaken. In the event that the assessment shows that an environmental standard can be exceeded, the report shall include proposals for further investigative work and remedial actions to reduce impacts to acceptable levels prior to increasing the co-processing rate of TPO. The operator shall implement the actions as agreed with the Environment Agency and shall not increase the co-processing rate of TPO without written approval by the Environment Agency.
PO5	Co-processing of TPO in the FCC unit feedstock	**3% TPO substitution rate** Prior to the routine operational co-processing of more than 3% by volume TPO in the feedstock to the FCC unit, the operator shall submit for written agreement by the Environment Agency proposals for a trial of TPO co-processing at substitution rates as close to this figure as possible. The trial shall include three separate monitoring campaigns to gather emissions data for the following parameters from emission point A6b: mercury, cadmium, thallium, antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium, polychlorinated dibenzodioxins/furans (PCDD/F), sulphur dioxide, oxides of nitrogen, carbon monoxide and particulates. Note 1

Table S1.6 Pre-operational measures for future development		
		The operator shall carry out the trial as agreed and submit a report to the Environment Agency for written approval that includes: • the monitoring data obtained during the three campaigns. • a comparison of the monitored trial emissions with the baseline data collected under PO2. • a comparison of the monitored trial emissions with those presented in the impact assessment submitted with application EPR/UP3230LR/V023 to validate the assumptions and the conclusions made in the application. • an assessment of the impact of the monitored emissions in accordance with Environment Agency guidance: Air Emissions Risk Assessment for your environmental permit, (link) published 01 February 2016, last updated 07 January 2025 (or subsequent update). • an appraisal of the assessments undertaken. In the event that the assessment shows that an environmental standard can be exceeded, the report shall include proposals for further investigative work and remedial actions to reduce impacts to acceptable levels prior to increasing the co-processing rate of TPO. The operator shall implement the actions as agreed with the Environment Agency and shall not increase the co-processing rate of TPO without written approval by the Environment Agency.
PO6	Co-processing of TPO in the FCC unit feedstock	**4% TPO substitution rate** Prior to the routine operational co-processing of more than 4% by volume TPO in the feedstock to the FCC unit, the operator shall submit for written agreement by the Environment Agency proposals for a trial of TPO co-processing at substitution rates as close to this figure as possible. The trial shall include three separate monitoring campaigns to gather emissions data for the following parameters from emission point A6b: mercury, cadmium, thallium, antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium, polychlorinated dibenzodioxins/furans (PCDD/F), sulphur dioxide, oxides of nitrogen, carbon monoxide and particulates. Note 1 The operator shall carry out the trial as agreed and submit a report to the Environment Agency for written approval that includes: • the monitoring data obtained during the three campaigns. • a comparison of the monitored trial emissions with the baseline data collected under PO2. • a comparison of the monitored trial emissions with those presented in the impact assessment submitted with application EPR/UP3230LR/V023 to validate the assumptions and the conclusions made in the application. • an assessment of the impact of the monitored emissions in accordance with Environment Agency guidance: Air Emissions Risk Assessment for your environmental permit, (link) published 01 February 2016, last updated 07 January 2025 (or subsequent update). • an appraisal of the assessments undertaken. In the event that the assessment shows that an environmental standard can be exceeded, the report shall include proposals for further investigative work and remedial actions to reduce impacts to acceptable levels prior to increasing the co-processing rate of TPO. The operator shall implement the actions as agreed with the Environment Agency and shall not increase the co-processing rate of TPO without written approval by the Environment Agency.
PO7	Co-processing of TPO in the FCC unit feedstock	**5% TPO substitution rate** Prior to the routine operational co-processing of more than 5% by volume TPO in the feedstock to the FCC unit, the operator shall submit for written agreement by the Environment Agency proposals for a trial of TPO co-processing at substitution rates as close to this figure as possible. The trial shall include three separate monitoring campaigns to gather emissions data for the following parameters from emission point A6b: mercury, cadmium, thallium, antimony, arsenic, chromium, cobalt, copper, lead, manganese, nickel, vanadium,

Table S1.6 Pre-operational measures for future development		
		polychlorinated dibenzodioxins/furans (PCDD/F), sulphur dioxide, oxides of nitrogen, carbon monoxide and particulates. Note 1 The operator shall carry out the trial as agreed and submit a report to the Environment Agency for written approval that includes: • the monitoring data obtained during the three campaigns. • a comparison of the monitored trial emissions with the baseline data collected under PO2. • a comparison of the monitored trial emissions with those presented in the impact assessment submitted with application EPR/UP3230LR/V023 to validate the assumptions and the conclusions made in the application. • an assessment of the impact of the monitored emissions in accordance with Environment Agency guidance: Air Emissions Risk Assessment for your environmental permit, (link) published 01 February 2016, last updated 07 January 2025 (or subsequent update). • an appraisal of the assessments undertaken. In the event that the assessment shows that an environmental standard can be exceeded, the report shall include proposals for further investigative work and remedial actions to reduce impacts to acceptable levels prior to increasing the co-processing rate of TPO. The operator shall implement the actions as agreed with the Environment Agency and shall not increase the co-processing rate of TPO without written approval by the Environment Agency.
PO8	Commissioning of activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment (activity AR10) • PCC Plant (activity AR11)	**Commissioning Plan** At least six months prior to the commencement of commissioning of the activities permitted by variation EPR/UP3230LR/V021, the operator shall submit a written commissioning plan to the Environment Agency for assessment and written approval. The commissioning plan shall address and include the following, but not be limited to: 1. The timelines for the commissioning and start-up operations and the expected durations of these activities; 2. The expected emissions to the environment during the different stages of commissioning, along with a risk assessment demonstrating that the environmental risks are not significant throughout all the phases of commissioning; 3. The actions to be taken to protect the environment throughout all the phases of commissioning; 4. The proposed monitoring for the commissioning emissions and the proposed reporting to the Environment Agency in the event that actual emissions exceed the expected emissions; 5. Details of how the duration and the environmental impacts of plant start-up activities will be minimised; 6. A detailed methodology to demonstrate the carbon capture efficiency of the plant, including detailed information on the process monitoring requirements identified in Table S3.4 of this permit. The approved methodology shall be used to demonstrate the overall carbon capture efficiency of the plant as part of the commissioning activities, and, after the commissioning phase, for process monitoring and reporting purposes in compliance with the conditions of the permit. 7. A detailed methodology for approval for quantifying total mass of CO_2 emissions during short duration venting that may be required during the start-up sequence of the PCC plants and during other than normal operating conditions (OTNOC). The commissioning activities shall be carried out in accordance with the commissioning plan approved by the Environment Agency.
PO9	Commencement of activities permitted by variation V021: • SCR, WGS and WESP	**Confirmation of start-up of activities** The operator shall submit a written report to the Environment Agency for confirmation. The report must contain: 1. Confirmation of the successful completion of commissioning of the FCCU Regenerator flue gas treatment, PCC plant, PTU and any associated ancillaries;

Table S1.6 Pre-operational measures for future development		
	systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment (activity AR10) • PCC Plant (activity AR11)	2. Notification of the date of the commencement of the normal operations (start-up) of these activities; 3. Confirmation of the decommissioning of emission point A6b.
PO10	Commissioning of activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment (activity AR10) • PCC Plant (activity AR11)	**Environment Management System (EMS)** Prior to the commencement of the commissioning of the activities permitted by variation EPR/UP3230LR/V021, the operator shall submit for assessment and written approval by the Environment Agency a report confirming the extension of the installation's EMS to these activities. The operator shall not begin the commissioning operations of the PCC plant, including any associated activities, prior to obtaining written approval by the Environment Agency to this report. The operator shall make available for inspection all documents and procedures which form part of the updated EMS. The updated EMS shall be developed/extended in line with the requirements set out in Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk). The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit. As part of the above, the following aspects shall be documented in the report submitted for approval (and in the updated EMS documentation made available for inspection): • the extension of the existing installation's equipment inspection, testing and maintenance programme to the new activities; • the update of the existing accident management plans / emergency response plans to cover the risks from potential accidental events associated with the operations of the new activities and their interactions with the pre-existing activities; • documented procedures for the management of other than normal operating conditions (OTNOC) associated with the new activities, and their potential interactions with the pre-existing activities; • The extension of the installation's leak detection and repair (LDAR) programme for volatile organic compounds (VOC) to the new activities.

Table S1.6 Pre-operational measures for future development		
PO11	Commissioning of Activities permitted by variation V021: PCC Plant (activity AR11)	**CO_2 venting assessment** Following the completion of the final design of the carbon capture plant and at least 12 months prior to the commencement of commissioning, the operator shall submit to the Environment Agency for assessment and written approval a report that reviews the outcomes of the CO_2 venting emissions to air risk assessment presented in the application EPR/UP3230LR/V021. This report shall include but not be limited to: • confirmation of the vent location(s) • information on how modelling has been used to inform the process design and manage risks associated with CO_2 venting. This should include a description of the different potential venting scenarios • confirmation that the design is in line with industry best practice, such as that produced by the Energy Institute, or other equivalent guidance • a description of the operating techniques that will minimise the risks associated with venting CO2 to atmosphere and limit venting scenarios to those considered in their application • a vent management plan which is in keeping with our published guidance on emerging techniques for post-combustion carbon capture and industry best practice, such as that produced by the Energy Institute, or other equivalent guidance.
PO12	Commissioning of activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment (activity AR10) • PCC Plant (activity AR11)	**Final design of secondary and tertiary containment infrastructure** Following the completion of the detailed engineering design for the carbon capture plant and associated activities, and prior to the commencement of commissioning operations, the operator shall submit for approval by the Environment Agency an updated report including detailed information on the detailed design and construction specification of the primary, secondary and tertiary containment infrastructure associated with these activities. The report shall demonstrate that the containment systems have been designed and specified by suitably qualified and experienced engineers to comply with the requirements of CIRIA Report 736 – 'Containment systems for the prevention of pollution' 736, addressing the key elements which include: • Updating the risk assessment and classification to identify the class of containment required; • Developing the specification and design of the primary, secondary and tertiary containment appropriate to the class of containment, taking into account CIRIA 736 guidance on bunding, further containment and transfer systems; • Demonstrating that the design has taken into account the capacity requirements, including the capacity of the inventory to be contained, allowance for rainfall, firefighting and cooling water provision; • Demonstrating that the isolation and operating philosophy for the secondary and tertiary containment infrastructure prevents accidental emissions to the environment. The Operator shall not begin the commissioning operations of the carbon capture plant, including any associated activities, prior to obtaining written approval by the Environment Agency to this pre-operational condition.
PO13	Commissioning of activities permitted by variation V021: PTU effluent treatment (activity AR10)	**Final design of Purge Treatment Unit (PTU) and updated water quality risk assessment** At least 18 months prior to the commissioning of the Purge Treatment Unit (PTU) activity the operator shall submit a written report to the Environment Agency for assessment and written approval. The report must contain: 1. A review of any additional information not submitted as part of variation application EPR/UP3230LR/V021 on the composition of the purge effluent stream generated from the Wet Gas Scrubbing process, which may emerge during the detailed engineering design and procurement process of the activities in the scope of the PCC plant project;

Table S1.6 Pre-operational measures for future development		
		2. A review of the conclusions of the trials and tests carried out to assess the treatability of the PTU effluent in the existing biological Effluent Treatment Plant (ETP) of the Humber Refinery; 3. If supported by the conclusions of the trials presented in item 2., a confirmation that the WGS purge effluent, pre-treated in the PTU, will undertake further treatment in the existing ETP (including floatation, equalisation and biological treatment stages), supported by adequate drawings/process flow diagrams as required. 4. If, according to the outcomes of the trials presented in item 2., it is concluded that it is not possible to treat the PTU effluent in the ETP, as this treatment might impair the performance of the biological treatment, the operator shall submit an assessment of treatment options and a proposal for approval by the Environment Agency including additional treatment equipment dedicated to the PTU effluent in order to attain: • A reduction of the ammoniacal nitrogen concentration in the PTU effluent prior to final discharge through emission point W2 • Further removal of particulates and metals as required to cope with the residual uncertainties of the design inputs; and the uncertainties of the effects of the sulphite oxidation process on the distribution of the oxidised products between the liquid and solid phases. 5. If, according to item 1., the operator identifies additional pollutants, or concentrations of pollutants that are significantly different from the data presented in the application documents for variation application EPR/UP3230LR/V021, the operator shall submit an updated environmental risk assessment of the impacts on the receiving water body (South Killingholme Drain) according to the most recent version of the guidance Surface water pollution risk assessment for your environmental permit - GOV.UK and H1 annex D2: assessment of sanitary and other pollutants in surface water discharges - GOV.UK. 6. If the results of the environmental risk assessment required by item 5. show a risk of causing exceedances of the environmental quality standards or further deterioration of the recipient water body, due to any pollutants in the WGS purge stream, the operator shall propose additional treatment to reduce the concentrations of these pollutants in the final discharge to acceptable levels. The operator must implement the proposals in the report in line with the timescales agreed with the Environment Agency's written approval. The operator must not begin the commissioning of the PTU prior to obtaining the written approval by the Environment Agency to this pre-operational condition.
PO14	Commissioning of activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment	**Noise Impact Assessment and Noise Management Plan** Following the completion of the detailed engineering design, and at least six months prior to the commencement of commissioning operations of the activities permitted by variation EPR/UP3230LR/V021, the operator shall submit for assessment and written approval by the Environment Agency a revised Noise Impact Assessment (NIA) and a revised Noise Management Plan (NMP). The revised NIA shall be based on the final design and be informed by revised noise modelling based on noise emissions data, evidenced by equipment manufacturer's data wherever available, taking account of any noise attenuation measures, for the final design in accordance with BAT. The revised noise impact assessment shall be carried out by an experienced and suitably qualified person (i.e. a noise consultant with an appropriate qualification accredited by the Institute of Acoustics), in accordance with the procedures given in BS4142:2014 (Rating industrial noise affecting mixed residential and industrial areas)

Table S1.6 Pre-operational measures for future development		
	(activity AR10) • PCC Plant (activity AR11)	and BS7445: 2003 (Description and measurement of environmental noise), or other methodology as agreed with the Environment Agency. The revised NIA shall include updated: • sound source data, with appropriate references for all plant. • detailed mitigation proposals, demonstrated to be compliant with BAT for this type of installation, with appropriate references for all proposed mitigation measures. • discussion of acoustic feature corrections depending on final plant specifications, with evidence provided to justify corrections for tonality, impulsivity or intermittency (if applicable). • discussion of context. • discussion of uncertainty. • BS4142 impact for the proposed carbon capture plant in isolation and cumulatively in the context of the existing site operations. The report shall: • Consider the background levels in the locality and assess the potential impact the carbon capture plant is likely to have upon identified sensitive receptors. • Provide a comparison with the predictions and conclusions of the preliminary Noise Impact Assessment submitted with the application for variation V021, titled 'Noise Impact Assessment, Phillips 66 Ltd, Permit Number: EPR/UP3230LR Humber Refinery, Project number: 60712174 v1' and dated January 2024 ('the preliminary NIA'). • Include an interpretation of the results and conclusions drawn. • Demonstrate that the detailed acoustic design of the carbon capture plant permitted by variation V021 is BAT and includes appropriate noise mitigation measures suitable to confirm the predictions and conclusions of the preliminary NIA as a minimum, or incorporates further reductions in sound levels from those identified in that study. The revised NMP shall reflect the updated NIA and shall include where relevant, but not be limited to, updated: • References to the revised NIA conclusions. • Specific noise control measures to be implemented with associated attenuation levels. • Confirmation that the noise attenuation levels stated in the preliminary Noise Management Plan submitted with the application for variation V021, titled Noise Management Plan, version number R05, revision 5, March 2025 ('the preliminary NMP') for the equipment which are part of the carbon capture plant permitted by variation V021, will be attained as a minimum, or further noise attenuation will be achieved when this practical, according to BAT. • Description of on-site processes that will ensure impacts do not increase on site. • Actions to be taken if noise is detected outside optimum process parameters. The operator shall not begin commissioning operations of the carbon capture plant, including any associated activities, prior to obtaining written approval by the Environment Agency of the revised NIA and NMP.

Table S1.6 Pre-operational measures for future development		
PO15	Operation of activities permitted by variation V021: PTU effluent treatment (activity AR10)	**Salinity Baseline** Prior to the commencement of operation of the carbon capture plant, the operator shall submit for assessment and written approval by the Environment Agency, proposals for monitoring effluent discharged at emission point W2a to gather baseline emissions data salinity, expressed in practical salinity units (PSU). The monitoring proposal shall consist of a suitable number of samples taking into account the seasonal variability of the effluent salinity. The operator shall undertake the monitoring as agreed and provide a report that includes the monitoring results to the Environment Agency for written approval. The carbon capture plant shall not be operated prior to gathering this additional data and without the written agreement of the Environment Agency.
PO16	Commissioning of activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PCC Plant (activity AR11)	**Emissions monitoring locations and configuration (emission points A6c and A6d)** Following the completion of the final design of the activities permitted by variation EPR/UP3230LR/V021 and at least 12 months prior to the commencement of their commissioning, the operator shall submit a report for assessment and written approval by the Environment Agency. The report shall include: • A description of the detailed monitoring locations and configuration of the Continuous Emissions Monitoring Systems (CEMS) installed to emission point A6d (WGS Stack) and the associated flue line conveying the flue gas to the PCC Absorber (A6d flue line). • Confirmation that the design of the monitoring systems installed to emission points A6c (PCC Plant Absorber Stack) and A6d (WGS Stack and associated flue line) meet the requirements of Section 4b of application Form Part C3 (application EPR/UP3230LR/V021); or where deviations are identified at design stage, an assessment of how the proposed design of the CEMS will meet the requirements of the BS EN 15259 standard, including, where applicable, the results of the computational fluid dynamics (CFD) modelling and analysis. • Confirmation of whether continuous monitoring of ammonia will be carried out on the flue line from the WGS to the PCC absorber column (emission point A6d flue line); or on the PCC Plant Absorber Stack (emission point A6c), according to a review of the ability to comply with BS EN 15259 and isokinetic sampling, when this is required to attain MCERTS certification of this CEMS. • Confirmation that the design of the sampling platforms meet the requirements of the Environment Agency's guidance 'Monitoring stack emissions: measurement locations' (version published 14/12/2022 or more recent version). • A method to demonstrate whether there are mist or water droplets present at the emission points A6c, A6d and on the flue line between the WGS and PCC Plant Absorber Stack. The operator must implement any proposals identified within the report in accordance with the Environment Agency's written approval and within the approved timescales.

Table S1.6 Pre-operational measures for future development		
PO17	Commissioning of activities permitted by variation V021: PCC Plant (activity AR11)	**Emissions from storage of solvent** Prior to commissioning the PCC plant, the operator shall submit a written report to the Environment Agency for assessment and written approval. The report must contain a confirmation that the final design of all the tanks containing fresh and used amine-based solvent Shell CANSOLV DC-103 consist, as a minimum, of white painted or milled finish to reduce emissions of Volatile Organic Compounds (VOCs), or propose alternative / additional measures to reduce emissions from storage from these tanks. The operator must implement any proposals identified within the report in accordance with the Environment Agency's written approval and within the approved timescales.
PO18	Commissioning of activities permitted by variation V021: PCC Plant (activity AR11)	**Solvent process monitoring methods** Following the completion of the final design of the PCC plant and at least 6 months prior to the commencement of commissioning of the PCC plant, the operator shall submit to the Environment Agency for assessment and written approval, methodologies for the following process monitoring requirements for absorber amine solvent quality as required in table S3.4 of this permit: • opacity/colour; • concentration of active amines; • carbon dioxide loading (rich amine); • foaming tendency; • amine and organic non-ionic degradation products – including but not limited to amines, nitrosamines, nitramines (in absorber amine solvent prior to reclaiming and after reclaiming); • organic acids; • heat stable salts; • metals including soluble iron concentration; • soluble iron concentration – rich amine; • soluble iron concentration – lean amine following stripper.
PO19	Commissioning of activities permitted by variation V021: • SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2 • PTU effluent treatment (activity AR10) • PCC Plant (activity AR11)	**Carbon capture plant Other Than Normal Operating Conditions (OTNOC) plan** Following the completion of the final design of the carbon capture plant and prior to the commencement of commissioning of the carbon capture plant, the operator shall submit to the Environment Agency for assessment and written approval an OTNOC management plan for the activities permitted by variation V021. The plan shall include: i. Any potential 'other than normal operating conditions (OTNOC)' for the carbon capture plant, taking into consideration both internal and external causes of OTNOC. ii. Details of measures to: • minimise the occurrence of OTNOC that are within the operator's control; and • reduce the impact of all OTNOC events. iii. Proposals for reviewing and optimising capture performance periodically so capture rates are as high as reasonably practicable during these periods. The OTNOC plan shall be included in the EMS.

Table S1.6 Pre-operational measures for future development
Note 1: Monitoring undertaken for both the baseline campaign and during the TPO trial campaigns shall be carried out under typical FCC unit operating conditions and with typical feedstock mix. Ideally, operating conditions should be replicated where practicable and details shall be provided in the reports submitted to the Environment Agency.

Schedule 2 - Waste types, raw materials and fuel

Table S2.1 Raw materials and fuels	
Raw materials and fuel description	**Specification**
For release points A1, A3, A5, A6a, A10 and A19, where the fuel fired is a mixture of natural gas and refinery fuel gas	The fraction of natural gas must be less than 50%
Non-waste Tyre Pyrolysis Oil (TPO)	Subject to specifications consistent with those stated for waste TPO as part of variation application EPR/UP3230LR/V023; or to other specification as agreed in writing with the Environment Agency as part of an end of waste quality protocol for TPO.
Carbon capture solvent used for activity AR11	Shell CANSOLV DC-103, formulation consistent with the emissions profile assessed in variation application EPR/UP3230LR/V021 (emissions of amines and their degradation products reported in Annex A of application document 'Environmental Permit Variation Application Appendix D - Air Impact Assessment', received on 30/01/2024).

Table S2.2 Permitted waste types and quantities for Effluent Treatment Plant	
Maximum quantity	Rate to be controlled to comply with the limits in Table S3.2
Waste code	**Description**
05 01 03*	Tank Bottom Sludges
05 01 09*	Oily Water Separator Sludge
10 01 19	Fuel gas knockout pot condensate
16 03 05*	Bioethanol solution (contaminated)
16 07 08*	Tank roof seal decontamination effluent
16 10 01*	Tank Water Bottoms and line flushing/ pigging water
16 10 02	Humber LPG Caverns pigging water and caverns abstracted water contaminated with methanol that has been segregated from the onsite lagoon to minimise the quantity of water contaminated.
	Tank Water Bottoms and line flushing/ pigging water
	Used fire fighting foam solution

Table S2.3 Permitted waste types and quantities for Refinery Processing	
Maximum quantity	
Waste code	**Description**
02 01 03	Plant – tissue waste
02 03 04	Materials unsuitable for consumption or processing
16 03 06	Organic wastes other than those mentioned in 16 03 05*
20 01 25	Edible oil and fat
19 01 17*	Pyrolysis wastes containing dangerous substances (Tyre Pyrolysis Oil – TPO) Note 1
Note 1 – Should Tyre Pyrolysis Oil cease to be a waste, the requirement to import using EWC 19 01 17* will no longer apply.	

Schedule 3 – Emissions and monitoring

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
A1	LCP 259 ST 101 Firing on RFG and Natural Gas 140 MWth (Total stack including additional 9 MWth unit is 149 MWth)	Sulphur dioxide	35 mg/m^3 Note X (1000 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			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
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	150 mg/m^3 Note X (300 mg/m^3) Note Y	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
		Dust	5 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			5.5 mg/Nm^3	Daily mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			10 mg/m^3	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181 Note 2
		Carbon monoxide	100 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
A2	ST102 No.1 Coker Charge Heater 46 MWth	Sulphur dioxide	35 mg/m^3 Note X	Calendar monthly mean of validated hourly averages	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	150 mg/m^3 Note X	Average over sampling period	Annually	BS EN 14792
		Dust	No limit set	-	-	-
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months	BS EN 15058
A3	LCP 261 ST201 Firing on RFG and Natural Gas 166 MWth	Sulphur dioxide	35 mg/m^3 Note X (1000 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous Note 1	BS EN 14181
			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
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	150 mg/m^3 Note X (300 mg/m^3) Note Y	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
		Dust	5 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			5.5 mg/m^3	Daily mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			10 mg/m^3	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181 Note 2

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**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
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
A4	ST202 No.2 Coker Charge Heater 27 MWth	Sulphur dioxide	35 mg/m^3 Note X	Calendar monthly mean of validated hourly averages	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	150 mg/m^3 Note X	Average over sampling period	Annually	BS EN 14792
		Dust	No limit set	-	-	-
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months	BS EN 15058
A5	LCP 260 ST301 Firing on RFG and Natural Gas 107 MWth (Total stack including additional 2 x 9 MWth units is 125 MWth)	Sulphur dioxide	35 mg/m^3 Note X (1000 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous Note 1	BS EN 14181
			1000 mg/m^3	Daily mean of validated hourly averages	Continuous Note 1	BS EN 14181
			1000 mg/m^3	95% of validated hourly averages within a calendar year	Continuous Note 1	BS EN 14181
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	150 mg/m^3 Note X (300 mg/m^3) Note Y	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
		Dust	5 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			5.5 mg/m^3	Daily mean of validated hourly averages	Continuous	BS EN 14181 Note 2

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
			10 mg/m^3	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181 Note 2
		Carbon monoxide	100 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
A6a	LCP 262 ST3401a Firing on RFG and Natural Gas 65 MWth	Sulphur dioxide	35 mg/m^3 Note X (1000 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous	Note 1
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	150 mg/m^3 Note X (300 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Dust	5 mg/m^3	-	At least every 6 months	BS EN 13284-1 Note 2
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months	BS EN 15058
A6b Note 11	ST3401b FCCU Regenerator	Sulphur dioxide	800 mg/m^3 Note X 600 mg/m^3 Note Z	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (as NO_2)	300 mg/m^3 Note X Note 7	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Dust	50 mg/m^3 Note 7	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		CO	200 mg/m^3 Note 7	Daily	Continuous	BS EN 14181
		Ammonia	15 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
		Metals (Nickel, Antimony and Vanadium)	No limit set	-	At least every 6 months or after significant changes to the unit	Direct measurement or analysis based on metals content in the catalyst fines
A6c Note 12	PCC Plant Absorber Stack (Carbon capture on the FCCU regeneration flue gas)	Oxides of nitrogen (as NO_2)	50 mg/m^3	Yearly average	Continuous	BS EN 14181
		Carbon Monoxide	100 mg/m^3	Daily average	Continuous	BS EN 14181
		Sulphur Dioxide	50 mg/m^3	Yearly average	Continuous	BS EN 14181
		Particulates	10 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Particulates	10 mg/m^3	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	Isokinetic EN 13284-1 and MID
		Ammonia	5 mg/m^3 Notes 19, 20	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Ammonia	5 mg/m^3 Notes 21	Average over the sampling period	Monthly	EN ISO 21877 Note 18
		Metals (Nickel, Antimony and Vanadium)	No limit set	-	At least every 6 months or after significant changes to the FCCU	Direct measurement or analysis based on metals content in the catalyst fines
		Amines				
		Total Amines	1.1 mg/m^3	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	EN ISO 21877 Notes 17 and 18
		1-Piperazineethanol CAS 103-76-4	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed	

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
					with the Environment Agency Note 23	
		Piperazine CAS 110-85-0	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		1,4-Piperazinediethanol CAS 122-96-3	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		Mono Ethanol Amine (MEA) CAS 141-43-5	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		Nitrosamines and nitramines				
		Total nitrosamines and nitramines	0.003 mg/m^3	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	Isokinetic impinger method based on EN ISO 21877 Notes 17 and 18
		4-Nitroso-1-piperazineethanol CAS 48121-20-6	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		1-nitrosopiperazine CAS 5632-47-3	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
		Heterocyclic organic compounds from solvent degradation				
		Total Amides and Formamides	0.03 mg/m^3	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	EN ISO 21877 Notes 17 and 18
		4-(2-Hydroxyethyl) piperazin-2-one CAS 23936-04-1	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency	
		Piperazin-2-one CAS 5625-67-2	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		1-formyl-4-(2-hydroxyethyl) Piperazine CAS 25209-64-7	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		1-formylpiperazine CAS 7755-92-2	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	
		Other solvent degradation products				
		Formaldehyde	0.07 mg/m^3	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	CEN TS 17638 Notes 17 and 18
		Acetaldehyde	0.20 mg/m^3	Average over the sampling period	Monthly until completion of IC38, then as agreed	CEN TS 17638 Notes 17 and 18

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
					with the Environment Agency Note 23	
		Acetone	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	CEN TS 13649 Notes 17 and 18
		Ethanol	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	CEN TS 13649 Notes 17 and 18
		Acetonitrile	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	CEN TS 13649 Notes 17 and 18
		Acetic Acid	No limit set	Average over the sampling period	Monthly until completion of IC38, then as agreed with the Environment Agency Note 23	CEN TS 13649 Notes 17 and 18
		Other parameters				
		Carbon Dioxide	No limit set	-	Continuous	BS EN 14181
		Oxygen	No limit set	-	Continuous as appropriate to reference	BS EN 14181
		Flow	No limit set	-	Continuous	EN ISO 16911 and MID
		Water vapour	No limit set	-	Continuous as appropriate to reference Note 16	BS EN 14181
		Stack gas temperature	No limit set	-	Continuous	Traceable to national standards

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
					As appropriate to reference	
		Stack gas pressure	No limit set	-	Continuous As appropriate to reference	Traceable to national standards
		Other parameters as required by the Method Implementation Document for BS EN 15259	No limit set	-	Pre-operation and when there is a significant operational change	BS EN 15259
A6d and A6d (flue line) Note 12 Note 13	WGS Stack (Flue gas from FFCU regeneration through SCR, WGS and WESP abatement) and flue line sampling point between WGS and PCC Absorber	Oxides of nitrogen (as NO_2)	50 mg/m^3 Note 15	Yearly average	Continuous	BS EN 14181
		Oxides of nitrogen (as NO_2)	300 mg/m^3 Note X, Note 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Carbon Monoxide	100 mg/m^3 Note 15	Daily average	Continuous	BS EN 14181
		Sulphur Dioxide	50 mg/m^3 Note 15	Yearly average	Continuous	BS EN 14181
		Sulphur Dioxide	600 mg/m^3 Note X, Note 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Particulates	10 mg/m^3 Notes 15	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Particulates	10 mg/m^3 Notes 15	Average over the sampling period	Once in 6 months	Isokinetic EN 13284-1 and MID
		Ammonia	5 mg/m^3 Notes 15, 19, 21	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Metals (Nickel, Antimony and Vanadium) Notes 15	No limit set	-	At least every 6 months or after significant changes to the unit	Direct measurement or analysis based on metals content in the catalyst fines
		Oxygen	No limit set	-	Continuous as appropriate to reference	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
		Flow	No limit set	-	Continuous	EN ISO 16911 and MID
		Water vapour	No limit set	-	Continuous as appropriate to reference Note 16	BS EN 14181
		Stack gas temperature	No limit set	-	Continuous As appropriate to reference	Traceable to national standards
		Stack gas pressure	No limit set	-	Continuous As appropriate to reference	Traceable to national standards
		Other parameters as required by the Method Implementation Document for BS EN 15259	No limit set	-	Pre-operation and when there is a significant operational change	BS EN 15259
A7	ST3501 DHDS feed preheater and reboiler 35 MWth	Sulphur dioxide	35 mg/m^3 Note X	Calendar monthly mean of validated hourly averages	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	150 mg/m^3 Note X	Average over sampling period	Annually	BS EN 14792
		Dust	No limit set	-	-	-
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months	BS EN 15058
A8	ST401 SRU/TGTU	Sulphur dioxide	0.42 t/h Note 9	Hourly	Continuous	Note 1
			1.32 tpd Note 9	Daily		
		Oxides of nitrogen (as NO_2)	No limit set	-	-	-
A9	ST5602 No. 3 Calciner	Sulphur dioxide	Note X	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			0.33 t/h Note 8	Hourly	Continuous	BS EN 14181
		Oxides of nitrogen (as NO_2)	Note X	Calendar monthly mean of	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
				validated hourly averages		
		Dust	150 mg/m^3	Daily	Continuous	BS EN 14181
A10	LCP 64 ST6001 Firing on RFG and Natural Gas 127 MWth	Sulphur dioxide	35 mg/m^3 Note X (600 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous Note 1	BS EN 14181
			600 mg/m^3	Daily mean of validated hourly averages	Continuous Note 1	BS EN 14181
			600 mg/m^3	95% of validated hourly averages within a calendar year	Continuous Note 1	BS EN 14181
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	150 mg/m^3 Note X (200 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			220 mg/m^3	Daily mean of validated hourly averages	Continuous	BS EN 14181
			400 mg/m^3	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
		Dust	5 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			5.5 mg/m^3	Daily mean of validated hourly averages	Continuous	BS EN 14181 Note 2
			10 mg/m^3	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181 Note 2
		Carbon monoxide	100 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards Note 2
A11	ST601 No's 1 and 2 Calciner stack	Sulphur dioxide	Note X	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			0.32 t/h	Hourly	Continuous	BS EN 14181

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
			Note 8			
		Oxides of nitrogen (as NO_2)	No limit set	Hourly	Continuous	BS EN 14181
		Dust	150 mg/m^3	Daily	Continuous	BS EN 14181
A12	ST602 No's 1 and 2 Calciner cooler stack	Dust	150 mg/m^3	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
			230 mg/m^3	Daily	Continuous	BS EN 14181
A13	ST701 GTA-706 Start up stack 41 MWth	Sulphur dioxide	No limit set	Hourly	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	No limit set	Average over sampling period	Annually Note 5	BS EN 14792
		Carbon monoxide				
A14	LSG HDS heater fired on refinery fuel gas 6.5 MWth	Oxides of nitrogen (as NO_2)	100 mg/m^3	Average over sampling period	Annually	BS EN 14792
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months Note 10	BS EN 15058
		Sulphur dioxide	35 mg/m^3	Hourly	Continuous	Note 1
		Dust	No limit set	-	-	-
A15	ST801 Rail loading vapour recovery stack	VOC's	10 g/m^3 Note 3	Hourly average	At least every 6 months	BS EN 12619:2013
		Benzene	<1 mg/m^3	Hourly average	At least every 6 months	BS EN 12619:2013
A16	H4102 (VDU-2) 19 MWth	Sulphur dioxide	No limit set Note X	Hourly	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	No limit set Note X	Average over sampling period	Annually Note 5	BS EN 14792
		Dust	No limit set	-	-	-
A17	H571 HDA reactor charge heater 10 MWth	Sulphur dioxide	No limit set Note X Note 4	Hourly	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	No limit set Note X	Average over sampling period	Annually Note 5	BS EN 14792
		Dust	No limit set	-	-	-
A18	H572 HDA purge tower reboiler 1 MWth	Sulphur dioxide	No limit set Note X Note 4	Hourly	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	No limit set Note X	Average over sampling period	Annually Note 5	BS EN 14792
		Dust	No limit set	-	-	-

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
A19	LCP 263 H6301/2 Firing on RFG and Natural Gas 76 MWth	Sulphur dioxide	35 mg/m^3 Note X (1000 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous	Note 1
		Oxides of nitrogen (NO and NO_2 expressed as NO_2)	150 mg/m^3 Note X (300 mg/m^3) Note Y	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Dust	5 mg/m^3	-	At least every 6 months	BS EN 13284-1 Note 2
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months	BS EN 15058
A20	H6303/4/5 Reformer Furnace 47 MWth	Sulphur dioxide	35 mg/m^3 Note X	Calendar monthly mean of validated hourly averages	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	150 mg/m^3 Note X	Average over sampling period	Annually Note 5	BS EN 14792
		Dust	No limit set	-	-	-
		Carbon monoxide	100 mg/m^3	Average over sampling period	At least every 6 months	BS EN 15058
A21	No 1 Flare	Sulphur dioxide	0.4 t/h equivalent	15 minutes	-	Note 1
A22	No 3 Flare	Sulphur dioxide	0.7 t/h equivalent	15 minutes	-	Note 1
A23	H151 GOHDS feed preheater 4 MWth	Sulphur dioxide	No limit set Note X	Hourly	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	No limit set Note X	Average over sampling period	Annually Note 5	BS EN 14792
		Dust	No limit set	-	-	-
A24	H501 Drier Regenerator Furnace 2 MWth	Sulphur dioxide	No limit set Note X	Hourly	Continuous	Note 1
		Oxides of nitrogen (as NO_2)	No limit set Note X	Average over sampling period	Annually Note 5	BS EN 14792
		Dust	No limit set	-	-	-
A28	AEU PSVs	Benzene	No Release Permitted	-	-	-
		Toluene	No Release Permitted	-	-	-
A29	W801	-	-	-	-	-
A31	D6305 CR2 Regen	VOCs (Class B)	No limit set	-	-	-
		PCDD/F	No limit set	Periodic over minimum 6 hours, maximum 8 hour period	Once a year or once a regeneration - whichever is longer	BS EN 1948 Parts 1, 2 and 3

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
A32	D6004 CR3 Regen	VOCs (Class B)	No limit set	-	-	-
		PCDD/F	No limit set	Periodic over minimum 6 hours, maximum 8 hour period	Once a year or once a regeneration - whichever is longer	BS EN 1948 Parts 1, 2 and 3
A33	ST4401 Amine filtration	Water vapour	No limit set	-	-	-
A34	D5422 Merox CPU	VOCs (Class B)	No limit set	-	-	-
A35	D3609 Merox PRU	VOCs (Class B)	No limit set	-	-	-
A36	Coking/Calciner silo vents and solid handling system vents	Dust	Non visible	-	Daily	-
A37	Hydrocarbon Storage Tank Vents	VOCs (Class B)	No limit set	-	-	Note 6
A38	PSVs/PRVs	VOCs (Class A)	No Release Permitted	-	-	-
		Benzene	No Release Permitted	-	-	-
A39 (Grid reference 515601, 416926)	CO_2 vent stack Note 22	Carbon dioxide	No limit set	-	-	-

Note 1 Continuous calculation of releases based on the method agreed with the Agency. Reference conditions for normalised flow, 3% O_2, dry or 15% O_2, dry for gas turbines.

Note 2 An equivalent monitoring standard/method/technique can be used as agreed in writing with the Environment Agency.

Note 3 Limit does not apply when PSVs 8202/8203/8204 are releasing VOCs.

Note 5 Monitoring required for compliance with reporting condition 4.2.2 (c)

Note 6 Based on the USEPA method 21.

Note 7 The limit does not apply at start up and shutdown.

Note 8 Combined limit of 0.4 t/h of sulphur dioxide from release points A9 and A11 with individual limits not to be exceeded, applies during periods of planned shutdown of Tail Gas Treatment Unit (TGTU).

Note 9 Daily limit applies except for justified periods of planned shutdown of TGTU or planned Sulphur Recovery Unit (SRU) start-ups or shut downs bypassing the TGTU, when informed in advance with the Environment Agency, where hourly limit applies.

Table S3.1 Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	**Source**	**Parameter**	**Limit (including unit)** From 01/11/18	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**

Note X Compliance with the emission limit value or performance standard for this unit can be achieved through inclusion of the unit in the BREF integrated emissions management bubble for SO_2/NOx.

Note Y When complying with the emission limit or performance standard through the BREF integrated emissions management bubble; the emission concentration from the emission point must not exceed the value specified in brackets.

Note Z Lower limit applies when using low sulphur feed (<0.5% w/w sulphur calculated as a monthly average).

Note 10 Monitoring frequency may be reduced to annual with written agreement by the Environment Agency if, after a period of one year, the data series clearly demonstrate a sufficient stability.

Note 11 Emission limits and monitoring requirements apply until the decommissioning of emission point A6b and its replacement with emission points A6c and A6d, as confirmed in response to pre-operational condition PO9.

Note 12 Emission limits and monitoring requirements apply from the start-up of the activities associated with emission points A6c and A6d, as confirmed in response to pre-operational condition PO9.

Note 13 Configuration, location and number of Continuous Emissions Monitoring Systems (CEMS) to be confirmed in response to pre-operational condition PO16.

Note 14 Interim emission limit, applicable up until new emission limits are approved in writing by the Environment Agency, as completion of improvement condition IC36.

Note 15 Emission limit and monitoring requirement apply when emissions are routed through the WGS Stack as the Post Combustion Carbon Capture plant is not operational, unless otherwise stated in other notes.

Note 16 The continuous measurement of the water vapour content of the flue-gas is not necessary if the flue-gas is dried before analysis.

Note 17 The monitoring standard or method shall be in accordance with our guidance for monitoring stack emissions: carbon capture plants with solvent-based abatement (at: Monitoring stack emissions: carbon capture plants with solvent-based abatement - GOV.UK) and our standard monitoring guidance at: Monitoring stack emissions: techniques and standards for periodic monitoring - GOV.UK

Note 18 Isokinetic sampling shall be undertaken unless it is demonstrated that no mist or droplets are present at the monitoring location.

Note 19 Subject to conclusions and approval of pre-operational condition PO16, continuous emissions monitoring of ammonia must take place at least at one monitoring point:

- in the flue line between the Wet Gas Scrubbing (WGS) system and the PCC Plant Absorber (emission point A6d flue line); or
- in the PCC Plant Absorber Stack (emission point A6c).

Note 20 When flue gas is routed through the PCC Plant Absorber, emission limit and monitoring requirement do not apply if continuous monitoring of this parameter is carried out on the flue line from the Wet Gas Scrubbing (WGS) to the PCC Plant Absorber (emission point A6d flue line), according to the conclusions and approval of pre-operational condition PO16.

Note 21 When flue gas is routed through the PCC Plant Absorber, emission limit and monitoring requirement do not apply if continuous monitoring of this parameter is carried out on the PCC Plant Absorber Stack (emission point A6c), according to the conclusions and approval of pre-operational condition PO16.

Note 22 Sources venting through the CO_2 vent stack include: LP vent (unheated, flow controlled), HP vent (heated, flow controlled), export vent (heated, flow controlled) and relief valves.

Note 23 When the monthly sampling carried out over the first year of operation shows that the concentration of this parameter is sufficiently stable and when the environmental risk associated with the emission of this pollutant is demonstrated to be insignificant in response to improvement condition IC38, the operator may propose reduced monitoring frequencies for approval by the Environment Agency. However, the reduced monitoring shall not be less frequent than ‘once in 6 months’.

Table S3.1a Point Source emissions to air – bubble emission limit and monitoring requirements						
Release Points	**Parameter**	**Sources**	**Bubble Limit**	**Reference Period**	**Monitoring frequency**	**Method**
A1-A11 A16-A20 A23-A24	Sulphur Dioxide	FCCU SRUs Calciners Heaters	900 mg/m^3 Note 1	Hourly	Continuous	Note 2
			0.80 t/h			
A1-A11 A16-A24		FCCU SRUs Calciners Heaters Flares	1.13 t/h			
A6a and A6b combined Note 3		LCP 262 and FCCU regenerator	2000 mg/m^3			
			0.33 t/h			
A6d Note 4		FCCU regenerator (WGS stack)	600 mg/m^3			
			0.135 t/h			

Note 1 The limit does not apply during a major refinery shutdown.

Note 2 Continuous calculation of releases based on the method agreed with the Agency. Reference conditions for normalised flow (3% O_2, dry).

Note 3 Emission limits and monitoring requirements apply until the decommissioning of emission point A6b and its replacement with emission points A6c and A6d, as confirmed in response to pre-operational condition PO9.

Note 4 Emission limits and monitoring requirements apply from the start-up of emission points A6c and A6d, as confirmed in response to pre-operational condition PO9.

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

Release Points	Parameter	Sources	Integrated emissions management limit (including unit)	Reference period	Monitoring frequency	Monitoring standard or method
The points specified in the Integrated Emissions Management Technique Protocol 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 Calciners FCCU	Limit as calculated in accordance with approved bubble (mg/m^3)	Monthly average	Continuous	Calculation using the method agreed in writing by the Environment Agency in accordance with agreed Integrated Emissions Management Technique Protocol
The points specified in the Integrated Emissions Management Technique Protocol 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 Calciners FCCU SRUs	Limit as calculated in accordance with approved bubble (mg/m^3)	Monthly average	Continuous	Calculation using the method agreed in writing by the Environment Agency in accordance with agreed Integrated Emissions Management Technique Protocol

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location Note 5	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
W1 emission to Habrough Marsh Drain	South tank farm surface water	Chemical Oxygen Demand	125 mg/l	Instantaneous	Monthly	BS ISO 15705:2002
		Oil	15 mg/l	Instantaneous	Monthly	IP426
W2a/W2b emissions to South Killingholme Drain	Effluent treatment plant and Purge Treatment Unit (combined effluent)	Total daily volume of discharge (Dry Weather)	16,000 m^3	24 hour total	Continuous	MCERTS self-monitoring of effluent flow scheme
		Temperature	32˚C	Hourly	Continuous	Thermometer
		pH	5 – 9	Hourly	Continuous	Meter
		TOC	50 mg/l	Instantaneous	Daily	BS EN 1484:1997
		Chemical Oxygen Demand	125 mg/l (Annual average)	Time related 24-hour composite	Daily	Calculation based on correlation with TOC Note 1
		Suspended solids	25 mg/l (Annual average)	Time related 24-hour composite	Daily	BS EN 872:2005 or as agreed in writing with the Environment Agency
		Hydrocarbon oil index	2.5 mg/l (Annual average)	Time related 24-hour composite	Daily	BS EN 9377 – 2 2002 or as agreed in writing with the Environment Agency Note 2
		Total nitrogen expressed as N	25 mg/l (Annual average)	Time related 24-hour composite	Daily	BS EN 12260
		Phenol index	-	Time related 24-hour composite	Monthly	BS EN ISO 14402 2002 or as agreed in writing with the Environment Agency Note 3

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location Note 5	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
		Benzene, toluene, ethyl benzene, xylene (BTEX)	Benzene 0.05 mg/l (Annual average)	Instantaneous	Monthly	ISO 11423-1 2002 or as agreed in writing with the Environment Agency
		Lead expressed as Pb	0.03 mg/l (Annual average)	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Cadmium expressed as Cd	0.008 mg/l (Annual average)	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Nickel expressed as Ni	0.1 mg/l (Annual average)	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Dissolved Nickel, expressed as Ni Note 4	0.034 mg/l	Spot sample	Fortnightly until completion of IC34, then monthly	BS EN ISO 11885 or BS EN ISO 17294-2 or BS EN ISO 15586
		Mercury expressed as Hg	0.001 mg/l (Annual average)	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 17852
		Vanadium	-	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Oil	5 mg/l	Time related 24-hour composite	Weekly	IP426

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location Note 5	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
		Phenols	0.5 mg/l	Time related 24-hour composite	Weekly	Ion chromatography
		Fluoride	20 mg/l	Time related 24-hour composite	Weekly	BS EN ISO 10304–2
		Cyanide	-	Time related 24-hour composite	Quarterly	ISO 14403
		Chromium	0.25 mg/l	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Copper	0.1 mg/l	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Zinc	0.75 mg/l	Quarterly average of monthly spot samples	Quarterly	EPA 3015 followed by BS EN ISO 11885
		Sulphates Note 4	600 mg/l	Annual average of 24-hour composite flow-proportional samples	Daily	BS ISO 15923-1 or BS EN ISO 10304-1
			1,500 mg/l	Spot sample	Fortnightly	BS ISO 15923-1 or BS EN ISO 10304-1

Table S3.2 Point Source emissions to water (other than sewer) and land – emission limits and monitoring requirements						
Emission point ref. & location Note 5	**Source**	**Parameter**	**Limit (incl. unit)**	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
		Ammoniacal Nitrogen Note 4	5 mg/l	95th percentile of spot samples over a quarter	Daily	BS 6068-2.11 ISO 7150-1 or BS ISO 15923-1 or BS EN ISO 11732
			20 mg/l	Spot sample	Daily	BS 6068-2.11 ISO 7150-1 or BS ISO 15923-1 or BS EN ISO 11732

Note 1: Measurement of TOC and application of a correlation factor used as a surrogate for COD.

Note 2: Internal test method shall be run in parallel with test method (BS EN ISO 9377-2) for up to 12 months adaptation period, whilst quality assurance of the new test method is undertaken. During this time compliance with the limit shall be assessed against the result from internal test method. At the end of the quality assurance period the operator shall confirm in writing that compliance with the hydrocarbon oil index BAT AEL is now assessed using monitoring standard BS EN ISO 9377-2.

Note 3: Test method BS 6068–2.12:1990 shall be run in parallel with test method (BS EN ISO 14402) for up to 12 months adaptation period, whilst quality assurance of the new test method is undertaken. At the end of the quality assurance period the operator shall confirm in writing that monitoring according to BS EN ISO 14402 is now the method used for monitoring phenol index.

Note 4: Emission limits and monitoring requirements apply from the start-up of Purge Treatment Unit (PTU) as confirmed in response to pre-operational condition PO9.

Note 5: Location of emission points and associated sampling points, as shown in Appendix A, Figure 2, of application document titled ‘Environmental Permit Variation Application Main Supporting Document - Phillips 66 Limited, Project number: 296344’ received on 30/01/2024 as part of variation application EPR/UP3230LR/V021.

Table S3.3 Annual limits		
Substance	**Medium**	**Limit (including unit)**
Sulphur Dioxide from A6b Note 1	Air	410 tonnes
Sulphur dioxide	Air	4,500 tonnes
Note 1: Emission limits and monitoring requirements apply until the decommissioning of emission point A6b and its replacement with emission points A6c and A6d, as confirmed in response to pre-operational condition PO9.		

Table S3.4 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 operational plant at the installation, as described in Section 2.2.4 of their application.	VOCs	-	LDAR programme (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 and Natural Gas Monitoring (RFG on-line analyser)	H_2S	Continuous	Continuously sampling chromatographic S gas analyser or Electrochemical cell or as approved by 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	Quarterly	Calculation by method to be approved in writing by 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 versus sulphur outputs.
Sulphur Recovery Units ST401	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% Note 1
Note 1: Compliance with the emission limit value for this unit can be achieved through inclusion of the unit in the BREF integrated emissions management bubble for SO_2.				

Table S3.4 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Specific process monitoring requirements for Post-Combustion Carbon Capture Plant				
Absorber amine solvent quality, activity AR11 in table S1.1	Solvent opacity and colour	Daily (on start-up), then weekly or otherwise agreed in writing with the Environment Agency	As agreed in writing with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Concentration of active amines	Daily (on start-up), then weekly or otherwise agreed in writing with the Environment Agency	As agreed in writing with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Carbon dioxide loading (rich amine)	Daily (on start-up), then weekly or otherwise agreed in writing with the Environment Agency	As agreed in writing with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Foaming tendency	Daily (on start-up), then weekly or otherwise agreed in writing with the Environment Agency	As agreed in writing with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Amine and organic non-ionic degradation products – including but not limited to amines, nitrosamines, nitramines (in absorber amine prior to reclaiming and after reclaiming)	Weekly (on start-up), then monthly in steady-state operation or otherwise agreed in writing with the Environment Agency	Liquid chromatography–mass spectrometry (LC-MS) or as otherwise agreed with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-

Table S3.4 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Absorber amine solvent quality, activity AR11 in table S1.1	Heat stable salts	Every day during the first month of operation then once per week, or otherwise agreed in writing with the Environment Agency	Ionic Chromatography or as otherwise agreed with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Organic acids	Weekly (on start-up), then monthly in steady-state operation or otherwise agreed in writing with the Environment Agency	Ionic Chromatography or as otherwise agreed with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Metals including soluble iron concentration	Weekly (on start-up), then monthly in steady-state operation or otherwise agreed in writing with the Environment Agency	Inductively Coupled Plasma (ICP) or as otherwise agreed with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-
Absorber amine solvent quality, activity AR11 in table S1.1	Soluble iron concentration – rich amine	Every day during the first month of operation then once per week, or otherwise agreed in writing with the Environment Agency.	As agreed in writing with the Environment Agency in accordance with PO18 in table S1.6 of this permit.	-

Table S3.4 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Carbon capture performance, activity AR11 in table S1.1	Carbon capture efficiency (%) during normal operation.	Continuous	Calculation by method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of PO8 in Table S1.6 of this permit.	Note 1
CO_2 metering package	Exported CO_2 mass flow (tonnes/hour)	Continuous	Mass flow metering traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of PO08 in table S1.6 of this permit	-
CO_2 custody transfer point	Composition of exported CO_2, including but not necessarily limited to: • water content • hydrogen content	To be agreed in writing with the Environment Agency	By method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of PO08 in table S1.6 of this permit	CO_2 transport and storage system specification
Venting of CO_2 from PCC Plant (activity AR11) – emission point A39	• Duration of event • Total mass of CO_2 emissions (tonnes / event)	Event specific, total annual	Calculation by method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of PO8 in Table S1.6 of this permit.	The operator shall identify the root cause of the venting event and consider ways to prevent or reduce the frequency and duration of reoccurrence.
Note 1: Instantaneous and annual average Carbon Capture Efficiency to be monitored. Annual average Carbon Capture Efficiency to be averaged over 1 year of operations (from 1st of January) during normal operation, excluding periods of OTNOC. OTNOC includes venting of CO_2 during periods of time when the CO_2 transport and storage system is not available due to causes external to the operations of the installation; and periods of start-up and shut-down.				

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
Emissions to air – sulphur dioxide Parameters as required by condition 3.3.1.	A1-A11, A13 and A16-A24.	Every 3 months	From date of permit issue
Emissions to air – oxides of nitrogen Parameters as required by condition 3.3.1.	A1-A11, A13, A16-A20 and A23-A24	Every 3 months	From date of permit issue
Emissions to air – Dust matter/dust Parameters as required by condition 3.3.1.	A1-A7, A9-A12, A16-A20 and A23-A24	Every 3 months	From date of permit issue
Emissions to air – oxides of nitrogen, sulphur dioxide, carbon monoxide Parameters as required by condition 3.3.1.	A14	Every 12 months	From commissioning of LSG HDS Heater (emission point A14)
Emissions to air – VOCs Parameters as required by condition 3.3.1.	A15	Every 12 months	From date of permit issue
Emissions to air Parameters as required by condition 3.3.1.	A6c, A6d	Every 3 months for continuous monitoring and monthly monitoring	1 January, 1 April, 1 July, 1 October
		Every 6 months for monthly and bi-annual monitoring	1 January, 1 July
		Every year where there is an annual average	1 January
Emissions to air – NOx Parameters as required by condition 3.3.1 and 3.7.1	All emission points specified in the integrated emissions management technique for NOx that is approved in writing by the Environment Agency, in accordance with condition 3.7.1.	Every 3 months	01/11/18
Emissions to air – SO_2 Parameters as required by condition 3.3.1 and 3.7.2	All emission points specified in the integrated emissions management technique for SO_2 that is approved in writing by the Environment Agency, in accordance with condition 3.7.2.	Every 3 months	01/11/18
Emissions to water – oil Parameters as required by condition 3.3.1	W1 and W2a/b	Every 3 months	From date of permit issue
Emissions to water – COD Parameters as required by condition 3.3.1	W1 and W2a/b	Every 12 months	01/01/19

Table S4.1 Reporting of monitoring data			
Parameter	**Emission or monitoring point/reference**	**Reporting period**	**Period begins**
Emissions to water – Flow Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – Temperature Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – pH Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – TOC Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – Suspended Solids Parameters as required by condition 3.3.1	W2a/b	Every 12 months	01/01/19
Emissions to water – Phenols Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – Fluorides Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – Cyanides Parameters as required by condition 3.3.1	W2a/b	Every 3 months	From date of permit issue
Emissions to water – Heavy Metals Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – Mercury Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – Total nitrogen expressed as N Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – Hydrocarbon oil index Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – Phenol index Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – BTEX Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – Vanadium Parameters as required by condition 3.3.1	W2a/b	Every 12 months	From 01/01/19
Emissions to water – Ammoniacal Nitrogen Parameters as required by condition 3.3.1	W2a/b	Every 3 months	1 January, 1 April, 1 July, 1 October
Emissions to water – Sulphates Parameters as required by condition 3.3.1	W2a/b	Every 3 months	1 January, 1 April, 1 July, 1 October
Emissions to water – Dissolved Nickel Parameters as required by condition 3.3.1	W2a/b	Every 3 months	1 January, 1 April, 1 July, 1 October

Table S4.2: Annual production/treatment	
Parameter	**Units**
Road and other transport fuels	**Tonnes**
Non-transport / heating fuels	**Tonnes**
Chemical / petrochemical feedstocks	**Tonnes**
Bitumen / petcoke / other heavy-end products	**Tonnes**

Table S4.3 Chapter III Performance parameters for reporting to DEFRA and other Performance parameters		
Parameter	**Frequency of assessment**	**Units**
Thermal Input Capacity for each LCP	Annually	MW
Annual Fuel Usage for each LCP	Annually	TJ
Total Emissions to Air of NOx for each LCP	Annually	Tonnes
Total Emissions to Air of SO_2 for each LCP	Annually	Tonnes
Total Emissions to Air of CO for each LCP	Annually	Tonnes
Total Emissions to Air of dust for each LCP	Annually	Tonnes
Operating Hours for each LCP	Annually	hr
NOx Factors by fuel type	Annually	Kg/tonne
Crude oil and other hydrocarbons import (i.e. feedstocks)	Annually	Tonnes
Water usage	Annually	Tonnes
Energy usage (electrical)	Annually	MWh
Energy usage (all fuels)	Annually	MJ
Total release of oil to water per tonne of feedstock	Annually	g oil / 1000 tonnes feedstock
Efficiency of CO_2 capture (PCC plant – Activity AR11)	Annually	%
Total (thermal and electrical) energy use per tonne of carbon dioxide captured (PCC plant – Activity AR11)	Annually	Thermal energy: kWth/Tonne CO_2 captured Electrical energy: kWe/Tonne CO_2 captured
Amine solvent usage (PCC plant – Activity AR11)	Annually	Tonnes
Total CO_2 captured (PCC plant – Activity AR11)	Annually	tonnes
Total CO_2 vented to atmosphere (PCC plant – Activity AR11)	Annually	tonnes
Water consumption per unit carbon dioxide captured each year (PCC plant – Activity AR11)	Annually	m^3/tonne
Periods where PCC plant (Activity AR11) is not available	Annually	Number of occasions and cumulative hours for current calendar year
Periods of malfunctioning of SCR, WGS and WESP systems installed to the FCCU Regenerator process - part of activity AR2	Annually	Number of occasions and cumulative hours for current calendar year

Table S4.4 Reporting forms				
Media/ parameter	**Reporting format**	**Starting Point**	**Agency recipient**	**Date of form**
Air	Form Emissions to Air – Emission point A14	From commissioning of LSG HDS Heater (emission point A14)	Area Office	08/03/21
Air	Form Emissions to Air – PCC Plant, emission point A6c	From commissioning of PCC Plant	Area Office	08/03/21
Air, Energy & Operating hours	Form IED AR1 – SO_2, NO_x and dust mass emission and energy	01/04/17	National	31/12/15
Air	Form IED CON 1 – continuous monitoring CEMs reporting for Boilers Only	01/04/17	Area Office	31/12/15

Table S4.4 Reporting forms				
Media/ parameter	**Reporting format**	**Starting Point**	**Agency recipient**	**Date of form**
CEMs	Form IED CEM – Invalidation Log	01/04/17	Area Office	31/12/15
Air	Form IED PM1 - discontinuous monitoring and load.	01/04/17	Area Office	31/12/15
Air – Fuels, Sulphur Balance, SRU performance	Form Air – 5 Refinery fuel analyses (daily average data – RFO, RFG), Refinery Sulphur Balance and SRU availability and efficiency	01/01/08	Area Office	01/01/08
Air – FCCU SO_2, NOx, CO, Dust	Form Air – 6 continuous monitoring or other form as agreed in writing by the Agency	01/01/08	Area Office	01/01/08
Air - Flares	Form Air – 7 Report of the flaring rate and energy loss and SO_2 released from flaring.	01/01/08	Area Office	01/01/08
Air - VOCs	Form Air – 8 Report of VOC losses [following the Institute of Petroleum protocol]	01/01/08	Area Office	01/01/08
Air – VOCs	Form Air – 9 PRV VOC releases	01/01/08	Area Office	01/01/08
Air - NOx Factors	Form Air - 10 NOx factor annual review	01/01/08	Area Office	01/01/08
Air – SO_2 ELVs	Form Air – 11 SO_2 Hourly Stack ELVs and Refinery Bubble	01/01/08	Area Office	01/01/08
Air - NOx	Form Air – 12 NOx IEMT report	01/11/18	Area Office	01/01/19
Air – SO_2	Form Air – 13 SO_2 IEMT report	01/11/18	Area Office	01/01/19
Air - Flares	Form Air – 14 Flaring report	01/11/18	Area Office	01/01/19
Water	Form Water – 1 Daily. Flow, pH, temperature, TOC, Ammoniacal Nitrogen, Sulphates and Dissolved Nickel (W2)	01/01/21 Note 1	Area Office	01/01/08 Note 1
Water	Form Water – 2 Weekly. COD, phenols, fluoride and oil (W2)	01/01/21	Area Office	01/01/08
Water	Form Water – 3 Quarterly Cyanide and Heavy Metals and Ammoniacal Nitrogen (W2)	01/01/21 Note 1	Area Office	01/01/08 Note 1
Water	Form Water – 4 Monthly Oil and COD (W1)	01/01/21	Area Office	01/01/08
Water	Form Water – 5 Annual suspended solids, heavy metals, mercury, total nitrogen, hydrocarbon oil index, phenol index, BTEX, vanadium and sulphates.	01/01/19 Note 1	Area Office	28/10/18 Note 1
Water usage	Form Water Usage1 or other form as agreed in writing by the Agency	01/01/08	Area Office	01/01/08
Energy usage	Form Energy 1 or other form as agreed in writing by the Agency	01/01/08	Area Office	01/01/08
Waste	Form Waste1 or other form as agreed in writing by the Agency	01/01/08	Area Office	01/01/08
Other performance indicators	Form Performance 1 or other form as agreed in writing by the Agency Tables S4.2 and S4.3 indicators.	01/01/08	Area Office	01/01/08

Table S4.4 Reporting forms				
Media/ parameter	**Reporting format**	**Starting Point**	**Agency recipient**	**Date of form**
PCC plant process monitoring (including CO_2 venting) as required by table S3.4 of this permit	Form Process 1 (PCC plant) – process monitoring or other form as agreed in writing by the Environment Agency	From commissioning of PCC Plant	Area Office	08/03/21
Note 1: Reporting of Ammoniacal Nitrogen, Sulphates and Dissolved Nickel to be added to existing reporting form, from the start-up of Purge Treatment Unit (PTU) as confirmed in response to pre-operational condition PO9.				

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	
Name of operator	
Location of Facility	
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 breach of permit conditions not related to limits	
To be notified within 24 hours of detection	
Condition breached	
Date, time and duration of breach	
Details of the permit breach i.e. what happened including impacts observed.	
Measures taken, or intended to be taken, to restore permit compliance.	

(d) 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" (or sour gas) means an offgas that contains high levels of hydrogen sulphide (H_2S)

"Annual average" means average of all daily averages obtained within a year, weighted according to the daily flows.

"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.

"average over the sampling period" means the average value of three consecutive measurements of at least 30 minutes each or as agreed in writing with the Environment Agency.

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

"BATAEL" means the range of achievable emission levels associated with application of the best available techniques.

"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 could have been released when complying with each BREF BATAEL separately.

"calendar monthly mean" means the value across a calendar month of all validated hourly means.

"CAS number" means the unique and unambiguous identifier for a specific substance

"CEM" Continuous emission monitor

"CEN" means Commité Européen de Normalisation

"commissioning" refers to the process of inspecting, preparing, testing and verifying that any new equipment and systems which are part of, or associated with, any activities referenced in schedule 1, table S1.1 of this permit, can be operated within the intended design envelope.

"DSD" means Dangerous Substances Directive.

"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 limit.*.**

"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.

"FCCU" means fluidised catalytic cracking unit.

"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.

"Industrial Emissions Directive" means DIRECTIVE 2010/75/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 on industrial emissions, as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016.

"Integrated emissions management technique" means the principle of delivering compliance with a number of BREF BATAELs for the same pollutant, by setting a single overarching "bubble emission limit".

"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.

"invalid day" means any day in which more than three hourly average values are invalid.

"ISO" means International Standards Organisation.

"hazardous property" has the meaning given in Schedule 3 of the Hazardous Waste (England and Wales) Regulations 2005 No.894 and the Hazardous Waste (Wales) Regulations 2005 No. 1806 (W.138).

"large combustion plant" or "LCP" is a combustion plant or group of combustion plants discharging waste gases through a common windshield or stack, where the total thermal input is 50 MW or more, based on net calorific value. The calculation of thermal input, excludes individual combustion plants with a rated thermal input below 15MW.

"LDAR", means Leak Detection and Repair, a managed scheme and programme for testing potential sources of fugitive emissions, from operational plant at the installation, and repairing or carrying out other actions to prevent, or where that is not possible, minimise continued emissions from those sources. The LDAR programme at the installation shall be consistent with the requirements of the Institute of Petroleum (Energy Institute) Protocol.

"mcr" means maximum continuous rating.

"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.

"Natural gas" means naturally occurring methane with no more than 20% by volume of inert or other constituents.

"ncv" means net calorific value.

"Normal operation" means the range of process conditions that can occur when a process unit is performing its intended duty.

"Offgas" means a gas stream produced by a refinery process

"operational hours" are whole hours commencing from the first unit ending start up and ending when the last unit commences shut down.

"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.

"RFG" means Refinery Fuel Gas: off-gases from distillation or conversion units used as a fuel.

"Sector Guidance Note" means IPPC Sector Guidance Note on Gasification, Liquefaction and Refining Activities, IPPC S1.02.

"SRU" means sulphur recovery unit.

"*SRU performance evaluation*" means measurement of process stream compositions, overall and inter-stage material balances, calculation of overall and inter-stage recovery efficiency, performance check of key equipment items [reaction furnaces, condensers, reheaters, converters (including superclaus), incinerator], key analyser performance checks and recommendations for unit performance improvements [including how to restore recovery to design capability].

"Standard contribution value" means the typical flue gas flowrate multiplied by the typical emission concentration produced by a unit during normal operation, which is specified for the purpose of defining the standard (or typical) contribution of that unit to the monthly calculation of bubble emissions.

"The BREF" means the BAT Reference Document for the Refining of Mineral Oil and Gas published by the European commission 2014/738/EU.

"VOC" means Volatile organic compounds as defined in Article 3(45) of Directive 2010/75/EU - 'volatile organic compound' means any organic compound as 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

"Waste code" means the six digit code referable to a type of waste in accordance with the List of Wastes (England)Regulations 2005, or List of Wastes (Wales) Regulations 2005, as appropriate, and in relation to hazardous waste, includes the asterisk.

"year" means calendar year ending 31 December.

"yearly average" means the average over a period of one year of validated hourly averages obtained by continuous measurements.

Where a minimum limit is set for any emission parameter, for example pH, reference to exceeding the limit shall mean that the parameter shall not be less than that limit.

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

(a) 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

(b) 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

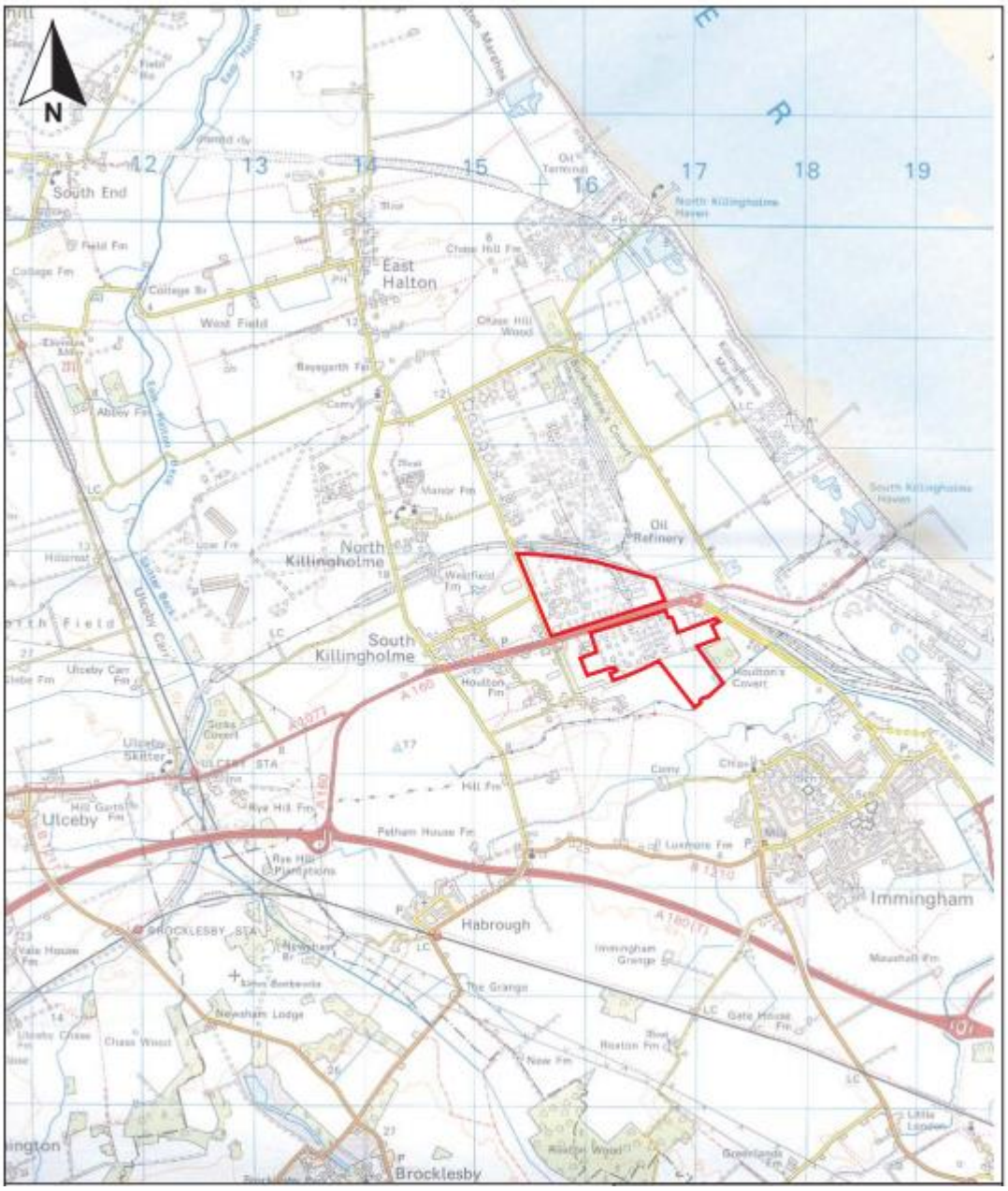
(c) in relation to emissions from non-combustion sources, except (d) and (e) below, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for oxygen or for water vapour content;

(d) in relation to the monthly average emissions of SO_2/NOx from emission point A6b that may be included in the monthly BREF integrated emissions management bubble, 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.

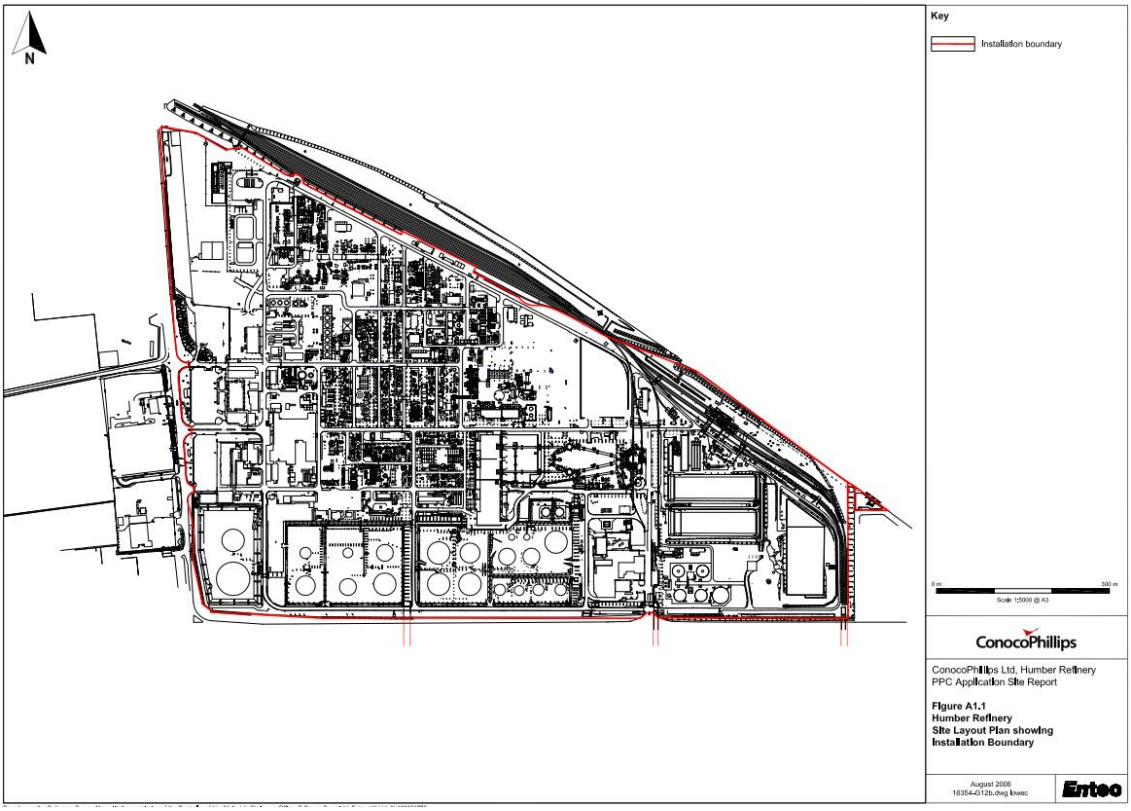
(e) in relation to emissions from the PCC plant, the concentration in dry air at a temperature of 273K, at a pressure of 101.3kPA and with an oxygen content of 3% dry.

Schedule 7 – Site Plan

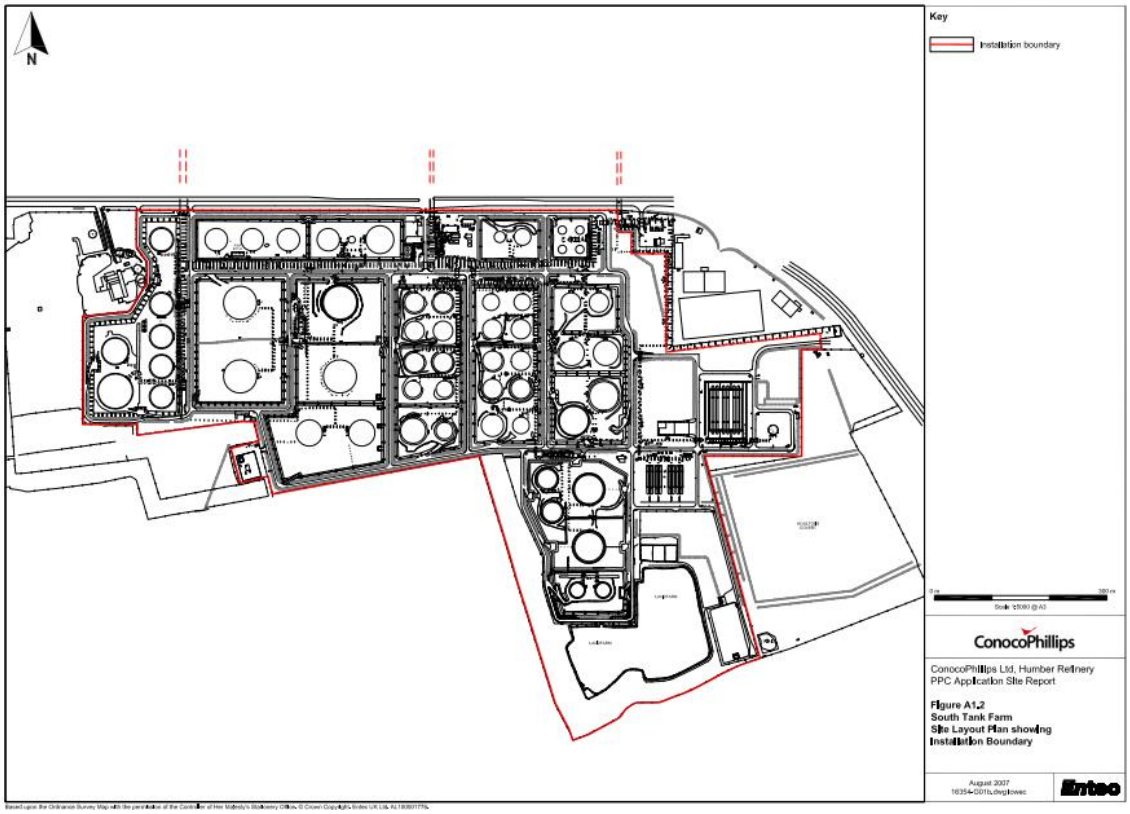
Site location plan



Installation boundary plan A



Installation boundary plan B



End of Permit