

# H2Teesside Project

Planning Inspectorate Reference: EN070009

Land within the boroughs of Redcar and Cleveland and Stockton-on-Tees, Teesside and within the borough of Hartlepool, County Durham

The H2 Teesside Order

Document Reference: 8.34 Summary of Applicant's Oral Submissions at the Issue Specific hearing 3 (ISH3)

The Planning Act 2008



**Applicant: H2 Teesside Ltd**

Date: January 2025

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## 1.0 SUMMARY OF APPLICANT'S ORAL SUBMISSIONS AT THE ISSUE SPECIFIC HEARING 3 (ISH3)

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<b>3. Change Request</b>	
<p><b>In accordance with Regulation 14(2) of the Infrastructure Planning (Compulsory Acquisition) Regulations 2010, the ExA will give an opportunity for any Additional Interested Party or Additional Affected Person, as a result of the accepted CR submitted by the Applicant to amend its Development Order Consent application, to make oral representations on the matters previously discussed at ISH1.</b></p>	<p>N/A</p>
<b>4. The details and the impact of the CR accepted into the Examination</b>	
<p><b>The Applicant will be asked to explain the substantive changes to the design approach as set out within the most recent CR accepted into the Examination and whether these could potentially lead to further changes in design</b></p>	<p>Mr Hereward Phillpot KC, on behalf of the Applicant, confirmed that the Change Request did not involve any substantive changes to the Applicant's design approach. As explained in the Change Request Report (CR1-044) and in Compulsory Acquisition Hearing 2, the changes fall within four categories: Category A relates to engineering and design development; Category B relates to changes to the construction approach; Category C involves reductions in the Order limits, which have principally arisen as a result of engagement with affected persons; and Category D relates to an increase in the Order Limits to enable the Applicant to utilise an existing natural gas pipeline to import natural gas to the Main Site.</p> <p>The Category A changes that relate to engineering and design development are changes 1, 5, 7 and 9. They involve the addition of a second flare stack for Phase 2 of the Hydrogen Production Facility (change 1); the removal of an air separation unit from Phase 1 of the Hydrogen Production Facility (change 5); updates to building dimensions at the Main Site (change 7) and the removal of an AGI within Work Number 2B (change 9).</p> <p><b>Change 1</b> (second flare stack) has arisen as a result of further engineering studies. It will be designed within the same maximum parameters as the Phase 1 flare, which are presented in table 4-1 of Environmental Statement, Chapter 4. In summary, it will have a maximum height of 108m AOD and a minimum height of 73m AOD; a maximum platform diameter of 4m and a maximum flare stack diameter of 1m (see <b>Change Report, para 2.3.3</b>).</p> <p><b>Change 5</b> (removal of air separation unit) has arisen as a result of commercial discussions about the oxygen and nitrogen supply for the Hydrogen Production Facility. Oxygen and nitrogen will now be sourced from a nearby supplier, which removes the requirement for an on-site Air Separation Unit and on-site liquid storage (see <b>Change Report, para 2.3.35</b>).</p> <p><b>Change 7</b> (updates to building dimensions) has arisen as a result of further engineering and technical elements to specific elements of the Development. The maximum building height has increased from 48m above ground level to 51m above ground level and the maximum height of the flash vessels has increased from 58m AOD to 73m AOD (see <b>Change Report, paras 2.3.40 – 2.3.41</b>).</p> <p><b>Change 9</b> (removal of AGI from Work 2B area) has been made as a result of further engineering interface discussions with relevant stakeholders, including Anglo American and NZT Power.</p> <p>None of these changes represent substantive changes to the design <i>approach</i>. As the Applicant had explained (eg response to 1WQs – 1.11.1 question (REP 2-019)), technical, engineering and design work is ongoing. As further technical and engineering information has become available, the Applicant has reflected this by making changes to the</p>

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	<p>application. However, the need for flexibility over the final detailed design remains as set out in the application documents (as explained in section 5 of the Design and Access Statement (APP-034) and is suitably controlled by the DCO, including, for example through Requirement 3 and the Protective Provisions, which we will come on to under agenda item 9. It is not envisaged that the changes brought forward in the CR will themselves lead to consequential further changes.</p>
<p><b>5. Air quality and emissions</b></p>	
<p><b>The ExA will ask the Applicant to:</b></p> <ul style="list-style-type: none"> <li><b>Explain its approach to the assessment of ammonia and acid emissions/ depositions from vehicles in regard to the impact on the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) (See Natural England's (NE) Relevant Representation (RR) [RR-026], Written Representation (WR) [REP2-072] and its Deadline (DL) 4 submission [REP4-028] under NE Key Issues: NE10 (Matter 1) and NE28.</b></li> </ul>	<p>Dr James Riley, Technical Director and HRA and Air Quality Lead, on behalf of the Applicant confirmed that the Applicant had produced a number of technical notes relating to the issues raised by Natural England which had informed the on-going discussions with them and informed the Applicant's updates to the HRA, as well as various iterations of the Report to Inform HRA, the latest version submitted alongside the Change Application Report, at Deadline 5 (REP5-011), and another iteration planned for Deadline 6A. It is the Applicant's view that this iteration of the Report to Inform HRA will adequately address the issues raised by Natural England in their Relevant Representation.</p> <p>With regard to traffic modelling, Dr Riley confirmed that the impacts on traffic modelling are covered in paragraphs 4.2.88 – 4.2.90 (likely significant effects) and paragraphs 6.6.1 to 6.6.12 (appropriate assessment of the HRA) in REP5-011. This covered all pollutants, including acid deposition and ammonia as raised by Natural England, and the Technical Note: Updates to Air Quality and Traffic Cumulative Assessments (REP5-034) presents all of the raw data. Dr Riley detailed several of the tables set out in the HRA report confirming coverage of issues such as ammonia, nitrogen deposition and oxides of nitrogen.</p> <p>The Applicant understands that NE has made written submissions in respect of this agenda item (NE letter of 8 January 2025) which confirms that it will review the most recent technical notes on this matter and provide further feedback at Deadline 6A.</p> <p>Dr Riley referred to Natural England's representation at NE28 regarding Teesmouth and Cleveland Coast SSSI and confirmed that there was no data regarding the SSSI that had not been presented in the documents submitted for Deadline 5 or previously. The Technical Note: Updates to Air Quality and Traffic Cumulative Assessments (REP5-034) and Chapter 23 Cumulative and Combined Effects (REP5-015) present all of the updated modelling relevant to the SSSI. Only the Cumulative Effects assessment has changed.</p> <p>Dr Riley confirmed that the Applicant will produce a Report on impacts to the SSSI at Deadline 7, having considered NE's comments at Deadline 6 (Action Point ISH3-AP3).</p>
<ul style="list-style-type: none"> <li><b>Provide a detailed explanation of how it has addressed the concerns of NE as raised in RR [RR-026], WR [REP2-072] and its DL4 submission [REP4-028] under NE Key Issue NE12, in relation to the "Close Loop" Carbon Capture process and treatment of amine and non-amine emissions including the handling of maintenance phases and any unplanned events that might lead to temporary releases.</b></li> </ul>	<p>By way of introduction and to aid understanding Mr Ross Nickson, Environmental and Social Manager, on behalf of the Applicant, provided a high-level description of the pre-combustion carbon capture process, talking to a process diagram that was shown on screen at the Hearing. He indicated it is worth considering that the process is a 'pre-combustion' carbon capture process. At a high level the process comprises a number of steps namely:</p> <ol style="list-style-type: none"> <li>1. Purification and pre-heating of the natural gas feedstock</li> <li>2. Reforming of the natural gas through the addition of heat, steam and oxygen to produce syngas, which is a mixture of hydrogen and carbon</li> <li>3. Removal of the CO2 from syngas stream using amine-based carbon capture process.</li> <li>4. Compression and purification of both hydrogen and carbon dioxide for onwards transmission</li> </ol> <p>This is fundamentally different to a post-combustion carbon capture process where the carbon is captured from an exhaust gas stream emitted to atmosphere. In this pre-combustion process there is no planned exhaust gas output during normal operations. There are 2 main outputs from the process – carbon dioxide and hydrogen – and both are contained.</p> <p>A similar process has been used to generate 'grey' hydrogen for many years with the resultant CO2 being emitted to atmosphere. It is known to generate a pure hydrogen stream as is required for industrial uses, meaning the majority of CO2 has been effectively separated out. The only difference in the process here is that the resultant CO2 will be captured and compressed for onward transport and storage, rather than emitted to atmosphere. Mr Nickson indicated the Applicant is confident it can achieve levels of purity of the hydrogen of well below 5% CO2 content.</p> <p>As such there are 2 main sources of CO2 emissions during normal operations:</p>

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	<p>1. Small quantities of residual natural gas in the hydrogen sent to consumers;</p> <p>Small quantities of residual natural gas in the hydrogen combusted to generate heat for the process.. Mr Nickson confirmed the removal of CO2 to less than 5% is based on what is achieved in existing processes with some further background given in previous submission AS-040.</p> <p><b>Post hearing note (and in response to Action Point ISH3-AP1): The process diagram produced at the Hearing is appended to this Summary at Appendix 1.</b></p> <p>Dr Garry Gray, Technical Director, on behalf of the Applicant, dealt with the points raised by Natural England in relation to an under-representation of the emission of amines. He confirmed there was a circular process in which amines are used, recharged and reused. There was a small possibility that a small amount of amine could be carried towards the flares in the event of a system closure or during start-up. In this situation hydrogen would be directed to the flare for combustion. Were there to be any trace of amine within that gas stream, it would then be combusted in the flare and not released to atmosphere. Therefore no assessment of amine releases to atmosphere is required for this process.</p> <p>It is important to distinguish the nature of the carbon capture operations associated with hydrogen production from those associated with post-combustion carbon capture on a power station for example, such as NZT or Keadby 3.</p> <p>All emissions to air would be controlled by the Environment Agency via an Environmental Permit, the permit application for which currently has 'duly made' status. However, to provide further reassurance on this point, a permit has been granted by the Environment Agency for the proposed HyNet Hydrogen Production Plant (ref EPR/FP3139FN/V013) which did not require assessment or monitoring of any amine emissions and does not set any emission limit values for amine emissions as it was recognised that none could occur from the hydrogen production process.</p> <p><b>Post hearing note (and in response to Action Point ISH3-AP2): A copy of this permit is appended to this Summary at Appendix 2.</b></p> <p>In its letter to the ExA of 8 January 2025, Natural England has confirmed that it will review the further information submitted by the Applicant and provide any further comments at Deadline 6A. We will continue to engage with Natural England to seek to resolve any outstanding concerns they may have and remain confident that this issue is capable of resolution.</p>
<p>• <b>Explain the controls and measures to be implemented for venting or emergency emissions during maintenance with reference to NE's RR [RR-026], WR [REP2-072] and its DL4 submission [REP4-028] under NE Key Issue NE12.</b></p>	<p>Dr Garry Gray, on behalf of the Applicant, confirmed that a written response to NE12 has been provided at Deadline 5 and response to Q 2.3.4 (REP5-041).</p> <p>In that response the Applicant provide a simple description of controls and measures. The key points for consideration of any potential impacts on designated ecological sites are that amines are not released to air from the process during normal operation and any abnormal releases are not combusted in the flare and are instead collected and reused within the process.</p> <p>In order to prevent NOx emissions to air from flares, BAT is to use flaring only for safety reasons or non-routine operational conditions (e.g. start-ups, shutdowns). The activity of flaring during start-up and shutdown will be controlled as part of the Environmental Permit. The Environmental Permit will include Start-up and Shut-down requirements that the Applicant must comply with.</p> <p>It is also expected there will be a condition that requires the production of an 'other than normal operating conditions (OTNOC)' plan. This will include periods of start-up and shut-down and will need to be agreed with the Environment Agency prior to operation.</p> <p><i>ExA asked for clarity on abnormal releases.</i></p> <p>Dr Gray explained that normal operation describes the plant when it is functioning in the way that it is intended to produce hydrogen. However the plant will need to be shut-down for maintenance or servicing and subsequently re-started, these are non-standard conditions.</p>
<p>• <b>Explain the assessment and approach to waste emissions and the potential impact on</b></p>	<p>Dr Garry Gray confirmed that the Applicant had sought to address the points raised in its Deadline 5 response to NE12 (REP5-51).</p>

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<p><b>protected sites, in particular minimal waste, amine and non-amine wastes or other waste or emissions having regard to the issues raised by NE in its RR [RR-026], WR [REP2-072] and its DL4 submission [REP4-028] under NE Key Issue NE12.</b></p>	<p>In that response the Applicant noted that where amines would be contained in liquid or solid wastes that would be contained and removed from site. These wastes do not represent sources of emissions of amines to air and therefore are not relevant to consideration of impacts at ecological receptors, for which the only viable pathway from source to receptor is via emissions to air.</p> <p>The Applicant awaited any further comments on this issue from Natural England at Deadline 6A and will continue to engage with Natural England to seek to resolve any outstanding concerns they may have on this issue. The Applicant remained confident that it is capable of resolution.</p>
<p><b>• Explain its approach in relation to NE Key Issues NE17 (Nitrogen Deposition) (Matter 1) and NE18 (Operational Emission of Amine and Amine Degradation Products) (Matter 1) and how it is seeking to address the concerns of NE.</b></p>	<p>In relation to Natural England's reference to the Wealden judgment, Mr Hereward Phillpot KC confirmed that the Applicant did not consider this was determinative. The Applicant identified the relevance of the Wealden judgment, but does not depend on the analysis of it.</p> <p>Dr James Riley, on behalf of the Applicant, confirmed that the Applicant's reference to the Wealden judgment (set out in paragraph 6.7.15 of the Deadline 5 HRA) was in relation to the definition of "very small indeed" for nitrogen deposition, which explained that if a contribution was "very small indeed" it could legitimately be excluded for combination assessment. The Wealden case dealt with 0.02 kilogrammes of nitrogen impact per year, which is equivalent to 0.2 of the critical load and is therefore an order of magnitude below the threshold for imperceptibility, which is 1% of the critical load. It is so small and very barely visible in the modelling and is well within the limits of normal variation in average nitrogen deposition rates. Dr James Riley however, reiterated that the Applicant's conclusion was not reliant on this case.</p> <p>Dr James Riley went on to explain that the only location to which that particular text applies is a historic nesting location at South Gare, and as already discussed in the HRA there is no evidence of actual nesting there since 2018. In addition, there are other issues that have an overriding influence on the potential for re-establishing successful tern-nesting including: the extensive recreational disturbance, the need to damage the SSSI dune vegetation and the requirement of bare shingle. Dr Riley confirmed that an area of shingle had been fenced off in 2019 to try and attract nesting, however coastal dynamics made it unsuitable for tern-nesting.</p> <p>Dr Riley confirmed that this will be further explained in the Deadline 6A HRA submission.</p>
<p><b>• Explain what progress there has been in regard to NE's Key Issue NE29 (Teessmouth &amp; Cleveland Coast SSSI and National Nature Reserve - Scope of pollutants considered in the construction and operational assessments) and NE31 (Teessmouth &amp; Cleveland Coast SSSI and National Nature Reserve Air Quality Impact of pollutants at SSSIs, including SSSIs underlying European designations) providing a timescale for progress in relation to this matter.</b></p>	<p>Dr James Riley, on behalf of the Applicant, explained that it had set out its position with regards to the cumulative assessment relating to the SSSI and the in-combination assessment in the HRA in its Deadline 5 submissions, and was awaiting further comments from Natural England.</p> <p>Dr Riley went on to explain that whilst the SSSI and HRA assessments are based on the same modelling they consider different features, as they are designed for reasons. For the HRA, the Applicant has moved information around in response to NE's requests to ultimately conclude no adverse effects on integrity in relation to acid deposition.</p> <p>The SSSI designation relates to its vegetated sand dunes amongst other things. Dr Riley set out that the Applicant's view on SSSI impacts remains that the total nitrogen deposition rate, including for the Proposed Development and other plans and projects cumulatively, will remain lower with the Proposed Development consented than it has been historically. As such, it cannot be argued that the Proposed Development will be harming the rest of the SSSI even by impeding restoration.</p> <p>Dr Riley went on to say that this is particularly the case because the contribution of the Proposed Development is at the level for being dismissed as imperceptible, and is therefore not a significant contributor to the overall nitrogen deposition even cumulatively. Moreover, there are other factors other than nitrogen deposition that will be key to the restoration of the best ecological interest to these dunes, in particular, controlling recreational pressure.</p> <p>In that context, anything that the Proposed Development does beyond what has already been built into the hydrogen production process, to address nitrogen deposition (such as stack heights) is going to have a minor impact on the restoration potential compared to getting a handle on recreation, which there's no indication that pressure is going to be handled.</p> <p>Dr Riley explained that whilst the Applicant understands that Natural England are most concerned with cumulative impacts, the Applicant's contribution to this is so small as to be imperceptible, and it considers that it would not be appropriate for the Applicant to be responsible for any additional mitigation beyond what we've already built into the design of the facility, stack heights, etc, to address the residual effects of the Proposed Development.</p>

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<p>The ExA will ask NE and any other Interested Parties for comment, observations or their views related to the above matters at any appropriate point during this item and the ExA may ask questions</p>	
<p><b>6. Biodiversity, Ecology and Nature Conservation, including Ornithology and Marine Ecology</b></p>	
	<p>Ms Kirstin Aldous, Associate Ecologist, on behalf of the Applicant, provided the following summary of HRA issues outstanding in relation to ornithology:</p> <p>The Applicant is still working with Natural England to resolve concerns about noise and visual disturbance impacting the waterbird assemblage. In the submission Report to Inform HRA, the Applicant discussed impacts upon birds on a sector-by-sector basis. The sectors surveyed are shown on Figure 4 within the Report to Inform HRA. This approach was chosen due to the large area which the Proposed Development covers and the complexity of the construction programme. The Applicant concluded that with timing of works, and mitigation measures (including noise and visual screening in sensitive locations), there would be no adverse effect on the integrity of the Teesmouth and Cleveland Coast SPA and Ramsar.</p> <p>During the course of Examination, Natural England have requested further information on how different stages of the project could impact the waterbird assemblage, through multiple activities occurring in different locations at the same time. It has taken a number of meetings to agree the methodology to be undertaken to provide this.</p> <p>The Applicant has completed additional work to assess this issue which will be presented in Annex J of the Deadline 6A iteration of the Report to Inform HRA.</p> <p>To calculate the percentage of the waterbird assemblage which could be disturbed, the Applicant has summed the monthly peak counts of waterbirds in the ornithology count sectors where construction will occur. The Applicant has then considered if the whole of the sector will be impacted, or just a proportion of the sector, and reduced the bird numbers proportionately. Finally, the Applicant has considered the reductions in affected bird numbers which could be achieved with mitigation applied in the form of noise and visual screening. Timing of works to avoid the most sensitive periods has been embedded into the construction programme wherever possible. However, as the waterbird assemblage is a year-round feature, it is not possible to time works to avoid birds completely.</p> <p>The updated HRA to be submitted at Deadline will outline an indicative programme for the Proposed Development. The outline programme shows that there are temporal overlaps between the construction taking place at the Main Site and the River Tees Crossing. There is also potential for work at Cowpen Bewley to overlap with work at the Main Site and Tees Crossing, and work at the Brinefields and Greatham Creek to overlap with the work at the Main Site and the River Tees Crossing.</p> <p>Some of the highest bird counts have been recorded at Bran Sands Lagoon, Dabholm Gut and the mudflats on the north bank of the River Tees.</p> <p>To minimise disturbance, the Application proposes to use rotary piling rather than percussive piling on the Main Site; piling is not required in any other parts of the Site. This will be secured within an update to the FCEMP submitted at 6A alongside the HRA. On the current outline programme, piling is proposed to take place between April and July 2026 on the Main Site and the above ground works for the Tees crossing is proposed to take place between October 2026 and November 2027 so there will be no overlap between these activities taking place. This lack of overlap will be secured in the FCEMP submitted at Deadline 6A. Noise and visual screening are proposed during construction to minimise disturbance of Bran Sands Lagoon, Dabholm Gut and Vopack Foreshore. The effects of this mitigation have been modelled and will be shown in Figures within the updated Report to Inform HRA. In addition, a technical note has been prepared in response to relevant representation NE5 with additional information on the predicted indicative L<sub>max</sub> noise levels.</p> <p>As Greatham Creek is important to both breeding and non-breeding birds, the most disturbing activities have been restricted to a three-month window between September and November. The Brinefields and Cowpen Bewley areas are mainly used by wintering birds, so works are proposed to take place between May and September in these areas. Figures 14a and 14b within the HRA show the seasonal restrictions and proposed locations for noise and visual screening and the measures are secured by the Framework CEMP.</p>

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	<p>Overall, the Applicant considers that with the careful timings of work embedded into the construction programme, and with additional mitigation in the form of noise and visual screening, there will be no adverse effect on the integrity of the Teesmouth and Cleveland Coast SPA and Ramsar as a result of noise and visual disturbance of waterbirds.</p>
<p><b>The ExA wishes to explore/ examine the following matters:</b></p> <ul style="list-style-type: none"> <li><b>NE maintain that further specific information is required regarding the treatment, pathways and composition of effluent streams (both aerial and liquid) before it can agree with the conclusion of No Adverse Effect on Integrity (AEOI) in relation to its Key Issues NE18 and NE20. NE advise that these impacts remain to be assessed alongside any exacerbating effects of reduced water availability before any mitigation measures can be identified and agreed. The ExA will ask the Applicant to advise on progress concerning/ resolving these matters, explaining what is being done to address/ satisfy NE in this regard, and providing timescales for reaching such resolution/ agreement on these matters.</b></li> </ul>	<p>Ms Tamara Percy, Technical Director, on behalf of the Applicant confirmed that in relation to Relevant Representation NE18, this is related to the closed-loop process discussed earlier in this Hearing. Similarly, NE12 was addressed under Agenda Item 5.2.</p> <p>Regarding Natural England's representation at NE20, Ms Tamara Percy confirmed that this related to nutrient neutrality and it is reported in the Statement of Common Ground with Natural England (REP5-056) that this matter is now agreed following the provision of further information from the Applicant.</p>
<ul style="list-style-type: none"> <li><b>With regard to Impacts to Teesmouth and Cleveland Coast SPA/Ramsar/SSSI and Functionally Linked Land (FLL), NE maintains it is concerned in regard to the applicant's methodology when considering impacts from the development on protected bird species and assemblages and advises it cannot agree with the applicant's conclusion of no AEOI, as presented in the Report to Inform an HRA. (See NE's Key Points: NE2, NE5, NE6, NE7 &amp; NE8).</b></li> </ul> <p><b>NE also advises the scale of the loss of FLL was unclear (NE Key Point: NE3) with it pointing out although direct loss of habitat from the Teesmouth and Cleveland Coast SPA is to be avoided by utilising Horizontal Directional Drilling (HDD), there remains the</b></p>	<p>Ms Kirstin Aldous, on behalf of the Applicant, dealt with Natural England's points in turn, beginning with an approach to NE1, the Risk of HDD Collapse/Leakage of Drilling Fluid to SPA Sites has been agreed (matter closed) (REP5-05)].</p> <p>In Relevant Representation NE2, Natural England requested further information on how different stages of the project could impact the waterbird assemblage, through multiple activities potentially occurring in different locations at the same time.</p> <p>As discussed above, the Applicant held discussions with Natural England on the 26 November 4 December and 10 December 2024 to agree an approach to resolve this issue. As part of these discussions, the Applicant provided an indicative construction programme to demonstrate that works are not likely to occur across all parts of the Proposed Development simultaneously. The Applicant has agreed an approach to assess potential impacts on waterbirds from works occurring simultaneously and is collating the peak counts each month with reference to the programme. These will then be compared to the overall waterbird assemblage which is 26,014 birds through an assessment methodology agreed with NE.</p> <p>This information will be presented in the HRA submitted at Deadline 6A which will demonstrate No Adverse Effect on Integrity.</p> <p>Although there is the potential for the Proposed Development to disturb birds at multiple locations, the construction programme has been designed to avoid the most sensitive periods for qualifying bird species. Furthermore, mitigation in the form of acoustic barriers and visual screening is proposed to reduce noise and visual disturbance at sensitive locations to acceptable levels.</p>



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<p><b>potential for direct loss of habitat in the event of HDD collapse.</b></p> <p><b>The Applicant will be asked to provide the ExA with an update in regard to progress on the NE Key Points listed above, including whether reaching a resolution is possible within the remaining Examination period and, if so, the expected timescales for such resolution</b></p>	<p>In Relevant Representation NE3, Natural England have requested clarification on the extent of temporary and permanent habitat loss within functionally linked land for birds. They have also requested further information on the specific function of the land to SPA birds.</p> <p>The Applicant has responded to these comments at D5 (in the updated HRA and REP5-051). Figures 16a and 16b show the extent of functionally linked land that intersects with the Proposed Development Site and the Applicant's Deadline 5 response summarises how birds use this land. The report to inform HRA has also been updated to clarify this information.</p> <p>NE is yet to review this information but has indicated that it will do so by 22 January 2025. The Applicant will continue to engage with NE on this issue.</p> <p>In Relevant Representations NE5 and NE6, Natural England have requested further information on impulsive noise and the effectiveness of mitigation. Natural England have advised that measurement of a maximum level is necessary to assess the loud bangs and impulsive noise that can disturb non-breeding waterbirds during construction and operation.</p> <p>The Applicant has reviewed the list of plant to be used to confirm sources of impulsive noise. Additional noise modelling has been completed to model the reductions in noise that can be achieved with mitigation, and the results will be accounted for in the Deadline 6A Report to Inform HRA. The Applicant considers that with mitigation, noise at sensitive locations can be reduced to acceptable levels so no adverse effect on integrity is caused.</p> <p>In Relevant Representation NE7, Natural England have requested further information to quantify operational visual disturbance sources. Disturbance within the Main Site will be limited once the Proposed Development becomes operational. Typical activities will include the arrival and departure of site staff; the average daily operational traffic will comprise fewer than 15 Heavy Goods Vehicles (HGVs) and approximately 50 light vehicles during regular operations. Some external lighting would be required to ensure that the Hydrogen Production Facility can operate safely at all times. It would be at the appropriate luminance required to provide safe working conditions. Lighting would be designed, positioned and directed to prevent or minimise light disturbance to sensitive receptors (human and ecological) and low-energy fittings would be used where possible – this is secured through the operational lighting strategy pursuant to DCO Requirement 6.</p> <p>The Applicant notes that land within and surrounding the Main Site has been subject to anthropogenic disturbance historically as it was the site of the former Redcar Steel Works. There are ongoing industrial activities within Teesworks including demolition and site remediation activities and movement of materials and machinery. As such, the bird assemblage in this area is likely to be habituated (to some extent) to the industrial landscape and activity. As such, visual disturbance during operation is anticipated to be lower than that historically or currently experienced within the site.</p> <p>Operational requirements in the pipeline corridor will be limited, requiring arrival by LGV and walkover visual inspection. Plant or equipment would, in the main, not be required, but there may be isolated incidents where unplanned/emergency repair is required where they may be necessary. Such isolated activities would not lead to likely significant effects.</p> <p>Based upon the above information, the Applicant has concluded there would be no Likely Significant Effects upon the Integrity of the Teesmouth and Cleveland Coast SPA and Ramsar as a result of visual disturbance during operation.</p> <p>In Relevant Representation NE8, Natural England has requested further information on how sight lines (for birds) from the blast furnace pool could be impacted. The Applicant prepared a technical note submitted at D5 to address this Relevant Representation which was appended to REP5-051. The Applicant has concluded that there will be no adverse effect on site integrity from disruption of flight lines to and from the blast furnace pool.</p>
<p><b>• The ExA has noted NE's Key Action Points NE14 (Clarification of the in combination assessment process) and NE19 (Teesmouth and Cleveland Coast SPA/Ramsar Site (Construction and Operation) In-</b></p>	<p>Ms Kirstin Aldous, on behalf of the Applicant, confirmed that Natural England had not yet reviewed the updated information provided by the Applicant at Deadline 5. In relation to NE14, Ms Aldous explained that Paragraph 5.1.4 and Table 5-1 within the Report to Inform HRA were updated at Deadline 5 to assess the potential for Likely Significant Effects (LSE) from the Proposed Development in conjunction with other plans/projects. Table 7-1 was also been updated to include additional projects and now provides a comprehensive summary of potential 'in-combination' effects.</p>

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<p>combination assessment) and that it "...has taken an action to review and confirm what project information is needed to achieve the requested, additional in combination assessment work." [REP4-028]. The ExA would ask NE for an update in regard to the above and a timeline for clarification on this matter. The Applicant will be asked to respond.</p>	
<p>• The ExA notes NE's DL4 submission [REP4-028] and its update regarding NE's Key Points NE15 (Internationally Designated Sites Process followed in the Habitats Regulation Assessment) and NE26 (North Northumberland Coast Special Area of Conservation (SAC), The Humber Estuary SAC and the Wash and North Norfolk Coast SAC - Noise disturbance – Seals). The ExA will ask the Applicant for an update in regard to these NE Key Points, including whether reaching a resolution within the remaining Examination period is possible and, if so, the expected timescales for such resolution.</p>	<p>Ms Tamara Percy, on behalf of the Applicant, confirmed that at NE15 Natural England had requested further information on the Applicant's approach to air quality within the HRA. This was addressed at Agenda item 5.1.</p> <p>Ms Percy continued, NE26 is in relation to potential effects on Seals and the Applicant will submit a Technical Note by Deadline 6A in response to the two rounds of comments provided by Natural England on 29th October 2024 and 19th November 2024. The updated approach using Natural England's suggested methodology, still highlights the minimal potential for disturbance to seals during the HDD works. Therefore, additional monitoring of noise and seal behaviour before and during the works is not considered necessary.</p>
<p>• The ExA notes NE's current position regarding its Key Points NE34 (Biodiversity Net Gain (BNG)) and NE35 (Soils/ Best and Most Versatile land) and would ask the Applicant to provide an update on progress in regard to these Key Points, including whether reaching a resolution within the remaining Examination period is possible and, if so, the expected timescales for such resolution.</p>	<p>Ms Tamara Percy, on behalf of the Applicant, explained that in relation NE34, the Applicant was exploring opportunities for biodiversity enhancements and habitat improvements within Teesside. Discussions are ongoing with various stakeholders, including local trusts, environmental authorities, and conservation organisations. The aim is to deliver a strategic biodiversity enhancements that benefit both habitats and species. These enhancements are not a legal or planning requirement for the project and will not be submitted for consideration in the Examination. Instead, they are being pursued voluntarily as part of the Applicant's commitment to responsible development.</p> <p>Further to discussion at the Hearing Mr Hereward Phillpot KC confirmed that an update on these matters will be reported by Deadline 8 of the Examination at the latest, but re-emphasised that the Applicant does not seek to rely on the delivery of these enhancements for its planning case.</p> <p>Regarding NE35, the Applicant has provided a detailed response to Natural England at Deadline 5, appended to REP5-051. This response has provided a number of clarifications with regards to the ALC Grade and current land use of different areas of the Proposed Development. Based on the information presented, the Applicant does not consider an ALC Survey to be required and understands NE now agree this.</p>
<p>• The ExA notes that none of NE's submissions [RR-026], [REP2-072] or [REP4-028] appears to include NE's Key Point NE30 and would seek clarification from NE in this regard.</p>	<p>Mr Hereward Phillpot KC, on behalf of the Applicant explained that clarification was received from Natural England on 6 January 2025 and the Applicant confirmed NE30 was a numbering error on their part and does not exist.</p>

Agenda Item	Applicant's Response
<p>The ExA will ask NE and any other Interested Parties for comment, observations or their views related to the above matters at any appropriate point during this item and the ExA may ask questions.</p>	
<p><b>7. Climate Change</b></p>	
<p>• In the light of Climate Emergency Planning and Policy's DL4 submission [REP4-038], the ExA would ask the Applicant for a detailed explanation of the 95% capture rate of the Proposed Development, including its assessment and the evidence basis, and in particular the assumptions relating to the 5% unabated carbon dioxide emissions</p>	<p>Dr Adrian Mallory, Principal Sustainability Consultant, on behalf of the Applicant explained that as detailed in the Environmental Statement (APP-072), the Proposed Development is assumed to operate at a 95% carbon capture rate. This capture rate will be regulated via the Environmental Permit and is fundamental to the business case through its impact on the low hydrogen standard compliance. The Proposed Development is designed to capture 97.1% of carbon, which will be published in the Environmental Permit consultation for the Proposed Development. 95% has been selected for the assessment as a reasonable worst case. The reason for this is that the Environmental Agency's guidance on blue hydrogen production sets out that any blue hydrogen production facility should be capturing 95% of carbon as a minimum. The Applicant approached this by taking the hourly emission rates from the design team and this was scaled up to annual figures by assuming a constant annual runtime of 8,760 hours per year. These are detailed in table 19-7 to 19-9 of the Environmental Statement.</p> <p><i>ExA shared a submission received by the Environment Agency which explained that in deciding whether to grant the Environmental Permit, the Environment Agency will set conditions in line with its Emerging Techniques guidance. The EA also confirmed its view that the carbon capture rate should be a matter for the Environmental Permit and is not required to be duplicated in the DCO.</i></p> <p>Mr Hereward Phillpot KC, on behalf of the Applicant, confirmed the ExA's position was consistent with the Applicant's submissions throughout. He also highlighted the Applicant's detailed response to ExQ1.5.6 (REP2-023). The scenario of 95% Carbon Capture is considered as achievable in line with EA guidance on Best Available Technology (BAT) Carbon Capture (Post-combustion carbon dioxide capture: emerging techniques, Environment Agency, 2021) and hydrogen production (Hydrogen production with carbon capture: emerging techniques, Environment Agency, 2023) and therefore can be assumed to be controlled through the Environmental Permit in due course. This level of carbon capture is also supported by current scientific literature (Brandl et al., 2021) (Q1.5.6).</p> <p>Mr Hereward Phillpot KC concluded by explaining that the Applicant did not know when the Environment Agency would commence the permit consultation, but should this be prior to the end of examination, a copy would be submitted <b>Post Hearing Note:</b> As at Deadline 6A, the permit consultation had not yet begun.</p>
<p>• The EA will be asked to explain the mechanism by which the EP will ensure the monitored carbon capture rate does not exceed the 95% threshold.</p>	<p><i>The Environment Agency was not in attendance.</i></p>
<p>• The ExA notes the draft SoCG with the Environment Agency (EA) [REP4-019], which if signed/ dated, would confirm it is agreed that the 95% capture rate will be monitored by the Environmental Permit. However, irrespective of previous submissions on this matter, including oral submissions at ISH2, the ExA would ask the Applicant to further explain why the proposed Development</p>	<p>Mr Hereward Phillpot KC, on behalf of the Applicant, confirmed that In respect of (i), at Deadline 5 the Applicant has included drafting in the DCO which achieves the same objective as the drafting in Keadby 3 and NZT which is that the hydrogen production facility must be <i>designed</i> to capture a minimum rate of 95% of the carbon dioxide emissions of each hydrogen unit operating at full load.</p> <p>The wording that is used for all projects is the same, with the approach only differing as follows:</p> <p>For Keadby 3 and NZT, the reference is to the '<i>generating station</i>' operating at full load and his reflects that they are both electricity generating stations and H2T is a hydrogen production facility.</p>

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<p><b>should be distinguished from other similar Development Consent Orders, such as Net Zero Teesside (NZT) and Keadby 3 (both Combined Cycle Gas Turbine), where:</b></p> <p><b>i) the required Carbon Capture Rate was included in Article 2 (interpretation) of the Development Consent Order (DCO). See Article 2 (interpretations) 'Carbon Capture Plant' in relation to the NZT DCO) and Article 2 (interpretations) 'Carbon Capture and Compression Plant of the Keadby 3 DCO;</b></p> <p><b>ii) a Requirement (Requirement 31 related to NZT and Requirement 33 related to Keadby 3) was included within the DCO that prevented critical elements of the Proposed Development not being brought into commercial use without other critical elements related to Carbon Capture and its transportation also being brought into commercial use.</b></p>	<p>For Keadby 3 and NZT, the wording was added to the definition of 'carbon capture and compression plant' or 'CCP', respectively; not directly into Schedule 1, as was done for H2T. This is because Keadby 3 and NZT, being post combustion carbon capture, had specific separate pieces of equipment involved in the carbon capture process where the carbon capture rate would be achieved. These specific pieces of equipment were separate Schedule 1 Works Numbers to the main CCGT 'turbine plant'. Mr Hereward Phillpot KC explained that by contrast, H2T involves pre-combustion carbon capture, meaning that the process of carbon capture happens as part of the wider hydrogen production process within the same facility, which is why the different aspects of the process are listed under each of Work No. 1A.1 and Work 1A.2. As such it is appropriate for the overall hydrogen production facility to be designed to capture 95%.</p> <p>The key point is that the same end result is achieved across all projects, and the differences in drafting approach do not affect that.</p> <p>In respect of (ii), Mr Hereward Phillpot KC confirmed that the Applicant notes that the practical position for H2T is different than it was for NZT and Keadby 3 for the following reasons:</p> <p>Northern Endurance Partnership is the Transport and storage network that H2T will connect into and:</p> <ul style="list-style-type: none"> <li>• the onshore carbon gathering network was consented through the NZT DCO;</li> <li>• the offshore carbon pipeline and associated store (known as 'Endurance') has now been consented by the NSTA; and</li> <li>• FID has been taken on all aspects of the NEP scheme.</li> </ul> <p>Keadby 3 is due to connect to a further gathering network that has not yet advanced beyond statutory consultation, so was in a vastly different place compared to H2T. There is therefore very little doubt that the carbon storage sites are coming forward and will be available to serve the Development.</p> <p>Finally, as also set out in the responses to CEPP, there is no need to duplicate the permitting regime, which has been developed by the EA to deal with the carbon capture position.</p> <p>In section 5.2 of the Applicant's response to CEPP's WR (AS-040), it is set out that the permitting regime is the appropriate method of control for carbon capture, as it is in Keadby and Net Zero Teesside. The DCO should not duplicate controls that can be imposed through the permitting regime. In section 7 of the Applicant's comments on deadline 3 submissions (REP5-051) it is set that there is no precedent of a carbon capture rate being required or secured in a DCO draft, instead the interpretation section of those DCOs describe the developments as being designed to achieve a particular capture rate. Therefore there is no need or precedent for the capture rate to be secured in the DCO given the existence and effect of the environmental permitting regime. Similarly there is no need to prevent hydrogen units being brought into commercial use without the export pipeline being connected to a storage site, as this is also controlled by the permitting regime.</p> <p>Notwithstanding the Applicant's position that it is unnecessary, it has provided without prejudice drafting in response to WQ 2.9.7 which provides that no part of Work 1A.1 or 1A.2 (Hydrogen facility) may be brought into commercial use following commissioning without Work No.7 (carbon dioxide export pipeline) being brought into commercial use (following commissioning) and being connected to an operational carbon dioxide storage site.</p>
<p><b>The ExA may ask the EA and any other Interested Parties for comment, observations or their views related to the above matters at any appropriate point during this item and the ExA may ask questions.</b></p>	<p><i>No further questions.</i></p>
<p><b>8. Geology, Hydrogeology and Land Contamination</b></p>	

Agenda Item	Applicant's Response
<p>The ExA will ask the Applicant and relevant Local Authority/ Authorities to provide an update with regard to the EA's observations [REP3-010] concerning land registered under Part 2A of the Environmental Protection Act 1990 in the location formerly referred to as the Seal Sands Chemical Company and the implications of this in relation to the Proposed Development. This update must include an update in regard to any discussions with Stockton-on-Tees Borough Council (STBC) and or other relevant bodies.</p>	<p>Mr Hereward Phillpot KC, on behalf of the Applicant, confirmed that the Applicant had provided a response to written question on this matter at Deadline 5.</p> <p>The question was WQ2.10.1 and the Applicant confirmed that following the provision of further information from Stockton-on-Tees Borough Council and the Environment Agency, that the Proposed Development did not overlap with any part of the land currently being investigated under Part 2A of the Environmental Protection Act 1990. The Applicant had prepared a plan displaying the Order Limits of the Proposed Development in relation to the investigation area, this can be found at Appendix 1 of REP5-046.</p> <p><b>Post Hearing Note (and in response to Action Point ISH3-AP3)</b> – Further to the discussion at the Hearing drawing attention to the EA's Deadline 5 submission, agreed to by STBC, that there could still be a contamination issue even if there is no physical overlap of the Order limits with the land being investigated, the Applicant has responded to this in its Response to Deadline 6 Submissions document also submitted at Deadline 6A.</p>
<p>The ExA may ask the EA and any other Interested Parties for comment, observations or their views related to the above matters at any appropriate point during this item and the ExA may ask questions.</p>	
<p><b>9. Design, Landscape and Visual Considerations</b></p>	
<p>The ExA will ask the Applicant to:</p> <ul style="list-style-type: none"> <li>• Outline the impact of the Change Request accepted into the examination in regard to the landscape and visual assessments, including the selection of viewpoints and the effectiveness of the photomontages entered into the Examination.</li> <li>• Explain and provide an update on the progress of the design process to date.</li> <li>• Explain the measures incorporated into the Proposed Development to secure the highest possible design quality, including the effectiveness of Requirement 3 of the draft DCO in securing a high quality of design and enhancement to the environmental quality of the surrounding area.</li> <li>• Explain what design work(s), illustrative or otherwise, related to the potential</li> </ul>	<p>Ms Tamara Percy, on behalf of the Applicant responded to the ExA's bullet points as follows:</p> <p><b>First Bullet Point - Change Request</b></p> <p>The Environmental Statement at Chapter 16: Landscape and Visual Amenity (APP-069), which formed part of the Original Environmental Statement, was re-examined in relation to the Proposed Development changes (as outlined in the Change Application Report (CR1-44)). The updated assessment is contained with Appendix 5A Landscape and Visual Amenity (CR1-045). It is considered that <b>Changes 2, 5 and 6</b> would not alter the outcomes of the landscape and visual amenity assessment, as reported in the Original ES, as they involve minor reductions in Order Limits, construction activities, and building dimensions.</p> <p>In relation to viewpoints, the changes did not prompt any party to suggest any changes to viewpoints (which remained and continue to remain as agreed in the ES). It was considered that none of the Proposed Development Changes require additional viewpoints or alteration to the representative viewpoints as presented in the Original ES due to the location of the changes in relation to the Proposed Development and existing representative viewpoint locations.</p> <p><i>Effectiveness of photomontages</i></p> <p>Ms Percy explained that the photomontages were prepared in line with Landscape Institute Technical Guidance Notes and other relevant legislation, policy and guidance as listed in ES Chapter 16: Landscape and Visual Amenity (APP-069). The photomontages were prepared for representative viewpoint locations from where likely significant effects are identified.</p> <p>The photomontages are effective at illustrating the size and scale of the proposed geometry within the photography from those viewpoints. This is achieved by positioning a virtual camera in the 3D software according to the same real-world position as the height. The camera is set up to match the field of view as the stitched panorama that is then</p>

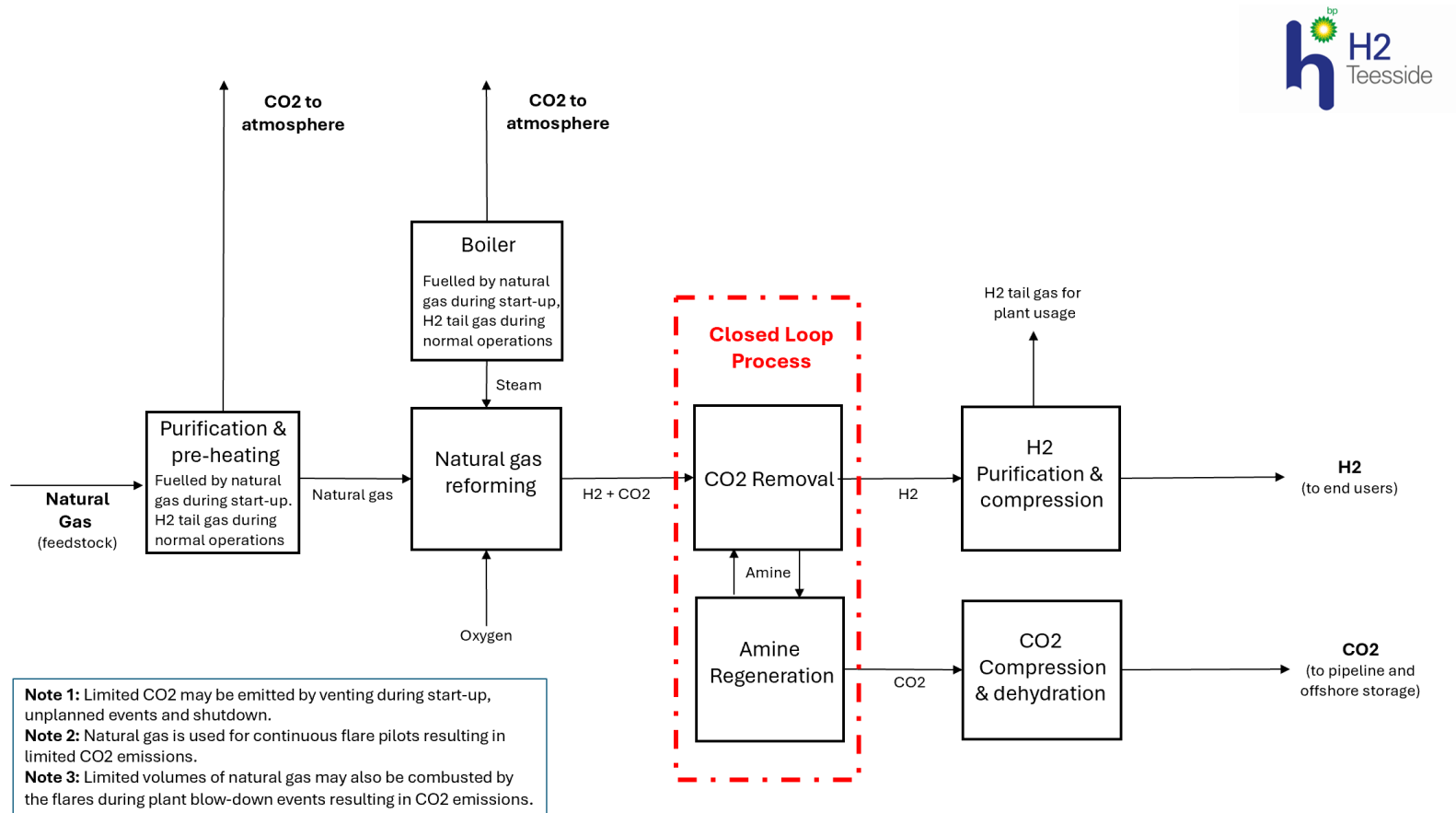
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<p><b>alternative site for Phase 2, in the location of the current proposed HyGreen development, has been undertaken and highlight where that design work has been submitted into the Examination</b></p> <p><b>• Explain the effectiveness of Requirement 4 of the draft DCO to ensure a high quality and effective landscaping and biodiversity scheme.</b></p>	<p>seen and proposed design is modelled and placed within that correct geo-reference position so the resulting images show the Proposed Development at the correct size and scale within the background photography as would be experienced from the receptor at that view.</p> <p><b>Second Bullet Point - Explain and provide an update on the progress of the design process to date</b></p> <p>In relation to the second bullet point, Mr Hereward Phillpot KC confirmed that as discussed at CAH1 and 2, the Applicant will continue to discuss the design with Interested Parties as it evolves, pursuant to the Protective Provisions.</p> <p>The DCO design has been informed by an Early Pre-Front End Engineering Process (FEED) process. The Applicant is currently undertaking FEED design and the Applicant is working with its contractors on a FEED Scope of Works.</p> <p><b>Third Bullet Point - Requirement 3</b></p> <p>Mr Hereward Phillpot KC, on behalf of the Applicant, explained that Requirement 3 provides that no part of the authorised development comprised in Work Nos. <b>1</b> (the carbon-capture enabled hydrogen production facility); <b>4</b> (water supply connection works); <b>5</b> (wastewater disposal works); <b>7A</b> or <b>7B</b> (carbon dioxide export pipeline works) may commence (save the permitted preliminary works); until details of certain specified matters, including siting, layout, scale, external appearance, colour, materials and finishes have been submitted to and, after consultation with STDC, approved by the relevant planning authority.</p> <p>In addition to consultation with STDC, Work Nos. <b>3</b> (electrical connection including associated AGIs); <b>6A.1</b>; <b>6A.2</b> (hydrogen gas pipeline); <b>6B.1</b>; <b>6B.2</b> (AGIs relating to works 6A.1 and 6A.2) and <b>8</b> (gas connections) may not commence until details of specified matters which include, where relevant (eg. in respect of the gas AGIs in Work No. 2B), appearance, colour, materials and finishes have been subject to consultation with Sembcorp and Work Nos. <b>2A</b>(gas pipelines) and <b>2B</b> (AGIs associated with the gas pipelines) must be subject to consultation with STDC, Sembcorp and the NSMP entities prior to approval.</p> <p>The relevant planning authority is Redcar and Cleveland Borough Council (RCBC). As a matter of general principle, when considering the imposition of requirements the Secretary of State should proceed on the basis that the Council will properly discharge the duties imposed upon it by the requirement, and only approve any submission after careful consideration by reference to all material considerations. In this case those considerations include the Council's Local Plan which requires, pursuant to policy SD4 (General Development Principles), that all development must be designed to a high standard, respect the character of the site and its surroundings, and improve the character and quality of the area (<b>DAS, para 4.6.4</b>). RCBC has also produced an SPD for the South Tees Area (adopted in 2018), which would also plainly constitute a material consideration in discharging this requirement. The SPD's expressed objective for the South Tees Area is to create an aspirational, modern industrial park, combining industrial, environmental, heritage and community assets in a well- designed development (<b>SPD, section 2.1</b>) and an exemplar, world-class industrial business park (<b>SPD, para 3.2</b>). Its guidance is intended to inform a comprehensive and coherent development strategy to deliver the physical and economic regeneration of the South Tees Area as a place to work and invest in (<b>SPD, section 1.3</b>). It identifies discrete development zones and identifies the type and scale of development appropriate to each zone. The Main Site lies within the North Industrial Zone where major energy development is appropriate. Development Principle STDC1 (Regeneration Priorities) provides that development across all zones will be expected <i>"to promote quality in new building and infrastructure and the provision of high quality public realm."</i></p> <p>The ExA can therefore be assured that not only will RCBC exercise appropriate oversight and control over the detailed design in discharging requirement 3, but also that it will do so by reference to relevant policy which directs consideration of relevant principles when making that decision. RCBC has the power to refuse to discharge the requirement if it is not satisfied with the final design. It is relevant to note that during the NZT DCO examination, RCBC confirmed that it had the necessary expertise and resources to take on the post-consent design approval (<b>NZT ExAR para 5.5.67</b>).</p> <p>Alongside the Local Plan and SPD, STDC has produced the South Tees Regeneration Masterplan (2019) which sets out the framework for regeneration of the Teesworks and South Tees Area and the Teesworks Design Guide for Development (2020) which is intended to guide the development of Teesworks, including the main site for this Proposed Development. The Design Guide sets out a number of design principles for Teesworks and additional guidance is provided in respect of four major plot typologies, including</p>

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	<p>'Large-Scale Industrial Operations' which covers 'Major energy generation'. Part D (Technical Appendices) to the Design Guide provides example materials and specifications for development at Teesworks that will be considered acceptable. Both the Masterplan and the Design Guide would be material considerations for the Council in determining an application to discharge the requirement.</p> <p>Although the response to SWQ 2.9.5 sets out why the Applicant cannot simply refer to the DAS (<a href="#">APP-034</a>) in Requirement 3, the submitted DAS does demonstrate how regard has been had to the surrounding context and to good design principles, as required by national and local policy in the design work to date. The DAS explains that the approach taken to the design of the Development has been informed by the design principles in the Teesworks Design Guide (<b>DAS, paras 1.1.18; 1.1.23; 4.7.6 – 4.7.13</b>) as well as the Design Principles for National Infrastructure, published by the National Infrastructure Commission's Design Group (<b>DAS, para 4.4.1</b>). For example, consistent with the Design Guide and Large-Scale Industrial Operations typology, the buildings and main process areas have been set back from the Site boundaries (<b>DAS, para 1.1.25</b>) and a simple and consistent approach is proposed in respect of materials and colour palette, predominantly comprising steel framed enclosures clad in appropriate materials (<b>DAS, para 7.6.4</b>). The DAS also explains how the design of the Development responds to the four guiding principles of the NIC's Design Principles guidance (climate, people, places, value) (<b>DAS, paras 4.4.1 – 4.4.9</b>).</p> <p>Given that detailed design must be subject to consultation with STDC prior to approval, STDC would have the opportunity to provide the Council with its considered views on the compatibility of the design with their Design Guide. STDC's considered input would also be a material consideration to which the Council must have regard in making its decision.</p> <p>When those matters are considered together and as a whole, which they must be, Requirement 3 as drafted, can be seen to provide adequate and effective control to ensure that the detailed design of the Development will achieve the high standards expected by national and local policy.</p> <p><b>Fourth Bullet Point – HyGreen</b></p> <p>Although this was not discussed at the Hearing, the Applicant can confirm that no additional design work has been done for the HyGreen plot than for the other Phase 2 options. As with those options, the Applicant has produced an indicative 'plot plan' for use of the Hygreen plot in similar fashion to the Indicative Hydrogen Production Facility Drawing and can submit this into Examination if the ExA would find that helpful. This confirms that Phase 2 could fit onto that land, but beyond that the detail would be dependent on the detailed design of Phase 1, NZT and the various connection corridors as they are developed over time, as discussed in the Written Summary of ISH1.</p> <p><b>Last Bullet Point – Requirement 4</b></p> <p>Requirement 4 ensures that no part of the authorised development may commence or be commissioned until a landscape and biodiversity management plan for the construction or commissioning of that part has been submitted to and, after consultation with STDC, approved by the relevant planning authority. The requirement specifies certain matters that must be covered by the plans (see requirements 4(2) and 4(5) which include measures to protect and enhance existing shrubs and trees; measures to enhance biodiversity; landscape and biodiversity management, maintenance and monitoring; and an implementation timetable). In both instances the plans must be in substantial accordance with the Outline Landscape and Biodiversity Management Plan (<b>OLBMP</b>) (see requirement 4(7)).</p> <p>The latest OLBMP is <b>CR1-022</b>. In particular the Outline LBMP has the objectives to:</p> <ul style="list-style-type: none"> <li>• promote the conservation, protection and improvement of the physical and natural environment within the Proposed Development and its setting; and</li> <li>• diversify ecological value of existing habitats through restoration and enhancement of bankside vegetation, restoration and creation of woodland.</li> </ul> <p>Mr Phillpot KC continued that the outline plan also sets out a number of measures to achieve those objectives. The detailed LBMP will need to show how what is proposed meets those objectives. Furthermore, Annex A to the Outline LBMP sets out the Applicant's proposals for planting, and section 5.2 confirms that new planting will be managed to ensure that these biodiversity objectives are met.</p>

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	<p>For example, it provides for pre-construction ecological surveys (<b>OLBMP, para 4.2.1</b>); the production of method statements by an ecological clerk of works (eg. if suitable reptile habitat is identified during surveys) (<b>OLBMP, para 4.2.7</b>); specifies certain periods during which certain works will be carried out (eg. works at Greatham Creek within or adjacent to the SPA will be completed between September and November to avoid the most sensitive periods for breeding and wintering birds) (<b>OLBMP, para 4.2.9</b>); requires sensitive lighting to avoid disturbance of bats (<b>OLBMP, para 4.2.14</b>) and requires the reinstatement of habitats that are temporarily lost or damaged during construction ((<b>OLBMP, para 4.7.1</b>).</p> <p>The OLBMP also makes provision for the reinstatement and enhancement of vegetation and woodland planting (<b>OLBMP, para 5.1.1</b>) and establishes habitat creation principles (<b>OLBMP, para 5.2.1</b>); management protocols (such as periodic mowing to maintain a sward height of 40 – 60mm) (<b>OLBMP, para 5.2.6</b>) and specifications for woodland creation at Cowpen Bewley (<b>OLBMP, para 5.2.8 – 5.2.9</b>). Annex A to the OLBMP sets out the Applicant's proposals for planting, and section 5.2 confirms that new planting will be managed to ensure that these biodiversity objectives are met.</p> <p>Furthermore, as with Requirement 3, this requirement is subject to approval by the LPA, in consultation with STDC. For the reasons already explained, the South Tees SPD and Design Guide will be material considerations and both documents direct consideration of landscape and biodiversity matters. One of the SPD's objectives is to deliver redevelopment in a way that provides long-term sustainability, safeguards biodiversity and enhances green infrastructure, open space and landscape character (<b>SPD, section 2.1</b>). Development Principle STDC1 (Regeneration Priorities) requires all development to safeguard biodiversity and support the protection and enhancement of landscape character. The Teesworks Design Guide includes a landscape and public realm strategy (<b>Design Guide, section A.4</b>) with design principles relating to boundary treatment and landscaping.</p> <p>Given that the landscape and biodiversity management plan must be subject to consultation with STDC prior to approval, it will have the opportunity to provide the Council with its considered views on the compatibility of the landscape and management plan with the Design Guide's principles, and RCBC will have ultimate control over the plan, and can be expected to have regard to the guidance in the SPD in respect of landscaping and biodiversity.</p> <p>Again, taking those matters together and as a whole, Requirement 4 plainly provides adequate and effective control to ensure the delivery and implementation of a high quality and effective landscaping and biodiversity scheme.</p>
<p>The ExA may ask relevant Local Planning Authorities (Redcar and Cleveland Borough Council (RCBC), STBC and Hartlepool Borough Council (HBC), as well as the South Tees Development Corporation (STDC) and any other Interested Parties for comment, observations or their views related to the above matters at any appropriate point during this agenda item and the ExA may ask questions.</p>	
<p><b>10. Any other business</b></p>	
	<p><i>None</i></p>



**APPENDIX 1: SIMPLIFIED PROCESS DIAGRAM<sup>1</sup>**



<sup>1</sup> Please note that CO2 offtake from the closed loop carbon capture process is shown coming from the amine regeneration step, rather than the CO2 removal step as was shown during ISH3. This provides a more accurate representation of the process steps.

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## **APPENDIX 2: HYNET HYDROGEN PRODUCTION PLANT ENVIRONMENTAL PERMIT**



# Notice of variation and consolidation with introductory note

## The Environmental Permitting (England & Wales) Regulations 2016

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Essar Oil (UK) Limited

Stanlow Manufacturing Complex  
PO Box 3  
Ellesmere Port  
Cheshire  
CH65 4HB

### **Variation application number**

EPR/FP3139FN/V013

### **Permit number**

EPR/FP3139FN

# Stanlow Manufacturing Complex

## Permit number EPR/FP3139FN

### 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.

#### **Scope of this variation**

The variation is to authorise the operation of a new Hydrogen Production Plant (HPP) on land formerly used by the Alcohols Plant at the Stanlow Manufacturing Complex. The new HPP is being developed as part of the wider HyNet Project and will consist of reforming of natural gas and refinery off-gas (ROG), followed by a carbon capture plant for geological storage (CCS). The CCS plant captures the carbon dioxide (CO<sub>2</sub>) generated by the hydrogen production process. The captured CO<sub>2</sub> is compressed and exported from the installation for off-site geological storage (beyond the boundaries of the installation and beyond the scope of this permit) through the infrastructure that is part of the wider HyNet Project. This variation permits the production of 100,000 Nm<sup>3</sup>/h of hydrogen (HyNet Phase 1), with a design CO<sub>2</sub> capture rate of 97%, approximately corresponding to 75 tonnes/hour of CO<sub>2</sub>.

This variation application authorises the following new Environmental Permitting Regulations (EPR) scheduled activities:

- Section 4.2 Part A(1)(a)(i) - Producing inorganic chemicals such as gases (hydrogen).
- Section 6.10 Part A(1)(a) - Capture of carbon dioxide for geological storage.
- Section 5.3 Part A(1)(a)(i) - Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day by biological treatment – HPP and CCS effluent treatment plant (ETP).
- Section 5.3 Part A(1)(a)(ii) - Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day by physio-chemical treatment – HPP and CCS ETP sludge treatment.

The following existing permitted activity is amended as a result of this variation application:

- Section 1.1 Part A(1)(a) - Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts.

The following existing permitted activities are removed from the permit, through this variation:

- Section 4.1 Part A(1)(a)(i) - Producing organic chemicals such as hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic) - Higher Olefins SHOP, including LCP 143 - serving this activity but part of activity Section 1.1 Part A(1)(a).
- Section 4.1 Part A(1)(a)(ii) - Producing organic chemicals such as organic compounds containing oxygen - Alcohols (Neodol and Linevol) including Syngas production.
- Section 4.1 Part A(1)(a)(ii) - Producing organic chemicals such as organic compounds containing oxygen - Epoxy resins.

However, the land associated with the activities removed is retained within the permitted installation boundary and will be occupied by the new proposed activities, therefore the above-mentioned activities are removed from the permit through a variation mechanism. References to the alcohol and resins production plants have been retained in the permit issue log, for the purpose of future surrender of the land associated with these activities, when the HPP, CCS and associated ETP activities are eventually surrendered. No changes to the boundaries of the permitted installation are resulting from this variation.

The HPP is designed to produce a compressed hydrogen product, of greater than 99.9% purity by volume, from a feedstock of natural gas, ROG, water and oxygen and to capture the CO<sub>2</sub> produced by the reforming process. The captured CO<sub>2</sub> is compressed and dehydrated to a specification suitable for routing to subsea geological sequestration via a CO<sub>2</sub> pipeline (the CO<sub>2</sub> sequestration infrastructure is beyond the boundaries of the installation).

We have carried out an Environment Agency initiated variation to update the status and progress of existing improvement conditions, to delete table S3.2(a) of the permit which is not applicable anymore, and to include an emission limit value for concentration of phenols emitted through emission point W3 in table S3.2(b) to correct a historical mistake.

The rest of the installation is unchanged. A description of the activities carried out at the installation, as amended after this variation application, is provided in the following:

### **The main features of the installation**

Stanlow Manufacturing Complex is situated south of the Mersey Estuary near Ellesmere Port and is operated by Essar Oil (UK) Limited. The Mersey Estuary is within 10km of the site and identified as a Special Protection Area (SPA) and Ramsar site. The Manchester Ship Canal (MSC) is located to the north, with the villages of Ince and Elton to the north-east and the village of Thornton-le- Moors to the south.

#### Refinery activities (Primary activity)

The installation processes crude oil in a refinery which includes crude distillation units (CDU-3 and CDU-4), a fluid catalytic cracker, alkylation unit, platformer and hydrodesulphurisation plant.

In general terms, crude oil is imported by ship into tankage at the Tranmere Oil Terminal some 15 miles away on the Mersey. The Tranmere Oil Terminal is subject to a separate EPR Permit (EPR/YP3238FT). Crude oil is transferred by pipeline to tankage at Stanlow. This is the main feed-stock for crude distillation, which separates the crude oil into fuel gas, liquefied petroleum gases (LPGs), naphtha, kerosene, gas oil and a residue for further processing.

The naphtha (gasoline) fraction from distillation is the feed for the platformer which reforms it into high octane motor gasoline. The product from the Platformer is fed to the Aromatics plant, which produces aromatic hydrocarbons such as benzene, toluene and xylene. The kerosene and gas oil streams are treated to remove sulphur before sale.

The bottom product of the distillation, termed 'long residue' is the feed for the catalytic cracking unit and high viscosity index (HVI) lubeoil complexes. The fluidised catalytic cracker and its associated gas separation units produce fuel gas, LPG, high octane motor gasoline, gas oil, and fuel oil. LPG streams from the cracker and distillation provide the feed for the Alkylation plant, which converts them into motor gasoline.

Other cracker LPG streams are feedstock for chemicals production both on and off-site. The fuel gas from the cracker and benzene from the Aromatics plant are the feedstocks for the production of ethyl benzene, which is exported for conversion to styrene.

The oil movements include receipts and storage of oil (and chemical) feedstocks, for the collection, storage, blending and internal distribution of products and for those parts of ship and road loading of products and intermediates.

Finished products are exported by pipeline then transported either by road tanker from the loading terminal or by water via the MSC.

The utilities plants supply cooling, fire and process water, steam, electricity, nitrogen and instrument air to most of the site. The utilities area also includes units for extracting hydrogen sulphide from refinery sour water and processing to produce elemental sulphur.

These activities fall under the following descriptions in Part 2 of Schedule 1 of the Environmental Permitting Regulations (EPR) 2016:

- Section 1.2 Part A(1)(d) – Refining mineral oil (cracking, secondary processes and distillation).
- Section 1.2 Part A(1)(e) - The loading, unloading or other handling of, the storage of, or the physical, chemical or thermal treatment of crude oil (oil movements).

#### Chemical activities

The permitted chemical activities include the following Schedule 1 listed activity descriptions:

- Section 4.2 Part A(1)(a)(v) – Producing inorganic chemicals such as, non-metals, metal oxides, metal carbonyls or other inorganic compounds (for example calcium carbide, silicon, silicon carbide, titanium dioxide) (Amine recovery unit, amine systems, sour water stripper units and sulphur recovery unit plants).
- Section 4.2 Part A(1)(a)(i) - Producing inorganic chemicals (hydrogen) – Hydrogen Production Plant (HPP), with a design capacity of 100,000 Nm<sup>3</sup>/h of hydrogen.

#### Carbon Capture for Geological Storage

- Section 6.10 Part A(1)(a) - Capture of carbon dioxide for geological storage, capturing the CO<sub>2</sub> generated by the HPP, with a design CO<sub>2</sub> capture rate of 97%.

#### Incineration activity (Energy Recovery Plant)

Process wastes arising from the oils and chemicals production (and other Essar UK sites such as the Tranmere Oil Terminal and STL assets) are disposed of by incineration which is subject to the conditions in Chapter IV of the Industrial Emissions Directive (IED).

Incineration falls under the following Schedule 1 listed activity description:

- Section 5.1 Part A(1)(a) - The incineration of hazardous waste in a waste incineration plant with a capacity exceeding 10 tonnes per day.

#### Combustion activities

The installation also operates a number of combustion plant, some of which are categorised as large combustion plant (LCP), defined as LCP 138 to 142. Some of these are included in the refining and chemicals activities; however, they fall under the following Schedule 1 listed activity description:

- Section 1.1 Part A(1)(a) - Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts: High Pressure Boiler House (HPBH) and Medium Pressure Boiler House Boiler (MPBH), HPP fired heater and Auxiliary Boiler, other combustion equipment.

#### Installation emissions

The site effluent is treated by a combination of physico-chemical and biological treatments on-site and off-site. Treated effluent is discharged to the River Gowy, MSC or the Ellesmere Port Waste Water Treatment Works dependent on composition. Improvements are being made to secure compliance with BAT Conclusion 12 (Refining of Mineral Oil and Gas) which requires a reduction in the emission load of pollutants in the waste water discharge to the receiving body.

The installation releases a number of pollutants to air, including sulphur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), particulates and volatile organic compounds (VOCs). These are from the activities described above and also from the burning of sour and sweet gases at the flares. Improvements are being made to secure compliance with BAT Conclusions 34 (NO<sub>x</sub>) and 52 (VOCs) which require the reduction of the emission load of pollutants to air.

#### Waste recovery/disposal

There are a number of waste recovery/disposal activities taking place at the installation which fall under the following Schedule 1 listed activity descriptions:

- Section 5.3 Part A(1)(a)(i)(ii) - Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving biological treatment & physico-chemical treatment.
- Section 5.4 Part A(1)(a)(ii) - Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving physico-chemical treatment (effluent treatment).

The schedules specify the changes made to the permit.

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

<b>Status log of the permit</b>		
<b>Description</b>	<b>Date</b>	<b>Comments</b>
Application EPR/NP3237LS/A001	21/08/06	Duly Made
Additional information received	25/01/07	Dated 19/01/07
Additional information received	01/03/07, 02/05/07, 07/07/07, 08/08/07, 11/09/07, 30/11/07	
Permit EPR/NP3237LS granted	21/12/07	
Variation Application EPR/NP3237LS/V002	22/12/08	Duly Made
Variation EPR/NP3237LS/V002 issued	23/12/08	
Transfer Application EPR/FP3139FN/T001	27/07/11	Duly made. Full transfer of permit EPR/NP3237LS from Shell Oil Products Limited
Additional information received	28/07/11	Relating to technical and financial capability plus specific asset management
Transfer EPR/FP3139FN/T001 issued	01/08/11	Full transfer of permit to Essar Oil (UK) Limited
Variation Application EPR/FP3139FN/V002	24/11/11	Duly made. To vary and reduce the flow and monitoring frequency for outlet W3 (N38)
Variation EPR/FP3139FN/V002 issued	27/01/12	Varied permit issued
Variation Application EPR/FP3139FN/V003	21/11/11	Duly made. To vary the monitoring requirements for SOx at emission point A-11 and update the permit to modern conditions
Variation EPR/FP3139FN/V003 issued	22/03/12	Varied permit issued
Variation EPR/FP3139FN/V004 issued	28/12/12	Environment Agency led variation to reduce the annual emission limit for SO <sub>2</sub> in 2013 from 10,000 tonnes per annum to 8,800 tonnes per annum (IC29 response)
Variation EPR/FP3139FN/V005 issued	31/03/14	Variation to change annual sulphur dioxide limits for 2014-2016 and to add an IC for the Eels Regulations Varied and consolidated permit issued in modern condition format
Variation EPR/FP3139FN/V006 issued	08/04/14	Variation to correct errors in table S3.2 introduced in variation EPR/FP3139FN/V002 Varied and consolidated permit issued in modern condition format
Regulation 61 Notice sent to the Operator (EPR/FP3139FN/V008)	05/08/15	Issue of a Notice under Regulation 61 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

<b>Status log of the permit</b>		
<b>Description</b>	<b>Date</b>	<b>Comments</b>
Regulation 61 Notice response (EPR/FP3139FN/V008)	30/09/15	Response received from the Operator Methodology for assigning periods of start-up and shutdown provided in Notes section for each LCP in the response
Additional information received (EPR/FP3139FN/V008)	01/10/15	Response to request for further information
	15/10/15	Corrected data for LCP 143 (SHOP)
	04/11/15	Worked example for LCP emission limit value calculation
	26/11/15	Response to the additional questions Additional information
	15/12/15	Additional information including LCP 140 (HPBH) rating
	06/10/16	IED LCP Response Letter including fuels & LCP 140 (HPBH) operations and fuel mix
	04/11/16	LCP 140 (HPBH) Representative emission limit value demonstration
	16/12/16	LCP 140 (HPBH) improvements commitment
	13/01/17	Annual LCP 140 (HPBH) NOx emission limit
Variation EPR/FP3139FN/V008 issued	03/03/17	LCP Chapter III Varied and consolidated permit issued in modern condition format Variation effective from 03/03/17
Part Surrender Application EPR/FP3139FN/S007	06/05/16	Duly made application to surrender land and amend permitted area to remove an area of land (Argent) that was never used to carry out any site operations or directly associated activities
Part Surrender EPR/FP3139FN/S007 issued	13/09/16	Part surrender complete
Regulation 61 Notice dated 05/08/15 (Notice requiring information for statutory review of permit) (EPR/FP3139FN/V009)	05/02/16	Response Received. Technical standards detailed in response to the information notice Information to demonstrate that relevant BAT conclusions are met for the refining activities Derogation requests (superseded, see below)
Response to request for further information dated 04/10/17	24/10/17	Updated technical standards provided in spreadsheet format Supersedes all previous submissions from 05/02/16, not included in this status log
Request for further information sent by email 22/03/18	06/04/18	General queries, including updated non-technical summary
	18/07/18	Updated site plan
	31/07/18	Explanation of changes
	02/08/18	Amended
Additional information received	07/06/18	General information and clarification
Additional information received	13/06/18	Phenol monitoring equivalence
Additional information received	17/07/18	Hydrogen content of refinery fuel gas
Additional information received	18/07/18	General information and clarification
Additional information received	24/07/18 30/07/18	Flaring information
Derogation requests (EPR/FP3139FN/V009)		
<u>BAT Conclusion 12</u>	28/10/16	Supporting information



Status log of the permit		
Description	Date	Comments
Effluent	10/07/17	Supporting information
	19/09/17	Supporting information and cost benefit analysis (CBA) submitted as Appendix 5 Supersedes previous submissions
	18/12/17	Supporting information supersedes previous submission
	22/02/18	Confirmation of contractual date for third party works
	22/06/18	Supporting information and CBA Supersedes previous submissions Derogation end date changed due to complexity of construction works
<u>BAT Conclusion 27</u> CO Boiler	31/03/16	Supporting information and CBA
	27/10/17	Supporting information
	17/11/17	Supporting information and CBAs Supersedes previous submissions
<u>BAT Conclusion 34</u> CDU-4	23/11/17	Supporting information – initial (first stage) submission
	07/12/17	Supporting information and CBA Supersedes previous submissions
	18/12/17	Supporting information and CBA Supersedes previous submissions Submission based on correction of the relevant BAT AELs for gas and multi-fuel firing
	24/05/18	Supporting information and CBA Supersedes previous submissions Submission based on updated proposal with partial compliance via the NOx emissions bubble
<u>BAT Conclusion 34</u> HPBH	31/03/16	Supporting information
	20/07/17	Supporting information
	20/10/17	Supporting information and CBA Supporting information supersedes previous submissions
	07/11/17	Additional information and amended CBA
	22/02/18	Supporting information and CBA, supersedes previous submissions
	23/02/18	Supporting information supersedes previous submissions – clarification of derogation date
	20/04/18	Email confirming withdrawal of derogation
<u>BAT Conclusion 52</u> Loading/unloading operations	17/11/17	Supporting information – initial (first stage) submission
	23/11/17	Supporting information and CBA Supersedes previous submission
	14/12/17	Supporting information and CBA Supersedes previous submission
	04/01/18	Supporting information Supersedes previous submission
	24/01/18	Clarification on unloading/unloading
	01/02/18	Clarification on unloading/unloading

<b>Status log of the permit</b>		
<b>Description</b>	<b>Date</b>	<b>Comments</b>
DRAFT DECISION EPR/FP3139FN/V009	09/08/18	Statutory review of permit - BAT Conclusions published 28 October 2014 Varied and consolidated permit Consultation 13/08/18 to 10/09/18
FINAL DECISION EPR/FP3139FN/V009	26/09/18	Statutory review of permit - BAT Conclusions published 28 October 2014 Varied and consolidated permit issued
Variation application EPR/FP3139FN/V010	05/07/19	To implement changes required following a change to the Competent Operator of the road terminal to Stanlow Terminals Limited (STL)
Updated site plan	27/01/20	To remove reference to the land to be surrendered (ex resins plant)
Variation EPR/FP3139FN/V010 issued (Billing ref: FP3506PQ)	27/01/20	Varied permit issued
Variation application EPR/FP3139FN/V011	Duly made 29/03/21	Application for a time limited derogation from BAT Conclusion 52 until 31/12/2025.
Response to Schedule 5 Notice issued 29/06/21	07/07/21	Amended proposal for a time limited derogation from BAT Conclusion 52 until 31/08/2024. Additional information including justification for the proposed option, revised calculation of emissions, technical configuration of the vapour recovery unit and revised cost-benefit analysis.
Response to Schedule 5 Notice issued 05/08/21	14/09/21	Additional information on the environmental risk assessment, execution of the Mogas Export Project, proposed milestones for the proposed derogation option and statement from board of directors.
Response to Schedule 5 Notice issued 24/09/21	26/11/21	Additional information including revised emissions calculation and revised air dispersion modelling assessment.
Draft decision EPR/FP3139FN/V011	06/04/22	Derogation from BAT Conclusion 52 - Varied and consolidated permit Consultation 08/04/22 to 11/05/22.
Final decision EPR/FP3139FN/V011 (Billing reference: EP3404LC)	12/05/22	Varied and consolidated permit issued.
Variation application EPR/FP3139FN/V012	Duly made 10/03/21	Application for a time limited derogation from BAT Conclusion 12 until 31/12/2022.
Draft decision EPR/FP3139FN/V012	-	Derogation from BAT Conclusion 12 - Varied and consolidated permit Consultation 13/10/22 to 10/11/22.
Final decision EPR/FP3139FN/V012 (Billing reference: GP3207LV)	15/11/22	Varied and consolidated permit issued.

<b>Status log of the permit</b>		
<b>Description</b>	<b>Date</b>	<b>Comments</b>
Variation application EPR/FP3139FN/V013	Duly made 07/12/21	Variation application to:  - Remove activities: Section 4.1 Part A(1)(a)(i): Higher Olefins SHOP production; Section 4.1 Part A(1)(a)(ii): Alcohols (Neodol and Linevol) production, including LCP 143 - serving this activity but part of activity Section 1.1 Part A(1)(a); and Section 4.1 Part A(1)(a)(ii): Epoxy Resins;  and to  - Add a new Hydrogen Production Plant (HPP) with Carbon Capture for Geological Storage (CCS) and associated effluent/sludge treatment plant (ETP) on land previously occupied by the Higher Olefins SHOP, Alcohols and Epoxy Resins production activities.  Reference to removed chemical activities to be retained for the purposes of demonstrating that land is returned to satisfactory state at the point of surrendering the HPP, CCS and associated ETP activities.
Response to Schedule 5 Notice issued 17/03/22 EPR/FP3139FN/V013	24/06/22	Responses to Schedule 5 Notice questions 1 to 21, including additional information on the proposed operating techniques, best available techniques and environmental risk for the HPP, CCS and associated ETP.
	15/07/22 18/07/22 09/08/22	Response to Schedule 5 Notice question 22, including additional information on noise and revised Noise Impact Assessment and noise data.
	29/07/22	H1 tool assessing emissions of methanol from TEG still column vent in response to Schedule 5 Notice question 20.
	26/09/22	Additional information on monitoring of sulphur content in ROG, emissions performance of combustion equipment, energy efficiency of combustion equipment, fire gas detection system, specification of the flare, secondary containment for Waste Water Blending Tank 10-BAG-T-001 and sub-surface process drain drums, and process description and operation of the pipelines connected to the HPP and CCS activities.
	25/11/22 28/11/22 09/12/22	Additional information in responses to Schedule 5 Notice question 19 including description, risk assessment of CO <sub>2</sub> venting operations and supporting information.
Response to request for additional information sent 12/12/22 EPR/FP3139FN/V013	30/01/23	Additional information and revised version of the CO <sub>2</sub> venting risk assessment.
Variation EPR/FP3139FN/V013 issued	02/05/23	Varied and consolidated permit issued.

<b>Other permits relating to this installation</b>		
<b>Operator</b>	<b>Permit number</b>	<b>Comments</b>
Essar Oil (UK) Limited	EPR/TP3301MD  Tranmere Oil Terminal	Original permit EPR/NP3437LX issued to Shell UK Oil Products Ltd 28/06/07 Permit transferred in full from Shell UK Oil Products Ltd 01/08/11 as EPR/YP3238FT. Permit transferred in full from Stanlow Terminals Limited (STL) to Essar Oil (UK) Limited as EPR/TP3301MD

<b>Other permits relating to this installation</b>		
<b>Operator</b>	<b>Permit number</b>	<b>Comments</b>
Stanlow Terminals Limited (STL)	EP/B/STANLOWTERMINAL/2019	Operator of road terminal loading facilities (local authority Part B permit, previously operated by Essar Oil (UK) Limited)
Argent Energy (UK) Limited	EPR/LP3233DK	Discharge of process effluent to Unit 78 of Essar Oil (UK) Limited effluent treatment plant

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 and consolidates

### Permit number

EPR/FP3139FN

### Issued to

**Essar Oil (UK) Limited** (“the operator”)

whose registered office is

**The Administration Building**

**5th Floor**

**Stanlow Manufacturing Complex**

**Ellesmere Port**

**Cheshire**

**CH65 4HB**

company registration number **07071400**

to operate an Installation at

**Stanlow Manufacturing Complex**

**PO Box 3**


**Ellesmere Port**

**Cheshire**

**CH65 4HB**

to the extent set out in the schedules.

The notice shall take effect from 02/05/2023

Name	Date
	02/05/2023

Authorised on behalf of the Environment Agency

## Schedule 1

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

- Condition 2.3.4, removed reference to LCP 143;
- Condition 3.5.1, reference to Table S3.5 amended as Table S3.5(a) and reference to new Table S3.5(b) added;
- Table S1.1 Activities, amended permitted activities;
- Table S1.2 Operating techniques, added reference to relevant application documents and responses to Schedule 5 Notice / requests for additional information;
- Table S1.3 Improvement programme requirements, added improvement conditions IC59, IC60, IC61 and IC62;
- Table S1.4 Pre-operational measures for future development, added pre-operational conditions POC5, POC6, POC7, POC8, POC9, POC10 and POC11;
- Table S2.1 Raw materials and fuels, added gas oil specification for Emergency Gas Oil Generator (emission point HPP-A-4), Firewater Pump (emission point HPP-A-5) and sulphur content of Refinery Off-Gas fed to Hydrogen Production Plant;
- Table S3.1(a) Point source emissions to air, added emission points relevant Hydrogen Production Plant, removed emission points relevant to Higher Olefins SHOP and Alcohols including LCP143;
- Table S3.1(e) Point source emissions to air during normal operation for which there are no limits, added emissions relevant Hydrogen Production Plant and Carbon Capture and Storage Plant, removed emissions relevant to Higher Olefins SHOP and Alcohols;
- Table S3.1(f) Point source emissions to air during abnormal operation, added emissions relevant to Hydrogen Production Plant and Carbon Capture and Storage Plant, removed emissions relevant to Higher Olefins SHOP and Alcohols;
- Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023, added reference to Hydrogen Production Plant and Carbon Capture Plant demineralisation water effluent;
- Table S3.3(a) Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023, removed references to Higher Olefins SHOP, Alcohols, resins plants, added discharge of uncontaminated surface water from Hydrogen Production Plant and Carbon Capture and Storage Plant to emission point S1;
- Table S3.5 Process monitoring requirements, table renumbered as S3.5(a) and added process monitoring requirements for Hydrogen Production Plant and Carbon Capture and Storage Plant;
- Table S3.5(b) Process monitoring requirements – Hydrogen Production Plant and Carbon Capture Plant demineralisation water effluent, added new process monitoring requirements for the demineralisation effluent at process monitoring point T1;
- Table S4.1 Reporting of monitoring data, added monitoring data reporting requirements for Hydrogen Production Plant and Carbon Capture and Storage Plant, removed monitoring data reporting requirements for Higher Olefins SHOP and Alcohols;
- Table S4.3 Performance parameters, added performance reporting requirements for Hydrogen Production Plant and Carbon Capture and Storage Plant;
- Table S4.5 Reporting forms or other form as agreed in writing by the Agency, added reporting forms for Hydrogen Production Plant and Carbon Capture and Storage Plant, removed reporting forms for Higher Olefins SHOP and Alcohols;

- Schedule 6 Interpretation, to include additional definitions.

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

- Table S1.2 Operating techniques, added reference to approved responses to IC50 and IC51;
- Table S1.3 Improvement programme requirements, updated the status of IC35, IC36, IC38, IC41, IC43, IC46, IC53, IC55 and deleted 'Note 2' referring to completed IC50 and IC51;
- Table S3.2(a) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply from 28 October 2018 up to the completion of the BAT 12 derogation i.e. no later than 31 December 2022, deleted as not applicable any more;
- Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023, retained emission limit for phenols at discharge point W3 from table S3.2(a) which has been deleted as part of this variation;
- Condition 3.1.1, removed reference to table S3.2(a);
- Condition 3.1.3, removed reference to table S3.2(a);
- Condition 3.1.4, removed reference to table S3.2(a);
- Condition 3.5.1, removed reference to table S3.2(a);
- Condition 3.5.4, removed reference to table S3.2(a).

## **Schedule 2 – consolidated permit**

Consolidated permit issued as a separate document.

# Permit

## The Environmental Permitting (England and Wales) Regulations 2016

### Permit number

**EPR/FP3139FN**

This is the consolidated permit referred to in the variation and consolidation notice for application **EPR/FP3139FN/V013** authorising,

**Essar Oil (UK) Limited** (“the operator”),

whose registered office is

**The Administration Building**

**5th Floor**

**Stanlow Manufacturing Complex**

**Ellesmere Port**

**Cheshire**

**CH65 4HB**

company registration number **07071400**

to operate an installation at

**Stanlow Manufacturing Complex**

**PO Box 3**

**Ellesmere Port**

**Cheshire**

**CH65 4HB**

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

Name	Date
[REDACTED]	02/05/2023

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.
- 1.2.2 The operator shall provide and maintain steam and/or hot water pass-outs such that opportunities for the further use of waste heat may be capitalised upon should they become practicable.

### 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;
  - (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”).
- 2.1.2 Waste authorised by this permit in condition 2.3.6 shall be clearly distinguished from any other waste on the site.
- 2.1.3 Hazardous waste shall not be mixed, either with a different category of hazardous waste or with other waste, substances or materials, unless it is authorised by schedule 1 table S1.1 and appropriate measures are taken.

### **2.2 The site**

- 2.2.1 The activities shall not extend beyond the site, being the land shown edged in red on the site plan 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 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 Any raw materials or fuels listed in schedule 2 table S2.1 shall conform to the specifications set out in that table.
- 2.3.3 For the following activities referenced in schedule 1, table S1.1: LCP 139 stand by liquid fuel may be used for periods of up to 240 hours per calendar year in accordance with section 6 of ‘IED Chapter III Protocol for Multi-fuel Firing Refinery Combustion Plants granted a Permit prior to 7<sup>th</sup> January 2013’. Version 5 or any later version unless otherwise agreed in writing by the Environment Agency (‘the MFF Protocol’).

- 2.3.4 For the following activities referenced in schedule 1, table S1.1: LCP 138, LCP 139, LCP 140, LCP 141 and LCP 142 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.
- 2.3.5 The following activities referenced in schedule 1, table S1.1: LCP 138 and LCP 141 (HVI only) shall not take place until the operator has submitted a report in writing to the Environment Agency demonstrating compliance with the requirements of this Permit and has obtained written approval from the Environment Agency.
- 2.3.6 For the following activities referenced in schedule 1, table S1.1: "incineration of hazardous waste" and "disposal or recovery of hazardous waste". Waste shall only be accepted if:
- (a) it is of a type and quantity listed in schedule 2 tables S2.2, S2.3; S2.4 and S2.5; and
  - (b) it conforms to the description in the documentation supplied by the producer and holder.
- 2.3.7 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.
- 2.3.8 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.
- 2.3.9 For the following activity referenced in schedule 1, table S1.1: "incineration of hazardous waste": The operator shall burn only those hazardous wastes specified in table S2.3 of schedule 2.
- 2.3.10 For the following activity referenced in schedule 1, table S1.1: "incineration of hazardous waste": Waste shall not be charged, or shall cease to be charged, if:
- (a) the combustion chamber temperature is below, or falls below, 850°C for non-hazardous waste or hazardous waste where the content of halogenated organic substances (as chlorine) does not exceed 1%; or
  - (b) any continuous emission limit value in schedule 3 table S3.1(c) is exceeded; or
  - (c) any continuous emission limit value in schedule 3 table S3.1(b) is exceeded, other than under abnormal operating conditions; or
  - (d) monitoring results required to demonstrate compliance with any continuous emission limit value in schedule 3 table S3.1(b) are unavailable other than under abnormal operating conditions.
- 2.3.11 For the following activity referenced in schedule 1, table S1.1: "incineration of hazardous waste": The operator shall have at least one auxiliary burner in each line at start up or shut down or whenever the operating temperature falls below that specified in condition 2.3.10, as long as incompletely burned waste is present in the combustion chamber. Unless the temperature specified in condition 2.3.10 is maintained in the combustion chamber, such burner(s) may be fed only with fuels which result in emissions no higher than those arising from the use of gas oil, liquefied gas or natural gas.
- 2.3.12 For the following activity referenced in schedule 1, table S1.1: "incineration of hazardous waste". The operator shall record the beginning and end of each period of "abnormal operation".
- 2.3.13 For the following activity referenced in schedule 1, table S1.1: "incineration of hazardous waste": During a period of "abnormal operation", the operator shall restore normal operation of the failed equipment or replace the failed equipment as rapidly as possible.

- 2.3.14 For the following activity referenced in schedule 1, table S1.1: “incineration of hazardous waste”: Where, during “abnormal operation”, on an incineration line, any of the following situations arise, waste shall cease to be charged on that line until normal operation can be restored:
- (a) continuous measurement shows that an emission exceeds any emission limit value in schedule 3 table S3.1(b) due to disturbances or failures of the abatement systems, or continuous emission monitor(s) are out of service, as the case may be, for a total of 4 hours uninterrupted duration;
  - (b) the cumulative duration of “ abnormal operation” periods over 1 calendar year has reached 60 hours;
  - (c) continuous measurement shows that an emission exceeds any emission limit value in schedule 3 table S3.1(c) due to disturbances or failures of the abatement systems; and
  - (d) continuous emission monitors or alternative techniques to demonstrate compliance with the emission limit value(s) for particulates, TOC and / or CO in schedule 3 table S3.1(c), as detailed in the application or as agreed in writing with the Environment Agency, are unavailable.
- 2.3.15 For the following activity referenced in schedule 1, table S1.1: “incineration of hazardous waste”. The operator shall interpret the end of the period of “abnormal operation” as the earliest of the following:
- (a) when the failed equipment is repaired and brought back into normal operation;
  - (b) when the operator initiates a shut-down of the waste combustion activity, as described in the application or as agreed in writing with the Environment Agency;
  - (c) when a period of four hours has elapsed from the start of the “abnormal operation”; and
  - (d) when, in any calendar year, an aggregated period of 60 hours “abnormal operation” has been reached .
- 2.3.16 For the following activity referenced in schedule 1, table S1.1: “incineration of hazardous waste” Bottom ash and APC residues shall not be mixed.

## **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 S1.4 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(a), S3.1(b), S3.1(e), S3.1(f), S3.2(b), S3.3 and S3.3(a).
- 3.1.2 The limits given in schedule 3 shall not be exceeded.
- 3.1.3 Where a substance is specified in schedule 3 tables S3.2(b) or S3.3 and S3.3(a) but no limit is set for it, the concentration of such substance in emissions to water from the relevant emission point shall be no greater than the background concentration.
- 3.1.4 Total annual emissions from the emission point(s) set out in schedule 3 tables S3.1(a), S3.1(b), S3.2(b), S3.3 and S3.3(a) of a substance listed in schedule 3 table S3.4 shall not exceed the relevant limit in table S3.4.
- 3.1.5 Wastes produced at the site shall, as a minimum, be sampled and analysed in accordance with schedule 3 table S3.6 Additional samples shall be taken and tested and appropriate action taken, whenever:
  - (a) disposal or recovery routes change; or
  - (b) it is suspected that the nature or composition of the waste has changed such that the route currently selected may no longer be appropriate.

#### **3.2 Emissions of substances not controlled by emission limits**

- 3.2.1 Emissions of substances not controlled by emission limits (excluding odour) shall not cause pollution. The operator shall not be taken to have breached this condition if appropriate measures, including, but not limited to, those specified in any approved emissions management plan, have been taken to prevent or where that is not practicable, to minimise, those emissions.
- 3.2.2 The operator shall:
  - (a) if notified by the Environment Agency that the activities are giving rise to pollution, submit to the Environment Agency for approval within the period specified, an emissions management plan which identifies and minimises the risks of pollution from emissions of substances not controlled by emission limits;
  - (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.
- 3.2.4 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.

### **3.3 Odour**

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

3.3.2 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.

### **3.4 Noise and vibration**

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

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 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.

### **3.5 Monitoring**

3.5.1 The operator shall, unless otherwise agreed in writing by the Environment Agency, undertake the monitoring specified in the following tables in schedule 3 to this permit:

- (a) point source emissions specified in tables S3.1(a), S3.1(b), S3.2(b), S3.3 and S3.3(a);
- (b) process monitoring specified in table S3.5(a) and S3.5(b);
- (c) residue quality in table S3.6.

3.5.2 The operator shall maintain records of all monitoring required by this permit including records of the taking and analysis of samples, instrument measurements (periodic and continual), calibrations, examinations, tests and surveys and any assessment or evaluation made on the basis of such data.

3.5.3 Monitoring equipment, techniques, personnel and organisations employed for the emissions monitoring programme and the environmental or other monitoring specified in condition 3.5.1 shall have either MCERTS certification or MCERTS accreditation (as appropriate) unless otherwise agreed in writing by the Environment Agency. Newly installed CEMs, or CEMs replacing existing CEMs, shall have MCERTS certification and have an MCERTS certified range which is not greater than 1.5 times the daily emission limit value (ELV) specified in schedule 3 tables S3.1(a), S3.1(b) and S3.1(c). 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.

- 3.5.4 Permanent means of access shall be provided to enable sampling/monitoring to be carried out in relation to the emission points specified in schedule 3 tables S3.1(a), S3.1(b), S3.2(b), S3.3 and S3.3(a) unless otherwise agreed in writing by the Environment Agency.
- 3.5.5 Where Continuous Emission Monitors are installed to comply with the monitoring requirements for the incineration of waste in schedule 3 table S3.1(b); the Continuous Emission Monitors shall be used such that;
- (a) the values of the 95% confidence intervals of a single measured result at the daily emission limit value shall not exceed the following percentages:
- |   |     |
|---|-----|
| • Carbon monoxide   | 10% |
| • Sulphur dioxide   | 20% |
| • Oxides of nitrogen (NO & NO <sub>2</sub> expressed as NO <sub>2</sub> ) | 20% |
| • Dust  | 30% |
| • Total organic carbon (TOC)  | 30% |
| • Hydrogen chloride   | 40% |
- (b) valid half-hourly average values shall be determined within the effective operating time (excluding the start-up and shut-down periods) from the measured values after having subtracted the value of the confidence intervals in condition 3.5.5 (a);
- (c) where it is necessary to calibrate or maintain the monitor and this means that data are not available for a complete half-hour period, the half-hourly average shall in any case be considered valid if measurements are available for a minimum of 20 minutes during the half-hour period. The number of half-hourly averages so validated shall not exceed 5 per day;
- (d) daily average values shall be determined as the average of all the valid half-hourly average values within a calendar day. The daily average value shall be considered valid if no more than five half-hourly average values in any day have been determined not to be valid;
- (e) no more than ten daily average values per year shall be determined not to be valid.

### **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(a); 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(a) 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 Monitoring for the purposes of integrated air emissions management**

- 3.7.1 In order to assess compliance with the integrated emissions management limit for NO<sub>x</sub>, specified in table S3.1(d) of this permit:
- (a) The operator shall undertake the monitoring and calculations described in their response to IC50 and as approved in writing by the Environment Agency, for all units covered by the 'bubble emission limit'; and
  - (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 response to IC50) when assessing compliance with the 'bubble emission limit'. The operator shall record the start and conclusion of periods of 'other than normal operation' and record the emissions from the affected unit during that period.
- 3.7.2 In order to assess compliance with the integrated emissions management limit for SO<sub>2</sub>, specified in Table S3.1(d) of this permit:
- (a) The operator shall undertake the monitoring and calculations described in their response to IC51 and as approved in writing by the Environment Agency, for all units covered by the 'bubble emission limit'; and
  - (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 response to IC51) when assessing compliance with the 'bubble emission limit'. The operator shall record the start and conclusion of periods of 'other than normal operation' 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 reports 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;
- (c) the performance parameters set out in schedule 4 table S4.3 using the forms specified in table S4.5 of that schedule;
- (d) the total annual emissions from, and total amount of energy input to each Large Combustion Plant in accordance with the requirements of Chapter III of the IED set out in schedule 4 table S4.4 using the forms specified in table S4.5 of that schedule; and
- (e) the functioning and monitoring of the incineration 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 and the emissions into air and water compared with the emission standards in the IED.

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 S4.5 ; 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.
- 4.2.6 Every quarter, the operator shall report details to the Environment Agency, as specified in Form AIR: F1, of periods of flaring; where the aggregate quantity of gas flared from the installation exceeds 2.9 tonnes/hour, as a daily mean value.
- 4.2.7 Every quarter, the operator shall report details to the Environment Agency, as specified in Form AIR: F2, of all flaring.
- 4.2.8 The operator shall keep a record of each flaring event, where the gas flared exceeded 2.9 tonnes/hour, including the cause of the event, whether sour and/or acidic gases were routed to the flare at the time, whether the event was planned and any action taken to minimise the duration of and/or the impact of flaring.
- 4.2.9 By 31 January each year the operator shall prepare and submit a report to the Environment Agency on the management of flaring, which includes:
- (a) a summary of the root causes of any flaring events reported on form AIR F1, in accordance with condition 4.2.6;
  - (b) a review of possible improvements to minimise the number and/or impact of all flaring events, with proposals for improvement and timescales for implementation;
  - (c) progress against any improvement proposals, identified in previous reports submitted in compliance with condition 4.2.8; and
  - (d) any other actions taken in the previous 12 months to minimise the number and/or impact of flaring events.
- 4.2.10 The operator shall submit written reports to the Environment Agency for approval which evaluate potential risk of exceedances of the short-term 15 minute UK air quality objective for sulphur dioxide. For incorporation into the integrated emission management approach, the report shall define the operating parameters and monitoring requirements, including, but not limited to, the agreed bubble design and the use of SO<sub>2</sub> reducing catalyst additives within the catalytic cracking process. Progress reports shall be submitted by 31<sup>st</sup> March and 30<sup>th</sup> September each year, unless otherwise agreed in writing by the Environment Agency.

### 4.3 Notifications

- 4.3.1 The Operator shall
- (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 immediately 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.
  - (d) any incident which has led to a period of abnormal operation of the incineration plant.
- 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.
- In any other case:
- (a) the death of any of the named operators (where the operator consists of more than one named individual);
  - (b) any change in the operator's name(s) or address(es); and
  - (c) any steps taken with a view to the operator, or any one of them, going into bankruptcy, entering into a composition or arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.
- 4.3.5 Where the operator proposes to make a change in the nature or functioning, or an extension of the activities, which may have consequences for the environment and the change is not otherwise the subject of an application for approval under the Regulations or this permit:
- (a) the Environment Agency shall be notified at least 14 days before making the change; and
  - (b) the notification shall contain a description of the proposed change in operation.
- 4.3.6 The Environment Agency shall be given at least 14 days notice before implementation of any part of the site closure plan.
- 4.3.7 Where the operator has entered into a climate change agreement with the Government, the Environment Agency shall be notified within one month of:
- (a) a decision by the Secretary of State not to re-certify the agreement;
  - (b) a decision by either the operator or the Secretary of State to terminate the agreement; and
  - (c) any subsequent decision by the Secretary of State to re-certify such an agreement.
- 4.3.8 The operator shall inform the Environment Agency in writing of the closure of any LCP within 28 days of the date of closure.

4.3.9 In the event that more than 6.4 tonnes of sulphur dioxide has or is likely to be emitted in a 24 hour period, from the flaring of acid gases (emission point A14); the operator shall immediately inform the Environment Agency, providing details of:

- (a) the likely duration of the flaring event;
- (b) the cause of the flaring event;
- (c) remedial actions being taken;

The operator shall confirm:

- (d) the quantity of sulphur dioxide emitted and duration of the flaring event; and
- (e) whether the event had a negative impact on local air quality.

4.3.10 In the event that the operator proposes to make a change to the design or operation of the integrated emissions management technique (emissions bubble), for oxides of nitrogen or sulphur dioxide;

- (a) the Environment Agency shall be notified at least 14 days before making the change;
- (b) the notification shall contain details of the change in operation or design, and an assessment of the impact that this change will have on the monthly emission limit, specified in Table S3.1(d) of this permit; and
- (c) the operator shall not implement the change until it has 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 listed in Schedule 1 of the EP Regulations	Description of specified activity	Limits of specified activity
Section 1.2 Part A(1)(d) Primary activity	Refining mineral oils (Cracking)	From receipt of feed to oil refining unit to use, intermediate or product storage, or export, including each of the following units: <ul style="list-style-type: none"> <li>i. Catalytic Cracking Unit no 2 (including process heaters), with a capacity of 11,000 tpd, consisting of the reactor and regenerator section, the main fractionator distillation column and a carbon monoxide (CO) boiler</li> <li>ii. Gas Separation Unit</li> <li>iii. Hydrogen Fluoride Alkylation (Butamer and Selective Hydrogenation (SHU) units</li> <li>iv. Ethyl benzene production unit (EBU) including process heater: F6800 9.45 MWth</li> <li>v. Low Sulphur Mogas Units (CD Hydro and HD Select) including process heater: F4001 7.0 MWth</li> </ul>
Section 1.2 Part A(1)(d) Primary activity	Refining mineral oils (Secondary Processes)	From receipt of feed, through blending (where necessary) to feed, intermediate and product storages including: <ul style="list-style-type: none"> <li>i. Iso-Pentane Unit</li> <li>ii. Kerosene Merox Treater No.2</li> <li>iii. <b>LCP 142:</b> Platformer No.3 and Hydrotreater No.3 including process heaters: <ul style="list-style-type: none"> <li>F9301 16.8 MWth</li> <li>F9401 30.4 MWth</li> <li>F9402 42.4 MWth</li> <li>F9403 28.8 MWth</li> <li>F9404 16.8 MWth</li> </ul> </li> <li>iv. Hydrotreater No. 2 including process heater: <ul style="list-style-type: none"> <li>F501 17.4 MWth</li> </ul> </li> <li>v. <b>LCP 141:</b> Aromatics production including process heaters: <ul style="list-style-type: none"> <li>F5901A 63.1 MWth</li> <li>F5901B 63.1 MWth</li> </ul> </li> <li>vi. <b>LCP 141:</b> Hydrodesulphurisation unit 2 including process heater: <ul style="list-style-type: none"> <li>F6301 18.3 MWth</li> </ul> </li> <li>vii. <b>LCP 141:</b> HVI lubricating oil including process heaters: <ul style="list-style-type: none"> <li>F4101 44.5 MWth</li> <li>F4102 5.6 MWth</li> <li>F4901A 44.5 MWth</li> <li>F4901B 44.5 MWth</li> </ul> </li> </ul>

**Table S1.1 activities**

Activity listed in Schedule 1 of the EP Regulations	Description of specified activity	Limits of specified activity
Section 1.2 Part A(1)(d) Primary activity	Refining mineral oils (Distillation)	From receipt of crude to operation of crude distillation units including: <b>LCP 138:</b> Crude Distillation Unit 3 (CDU-3) (throughout 8,000 t/d) and High Vacuum Unit 3 (throughout 4,500 t/d) including process heaters: F301      33.2 MWth F301U     37.6 MWth F302      27.9 MWth <b>LCP 139:</b> Crude Distillation Unit 4 (CDU-4) including process heaters: F201A     58.9 MWth F201B     58.9 MWth F201C     49.0 MWth F202      53.3 MWth F650      2.4 MWth

**Table S1.1 activities**

Activity listed in Schedule 1 of the EP Regulations	Description of specified activity	Limits of specified activity
Section 1.2 Part A(1)(e)	The loading, unloading or other handling of, the storage of, or the physical, chemical or thermal treatment of crude oil (Oil movements)	<p>From receipt of feed, through blending (where necessary) to feed, intermediate and product storages including: liquefied petroleum gases, white oils, gas oils/ black oils, crude oil/slops.</p> <p>The activity is limited to the locations identified on site plan provided as Appendix 3 of the BAT 52 derogation received 04 January 2018.</p> <p>=====</p> <p>Loading/unloading at White Oil Docks (Berths 1 and 3 on Stanlow Island) shall be limited as follows:</p> <ol style="list-style-type: none"> <li>1. From 01/07/2022 to 31/12/2022 the loading/unloading throughput shall be limited to 500,000 m<sup>3</sup> [Note1], unless the Environment Agency grants written authorisation to exceed this limit during the reference period, following review of the report submitted in response to improvement condition IC54, in which case loading/unloading shall be limited to the level specified in the authorisation.</li> <li>2. From 01/01/2023 to 30/06/2023 the loading/unloading throughput shall be limited to 500,000 m<sup>3</sup> [Note1], unless the Environment Agency grants written authorisation to exceed this limit during the reference period, following review of the report submitted in response to improvement condition IC55, in which case loading/unloading shall be limited to the level specified in the authorisation.</li> <li>3. From 01/07/2023 to 31/12/2023 the loading/unloading throughput shall be limited to 500,000 m<sup>3</sup> [Note1], unless the Environment Agency grants written authorisation to exceed this limit during the reference period, following review of the report submitted in response to improvement condition IC56, in which case loading/unloading shall be limited to the level specified in the authorisation.</li> <li>4. From 01/01/2024 to 30/06/2024 the loading/unloading throughput shall be limited to 500,000 m<sup>3</sup> [Note1], unless the Environment Agency grants written authorisation to exceed this limit during the reference period, following review of the report submitted in response to improvement condition IC57, in which case loading/unloading shall be limited to the level specified in the authorisation.</li> <li>5. From 01/07/2024 to 31/08/2024 the loading/unloading throughput shall be limited to 167,000 m<sup>3</sup> [Note1], unless the Environment Agency grants written authorisation to exceed this limit during the reference period, following review of the report submitted in response to improvement condition IC58, in which case loading/unloading shall be limited to the level specified in the authorisation.</li> <li>6. From 01/09/2024 to 31/12/2024 the loading/unloading throughput shall be limited to 334,000 m<sup>3</sup> [Note1].</li> <li>7. From 01/01/2025 the loading/unloading throughput shall be limited to &lt;1 million m<sup>3</sup>/annum.</li> </ol> <p>[Note 1: any unused loading/unloading throughput allowance may be carried forward between subsequent periods within the same calendar year, provided that the threshold of 1 million m<sup>3</sup>/annum is not exceeded in that calendar year].</p>

**Table S1.1 activities**

Activity listed in Schedule 1 of the EP Regulations	Description of specified activity	Limits of specified activity
Section 1.1 Part A(1)(a)	Burning any fuel in an appliance with a rated thermal input of 50 or more megawatts (MW)	<p>From receipt of natural gas, fuel oil and storage of fuel oil. Natural gas, fuel oil and refinery fuel gas supply systems to combustion units and any associated activities necessary to maintain the operation of the plant and fuel supplies through to the discharge of exhaust gases from the stacks, ash removal from the combustion process and the export of steam to the steam systems, including:</p> <ul style="list-style-type: none"> <li>i. LCP 140 HPBH boilers 21 to 26 6 x 104 MWth boilers Combined capacity limited by software interlock to less than 500 MWth in accordance with Environment Agency Regulatory Guidance Note 2 and subject to provisions set out in Section 4 of the MFF Protocol.</li> <li>ii. MPBH 2 x 28 MWth boilers</li> </ul> <p><u>Notes</u></p> <ul style="list-style-type: none"> <li>- <b>LCPs 138, 139, 141 &amp; 142</b> included in listed activity Section 1.2 Part A(1)(d)</li> <li>- Combustion equipment serving activity Section 4.2 Part A(1)(a)(i) – Hydrogen Production Plant – are shown as part of that activity, although they take part to the aggregation under the Section 1.1 Part A(1)(a) combustion activity.</li> </ul>
Section 4.2 Part A(1)(a)(i)	Producing inorganic chemicals such as gases – Hydrogen	<p><b>Hydrogen Production Plant (HPP)</b></p> <p>From receipt of natural gas and refinery off-gas, its purification, reforming in a gas-heated reforming followed by auto-thermal reforming (GHR+ATR configuration) and isothermal shift conversion, to the separation of gases from the synthesis gas (syngas) stream to produce hydrogen with a design capacity of 100,000 Nm<sup>3</sup>/h, including hydrogen compression.</p> <p>Combustion equipment serving this activity, which are part of the aggregation under Section 1.1 Part A(1)(a):</p> <ul style="list-style-type: none"> <li>- Feed Fired Heater (20.2 MWth input), new Medium Combustion Plant (MCP) normally fired on sulphur-free Pressure Swing Adsorption (PSA) tail gas (or natural gas during start-up and shut-down only)</li> <li>- Steam Boiler (27.6 MWth input), new MCP normally fired on sulphur-free PSA tail gas (or natural gas during start-up and shut-down only)</li> <li>- Gas oil emergency generator (2.9 MWth input), new MCP, operating in emergency only for less than 500 hours per year; maintenance testing is permitted for less than 50 hours per year</li> <li>- Firewater pump, gas oil fired, less than 1 MWth input</li> </ul>



<b>Table S1.1 activities</b>		
<b>Activity listed in Schedule 1 of the EP Regulations</b>	<b>Description of specified activity</b>	<b>Limits of specified activity</b>
Section 4.2 Part A(1)(a)(v)	Producing inorganic chemicals such as, non-metals, metal oxides, metal carbonyls or other inorganic compounds (for example calcium carbide, silicon, silicon carbide, titanium dioxide)	<b>Sulphur recovery and production</b> Amine recovery unit, amine systems, sour water stripper units and sulphur recovery unit plants including: i. Unit 5300 (100 t/d design feed rate for sour gas) ii. Unit 5500 (100 t/d design feed rate for sour gas) iii. Claus Off gas Treating Unit
Section 5.1 Part A(1)(a)	The incineration of hazardous waste in an incineration plant with a capacity exceeding 10 tonnes per day	<b>Energy Recovery Plant</b> From receipt and preparation of wastes for incineration to export of ashes and air pollution control (APC) residues. The incinerator is permitted to burn 50,000 tonnes/year of hazardous and non-hazardous waste as specified in Table 2.3 of this permit. Energy is recovered from the burning of the waste.
Section 5.3 Part A(1)(a)(i)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving biological treatment	<b>North Dissolved Air Flotation (NDAF): Biological treatment of waste waters and storage of sludge &gt;50t/day</b> From collection and treatment of process effluent including: Receipt of ballast water received from ships in Manchester Ship Canal (MSC) berths, surface waters from north site and effluent from No 1 and No 2 Gate STL road terminals and subsequent physical and biological treatment to the discharge point W2, to the River Gowy.  Discharge point shall normally be to sewer following completion of BAT 12 as specified by IC41 in Table S1.3 of this permit.
Section 5.3 Part A(1)(a)(i)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving biological treatment	<b>South Dissolved Air Flotation (SDAF): Biological treatment of waste waters and storage of sludge &gt;50t/day</b> From collection and treatment of process effluent including: Surface waters from storages West and East of Gowy, the distillation department and non-process effluents arising from HF Alkylation unit and subsequent physical and biological treatment to the discharge point W1, to Thornton Brook, tributary of River Gowy.  Discharge point shall normally be to sewer following completion of BAT 12 as specified by IC41 in Table S1.3 of this permit.
Section 5.3 Part A(1)(a)(ii)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment	<b>Spent Caustic Neutralisation Unit: Disposal of hazardous waste</b> From collection and treatment of spent caustic from CDU-4 furnaces, HDS2 unit, Merox and Gas plant to transfer to the Process Dissolved Air Flotation (PDAF) and subsequent discharge at W3, MSC.  Discharge point shall normally be to sewer following completion of BAT 12 as specified by IC41 in Table S1.3 of this permit.

<b>Table S1.1 activities</b>		
<b>Activity listed in Schedule 1 of the EP Regulations</b>	<b>Description of specified activity</b>	<b>Limits of specified activity</b>
Section 5.3 Part A(1)(a)(ii)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment	<b>Unit 78: Physico-chemical treatment of waste waters and storage of sludge &gt;50t/day</b> From collection and treatment of process effluent including: Process effluents arising from chemicals units located at north and south sites and effluent by pipeline from Argent Energy (UK) Limited (EPR/LP3233DK) which is subject to pH correction and physical treatment prior to discharge to sewer.
Section 5.3 Part A(1)(a)(ii)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment	<b>PDAF: Physico-chemical treatment of waste waters and storage of sludge &gt;50t/day</b> From collection and treatment of process effluent including: Process effluents from refinery operation and subsequent treatment to joint discharge point with surface waters from refinery operations (N38) to W3, MSC. Discharge point shall normally be to sewer following completion of BAT 12 as specified by IC41 in Table S1.3 of this permit.
Section 5.3 Part A(1)(a)(ii)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day involving physico-chemical treatment:	<b>Storage (Maintenance): Disposal of hazardous waste</b> The de-sludging together with the dewatering and/or de-oiling of hazardous sludge including; tank/vessel bottoms, oil water separators and interceptors. Recovered oil to be directed to existing tankage. Recovered water to be discharged via an effluent emission point listed in Schedule 3 Table 3.2(a) of this permit.
Section 5.3 Part A(1)(a)(i)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day by biological treatment - HPP effluent treatment plant	<b>Effluent treatment plant serving the HPP and CCS activities</b> From the collection of process wastewater effluents (from blow-down and condensate returns, sludge dewatering, and the CO <sub>2</sub> removal system) and potentially contaminated rainwater (via oil removal in corrugated plate interceptor), to its biological treatment in a Membrane Bioreactor (MBR) including a nitrification/denitrification nitrogen removal process. The treated effluent from the MBR is then routed to the Clarified Water Tank, where it joins the clarified raw water stream to be fed to the Demineralisation Plant serving the HPP and CCS activities.
Section 5.3 Part A(1)(a)(ii)	Disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day by physio-chemical treatment – HPP sludge treatment	<b>Sludge dewatering serving the HPP and CCS effluent treatment plant</b> From receipt of sludges arising from the pre-treatment of water and process effluents, their physico-chemical treatment (dewatering by centrifugation) to the removal of waste sludge by tanker for off-site disposal and recycling of supernatant water to MBR biological treatment.
Section 5.4 Part A(1)(a)(ii)	Disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day involving physico-chemical treatment:	<b>Effluent (Maintenance): Physico-chemical treatment of non- hazardous waste</b> The de-sludging and dewatering of non-hazardous sludge from the demineralisation plant (CT2) and component parts of the effluent management system (including settlement ponds, grit chambers and channels). Recovered water to be discharged via an effluent emission point listed in Schedule 3 Table 3.2(a) of this permit.
Section 6.10 Part A(1)(a)	Capture of carbon dioxide for geological storage from hydrogen production plant	<b>Carbon Capture for Geological Storage (CCS)</b> From the separation and capture of CO <sub>2</sub> from hydrogen production plant (reforming process), CO <sub>2</sub> dehydration to the export specification, to its compression for offsite exporting via pipeline for offsite geological storage.

<b>Table S1.1 activities</b>		
<b>Activity listed in Schedule 1 of the EP Regulations</b>	<b>Description of specified activity</b>	<b>Limits of specified activity</b>
<b>Directly Associated Activity</b>		
Flaring of gases	Burning of sour and sweet gases at flares	Hydrocarbon gas recovery compressor, flare headers, knock-out pots and flare stacks and any ancillary equipment consisting of Flares 1 to 4 (emission point A-14) on South Site.
Nitrogen generation	On-site generation by third party	From the production facility piped to the respective plants.
Cooling water system	Closed circuit natural draft cooling tower	Cooling Tower 1 serves Sulfolane, Instrument Air compressors and sour water stripper.
Cooling water system	Once through cooling tower	CT2 serves HVI Luboil, Crude Distillers, Feed Preparation Units, Merox Treater 2 and HPBH.
Cooling water system	Closed circuit natural draft cooling towers	CT5 serves Platformers, Aromatics, Hydrodesulphuriser 2, Catalytic Cracking Units and Gas Separation Units.
Cooling water system	Closed circuit natural draft cooling towers	HF alkylation unit, HPBH and Distillation PU.
Surface water drainage	Collection and handling of surface waters within installation	Handling and storage of site drainage until discharge to the site waste water treatment system or to discharge off-site.
Demineralised water unit	HPBH demineralised water plant	From the production of demineralised water to process water use in the HPBH.
Water demineralisation plant	Demineralisation unit serving the Hydrogen Production Plant and Carbon Capture and Storage	From the receipt of water from the Clarified Water Tank to the production of demineralised water for use in the HPP and CCS. The demineralisation plant generates a demineralised water stream and a reject effluent. Subject to completion of POC7, the reject effluent is discharged to the refinery drainage system at point T1 (as specified in Table S3.5(b)), via CT2 open sump and N38, to discharge point W3 to the Manchester Ship Canal.
Surface water drainage	Collection and handling of uncontaminated surface water within Hydrogen Production Plant, Carbon Capture and Storage and associated Effluent Treatment Plant	Operation of systems for the collection, re-use and discharge of uncontaminated surface water to the United Utilities treatment plant, through the existing emission point S1.
Surface water drainage	Collection and handling of potentially contaminated surface water from process areas within Hydrogen Production Plant, Carbon Capture and Storage and associated Effluent Treatment Plant	Potentially contaminated areas (runoff from hardstanding in process areas) drain to a corrugated plate interceptor (CPI) to remove oil, are then mixed with the process water steam and routed to the MBR for treatment and re-use.

**Table S1.1 activities**

<b>Activity listed in Schedule 1 of the EP Regulations</b>	<b>Description of specified activity</b>	<b>Limits of specified activity</b>
Process water drainage	Collection and handling of process wastewater from Hydrogen Production Plant and Carbon Capture and Storage	Collection of condensates, discharges from amine-based CO <sub>2</sub> capture, mixed wastewater from process units and CO <sub>2</sub> Compressor wastewater, blowdown to a sealed drainage system for treatment in the MBR for re-use in the process.
Production oxygen and nitrogen	Air Separation Unit (ASU) serving the Hydrogen Production Plant and Carbon Capture and Storage	Production and storage of oxygen and nitrogen in a cryogenic Air Separation Unit (ASU).
Cooling system	Closed loop cooling system serving the Hydrogen Production Plant and Carbon Capture and Storage	Air-cooled closed-circuit system using a propylene glycol/water mix as the cooling medium.
Flaring of gases	Hydrogen Production Plant Flare	Operation of a flare for the safe disposal of flammable off-gases in start-up, shut-down, process upsets and emergencies only.

<b>Table S1.2 Operating techniques</b>		
<b>Description</b>	<b>Parts</b>	<b>Date Received</b>
Application EPR/NP3237LS/A001	The response to sections 2.1 and 2.2 in the Application not including: That part of KMT2 operation involving the use of R1101	21/08/06
Receipt of additional information to the application	Responses to informal request for clarification on a number of sections on the application – dated 19/01/07	25/01/07
Receipt of additional information to the application	Responses to informal request for clarification on a number of sections on the application	01/03/07
Receipt of additional information to the application	Responses to informal request for clarification on improvement programme with respect to reduction in sulphur dioxide emissions	02/08/07 and 23/08/07
Receipt of additional information to the application	Responses to informal request for clarification on improvement programme with respect to reduction in emissions of oxides of nitrogen and particulates	31/08/07
Receipt of additional information to the application	Summary of key aspects of the additional information supplied during the determination period	30/11/07
Application EPR/NP3237LS/V002	All parts	22/12/08
Application EPR/FP3139FN/T001 (full transfer of permit EPR/NP3237LS)	All parts	27/07/11
Additional information	Information relating to technical and financial capability plus specific asset management	28/07/11
Variation Application EPR/FP3139FN/V002	All parts - application to vary and reduce the flow and monitoring frequency for outlet W3 (N38)	24/11/11
Variation Application EPR/FP3139FN/V003	All parts	21/11/11
Variation Application EPR/FP3139FN/V004	Environment Agency led variation to reduce the SO <sub>2</sub> limit in accordance with IC29	28/12/12
Variation Application EPR/FP3139FN/V005	Environment Agency led variation to change annual SO <sub>2</sub> limits and to add IC for Eels Regulations	26/03/14
Receipt of additional information	By email - Procedures for compliance with storm overflow conditions	24/03/14 and 25/03/14
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 NO <sub>x</sub> , SO <sub>2</sub> and dust by reference to parts 3 and 4 of Annex V of Chapter III of IED) and 2f (methodology for assigning periods of start-up and shutdown).	30/09/15

<b>Table S1.2 Operating techniques</b>		
<b>Description</b>	<b>Parts</b>	<b>Date Received</b>
Receipt of additional information to the regulation 60(1) Notice	Compliance route(s) and operating techniques identified in 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 NO <sub>x</sub> , SO <sub>2</sub> and dust by reference to parts 3 and 4 of Annex V of Chapter III of IED) and 2f (methodology for assigning periods of start-up and shutdown) for LCP 143 (SHOP).	15/10/15
Receipt of additional information to the regulation 60(1) Notice	Confirmation of the rate limiting approach for LCP 140 (HPBH)	15/12/15
Receipt of additional information to the regulation 60(1) Notice	Confirmation of the compliance route chosen approach for LCP 138 (CDU-3), LCP 139 (CDU-4), LCP 141 (Secondary Processes), LCP 142 (Platformer 3 & HDT3) and LCP 143 (SHOP)	06/10/16
Receipt of additional information to the regulation 60(1) Notice	Confirmation of the compliance route chosen approach and representative ELV for LCP 140 (HPBH)	04/11/16
Minor operational change	By email – Changes to nitrogen generation & supply by third party	26/11/15
Minor operational change	By email – Receiving effluent by pipeline from Argent Energy (UK) Limited (EPR/LP3233DK) via Unit 78 before discharging to sewer	29/11/16
Receipt of information to the Regulation 61 Notice. Initial request by letter dated 05/08/15 and final request by email sent 04/10/17	Technical standards detailed in response to BAT conclusions of the notice provided under Regulation 61 of Environmental Permitting Regulations. Best available techniques as described in BAT conclusions under Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions for the Refining of Mineral Oil and Gas.	24/10/17
Annex to conditions in Variation EPR/FP3131FN/V009	Operating techniques for BAT Conclusions 12, 27, 34 and 52	-
Environmental Management System	<u>BAT Conclusion 7</u> (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.	To be available for inspection by an Environment Agency officer from 21/12/18
Environmental Management System	<u>BAT Conclusion 54</u> Wherever practicable, the Operator shall treat off-gas streams, which are to be used as refinery fuel gas (RFG), to remove acid gases such as hydrogen sulphide.	To be available for inspection by an Environment Agency officer from 21/12/18

<b>Table S1.2 Operating techniques</b>		
<b>Description</b>	<b>Parts</b>	<b>Date Received</b>
Environmental Management System	<u>BAT Conclusions 57 &amp; 58</u> Approved bubble design and monitoring protocol for Integrated Air Emissions Management, subject to response provided for improvement conditions IC50 and IC51 in Table S1.3 of this permit.  Any approved revisions to this protocol shall automatically supersede earlier approved submissions.	Date of written approval by the Environment Agency
Installation operation on natural gas	<u>POC1</u> Approved submission for pre-operational condition POC1 (previously in Table S1.4 of the permit).	26/06/12
Cease burning of the remaining sour water stripper off-gases in combustion plant at the installation (i.e. from HDS2 sour water stripper, C6501) and sulphur recovery	<u>IC4 submission</u> Approved submission for improvement condition IC4 (previously in Table S1.3 of the permit).	13/11/13
Variation Application EPR/FP3139FN/V010	All parts	05/07/19
Response to improvement conditions IC50	Document titled 'Fixed NOx Emissions Bubble (IC50)' Rev 2, dated 09/10/19	Approved 25/10/19
Response to improvement conditions IC51	Document titled 'Fixed SOx Emissions Bubble (IC51)' Rev 3, dated 06/11/19	Approved 11/11/19
Variation Application EPR/FP3139FN/V011 Response to Schedule 5 Notice served 29/06/21	Operating techniques for BAT Conclusion 52 described in document reference: 1. Response to Schedule 5 Notice 2. Att C2_3 Confidential - BAT 52 Derogation_Rev2, titled 'Derogation from BAT-AEL for VOCs from loading and unloading operations'	07/07/21
Variation Application EPR/FP3139FN/V011 Response to Schedule 5 Notice served 05/08/21	Response to Schedule 5 Notice served on 05/08/2021, received on 14/09/2021, including additional information on the Mogas Export Project (the proposed derogation option) and proposed detailed milestones for the Mogas Export Project.	14/09/21
Variation Application EPR/FP3139FN/V011 Response to Schedule 5 Notice served 24/09/21	Operating techniques for BAT Conclusion 52 described in document reference: 1. Response to Schedule 5 Notice 2. Appendix 1, document titled 'Dispersion modelling assessment of emissions of VOCs', dated 25/11/2021. 3. Appendix 2, document titled 'EOUK BAT 52 Dispersion Modelling – Data and Assumptions'. 4. Appendix 3, document titled 'Appendix 3 Sensitivity Dispersion Modelling Results'	26/11/21
Variation Application EPR/FP3139FN/V012	Forms Part C2 and C3 of the application together with supplementary information supplied with these parts.	10/03/21

<b>Table S1.2 Operating techniques</b>		
<b>Description</b>	<b>Parts</b>	<b>Date Received</b>
Variation Application EPR/FP3139FN/V013	<p>Responses to section 3 of application Form Part C3, including the document titled 'HyNet Hydrogen Production Plant Environmental Permit Application Supporting Document', dated 21/07/2021 (received on 31/08/2021) and appendixes A.1.0, A.2.0 and A.4.0 to this document.</p> <p>Additional information on legal operator of the HPP and CCS plant, risk of pollution in the event of flooding, water balance, specification of the primary, secondary and tertiary containment infrastructure provided on 07/12/2021 in response to non-duly made request for information.</p>	Duly made 07/12/21
Variation Application EPR/FP3139FN/V013 Response to Schedule 5 Notice served 17/03/22	Responses to Schedule 5 Notice questions 1 to 21, including all the additional information on minimum staffing and resourcing levels to operate the HPP and CCS plants, all operating techniques, best available techniques and environmental risk for the HPP, CCS and associated effluent treatment plant.	24/06/22
	Response to Schedule 5 Notice question 22, including additional information on noise and revised Noise Impact Assessment and noise data.	15/07/22 18/07/22 09/08/22
	Additional information on monitoring of sulphur content in ROG, emissions performance of combustion equipment, energy efficiency of combustion equipment, fire gas detection system, specification of the flare, secondary containment for Waste Water Blending Tank 10-BAG-T-001 and sub-surface process drain drums, and process description, isolation and blowdown philosophy for the pipelines connected to the HPP and CCS activities.	26/09/22
	Operating techniques described as part of the additional information provided in response to Schedule 5 Notice question 19 including description of scenarios, risk assessment of CO <sub>2</sub> venting operations and supporting information.	25/11/22 28/11/22 09/12/22
Variation Application EPR/FP3139FN/V013 Response to Request for Information served on 12/12/2022	Additional information in response to request to address in more detail the uncertainties of the CO <sub>2</sub> venting study, including responses in email from Essar Oil UK Limited received on 30/01/2023 and revised version of report titled 'Environmental risk assessment for abnormal emissions of carbon dioxide, Essar Stanlow Refinery'.	30/01/23



<b>Table S1.3 Improvement programme requirements</b>		
<b>Reference</b> Note 1	<b>Requirement</b>	<b>Date</b>
IC2	<p>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 sections 2.2.2. and 2.2.5 of TGN S1.02 and section 2.2.5 of TGN S 4.01, including but not limited to:</p> <ul style="list-style-type: none"> <li>• kerbing at HVI lube plant and north site berths;</li> <li>• materials of construction of acids and alkali storages at HVI lube oil and alcohols plants;</li> <li>• basis of design for bunding for D17 gas oil area, EOG, WOG T site storage, NDAF and NO3 VRU ballast</li> </ul> <p>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.</p> <p>The plan shall be implemented by the operator from the date of approval by the Agency.</p>	Completed
IC19	<p>A written plan shall be submitted to the Agency for approval detailing the timescale to address the issues identified in the Application Site Report sections D2A and D2B with regard to potential for pollution</p> <p>Where appropriate, the plan shall contain the 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.</p> <p>The plan shall be implemented by the operator from the date of approval by the Agency.</p>	Completed
IC34	<p>The Operator shall prepare and submit a desk top study in line with Stages 1–7 set out within the European Commission Guidance concerning baseline reports dated 5th May 2014 (Ref: 2014/C 136/03) and the Environment Agency’s H5 guidance to the Environment Agency for review and approval. This shall include but not be limited to the following:</p> <ul style="list-style-type: none"> <li>• An assessment to determine whether there is a possibility of soil and / or groundwater contamination from relevant hazardous substances (RHS) used, stored or released from site;</li> <li>• A review of existing soil and groundwater measurements to determine whether an appropriate baseline can be established for RHS in the locations that they will be used, stored or released, having regard to the possibility of soil and/or groundwater contamination;</li> <li>• Proposals to undertake site investigation works should additional soil and groundwater measurements be required to enable an baseline to be established for RHS in the locations that they will be used, stored or released, having regard to the possibility of soil and/or groundwater contamination; and</li> <li>• An assessment to demonstrate that the requirements of improvement conditions IC2 and IC19 have been addressed.</li> </ul>	Completed

<b>Table S1.3 Improvement programme requirements</b>		
<b>Reference</b> Note 1	<b>Requirement</b>	<b>Date</b>
IC35	<p>The Operator shall undertake any relevant intrusive works identified within IC34 to enable an adequate baseline to be established for relevant hazardous substances (RHS) in the locations that they will be used, stored or released, having regard to the possibility of soil and/or groundwater contamination in line with the requirements set out within Stage 7 of European Commission Guidance concerning baseline reports dated 5th May 2014 (Ref: 2014/C 136/03) and the Environment Agency's H5 guidance; and</p> <p>Prepare and submit a baseline report to the Environment Agency for approval in line with the requirements set out within Stage 8 of the European Commission Guidance concerning baseline reports dated 5th May 2014 (Ref: 2014/C 136/03) and the Environment Agency's H5 guidance.</p>	31/03/23
IC36	<p>The Operator shall submit an updated site condition report to the Environment Agency for review. The Report shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> <li>• The baseline report required by IC35 above.</li> <li>• Baseline reference data for any 'other polluting substances'.</li> <li>• A soil and groundwater monitoring plan, to demonstrate proposed compliance with permit condition 3.2.4 in respect of periodic monitoring of relevant hazardous substances (RHS) in soil and groundwater and proposed monitoring for 'any other polluting substances'.</li> </ul> <p>Further information in respect of setting baseline reference data for any other polluting substances is detailed within the Environment Agency's H5 guidance.</p>	31/03/23
IC38	<p>The Operator shall undertake an impact assessment in accordance with the methodology in the Environment Agency H1 screening tool for all determinands listed in Schedule 3 Table S3.2 for emissions points to water W1, W2, W3 and W4.</p> <p>Based on the outcomes of the H1 screening and IC5, the Operator shall propose a revised Table S3.2 (or Table S3.2(a)(b) as appropriate), including applicable emission limit values, a monitoring schedule, and a revised Table S3.4 annual limit for oil in water (total). These shall be submitted in writing to the Environment Agency for approval.</p>	31/03/19  (Under review)
IC39	<p><u>BAT Conclusion 6</u></p> <p>The Operator shall submit a diffuse VOC monitoring plan to the Environment Agency for written approval. This shall include but not be limited to:</p> <ul style="list-style-type: none"> <li>• The nature of the material handled.</li> <li>• The sources of emissions.</li> <li>• Justification of the monitoring techniques selected.</li> <li>• How the monitoring data will be recorded and reviewed.</li> </ul> <p>The plan shall take into account the appropriate techniques for VOC monitoring specified in BAT Conclusion 6 for the Refining of Mineral Oil and Gas.</p> <p>The Operator shall implement the approved plan and produce and submit an annual report (in accordance with permit condition 4.2.2) on the results of the monitoring undertaken under the plan.</p>	Completed

Table S1.3 Improvement programme requirements		
Reference Note 1	Requirement	Date
IC40	<p><u>BAT Conclusion 11</u></p> <p>The Operator shall carry out an assessment of the options available for segregation of waste water streams and the viability of their implementation; to reduce the volume of process water produced, as detailed in BAT Conclusion 11 for the Refining of Mineral Oil and Gas.</p> <p>A written report summarising the findings shall be submitted to the Environment Agency for approval, along with a timetable for implementing viable improvements identified. The Operator shall implement the improvements to the approved timetable.</p>	Completed
IC41	<p><u>BAT Conclusion 12</u></p> <p>The Operator shall submit, for approval by the Environment Agency, reports setting out progress to achieving compliance with the BAT 12 AELs by no later than <b>30 September 2021</b> for this <b>time limited</b> derogation.</p> <p>The report shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> <li>• Current performance against the BAT Conclusion 12 AELs.</li> <li>• Methodology for reaching the AELs.</li> <li>• Associated targets / timelines for reaching compliance by <b>30 September 2021</b> at W1 to W4 defined in Tables S3.2, S3.2(a) and S3.2(b) of this permit for emissions of: <ul style="list-style-type: none"> <li>Hydrocarbon oil index (HOI) at W1 to W4</li> <li>Chemical Oxygen Demand (COD) at W2</li> <li>Total Suspended Solids (TSS) at W2 &amp; W3</li> <li>Benzene at W3</li> <li>Total nitrogen expressed as N at W4</li> <li>Lead, cadmium, nickel &amp; mercury at W4</li> </ul> </li> <li>• Address any potential uncertainties about the quality of the remaining surface water within the intermittent discharges, which will no longer receive DAF treatment. This shall include a review of these releases to confirm the requirement for any future monitoring that may be required to determine the significance of any residual impacts.</li> <li>• Procedures to control effluent releases at W1 &amp; W2 in the event that they cannot be discharged to the third party waste water treatment works. These shall include an assessment of the impact of any such releases.</li> <li>• Any alterations to the initial plan – for progress reports.</li> <li>• Address each deficiency identified in the Flowcheck Ltd. Report No. SV1160F, dated 7 March 2012.</li> </ul> <p>The Operator shall submit reports on progress with the approved compliance plan on a six monthly frequency specified by this condition.</p> <p>The final report shall be submitted three months after the compliance date specified by this condition.</p>	<p>Initial Report 31/12/18</p> <p>Progress reports by 30/06/19 31/12/19 30/06/20 31/12/20 30/06/21 30/06/23</p> <p>(Under review)</p>

Table S1.3 Improvement programme requirements		
Reference Note 1	Requirement	Date
IC42	<p><u>BAT Conclusion 27</u> The Operator shall submit, for approval by the Environment Agency, a summary report of the investigations carried out to assess the impact of modifications to the CO boiler for this <b>non time limited</b> derogation.</p> <p>The report shall include, but not be limited to the following:</p> <ul style="list-style-type: none"> <li>• The findings of the 'internal' assessment of the associated equipment carried out in 2018.</li> <li>• Implementation dates for any changes/modifications to the air flow.</li> <li>• The findings of the further simulation and design work, along with 'internal' inspection to assess the practicality of enhancing CO combustion by installation of a baffle in the combustion section of the CO boiler.</li> <li>• The changes to the CO/NOx emissions profile as a result of any changes/modifications identified.</li> </ul> <p>The Operator shall submit initial and final reports as specified by this condition.</p>	Completed
IC43	<p><u>BAT Conclusion 34 – CDU-4</u> The Operator shall submit, for approval by the Environment Agency, reports setting out progress to achieving compliance with the BAT 34 NOx AEL. Compliance shall be achieved no later than 31 December 2022, for this <b>time limited</b> derogation.</p> <p>The report shall include any alterations to the initial plan – for progress reports.</p> <p>The Operator shall submit reports on progress with the approved compliance plan on a twelve monthly frequency specified by this condition.</p> <p>The final report shall be submitted as specified by this condition.</p>	<p>Initial Report 31/12/18</p> <p>Progress reports by 31/12/19 31/12/20 31/12/21</p> <p>Final Report 31/12/22 (Under review)</p>
IC44	<p><u>BAT Conclusion 48</u> The Operator shall prepare a caustic use minimisation plan, which shall consider:</p> <ol style="list-style-type: none"> <li>1. Uses of caustic, including volume and caustic strength, in; <ol style="list-style-type: none"> <li>i. Product treatment processes such as neutralisation of acid from the alkylation process, caustic washing of hydrocarbon streams leaving the FCC, caustic washing of propylene or butylene feeds to polymerisation units to remove mercaptans, gasoline sweetening.</li> <li>ii. Gas treatment, such as SRU off-gas scrubbing, tail-gas scrubbing, FCC regeneration vent gas scrubbing.</li> <li>iii. Corrosion protection of atmospheric distillation unit (ADU) overhead, steam conditioning, effluent pH adjustment.</li> </ol> </li> <li>2. Whether spent caustic streams generated from any of the processes in (i) above could be used as a raw material for the processes in (ii) or (iii) above.</li> <li>3. Whether any other caustic minimisation measures could be applied, such as regeneration of caustic washings.</li> </ol> <p>The Operator shall implement measures identified in 2 &amp; 3 above and provide the Environment Agency with a written copy of the plan for approval.</p>	Completed

Table S1.3 Improvement programme requirements		
Reference Note 1	Requirement	Date
IC45	<p><u>BAT Conclusion 49</u></p> <p>The Operator shall undertake an assessment of measures to reduce point source and fugitive emissions of VOCs from the storage of liquid hydrocarbons. The assessment shall take into account the techniques identified in BAT Conclusion 49 for the Refining of Mineral Oil and Gas, together with any other suitable reduction techniques.</p> <p>A written report summarising the findings shall be submitted to the Environment Agency, along with a timetable for implementing improvements. The Operator shall implement the improvements identified to a timetable approved in writing with the Environment Agency.</p>	Completed
IC46	<p><u>BAT Conclusion 51</u></p> <p>The Operator shall review all secondary containment measures, provided for liquid hydrocarbons that are stored or held on site, (excluding those bunds in scope of the COMAH Containment Policy).</p> <p>The review shall verify whether all storage tanks and areas designed for the storage of drums/IBCs and other portable liquid containers, within the installation; are sited on an impermeable base and with sufficient bunding as specified in the CIRIA C736 Guidance.</p> <p>Where containment provisions do not meet this standard, the Operator shall identify improvements, or alternative measures (such as additional primary or tertiary containment measures) to provide an equivalent level of protection.</p> <p>The Operator shall provide the Environment Agency with a written report of the review and shall implement identified improvements to a timescale approved in writing with the Environment Agency.</p>	Completed
IC47	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall submit, for approval by the Environment Agency, reports setting out progress to achieving compliance with BAT 52 by no later than <b>31 December 2020</b> for this <b>time limited</b> derogation.</p> <p>The report shall include, but not be limited to, the following:</p> <ul style="list-style-type: none"> <li>• A regular review of the progress to reduce loading/unloading operations at White Oil Docks to &lt; 1 million m<sup>3</sup>/annum by 1 January 2021 as specified in Table S1.1 of this permit.</li> <li>• Any alterations to the initial plan – for progress reports.</li> </ul> <p>The Operator shall submit reports on progress with the approved compliance plan as specified by this condition.</p> <p>The final report shall be submitted as specified by this condition.</p>	Superseded by variation application EPR/FP3139FN/V011
IC48	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall develop 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 approved in writing with the Environment Agency having regard to the Environment Agency M2 and M16 Guidance Notes. Routine benzene monitoring is not required where it can be demonstrated that benzene emissions are consistently less than 1 mg/Nm<sup>3</sup> from a point source.</p>	Completed

<b>Table S1.3 Improvement programme requirements</b>		
<b>Reference</b> Note 1	<b>Requirement</b>	<b>Date</b>
IC49	<p><u>BAT Conclusions 55 &amp; 56</u></p> <p>The Operator shall carry out a study of the flaring system and flare sources for the purpose of reducing baseline flaring. The study shall include:</p> <ul style="list-style-type: none"> <li>• Options to improve flare flow metering from individual sources.</li> <li>• Options to reduce arising of gases requiring flaring, giving consideration to the requirements of BAT Conclusions 55 and 56 for the Refining of Mineral Oil and Gas.</li> <li>• Assessment of the feasibility of installing a flare gas recovery system to minimise the base load to current flare systems, including arising from planned shut-downs.</li> </ul> <p>The Operator shall submit a written report, to the Environment Agency providing details of the findings of the study and a timetable for implementation of any improvements identified.</p>	Completed
IC50	<p><u>BAT Conclusion 57</u> <sup>Note 2</sup></p> <p>The Operator shall submit, for approval by the Environment Agency, the design for the fixed NOx emissions bubble for the installation and an associated monitoring programme to demonstrate compliance with the bubble. The bubble design and associated monitoring programme shall be in accordance with the principals described in the 'Integrated Air Emissions Management Protocol'.</p> <p>The bubble design shall specify, but not be limited to:</p> <ol style="list-style-type: none"> <li>1. A description of the units to be included in the bubble including; the type of unit, the fuel fired, the representative flue gas flow-rate, the applicable BAT AEL for that unit, calculation of the fixed bubble limit.</li> <li>2. A demonstration, using historic data from a representative period that the operations can comply with the bubble limit.</li> </ol> <p>The monitoring protocol shall include but not be limited to:</p> <ol style="list-style-type: none"> <li>1. A description of the monitoring provision, or surrogate measure, for each unit included in the bubble.</li> <li>2. Identification of the abnormal operating conditions for each unit, and specification of the 'standard contribution value' for each unit, equal to the representative flow-rate multiplied by the applicable BAT AEL, which will be used as a surrogate value during periods of abnormal operation.</li> </ol>	Completed

<b>Table S1.3 Improvement programme requirements</b>		
<b>Reference</b> Note 1	<b>Requirement</b>	<b>Date</b>
IC51	<p><u>BAT Conclusion 58</u></p> <p>The Operator shall submit, for approval by the Environment Agency, the design for the fixed SO<sub>2</sub> emissions bubble for the installation and an associated monitoring programme to demonstrate compliance with the bubble limit. The bubble design and associated monitoring programme shall be in accordance with the principals described in the 'Integrated Air Emissions Management Protocol'</p> <p>The bubble design shall specify, but not be limited to:</p> <ol style="list-style-type: none"> <li>1. A description of the units to be included in the bubble including; the type of unit, the fuel fired, the representative flue gas flowrate, the applicable BATAEL for that unit, formulae for the calculation of the fixed bubble limit.</li> <li>2. A demonstration, using historic data from a representative period that the operations can comply with the fixed bubble limit.</li> </ol> <p>The monitoring procedures shall specify, but not be limited to:</p> <ol style="list-style-type: none"> <li>1. A description of the monitoring provision, or surrogate measure, for each unit included in the bubble.</li> <li>2. The formulae that will be used to calculate the monthly average compliance value.</li> <li>3. Identification of the abnormal operating conditions for each unit, and specification of the 'standard contribution value' for each unit, equal to the representative flow-rate multiplied by the applicable BAT AEL, which will be used as a surrogate value during periods of abnormal operation.</li> </ol>	Completed
IC52	<p><u>BAT Conclusion 58</u></p> <p>The Operator shall submit a written report to the Environment Agency for approval which provides evidence to evaluate the risk of potential exceedances of the short-term 15 minute SO<sub>2</sub> air quality objective. The purpose of this is to determine an hourly bubble SO<sub>2</sub> limit to replace the current limit in table S3.1(d) of this permit (Integrated Emissions Management). This evidence shall include the following:</p> <ol style="list-style-type: none"> <li>1. Data for a number of representative years for current and future operations, including release profiles, peak emissions and how frequent these peaks are likely to be. <ul style="list-style-type: none"> <li>• Hourly SO<sub>2</sub> concentrations from the SRU and the CO boiler; with a comparison to values used in the CERC report <sup>Note 3</sup>.</li> <li>• Hourly bubble SO<sub>2</sub> concentration (using CDU-4, HPBH, CO boiler and SRU).</li> </ul> </li> <li>2. Discussion and interpretation of these release profiles and peak concentrations with consideration to: <ul style="list-style-type: none"> <li>• Operational scenario (e.g. potential unit off-sets, unusually high sulphur crudes, etc.);</li> <li>• Frequency of peaks within the year and their likelihood within future years;</li> <li>• How CERC's modelled values may or may not represent these short-term peaks.</li> </ul> </li> </ol>	Completed

<b>Table S1.3 Improvement programme requirements</b>		
<b>Reference</b> Note 1	<b>Requirement</b>	<b>Date</b>
IC53	<p><u>WFD - sewer</u></p> <p>The Operator shall submit a written report to the Environment Agency for approval that includes:</p> <p>The results of an assessment of the impact of the emissions to surface water from the site following the treatment of the effluent at the United Utilities treatment works in accordance with the Environment Agency's Surface Water Pollution Risk Assessment Guidance available on our website. The report shall:</p> <p>(a) Be based on a representative monitoring dataset of hazardous pollutants.</p> <p>(b) Include proposals for appropriate measures to mitigate the impact of any emissions where the assessment determines they are liable to cause pollution, including timescales for implementation of individual measures.</p> <p>(c) Propose emission limit values at the point of discharge from the installation at S1. These limits shall be based on the treatment factor from the third party treatment works that shall be applied to each AEL associated with BAT Conclusion 12.</p> <p>(d) The outcomes shall also be used to propose a revised annual limit for oil in water in Table S3.4 (annual limits) of this permit.</p>	31/03/19 (Under review)
IC54	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall submit a report setting out the progress made in delivering the Mogas export project relied upon to achieve compliance with BAT 52, for approval by the Environment Agency.</p>	Completed
IC55	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall submit a report setting out the progress made in delivering the Mogas export project relied upon to achieve compliance with BAT 52, for approval by the Environment Agency.</p>	Completed
IC56	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall submit a report setting out the progress made in delivering the Mogas export project relied upon to achieve compliance with BAT 52, for approval by the Environment Agency.</p>	31/05/23
IC57	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall submit a report setting out the progress made in delivering the Mogas export project relied upon to achieve compliance with BAT 52, for approval by the Environment Agency.</p>	30/11/23
IC58	<p><u>BAT Conclusion 52</u></p> <p>The Operator shall submit a report setting out the progress made in delivering the Mogas export project relied upon to achieve compliance with BAT 52, for approval by the Environment Agency.</p>	31/05/24
IC59	<p><u>HPP and CCS Carbon Capture Performance</u></p> <p>The Operator shall submit for approval by the Environment Agency a report including a detailed review of the carbon capture performance of the Carbon Capture Plant serving the Hydrogen Production Plant. The report shall demonstrate that the actual Carbon Capture Efficiency of the operating plant averaged over one year of operation, as specified in table S3.5(a) of this permit, is consistent with the design specification stated in the application for variation V013. Should the actual capture efficiency be less than the minimum capture performance of 95% stated in the Environment Agency's guidance 'Emerging techniques for hydrogen production with carbon capture', the Operator shall carry out an analysis of the issues affecting the performance of the plant and propose remedial actions for approval by the Environment Agency to improve the capture efficiency performance.</p>	Within 15 months from the beginning of the commercial operation of the HPP and CCS plant, agreed as part of pre-operational condition POC11



<b>Table S1.3 Improvement programme requirements</b>		
<b>Reference</b> Note 1	<b>Requirement</b>	<b>Date</b>
IC60	<u>HPP spent catalyst management</u> The Operator shall submit for approval by the Environment Agency a review of the proposed waste management arrangements and the re-use, recycling, recovery and/ or disposal routes for wastes generated by the HPP and CCS plant. This shall include the development of a catalyst care programme for spent catalysts and adsorbents/adsorbents.	Within 3 months from the beginning of the commercial operation of the HPP and CCS plant, agreed as part of pre-operational condition POC11
IC61	<u>LDAR programme</u> The Operator shall submit a plan for approval by the Environment Agency detailing the extension of the refinery VOC LDAR programme to include the HPP and CCS plant. The extension of the LDAR programme to these activities shall also cover fugitive emissions of hydrogen, according to suitable standards to be agreed in writing with the Environment Agency.	Within 3 months from the beginning of the commercial operation of the HPP and CCS plant, agreed as part of pre-operational condition POC11
IC62	<u>Emission points HPP-A-1 and HPP-A-2</u> The Operator shall carry out tests to assess whether the air monitoring location for emission points HPP-A-1 and HPP-A-2 meet the requirements of BS EN 15259 and supporting Method Implementation Document (MID).  A written report shall be submitted for approval setting out the results and conclusions of the assessment including where necessary proposals for improvements to meet the requirements.  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 time scale in the notification.  The proposals shall be implemented in accordance with the Environment Agency's written approval.	Within 3 months from the beginning of the commercial operation of the HPP and CCS plant, agreed as part of pre-operational condition POC11
<p>Note 1: Completed ICs have been removed with numbering retained for ease of future reference.</p> <p>Note 2: Deleted.</p> <p>Note 3: CERC report - Dispersion modelling of SO<sub>2</sub> emissions from Stanlow refinery, Cheshire. Draft report (Ref: FM1080/R3/16, dated 12 August 2016) produced by Cambridge Environmental Research Consultants (CERC), for Cheshire West and Chester Council.</p>		

Table S1.4 Pre-operational measures for future development		
Reference Note 1	Operation	Pre-operational measures
POC3	Operation of Crude Distillation Unit 3 (CDU-3) (LCP138)	<p>At least 3 months prior to commencement of start-up of Crude Distillation Unit 3 the Operator shall submit a report for approval by the Environment Agency describing in detail any changes in operating techniques and fuels used, when compared to the techniques and fuels described in the '<i>reference relevant documents in the operating techniques table</i>'. Operating techniques shall also include a review of compliance against the BAT Conclusions for the Refining of Mineral Oil and Gas to demonstrate how the unit will meet or plan to meet the BAT standards.</p> <p>If compliance is subject to the refinery site bubble the Operator shall submit the necessary data and calculations in accordance with the principals described in the 'Integrated Air Emissions Management Protocol' and in accordance with condition 4.3.10 of this permit, for approval by the Environment Agency to demonstrate how this shall be achieved.</p> <p>The Operator shall also submit a periodic monitoring plan for approval which shall be implemented within one month of stable unit operation.</p>
POC4	Operation of HVI unit (LCP141 - HVI part only)	<p>At least 3 months prior to commencement of start-up of HVI, the Operator shall submit a report for approval by the Environment Agency describing in detail any changes in operating techniques and fuels used, when compared to the techniques and fuels described in the '<i>reference relevant documents in the operating techniques table</i>'. Operating techniques shall also include a review of compliance against the BAT Conclusions for the Refining of Mineral Oil and Gas to demonstrate how the unit will meet or plan to meet the BAT standards.</p> <p>If compliance is subject to the refinery site bubble the Operator shall submit the necessary data and calculations in accordance with the principals described in the 'Integrated Air Emissions Management Protocol' and in accordance with condition 4.3.10 of this permit, for approval by the Environment Agency to demonstrate how this shall be achieved.</p> <p>The Operator shall also submit a monitoring plan for continuous monitoring across the LCP; for approval, which shall be implemented from the start-up of the HVI operation.</p>

Table S1.4 Pre-operational measures for future development		
Reference Note 1	Operation	Pre-operational measures
POC5	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Commissioning plan</b>	<p>Prior to the commencement of commissioning, the Operator shall submit a written commissioning plan to the Environment Agency and obtain the Environment Agency’s written approval to it.</p> <p>The commissioning plan shall:</p> <ol style="list-style-type: none"> <li>1. Include the timelines for the commissioning and start-up operations and the expected durations of these activities;</li> <li>2. Report 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;</li> <li>3. Address the actions to be taken to protect the environment throughout all the phases of commissioning;</li> <li>4. Include the proposed monitoring for the commissioning emissions and set out the proposed reporting to the Environment Agency in the event that actual emissions exceed the expected emissions;</li> <li>5. Demonstrate that the duration and the environmental impacts of plant start-up activities are minimised;</li> <li>6. Propose a detailed methodology to demonstrate the overall energy efficiency and carbon capture efficiency of the plant, including detailed information on the process monitoring requirements identified in Table S3.5(a) of this permit. The approved methodology shall be used to demonstrate the overall energy efficiency and carbon capture efficiency of the plant as part of the commissioning activities (refer to POC11), and, after the commissioning phase, for process monitoring and reporting purposes in compliance with the conditions of the permit.</li> </ol> <p>The commissioning activities shall be carried out in accordance with the commissioning plan approved by the Environment Agency.</p>
POC6	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Environmental Management System</b>	<p>Prior to the commencement of commissioning, the Operator shall submit for approval by the Environment Agency a report confirming the extension of the installation’s Environment Management System (EMS) to the hydrogen production and carbon capture plant.</p> <p>The Operator shall not begin the commissioning operations of the hydrogen production and carbon capture plant, including any associated activities, prior to obtaining written approval by the Environment Agency to this report.</p> <p>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 <a href="http://www.gov.uk">www.gov.uk</a>). 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.</p> <p>As part of the above, the following aspects shall be addressed in detail in the report and updated EMS documentation:</p> <ul style="list-style-type: none"> <li>• The extension of the existing refinery plant and equipment inspection, testing and maintenance programme to hydrogen production and carbon capture plant.</li> <li>• The update to the existing refinery Accident Management Plan to cover the risks from potential accidental events associated with the operations of the hydrogen production and carbon capture plant, as adequately informed by the updated Safety Report developed for the installation under the COMAH Regulations.</li> </ul>

Table S1.4 Pre-operational measures for future development		
Reference Note 1	Operation	Pre-operational measures
POC7	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Water discharges</b>	<p>Following the approval by the Environment Agency of the assessment report supporting the review of discharges across the Refinery in response to IC38 and prior to the commencement of commissioning of the hydrogen production and carbon capture plant and associated water treatment activities, the Operator shall submit for approval by the Environment Agency an updated environmental risk assessment for the emissions to water from emission point W3, including the demineralisation effluent generated from the water treatment activities associated with the hydrogen production and carbon capture plants, together with the revised discharges identified in response to IC38.</p> <p>The report shall be submitted to the Environment Agency for approval and the Operator shall not begin the commissioning operations of the hydrogen production and carbon capture plant, including any associated water treatment activities, prior to obtaining written approval by the Environment Agency to the environmental risk assessment required by this pre-operational condition.</p> <p>The risk assessment shall follow the latest methodology set out in the Environment Agency guidance 'Surface water pollution risk assessment for your environmental permit' and 'H1 annex D2: assessment of sanitary and other pollutants in surface water discharges' (as found on <a href="http://www.gov.uk">www.gov.uk</a>) or other methodology agreed in writing with the Environment Agency as part of the approval of improvement condition IC38. The risk assessment shall confirm that the hydrogen production and carbon capture plant effluent, when added to the existing effluent discharged through emission point W3, will not cause risks of exceedances of the environmental quality standards for all the relevant pollutants identified in the discharge and that the discharge will not cause deterioration of the receiving water body. If warranted by the outcomes of the risk assessment, the Operator shall propose amended operating techniques according to Best Available Techniques (BAT), such as different design configurations of the water treatment activities, different disposal options, and/or emission limits more stringent than the BAT-Associated Emission Levels (AELs) for the parameters of concern due to their potential environmental impacts. Any amended operating techniques and emission limits proposed by the Operator shall be approved by the Environment Agency prior to the start of the commissioning operations of the hydrogen production and carbon capture plant.</p>

Table S1.4 Pre-operational measures for future development		
Reference Note 1	Operation	Pre-operational measures
POC8	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Containment Infrastructure</b>	<p>Following the completion of the detailed engineering design for the hydrogen production and carbon capture plant, 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:</p> <ul style="list-style-type: none"> <li>• Updating the risk assessment and classification to identify the class of containment required;</li> <li>• 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;</li> <li>• Demonstrating that 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;</li> <li>• Demonstrating that the isolation and operating philosophy for the secondary and tertiary containment infrastructure prevents accidental emissions to the environment.</li> </ul> <p>The Operator shall not begin the commissioning operations of the hydrogen production and carbon capture plant, including any associated activities, prior to obtaining written approval by the Environment Agency to this pre-operational condition.</p>

Table S1.4 Pre-operational measures for future development		
Reference Note 1	Operation	Pre-operational measures
POC9	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Noise impact assessment</b>	<p>Following the completion of the detailed engineering design for the hydrogen production and carbon capture plant, and prior to the commencement of commissioning operations, the Operator shall submit for approval by the Environment Agency a revised Noise Impact Assessment informed by updated and final noise emissions data provided by equipment manufacturers during the detailed engineering design of the plant, taking into account the detailed noise attenuation measures included in the design according to BAT.</p> <p>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) and BS7445: 2003 (Description and measurement of environmental noise). The revised noise impacts assessment shall include:</p> <ul style="list-style-type: none"> <li>• Updated sound source data, with appropriate references for all plant.</li> <li>• Updated detailed mitigation proposals, demonstrated to be compliant with BAT for this type of installation, with appropriate references for all proposed mitigation measures.</li> <li>• Updated discussion of acoustic feature corrections depending on final plant specifications, with evidence provided to justify corrections for tonality, impulsivity or intermittency (if applicable).</li> <li>• Updated discussion of context.</li> <li>• Updated discussion of uncertainty.</li> <li>• Updated BS4142 impact for the proposed hydrogen production and carbon capture plant in isolation and cumulatively in the context of the existing site operations.</li> </ul> <p>The report shall also draw comparisons with the background levels in the locality any potential impact that the hydrogen production and carbon capture plant is likely to have upon identified sensitive receptors and compare them with the predictions and conclusions of the preliminary Noise Impact Assessment submitted with the application for variation V013 (document titled 'HyNet Environment Agency Permitting Noise Assessment', dated 15/07/2022). The report shall include an interpretation of the results and conclusions drawn.</p> <p>The report shall demonstrate that the detailed acoustic design of the hydrogen production and carbon capture plants implemented BAT measures suitable to confirm the conclusions of the preliminary Noise Impact Assessment submitted with the application for variation V013 (document titled 'HyNet Environment Agency Permitting Noise Assessment', dated 15/07/2022) and to mitigate further the noise impacts from the operations of the HPP preliminarily identified in that study.</p> <p>The Operator shall not begin the commissioning operations of the hydrogen production and carbon capture plants, including any associated activities, prior to obtaining written approval by the Environment Agency to the revised Noise Impact Assessment.</p>
POC10	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Energy efficiency</b>	<p>As part of the detailed engineering design for the hydrogen production and carbon capture plant, and prior to the commencement of commissioning operations, the Operator shall submit for approval by the Environment Agency an energy efficiency optimisation study further reviewing options for reducing the energy demand of the plant including any options for recovering waste heat from the compression of hydrogen and CO<sub>2</sub>. The Operator shall demonstrate that any energy optimisation options that have been deemed technically and economically viable have been implemented in the final design of the activities, within the environmental risk envelope of application for variation V013.</p>

Table S1.4 Pre-operational measures for future development		
Reference Note 1	Operation	Pre-operational measures
POC11	Operation of HPP and carbon capture plant for geological storage (Phase 1) – <b>Commissioning compliance report</b>	<p>Within one month after the completion of the commissioning, the Operator shall submit a written report for approval by the Environment Agency, confirming that the environmental performance of the plant meets all the specifications stated in the permit application, in the responses to pre-operational conditions POC5 to POC10 as approved by the Environment Agency, and that the plant is capable to operate in compliance with the permit and within the risk envelope assessed in the application for variation V013 and the relevant pre-operational conditions.</p> <p>The report shall confirm that the plant meets the emission limits to air and water, energy efficiency, carbon capture efficiency specifications, and noise performance of the plant.</p> <p>In particular for noise, the Operator shall demonstrate that the noise performance of the plant is consistent with the conclusions of the Noise Impact Assessment submitted with the application for variation V013 (document titled 'HyNet Environment Agency Permitting Noise Assessment', dated 15/07/2022).</p> <p>Where deviations from the specified environmental performance are identified, the Operator shall set out for approval by the Environment Agency any applicable remedial measures to make the operations compliant.</p> <p>In responding to this pre-operational condition, the Operator shall agree with the Environment Agency the date for the commencement of the commercial operations of the activities of the HPP and CCS plants.</p>
Note 1: POC1 and POC2 are complete and have been removed with numbering retained for ease of future reference.		

## Schedule 2 - Waste types, raw materials and fuels

Table S2.1 Raw materials and fuels	
Raw materials and fuel description	Specification
Flushing Oil	Maximum 1.5% sulphur
Gas Oil (MP Boilers, etc.)	< 0.1% sulphur content
Gas oil for emergency gas oil generator (HPP-A-4) and firewater pump (HPP-A-5)	Ultra-low sulphur with <0.001% weight sulphur content
For release points: REF-A-5 (LCP142: Platformer 3 and HDT3), REF-A-6 (LCP141: HDS2 and Aromatics ONLY)	No liquid fuel shall be fired
For release point: REF-A-2 (LCP139: CDU-4)	Back up liquid fuel firing is allowed for 240 hours per calendar year as described in section 6 of the MFF Protocol
Refinery Off-Gas to Hydrogen Production Plant	<20 ppm Volume total sulphur

Table S2.2 Permitted waste types and quantities for receipt of ballast water	
Maximum quantity	N/A
Waste code	Description
16 07 08*	Waste containing oil (ballast water)

Table S2.3 Permitted waste types and quantities for Energy Recovery Plant (Incineration listed activity)	
Maximum quantity	Total hazardous and non-hazardous waste throughput shall not exceed 50,000 tonnes per year
Waste code	Description
<b>01</b>	<b>WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS</b>
<b>01 05</b>	<b>drilling muds and other drilling wastes</b>
01 05 05	oil-containing drilling muds and wastes
<b>05</b>	<b>WASTES FROM PETROLEUM REFINING, NATURAL GAS PURIFICATION AND PYROLYTIC TREATMENT OF COAL</b>
<b>05 01</b>	<b>Wastes from petroleum refining</b>
05 01 02*	wastes from petroleum refining
05 01 03*	desalter sludges
05 01 04*	acid alkyl sludges
05 01 05*	oil spills
05 01 06*	oily sludges from maintenance operations of the plant or equipment
05 01 08*	other tars
05 01 09*	Sludges from on-site effluent treatment containing dangerous substances
05 01 10	sludges from on-site effluent treatment other than those mentioned in 05 01 09



<b>Table S2.3 Permitted waste types and quantities for Energy Recovery Plant (Incineration listed activity)</b>	
<b>Maximum quantity</b>	Total hazardous and non-hazardous waste throughput shall not exceed 50,000 tonnes per year
<b>Waste code</b>	<b>Description</b>
05 01 11*	wastes from cleaning of fuels with bases
05 01 13	oil containing acids
05 01 14	Wastes from cooling columns
05 01 15*	spent filter clays
05 01 16	sulphur-containing wastes from petroleum desulphurisation
05 01 17	Bitumen
05 01 99	wastes not otherwise specified
<b>05 07</b>	<b>Wastes from Natural Gas Purification and transportation</b>
05 07 99	wastes not otherwise specified
<b>06</b>	<b>WASTES FROM INORGANIC CHEMICAL PROCESSES</b>
<b>06 02</b>	<b>wastes from the MFSU of bases</b>
06 02 01*	Calcium Hydroxide
06 02 03*	ammonium hydroxide
06 02 04*	sodium and potassium hydroxide
<b>06 06</b>	<b>wastes from the MFSU of sulphur chemicals, sulphur chemical processes and desulphurisation processes</b>
06 06 02*	wastes containing dangerous sulphides
06 06 03	wastes containing sulphides other than those mentioned in 06 06 02
<b>06 09</b>	<b>wastes from the MFSU of phosphorous chemicals and phosphorous chemical processes</b>
06 09 03*	calcium-based reaction wastes containing or contaminated with dangerous substances
06 09 04	calcium-based reaction wastes other than those mentioned in 06 09 03
<b>06 13</b>	<b>wastes from inorganic chemical processes not otherwise specified</b>
06 13 02*	spent activated carbon (except 06 07 02)
<b>07</b>	<b>WASTES FROM ORGANIC CHEMICAL PROCESSES</b>
<b>07 01</b>	<b>wastes from the manufacture, formulation, supply and use (MFSU) of basic organic chemicals</b>
07 01 01*	aqueous washing liquids and mother liquors
07 01 04*	other organic solvents, washing liquids and mother liquors
07 01 08*	other still bottoms and reaction residues
07 01 10*	other filter cakes and spent absorbents
07 01 11*	sludges from on-site effluent treatment containing dangerous substances
07 01 12	sludges from on-site effluent treatment other than those mentioned in 07 01 11
07 01 99	wastes not otherwise specified

<b>Table S2.3 Permitted waste types and quantities for Energy Recovery Plant (Incineration listed activity)</b>	
<b>Maximum quantity</b>	Total hazardous and non-hazardous waste throughput shall not exceed 50,000 tonnes per year
<b>Waste code</b>	<b>Description</b>
<b>07 07</b>	<b>wastes from the MFSU of fine chemicals and chemical products not otherwise specified</b>
07 07 01*	aqueous washing liquids and mother liquors
07 07 04*	other organic solvents, washing liquids and mother liquors
07 07 08*	other still bottoms and reaction residues
07 07 10*	other filter cakes and spent absorbents
07 07 11*	sludges from on-site effluent treatment containing dangerous substances
07 07 12	sludges from on-site effluent treatment other than those mentioned in 07 07 11
07 07 08	other still bottoms and reaction residues
07 07 99	wastes not otherwise specified
<b>10</b>	<b>WASTES FROM THERMAL PROCESSES</b>
<b>10 01</b>	
10 01 01	bottom ash, slag and boiler dust (excluding boiler dust mentioned in 10 01 04)
10 01 04*	Oily fly ash and boiler dust
10 01 23	aqueous sludges from boiler cleansing other than those mentioned in 10 01 22
<b>12</b>	<b>WASTES FROM SHAPING AND PHYSICAL AND MECHANICAL SURFACE TREATMENT OF METALS AND PLASTICS</b>
<b>12 01</b>	<b>wastes from shaping and physical and mechanical surface treatment of metals and plastics</b>
12 01 02	ferrous metal dust and particles
12 01 16*	waste blasting material containing dangerous substances
<b>13</b>	<b>OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)</b>
<b>13 03</b>	<b>Waste insulating and heat transmission oils</b>
13 03 07*	mineral-based non-chlorinated insulating and heat transmission oils
<b>13 05</b>	<b>oil/water separator contents</b>
13 05 02*	sludges from oil/water separators
13 05 03*	interceptor sludges
13 05 06*	oil from oil/water separators
13 05 07*	oily water from oil/water separators
<b>13 07</b>	<b>wastes of liquid fuels</b>
13 07 01*	fuel oil and diesel
13 07 02*	Petrol
<b>13 08</b>	<b>Oil wastes not otherwise specified</b>
13 08 01*	Desalter sludges or emulsions
13 08 02*	Other emulsions

<b>Table S2.3 Permitted waste types and quantities for Energy Recovery Plant (Incineration listed activity)</b>	
<b>Maximum quantity</b>	Total hazardous and non-hazardous waste throughput shall not exceed 50,000 tonnes per year
<b>Waste code</b>	<b>Description</b>
<b>14</b>	<b>WASTE ORGANIC SOLVENTS, REFRIGERANTS AND PROPELLANTS</b>
<b>14 06</b>	<b>waste organic solvents, refrigerants and foam/aerosol propellants</b>
14 06 03*	other solvents and solvent mixtures
<b>15</b>	<b>WASTE PACKAGING; ABSORBANTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED</b>
<b>15 01</b>	<b>Packaging (including separately collected municipal packaging waste)</b>
15 01 10*	packaging containing residues of or contaminated by dangerous substances
<b>15 02</b>	<b>Absorbants, filter materials, wiping cloths and protective clothing</b>
15 02 02*	absorbants, filter materials (including oil filters not specified) wiping cloths and protective clothing contaminated with dangerous substances
<b>16</b>	<b>WASTE NOT OTHERWISE SPECIFIED IN THE LIST</b>
<b>16 03</b>	<b>off-specification batches and unused products</b>
16 03 03*	inorganic wastes containing dangerous substances
16 03 04	inorganic wastes other than those mentioned in 16 03 03
16 03 05*	organic wastes containing dangerous substances
<b>16 08</b>	<b>spent catalysts</b>
16 08 02*	spent catalyst containing dangerous transition metals or dangerous transition metal compounds
16 08 04	spent catalysts contaminated with dangerous substances
16 08 07*	spent fluid catalytic cracking catalyst
<b>19</b>	<b>WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE</b>
<b>19 01</b>	<b>wastes from incineration or pyrolysis of waste</b>
19 01 11*	Bottom ash and slag containing dangerous substances
19 01 13*	Fly ash containing dangerous substances
<b>19 08</b>	<b>wastes from waste water treatment plants not otherwise specified</b>
19 08 02	Waste from de-sanding
19 08 05	Sludges from treatment of Urban waste water
19 08 06*	Saturated or spent ion exchange resins
19 08 07*	Solutions and sludges from regeneration of ion exchangers
<b>19 09</b>	<b>wastes from the preparation of water intended for human consumption or water for industrial use</b>
19 09 04	Spent activated carbon
19 09 05	Saturated or spent ion exchange resins

<b>Table S2.3 Permitted waste types and quantities for Energy Recovery Plant (Incineration listed activity)</b>	
<b>Maximum quantity</b>	Total hazardous and non-hazardous waste throughput shall not exceed 50,000 tonnes per year
<b>Waste code</b>	<b>Description</b>
<b>20</b>	<b>MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS</b>
<b>20 01</b>	<b>separately collected fractions (except 15 01)</b>
20 01 01	Paper and Cardboard
20 01 02	Glass
20 01 13*	Solvents
20 01 38	Wood other than that mentioned in 20 01 37
<b>20 03</b>	<b>other municipal wastes</b>
20 03 01	Mixed municipal waste
20 03 03	Street cleaning residues

<b>Table S2.4 Permitted waste types for NDAF Effluent Treatment plant from STL road terminal (EP/B/STANLOWTERMINAL/2019)</b>	
<b>Waste code</b>	<b>Description</b>
<b>13</b>	<b>OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)</b>
<b>13 05</b>	<b>oil/water separator contents</b>
13 05 01*	solids from grit chambers and oil/water separators
13 05 02*	sludges from oil/water separators
13 05 03*	interceptor sludges
13 05 06*	oil from oil/water separators
13 05 07*	oily water from oil/water separators
13 05 08*	mixtures of wastes from grit chambers and oil/water separators
<b>13 07</b>	<b>wastes of liquid fuels</b>
13 07 01*	fuel oil and diesel
13 07 02*	Petrol
13 07 03*	Other fuels (including mixtures)

<b>Table S2.5 Permitted waste types for Unit 78 from Argent Energy (UK) Limited (EPR/LP3233DK)</b>	
<b>Waste code</b>	<b>Description</b>
<b>16</b>	<b>Wastes not otherwise specified in the list</b>
<b>16 10</b>	<b>aqueous liquid wastes destined for off-site treatment</b>

<b>Table S2.5 Permitted waste types for Unit 78 from Argent Energy (UK) Limited (EPR/LP3233DK)</b>	
<b>Waste code</b>	<b>Description</b>
16 10 01*	aqueous liquid wastes containing hazardous substances
16 10 02	aqueous liquid wastes other than those mentioned in 16 10 01

## Schedule 3 – Emissions and monitoring

Locations of key emissions to air detailed as figure 2.2.1 (823161) in the application and key emissions to water detailed as figure 2.2 (figure 823160).

Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-1 Crude Distillation Unit 3 (CDU-3) (X, Y coordinates 343788, 374800)	<b>LCP 138</b> CDU-3 furnaces F301, F301U, F302 Flexible multi-fuel firing (RFG & non-commercial liquid fuels) 98.8 MWth	Sulphur dioxide	600 mg/Nm <sup>3</sup>  (1000 mg/Nm <sup>3</sup> LCP-Chapter III IED) Subject to refinery bubble Notes 12 & 14	-	At least every 6 months <sup>Note 1</sup>	BS EN 14791 or TGN M21
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	450 mg/Nm <sup>3</sup> <sup>Note 9</sup>  (300 – 450 mg/Nm <sup>3</sup> LCP-Chapter III IED) Subject to refinery bubble Notes 12 & 14	-	At least every 6 months <sup>Note 1</sup>	BS EN 14792 or TGN M22
		Dust	5 - 50 mg/Nm <sup>3</sup> <sup>Note 8</sup>	-	At least every 6 months <sup>Note 1</sup>	BS EN 13284-1
		Carbon monoxide	-	-	At least every 6 months <sup>Note 1</sup>	BS EN 15058

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Nickel (Ni) Antimony (Sb) Vanadium (V) <small>Liquid/multi fuel firing only</small>	-	-	Once every six months and after significant changes to the unit <small>Note 1</small>	BS EN 14385 or analysis based on metals content in the in the fuel
		Oxygen	-	-	Periodic As appropriate to reference <small>Note 1</small>	BS EN 14789
		Water vapour	-	-	Periodic As appropriate to reference <small>Note 1</small>	BS EN 14790
<b>Requirements for gas firing</b>						
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	<b>LCP 139:</b> CDU-4 furnaces: F201 A, B, C F202 <small>Note 13</small> F202 <small>Note 12</small> Gas fired with back-up non-commercial liquid fuels 222.5 MWth	Sulphur dioxide	35 mg/Nm <sup>3</sup>  (1000 mg/Nm <sup>3</sup> <small>LCP-Chapter III IED</small> ) Subject to refinery bubble <small>Notes 12 &amp; 14</small>	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> <small>LCP-Chapter III IED</small>	Daily mean of validated hourly averages	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	<b>LCP 139:</b> CDU-4 furnaces: F201 A, B, C F202 <small>Note 13</small> F202 <small>Note 12</small> Gas fired with back-up non-commercial liquid fuels 222.5 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	200 mg/Nm <sup>3</sup> <small>Notes 2a &amp; 10</small> (300 mg/Nm <sup>3</sup> LCP-Chapter III IED ) <small>Note 2a</small> Subject to refinery bubble <small>Note 12 &amp; 14</small>	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	330 mg/Nm <sup>3</sup> <small>Note 2</small> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	600 mg/Nm <sup>3</sup> <small>Note 2</small> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181



**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	<b>LCP 139:</b> CDU-4 furnaces: F201 A, B, C F202 <small>Note 13</small> F202 <small>Note 12</small>	Dust	5 mg/Nm <sup>3</sup> <b>Note 2</b> LCP-Chapter III IED	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
	Gas fired with back-up non-commercial liquid fuels 222.5 MWth	Dust	5.5 mg/Nm <sup>3</sup> <b>Note 2</b> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Dust	10 mg/Nm <sup>3</sup> <b>Note 2</b> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
<b>Requirements for liquid/multi-fuel firing</b>						
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	<b>LCP 139:</b> CDU-4 furnaces: F201 A, B, C F202 <small>Note 13</small> F202 <small>Note 12</small> Gas fired with back-up non-commercial liquid fuels 222.5 MWth	Sulphur dioxide	600 mg/Nm <sup>3</sup>  (1000 mg/Nm <sup>3</sup> LCP-Chapter III IED) <b>Note 3</b> Subject to refinery bubble <small>Notes 12 &amp; 14</small>	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> <b>Note 3</b> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> Note 3 LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	<b>LCP 139:</b> CDU-4 furnaces: F201 A, B, C F202 Note 13 F202 Note 12 Gas fired with back-up non-commercial liquid fuels 222.5 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	450 mg/Nm <sup>3</sup> Notes 2a & 9  (450 mg/Nm <sup>3</sup> LCP-Chapter III IED ) Notes 2a and 3 Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	495 mg/Nm <sup>3</sup> Note 3 LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	900 mg/Nm <sup>3</sup> Note 3 LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	<b>LCP 139:</b> CDU-4 furnaces: F201 A, B, C F202 <small>Note 13</small> F202 <small>Note 12</small>	Dust	50 mg/Nm <sup>3</sup> <b>Note 3</b> LCP-Chapter III IED	Calendar monthly mean of validated hourly averages	Continuous Continuous	BS EN 14181
	Gas fired with back-up non-commercial liquid fuels 222.5 MWth	Dust	55 mg/Nm <sup>3</sup> <b>Note 3</b> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Dust	100 mg/Nm <sup>3</sup> <b>Note 3</b> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-2 Crude Distillation Unit 4 (CDU-4) (X, Y coordinates 343955, 374890)	LCP 139: CDU-4 furnaces: F201 A, B, C F202 222.5 MWth	Carbon monoxide	100 mg/Nm <sup>3</sup>	Monthly mean	Continuous	BS EN 14181
		Nickel (Ni) Antimony (Sb) Vanadium (V) <small>Liquid/multi fuel firing only</small>	-	-	Once every six months and after significant changes to the unit	BS EN 14385 or analysis based on metals content in the in the fuel
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards
REF-A-3 CD4 Molecular Sieve Start Up Heater (X, Y coordinates 343800, 374800)	F-650 2.4 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency
		Oxides of sulphur	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-4 HPBH Boilers (X, Y coordinates 344200, 375180) Note 5	<b>LCP 140</b> HP21-HP26 (3 flues in a common stack, 2 boilers per flue) Multi-fuel firing (Natural gas, RFG & non-commercial liquid fuels) 624 MWth limited to 500 MWth	Sulphur dioxide	600 mg/Nm <sup>3</sup>  (1000 mg/Nm <sup>3</sup> LCP-Chapter III IED) Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-4 HPBH Boilers (X, Y coordinates 344200, 375180) Note 5	<b>LCP 140</b> HP21-HP26 (3 flues in a common stack, 2 boilers per flue) Multi-fuel firing (Natural gas, RFG & non-commercial liquid fuels) 624 MWth limited to 500 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	450 mg/Nm <sup>3</sup> Note 9  (411 mg/Nm <sup>3</sup> LCP-Chapter III IED) Note 4 Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	452 mg/Nm <sup>3</sup> <b>Note 4</b> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	822 mg/Nm <sup>3</sup> <b>Note 4</b> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-4 HPBH Boilers (X, Y coordinates 344200, 375180) <b>Note 5</b>	<b>LCP 140</b> HP21-HP26 (3 flues in a common stack, 2 boilers per flue) Multi-fuel firing (Natural gas, RFG & non-commercial liquid fuels) 624 MWth limited to 500 MWth	Dust	37 mg/Nm <sup>3</sup> <b>Note 4</b> LCP-Chapter III IED	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Dust	41 mg/Nm <sup>3</sup> <b>Note 4</b> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Dust	74 mg/Nm <sup>3</sup> <b>Note 4</b> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-4 HPBH Boilers (X, Y coordinates 344200, 375180) Note 5	<b>LCP 140</b> HP21-HP26 (3 flues in a common stack, 2 boilers per flue) Multi-fuel firing (Natural gas, RFG & non-commercial liquid fuels) 624 MWth limited to 500 MWth	Carbon monoxide	100 mg/Nm <sup>3</sup>	Monthly mean	Continuous	BS EN 14181
		Nickel (Ni) Antimony (Sb) Vanadium (V)	-	-	Once every six months and after significant changes to the unit	BS EN 14385 or analysis based on metals content in the in the fuel
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards
REF-A-5 Platformer 3 and HDT3 (vent from catalytic reformer) (X, Y coordinates 343490, 375945)	<b>LCP 142</b> PF3 (F9401-4) and HDT3 (F9301) Comprises five individual furnaces, F9401/2/3/4 & HDT3 F9301 with a common stack. <b>RFG firing only</b> 135.2 MWth	Sulphur dioxide	35 mg/Nm <sup>3</sup>  (1000 mg/Nm <sup>3</sup> LCP-Chapter III IED) Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-5 Platformer 3 and HDT3 (vent from catalytic reformer) (X, Y coordinates 343490, 375945)	<b>LCP 142</b> PF3 (F9401-4) and HDT3 (F9301) Comprises five individual furnaces, F9401/2/3/4 & HDT3 F9301 with a common stack. <b>RFG firing only</b> 135.2 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	200 mg/Nm <sup>3</sup> Note 10  (300 mg/Nm <sup>3</sup> LCP-Chapter III IED)  Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	330 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	600 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181



**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-5 Platformer 3 and HDT3 (vent from catalytic reformer) (X, Y coordinates 343490, 375945)	<b>LCP 142</b> PF3 (F9401-4) and HDT3 (F9301) Comprises five individual furnaces, F9401/2/3/4 & HDT3 F9301 with a common stack. <b>RFG firing only</b> 135.2 MWth	Dust	5 mg/Nm <sup>3</sup> LCP-Chapter III IED	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Dust	5.5 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Dust	10 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-5 Platformer 3 and HDT3 (vent from catalytic reformer) (X, Y coordinates 343490, 375945)	<b>LCP 142</b> PF3 (F9401-4) and HDT3 (F9301) Comprises five individual furnaces, F9401/2/3/4 & HDT3 F9301 with a common stack. <b>RFG firing only</b> 135.2 MWth	Polychlorinated dibenzodioxins/ furans (PCDD/F) emissions	-	Spot sample	Once a year, or once a regeneration, whichever is longer	Isokinetic sampling , extraction, then GC-MS analysis BS EN 1948 Parts 1,2 and 3 and MID
		Carbon monoxide	100 mg/Nm <sup>3</sup>	Monthly mean	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181

Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards
Requirements for gas firing						
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> Aromatics (F5901 A and B) and HDS2 (F6301) <b>RFG ONLY</b> 139.1 MWth	Sulphur dioxide	35 mg/Nm <sup>3</sup>  (1000 mg/Nm <sup>3</sup>  LCP-Chapter III IED) Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Sulphur dioxide	1000 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> Aromatics (F5901 A and B) and HDS2 (F6301) <b>RFG ONLY</b> 139.1 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	200 mg/Nm <sup>3</sup> Note 10  (300 mg/Nm <sup>3</sup> LCP-Chapter III IED)  Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	330 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	600 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> Aromatics (F5901 A and B) and HDS2 (F6301) <b>RFG ONLY</b> 139.1 MWth	Dust	5 mg/Nm <sup>3</sup> LCP-Chapter III IED	Calendar monthly mean of validated hourly averages	Continuous	BS EN 14181
		Dust	5.5 mg/Nm <sup>3</sup> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous	BS EN 14181
		Dust	10 mg/Nm <sup>3</sup> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous	BS EN 14181
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> Aromatics (F5901 A and B) and HDS2 (F6301) <b>RFG ONLY</b> 139.1 MWth	Carbon monoxide	100 mg/Nm <sup>3</sup>	Monthly mean	Continuous	BS EN 14181
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
<b>Requirements for liquid/multi-fuel firing</b> <small>Note 6</small>						
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> HVI (F4101, F4102 and F4901 A and B) and Aromatics (F5901 A and B) and HDS2 (F6301) Multi-fuel firing (RFG & non-commercial liquid fuels) 139.1 MWth	Sulphur dioxide	600 mg/Nm <sup>3</sup> <small>Note 6</small>  (LCP-Chapter III IED limit) <small>Note 6</small>  Subject to refinery bubble <small>Notes 12 &amp; 14</small>	Calendar monthly mean of validated hourly averages	Continuous <small>Note 6</small>	BS EN 14181
		Sulphur dioxide	<small>Note 6</small> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous <small>Note 6</small>	BS EN 14181
		Sulphur dioxide	<small>Note 6</small> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous <small>Note 6</small>	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> HVI (F4101, F4102 and F4901 A and B) and Aromatics (F5901 A and B) and HDS2 (F6301) Multi-fuel firing (RFG & non-commercial liquid fuels) 139.1 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	300 mg/Nm <sup>3</sup> Notes 6 & 9  LCP-Chapter III IED limit) Note 6  Subject to refinery bubble Notes 12 & 14	Calendar monthly mean of validated hourly averages	Continuous Note 6	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	Note 6 LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous Note 6	BS EN 14181
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	Note 6 LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous Note 6	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> HVI (F4101, F4102 and F4901 A and B) and Aromatics (F5901 A and B) and HDS2 (F6301) Multi-fuel firing (RFG & non-commercial liquid fuels) 139.1 MWth	Dust	50 mg/Nm <sup>3</sup> <b>Note 6</b> LCP-Chapter III IED	Calendar monthly mean of validated hourly averages	Continuous <b>Note 6</b>	BS EN 14181
		Dust	<b>Note 6</b> LCP-Chapter III IED	Daily mean of validated hourly averages	Continuous <b>Note 6</b>	BS EN 14181
		Dust	<b>Note 6</b> LCP-Chapter III IED	95% of validated hourly averages within a calendar year	Continuous <b>Note 6</b>	BS EN 14181
REF-A-6 Secondary Processes (X, Y coordinates 343640, 375450)	<b>LCP 141</b> HVI (F4101, F4102 and F4901 A and B) and Aromatics (F5901 A and B) and HDS2 (F6301) Multi-fuel firing (RFG & non-commercial liquid fuels) 139.1 MWth	Carbon monoxide	100 mg/Nm <sup>3</sup> <b>Note 6</b>	Monthly mean	Continuous <b>Note 6</b>	BS EN 14181
		Nickel (Ni) Antimony (Sb) Vanadium (V)	-	-	Once every six months and after significant changes to the unit <b>Note 6</b>	BS EN 14385 or analysis based on metals content in the in the fuel
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181
		Water vapour	-	-	Continuous as appropriate to reference	BS EN 14181

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Stack gas temperature	-	-	Continuous as appropriate to reference	Traceable to national standards
		Stack gas pressure	-	-	Continuous as appropriate to reference	Traceable to national standards
REF-A-7 HDT2 (X, Y coordinates 343575, 375350)	HDT-2 (F501) 17.4 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency
		Oxides of sulphur	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency
REF-A-8 HD Select (X, Y coordinates 343825, 375140)	HD Select (F4001) 7.0 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency
		Oxides of sulphur	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency
REF-A-9 Ethyl benzene unit (X, Y coordinates 343500, 375290)	EBU (F6800) 9.45 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency



**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Oxides of sulphur	No limit set Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	By calculation as agreed with the Environment Agency	By calculation as agreed with the Environment Agency
REF-A-10 Sulphur recovery unit (X, Y coordinates 344420, 375320)	SRU	Oxides of sulphur	20,000 mg/Nm <sup>3</sup>	As monitoring method	Continuous	BS EN 15267-3
REF-A-11 CO Boiler Exhaust (X, Y coordinates 343640, 375110)	CCU CO Boiler Exhaust (F2151)	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	400 mg/Nm <sup>3</sup> Subject to refinery bubble <sup>Note 12</sup>	Calendar monthly mean	Continuous	BS EN 14181
		Oxides of sulphur	1,200 mg/Nm <sup>3</sup> Subject to refinery bubble <sup>Note 12</sup>	Calendar monthly mean	Continuous	BS EN 14181
		Dust	50 mg/Nm <sup>3</sup>	Calendar monthly mean <sup>Note 7</sup>	Continuous	BS EN 14181
		Carbon monoxide	1,300 mg/Nm <sup>3</sup> <sup>Note 11</sup>	Calendar monthly mean	Continuous	BS EN 14181
		Nickel (Ni) Antimony (Sb) Vanadium (V)	-	-	Once every six months and after significant changes to the unit	BS EN 14385 or analysis based on metals content in the in the fuel

Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements						
Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Oxygen	-	-	Continuous as appropriate to reference	BS EN 14181
REF-A-12 MP Boiler Plant (X, Y coordinates 344260, 375125)	MP Boiler Plant (common stack for two vents)	Oxides of sulphur	35 mg/Nm <sup>3</sup> See Table S2.1 Subject to refinery bubble <sup>Note 12</sup>	-	-	By calculation as agreed with the Environment Agency
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	150 mg/Nm <sup>3</sup> Subject to refinery bubble <sup>Note 12</sup>	As monitoring method	Every two years post maintenance	BS EN 14792
		Carbon monoxide	150 mg/Nm <sup>3</sup>	As monitoring method	Every two years post maintenance	BS EN 15058
		Dust	100 mg/Nm <sup>3</sup>	As monitoring method	Every two years post maintenance	BS EN 13284-1
REF-A-14 Refinery flare (X, Y coordinates 344155, 375360)	Refinery flare (4 flares in common structure)	Sour gas combustion products (sulphur dioxide)	Notification threshold set by condition 4.3.9	As monitoring method	As required by flaring event	By calculation as agreed with the Environment Agency
<b>Hydrogen Production Plant (HPP)</b>						
HPP-A-1 (X, Y coordinates 344462, 375236)	Feed Fired Heater (fired on PSA tail gas, or natural gas during start-up/shut-down only) <sup>Note 15</sup>	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	80 mg/Nm <sup>3</sup>	Average over sampling period	Annual	BS EN 14792

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
	20.2 MWth	Carbon monoxide	100 mg/Nm <sup>3</sup>	Average over sampling period	6-monthly	BS EN 15058
		Sulphur Dioxide	35 mg/Nm <sup>3</sup>	Average over sampling period	Annual	BS EN 14791
HPP-A-2 (X, Y coordinates 344467, 375247)	Steam Boiler (fired on PSA tail gas, or natural gas during start-up/shut-down only) <small>Note 15</small>	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	80 mg/Nm <sup>3</sup>	Average over sampling period	Annual	BS EN 14792
	27.6 MWth	Carbon monoxide	100 mg/Nm <sup>3</sup>	Average over sampling period	6-monthly	BS EN 15058
		Sulphur Dioxide	35 mg/Nm <sup>3</sup>	Average over sampling period	Annual	BS EN 14791

**Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
HPP-A-4 (X, Y coordinates 344807, 374935)	Emergency Gas Oil Generator 2.9 MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	No limit specified	In line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5)	Every 1500 hours of operation or once every five years (whichever comes first).	In line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5) as subsequently updated
		Carbon monoxide	No limit specified	In line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5)	Every 1500 hours of operation or once every five years (whichever comes first).	In line with web guide 'Monitoring stack emissions: low risk MCPs and specified generators' Published 16 February 2021 (formerly known as TGN M5) as subsequently updated
HPP-A-5 (X, Y coordinates 344861,374968)	Firewater pump fired on gas oil < 1MWth	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	No limit specified	-	-	-
		Carbon monoxide	No limit specified	-	-	-

<b>Table S3.1(a) Point source emissions to air – emission limits and monitoring requirements</b>						
<b>Emission point ref. &amp; location</b>	<b>Source</b>	<b>Parameter</b>	<b>Limit (including unit)</b>	<b>Reference Period</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>
Note 1	Condition 2.3.5 and Pre-operational Condition to be fulfilled prior to CDU-3 operation following Section 6 III (a) of the MFF Protocol.					
Note 2	Section 6 II of the MFF Protocol applies.					
Note 2a	The lower BAT AEL limit shall apply to furnaces F201 A, B, C following completion of IC43 in Table S1.3 of this permit.					
Note 3	These Emission Limit Values apply only when back up liquid fuels are used in accordance with condition 2.3.3 and Section 6 II of the MFF Protocol.					
Note 4	Based on representative fuel split which shall be subject to annual review or if there are significant changes to the fuel split in accordance with Section 6 of the MFF Protocol					
Note 5	Capacity limited to <500MW by application of software interlock in accordance with RGN2 and guidance provided in Section 4 of the MFF Protocol.					
Note 6	Condition 2.3.5 and Pre-operational Condition to be fulfilled prior to operation. Emission Limit Values to be set following Section 5 & 6 of the MFF Protocol.					
Note 7	Excluding periods of soot blowing.					
Note 8	Section 6 III (a) of the MFF Protocol applies.					
Note 9	For existing units < 100 MW firing fuel oil with a nitrogen content higher that 0.5% (w/w) or with liquid firing > 50% or using air preheating values up to 450 mg/Nm <sup>3</sup> may occur.					
Note 10	For an existing unit using high air pre-heat (i.e. > 200 C) or with H <sub>2</sub> content in the fuel gas higher that 50% the upper end of the BAT-AEL range is 200 mg/Nm <sup>3</sup> .					
Note 11	The limit shall be reviewed every 12 months and in accordance with the derogation agreed under BAT Conclusion 27 and as specified by IC42 in Table S1.3 of this permit.					
Note 12	Compliance via the site emissions bubble as set out in Table S3.1(d) of this permit, shall be subject to written approval for IC50 & IC51 in Table S1.3 of this permit.					
Note 13	The BREF for the Refining of Mineral Oil & Gas sets BAT AELs for individual combustion units. The operator shall demonstrate by calculation that the relevant limits are met by each combustion unit/individual furnace.					
Note 14	Compliance with the emission limit value for this unit can be achieved through inclusion of the unit in the BREF air emissions bubble for NO <sub>x</sub> and SO <sub>2</sub> . When complying with the emission limit through the air emissions bubble; the emission concentration from the emission point shall not exceed the monthly mean value specified in the brackets. Demonstration of compliance with the Chapter III IED backstop limits is required.					
Note 15	Emission limits apply to combustion of PSA Tail Gas as use of natural gas is restricted to other than normal operating conditions during start-up and shut-down only.					

<b>Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements (Energy Recovery Plant)</b>						
<b>Emission point ref. &amp; location</b>	<b>Source</b>	<b>Parameter</b>	<b>Limit (including unit)</b>	<b>Reference Period</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>
ERP-A-1	Energy Recovery Plant	Particulate matter	10 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3
		Particulate matter	10 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181 and BS EN 15267-3
		Total organic carbon (TOC)	10 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3

**Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements (Energy Recovery Plant)**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Total organic carbon (TOC)	10 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181 and BS EN 15267-3
		Hydrogen chloride	10 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3 <sup>Note 1</sup>
		Hydrogen chloride	10 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181 and BS EN 15267-3 <sup>Note 1</sup>
		Hydrogen fluoride	2 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3
		Hydrogen fluoride	1 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181 and BS EN 15267-3
		Carbon monoxide	100 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3
		Carbon monoxide	50 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181 and BS EN 15267-3
		Sulphur dioxide	50 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3 <sup>Note 1</sup>
		Sulphur dioxide	50 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181 and BS EN 15267-3
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	400 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 14181 and BS EN 15267-3
		Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	200 mg/m <sup>3</sup>	Daily average	Continuous	BS EN 14181
ERP-A-1	Energy Recovery Plant	Cadmium and thallium and their compounds (total)	0.05 mg/m <sup>3</sup>	Periodic over minimum 30 minute, maximum 8 hour period	Six monthly	BS EN 14385

**Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements (Energy Recovery Plant)**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Mercury and its compounds	0.05 mg/m <sup>3</sup>	Periodic over minimum 30 minute, maximum 8 hour period	Six monthly	BS EN 13211
		Antimony, arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel and Vanadium and their compounds (total)	0.5 mg/m <sup>3</sup>	Periodic over minimum 30 minute, maximum 8 hour period	Six monthly	BS EN 14385
		Dioxins / furans (I-TEQ)	0.1 ng/m <sup>3</sup>	Periodic over minimum 6 hours, maximum 8 hour period	Six monthly	BS EN 1948 Parts 1, 2 and 3
		Dioxins / furans (WHO-TEQ Humans / Mammals)	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS EN 1948 Parts 1, 2 and 3
		Dioxins / furans (WHO-TEQ Fish)	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS EN 1948 Parts 1, 2 and 3

**Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements (Energy Recovery Plant)**

Emission point ref. & location	Source	Parameter	Limit (including unit)	Reference Period	Monitoring frequency	Monitoring standard or method
		Dioxins / furans (WHO-TEQ Birds)	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS EN 1948 Parts 1, 2 and 3
		Dioxin-like PCBs (WHO-TEQ Humans / Mammals)	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS EN 1948-4
		Dioxin-like PCBs (WHO-TEQ Fish)	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS EN 1948-4
		Dioxin-like PCBs (WHO-TEQ Birds)	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS EN 1948-4
		Specific individual poly-cyclic aromatic hydrocarbons (PAHs), as specified in Schedule 6.	-	periodic over minimum 6 hours, maximum 8 hour period	Annually	BS ISO 11338 Parts 1 and 2



<b>Table S3.1(b) Point source emissions to air – emission limits and monitoring requirements (Energy Recovery Plant)</b>						
<b>Emission point ref. &amp; location</b>	<b>Source</b>	<b>Parameter</b>	<b>Limit (including unit)</b>	<b>Reference Period</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>
ERP-A-2	Storage tanks cold water condenser	Class B VOC	50 tpa	Annual	Annually	BS EN 12619
Note 1 Sulphur dioxide and hydrogen chloride assume zero S and HCl in support gas. Stack concentrations corrected to account for residual H <sub>2</sub> S and HCl in RFG.						

<b>Table S3.1(c) Point source emissions to air during abnormal operation of Energy Recovery Plant – emission limits and monitoring requirements</b>						
<b>Emission point ref. &amp; location</b>	<b>Source</b>	<b>Parameter</b>	<b>Limit (including unit)</b>	<b>Reference period</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>
ERP-A-1	Energy Recovery Plant	Particulate matter	150 mg/m <sup>3</sup>	Half hourly average	Continuous	BS EN 15267-3 during abatement plant failure or alternative surrogate as specified in the Application during failure of the continuous emission monitor
		Total organic carbon (TOC)	20 mg/m <sup>3</sup>	Half hourly average	Continuous	
		Carbon monoxide	100 mg/m <sup>3</sup>	Half hourly average	Continuous	

Table S3.1(d) Point Source emissions to air – Integrated Emissions Management limits and monitoring requirements (refinery bubble)						
Emission point ref. & location	Parameter	Source	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method
<b>Emission limits shall apply from 28 October 2018</b>						
REF-A-1; REF-A-2; REF-A-3; REF-A-4; REF-A-5; REF-A-6; REF-A-7; REF-A-8; REF-A-9; REF-A-10; REF-A-11	Sulphur dioxide	Stacks releasing sulphur dioxide as a combustion product: CDU-3 CDU-4 F-650 HP21-HP26 PF3 Sec proc HDT2 HD Select EBU SRU CO Boiler	1,400 mg/Nm <sup>3</sup> <small>Note 1</small>	Hourly average	Continuous	As agreed in writing with the Environment Agency.
The points specified in the Integrated Emissions Management Technique document submitted in accordance with IC51 in Table S1.3 of this permit, or subsequently notified in accordance with condition 4.3.10 and agreed in writing by the Environment Agency	Sulphur dioxide	Stacks releasing sulphur dioxide as a combustion product, CCU and Sulphur Recovery Units	Limit shall be determined in accordance with the methodology approved in writing by the Environment Agency, in accordance with IC51 in Table S1.3 of this permit.	Monthly average	Continuous	Calculation using the method approved in writing by the Environment Agency in accordance with IC51 in Table S1.3 of this permit.
The points specified in the Integrated Emissions Management Technique document submitted in accordance with IC50 in Table S1.3 of this permit, or subsequently notified in accordance with condition 4.3.10 and agreed in writing by the Environment Agency	Oxides of nitrogen (NO and NO <sub>2</sub> expressed as NO <sub>2</sub> )	Stacks releasing oxides of nitrogen as a combustion product and CCU	Limit shall be determined in accordance with the methodology approved in writing by the Environment Agency, in accordance with IC50 in Table S1.3 of this permit.	Monthly average	Continuous	Calculation using the method approved in writing by the Environment Agency in accordance with IC50 in Table S1.3 of this permit.
Note 1 The limit shall be reviewed in accordance with IC52 in table S1.3 of this permit.						

<b>Table S3.1(e) Point source emissions to air during normal operation for which there are no limits</b>	
<b>Emission point ref. &amp; location</b>	<b>Source</b>
<b>Refinery Operations</b>	
REF-A-13	VRU ship loading (intermittent)
Vents from Ethyl Benzene Unit (EBU)	E6800 surplus gas vent
	Benzene sewer
Oil Movements	Stanlow Island White Oils Vent
HDS-2	V6327 vent
HVI (FEU)	C4306 vacuum system exhaust
HVI (MDU)	C4406 vacuum system exhaust
ODU (Sour water stripper, SWS)	T4009, T4010
Storage tanks	South site- white oils storage tanks as application table 2.1.5.1 (35 storage tanks)
Storage tanks	South site- black oils as application table 2.1.5.2 a & b (34 & 25 off)
Storage tanks	Hill site- crude oils and slops as application table 2.1.5.3 (11 off)
Storage tanks	North site- white oils as application table 2.1.5.4 (34 off)
Storage tanks	North site- black oils as application table 2.1.5.5 (15 off)
Storage tanks	North site- other materials as application table 2.1.5.5 (4 off)
<b>Hydrogen Production Plant and Carbon Capture Plant</b>	
Process vent	TEG still column for carbon dioxide dehydration – normal operation vent
Storage tank	Amine solvent storage tank under nitrogen blanket – Pressure valve discharge vent
Storage tank	TEG storage tank under nitrogen blanket – Pressure valve discharge vent

<b>Table S3.1(f) Point source emissions to air during abnormal operation</b>	
<b>Emission point ref. &amp; location</b>	<b>Source</b>
REF-A-11 - CO Boiler Exhaust Note 1	CCU CO Boiler Exhaust (F2151)
ODU (amine recovery unit)	S-5801/ S-5802
Secondary processes (aromatics)	Knockout pot to flare
Secondary processes (HVI)	MDU inert gas system pressure control valve T4401
Oil movements	Pressure relief serving V4241-V4248, V4253- V4257
Oil movements	Ship loading purging and line depressurising
Energy Recovery Plant	Fuel gas knock out pot, V7701
<b>Hydrogen Production Plant and Carbon Capture Plant</b>	
HPP-A-3 (X, Y coordinates 344337, 375507)	Hydrogen plant flare
Pipeline AGI (X, Y coordinates 344557, 375024)	CO <sub>2</sub> venting from PSV-002, PSV-0025, BDV-0010, BDV-0001, metering package 10-AAH-U-001 Note 2
CO <sub>2</sub> Dehydration (X, Y coordinates 344568, 375338)	CO <sub>2</sub> venting during emergency pressure relief (fire) from TEG regeneration skid 10-FAB-U-102
CO <sub>2</sub> Capture Unit (X, Y coordinates 344538, 375314) Note 3	CO <sub>2</sub> venting from CO <sub>2</sub> Absorber Column Reflux Drum V-117 (via PCV-0014)
	CO <sub>2</sub> venting from CO <sub>2</sub> Compressor Package (C-103)
<p>Note 1 In the event of an outage of the CO boiler, releases may be made to air via the by-pass system. In such an event, after 24 hours of operation without combustion via the boiler, the CO concentration of the stack gases will be reduced to a value not greater than 2% by volume. The CO concentrations shall be measured continuously in the regenerator flue gas. The Environment Agency shall be informed of CO boiler outages of greater than 24 hours at the Reporting Address.</p> <p>Note 2 Pipeline AGI venting to be operated in accordance with the response to Schedule 5 Notice received on 26/09/22 and included in table S1.2 Operating techniques: each AGI operator to be responsible for blowdown/depressurisation of the pipeline and equipment on their side of the interface, identified by the isolation valves. Venting of inventories arising from sections of the pipeline beyond the isolation valves is not permitted at the installation.</p> <p>Note 3 In the case of planned or unplanned availability of the CO<sub>2</sub> Transport and Storage (T&amp;S) network due to external factors, venting of CO<sub>2</sub> shall be minimised according to the operating techniques stated in response to Schedule 5 Notice question 19b received on 24/06/2022 and included in table S1.2 Operating techniques.</p>	

**Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method <sup>Note 10</sup>
W1 <sup>Note 6</sup> Discharge to Thornton Brook	SDAF Effluent Treatment plant (treating effluent from a number of plant drainage interceptors)	In accordance with approved procedures provided in accordance with IC41 in Table S1.3 of this permit (BAT 12 derogation). Discharge during normal operation via S1 to a third party waste water treatment works.				
W2 <sup>Note 6</sup> Discharge to River Gowy	NDAF Effluent Treatment plant (treating effluent from the STL road terminal (N44) and Hillside (N52) & ships cargo slops)	In accordance with approved procedures provided in accordance with IC41 in Table S1.3 of this permit (BAT 12 derogation). Discharge during normal operation via S1 to a third party waste water treatment works.				
W3 Discharge to Manchester Ship Canal via N38	Demin reactivator effluent Demin regenerator effluent Plant drainage interceptors Once through cooling water HPP demin effluent from T1 <sup>[Note 12]</sup>	Flow	90,000 m <sup>3</sup> /d Normal operation 100,000 m <sup>3</sup> /d Other than normal operation, S1 unavailable	Continuous	Continuous	MCERTS performance requirements
		Temperature	32.5 °C	Spot sample	Daily	
		pH	6-9	Spot sample	Weekly	ASTM E70
		Total suspended solids	25 mg/l <sup>Notes 1 &amp; 11</sup>	24 hour flow proportional	Daily	BS EN 872
		COD	125 mg/l <sup>Notes 1 &amp; 11</sup>	24 hour flow proportional	Daily	BS 6068-2.34 Same as ISO 6060 BS ISO 15705 <sup>Note 7</sup>
		Hydrocarbon oil	10 mg/l <sup>Note 1</sup>	24 hour flow proportional	Daily	Energy Institute method for Total IR Oil (IP 426)

**Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method <sup>Note 10</sup>
		Hydrocarbon oil index	2.5 mg/l <sup>Note 11</sup>	24 hour flow proportional	Monthly	BS EN 9377-2 <sup>Note 8</sup>
		Total Nitrogen expressed as N	20 mg/l <sup>Notes 1, 2 &amp; 11</sup>	24 hour flow proportional	Daily	BS EN 12260
		Phenols	0.5 mg/l <sup>Note 1 &amp; 2</sup>	24 hour flow proportional	Monthly	UKAS accredited colorimetric method - UK 497 <sup>Note 9</sup>
		Benzene, toluene, ethyl benzene, xylene (BTEX)	Benzene 0.05 mg/l <sup>Note 11</sup>	Spot sample	Monthly	ISO 11423-1
		<b>Metals</b> <sup>Note 1 &amp; 2</sup>				
		Cd	0.002 mg/l <sup>Note 11</sup>	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
		Hg	0.0002 mg/l <sup>Note 11</sup>	24 hour flow proportional		UOP 938
		Pb	0.002 mg/l <sup>Note 11</sup>	24 hour flow proportional		R-BILENVI-TP004 (in-house ICP-MS)
		Ni	0.02 mg/l <sup>Note 11</sup>	24 hour flow proportional		R-BILENVI-TP004 (in-house ICP-MS)
		V	-	24 hour flow proportional		R-BILENVI-TP004 (in-house ICP-MS)
		Cyanide <sup>Note 1 &amp; 2</sup>	20 µg/l	24 hour flow proportional	Monthly	ISO 6703-1
		Sulphide <sup>Note 1 &amp; 2</sup>	1 mg/l	24 hour flow proportional	Monthly	ISO 10530

**Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method <sup>Note 10</sup>
W4 Discharge to River Goway via N19 interceptor	Surface water run-off	Flow	No limit set	-	-	Surface water resulting from rainfall over area not exceeding 450,000m <sup>2</sup> .
		pH	6-9	Spot sample	Daily	ASTM E70
		Total suspended solids	25 mg/l <sup>Note 11</sup>	24 hour flow proportional	Daily	BS EN 872
		COD	125 mg/l <sup>Note 11</sup>	24 hour flow proportional	Daily	BS 6068-2.34 Same as ISO 6060 BS ISO 15705 <sup>Note 7</sup>
		Hydrocarbon oil	10 mg/l <sup>Note 1</sup>	24 hour flow proportional	Daily	Energy Institute method for Total IR Oil (IP 426)
		Hydrocarbon oil index	2.5 mg/l <sup>Note 11</sup>	24 hour flow proportional	Monthly	BS EN 9377-2 <sup>Note 8</sup>
		Oil	None visible	-	Daily	-
		Total nitrogen expressed as N	25 mg/l <sup>Note 11</sup>	24 hour flow proportional	Daily	BS EN 12260
		Phenols	-	24 hour flow proportional	Monthly	UKAS accredited colorimetric method - UK 497 <sup>Note 9</sup>
		Benzene, toluene, ethyl benzene, xylene (BTEX)	Benzene 0.05 mg/l <sup>Note 11</sup>	Spot sample	Monthly	ISO 11423-1
		Cd	0.008 mg/l <sup>Note 11</sup>	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
Hg	0.001 mg/l <sup>Note 11</sup>	24 hour flow proportional	Quarterly	UOP 938		

**Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method <sup>Note 10</sup>
		Pb	0.03 mg/l Note 11	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
		Ni	0.1 mg/l Note 11	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
		V	-	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
W5 Discharge to Manchester Ship Canal	Cooling water intake screens flush	-	-		-	-
W6 Discharge to River Gowy	Surface water run-off from former rail loading area	-	-	-	-	-
W7 Discharge to Mill Brook	Surface water ex LPG spheres	-	-	-	-	-
W8 Discharge to Mill Brook	Fire deluge water ex LPG spheres	-	-	-	-	-
W9 Discharge to River Gowy	Surface water run-off from former SHOP area Notes 3 & 4	Flow	1000 m <sup>3</sup> /d	Continuous	-	-
		Butanediol (BDL)	20 mg/l	Spot sample	Prior to discharge of S9002 to the River Gowy	UKAS accredited method UK1744
W10 Discharge to River Gowy	Fire deluge water ex LPG storage area	-	No limit set	-	-	-
W12 <sup>Note 5</sup> Discharge to Thornton Brook	Storm overflow ex T1403/4	-	No limit set	-	-	-
W13 <sup>Note 5</sup> Discharge to River Gowy	Storm overflow ex T1405 A&B	-	No limit set	-	-	-



**Table S3.2(b) Point Source emissions to water (other than sewer) – emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. unit)	Reference Period	Monitoring frequency	Monitoring standard or method <sup>Note 10</sup>
W14 <sup>Note 5</sup> Discharge to Gale Brook	Storm overflow ex T1402 A&B	-	No limit set	-	-	-
W15 <sup>Note 5</sup> Discharge to Gale Brook	Storm water overflow ex T7801,2	-	No limit set	-	-	-
W16 Discharge to Gale Brook	Surface water ex A track, car parks, old Phenol plant site	-	No limit set	-	-	-
W17	T4082/T4084 tank overflow	-	No limit set	-	-	-

Note 1 Comparison between influent (background concentrations at the Ince intake) and effluent concentrations  
 Note 2 Emission limit value under review subject to completion of IC38 in Table S1.3 of this permit.  
 Note 3 Compliance is defined as 95% of all results being 20 mg/l BDL with a maximum concentration of 40 mg/l without heavy rain.  
 Note 4

- SHOP operations to sample S-9002 for BDL content using the plant lab when the basin high alarm activates - as per current procedure.
- If sample result <20mg/l then discharge to R. Gowy.
- If sample >20mg/l but <40mg/l then shift production team leader to authorise discharge to R. Gowy based if <5% of all results. If >5% of all results then instigate emergency procedures to pump S-9002 contents to Unit 78 via RM/Ashless pit or S-9741.
- If sample >40mg/l then instigate emergency procedures to pump S-9002 contents to Unit 78 via RM/Ashless pit or S-9741

Note 5 Compliance with storm overflow procedures  
 Note 6 Emission points W1 and W2 will remain in place after the completion of improvements set out in IC41 in Table S1.3 of this permit (agreed under the derogation from BAT 12 AELs). They will be authorised for non-routine operation following written approval from the Environment Agency and the previous limits and monitoring requirements shall no longer apply.  
 Note 7 Measurement of TOC and application of a correlation factor may be used as a surrogate for COD. Parallel monitoring of TOC and COD shall be undertaken over a period of 1 year (to allow for seasonal variance) to determine the applicable correlation factor. The TOC correlation factor shall be agreed in writing with the Environment Agency before parallel monitoring of COD can cease.  
 Note 8 Test method UK1412 shall be run in parallel with test method BS EN ISO 9377-2 for up to 12 months, whilst quality assurance of the methods is undertaken. At the end of the quality assurance period the operator shall confirm in writing the correlation between the two methods and how ongoing validation shall be carried out.  
 Note 9 The operator shall provide evidence when requested by the Environment Agency of the results of the analytical laboratory aquacheck proficiency scheme. This is required to demonstrate equivalence of the current test method against test method BS EN ISO 14402.  
 Note 10 Or an equivalent method approved in writing by the Environment Agency.  
 Note 11 The BAT AELs are yearly averages, see Schedule 6 of this permit for the interpretation.  
 Note 12 Discharge of this effluent shall be confirmed in writing on approval by the Environment Agency of pre-operational condition POC7. Refer to Table S3.5(b).

**Table S3.3 Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements – shall apply until completion of the BAT 12 derogation i.e. no later than the 31 December 2022**

Emission point ref. & location	Source	Parameter	Limit (incl. Unit)	Reference period	Monitoring frequency	Monitoring standard or method
S1	Unit 7800, Chemicals (SHOP, Alcs, resins, Sulfolane, surface water ex Solvents, process effluent ex Argent Biodiesel Stanlow Plant (EPR/LP3233DK))	Subject to contractual agreement between United Utilities and operator October 2004.	-	-	As application	As application

**Table S3.3(a) Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. Unit) <small>Note 1</small>	Reference period	Monitoring frequency	Monitoring standard or method
S1	Unit 7800, Chemicals (Sulfolane, surface water ex Solvents, process effluent ex Argent Biodiesel Stanlow Plant (EPR/LP3233DK)), uncontaminated surface water from HPP and CCS areas. Refinery operations, SDAF, NDAF, PDAF, T1402A/B	Flow	<small>Note 1</small>	Continuous	Continuous	MCERTS performance requirements
		Temperature	<small>Note 1</small>	24 hour flow proportional	Daily	
		pH	6-9	24 hour flow proportional	Daily	ASTM E70
		Total suspended solids	<small>Note 1</small>	24 hour flow proportional	Daily	BS EN 872
		COD	<small>Note 1</small>	24 hour flow proportional	Daily	BS 6068-2.34 Same as ISO 6060 BS ISO 15705 <small>Note 4</small>
		Total Nitrogen expressed as N	<small>Note 1</small>	24 hour flow proportional	Daily	BS EN 12260
		Hydrocarbon oil	<small>Note 1</small>	24 hour flow proportional	Daily	Energy Institute method for Total IR Oil (IP 426)
		Hydrocarbon oil index	<small>Note 1</small>	24 hour flow proportional	Daily	BS EN 9377-2 <small>Note 3</small>
		Phenols	-	24 hour flow proportional	Monthly	UKAS accredited colormetric method - UK 497 <small>Note 2</small>
		Benzene, toluene, ethyl benzene, xylene (BTEX)	Benzene <small>Note 1</small>	Spot sample	Monthly	ISO 11423-1
		<b>Metals</b>				
		Cd	<small>Note 1</small>	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
Hg	<small>Note 1</small>	24 hour flow proportional		UOP 938		

**Table S3.3(a) Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements shall apply following completion of the BAT 12 derogation, i.e. from 01 January 2023**

Emission point ref. & location	Source	Parameter	Limit (incl. Unit) <sup>Note 1</sup>	Reference period	Monitoring frequency	Monitoring standard or method
S1	Unit 7800, Chemicals (Sulfolane, surface water ex Solvents, process effluent ex Argent Biodiesel Stanlow Plant (EPR/LP3233DK)) uncontaminated surface water from HPP and CCS areas.  Refinery operations, SDAF, NDAF, PDAF, T1402A/B & North Site Interceptors N55 (energy recovery plant), N56 (toluene gantry) & N1B	Pb	Note 1	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
		Ni	Note 1	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)
		V	Note 1	24 hour flow proportional	Quarterly	R-BILENVI-TP004 (in-house ICP-MS)

Note 1 Parameter limits shall be set based on the outcome of improvement condition IC53 in Table S1.3 of this permit.

Note 2 The operator shall provide evidence when requested by the Environment Agency of the results of the analytical laboratory aquacheck proficiency scheme. This is required to demonstrate equivalence of the current test method against test method BS EN ISO 14402.

Note 3 Test method UK1412 shall be run in parallel with test method BS EN ISO 9377-2 for up to 12 months, whilst quality assurance of the methods is undertaken. At the end of the quality assurance period the operator shall confirm in writing the correlation between the two methods and how ongoing validation shall be carried out.

Note 4 Measurement of TOC and application of a correlation factor may be used as a surrogate for COD. Parallel monitoring of TOC and COD shall be undertaken over a period of 1 year (to allow for seasonal variance) to determine the applicable correlation factor. The TOC correlation factor shall be agreed in writing with the Environment Agency before parallel monitoring of COD can cease.

**Table S3.4 Annual Limits**

Parameter	Medium	Limit (including unit)
Sulphur dioxide	Air	7,400 tonnes
Oxides of nitrogen from emission point REF-A-4	Air	1,311 tonnes
Oil in water (total)	Water	3g / tonne crude oil processed <sup>Notes 1 &amp; 2</sup>

Note 1 Comparison between influent and effluent concentrations.

Note 2 Emission limit value under review subject to completion of IC38 in this permit.

Table S3.5(a) Process monitoring requirements				
Emission point reference or source or description of point of measurement	Parameter	Monitoring frequency	Monitoring standard or method	Other specifications
REF-A-1 CDU-3	PM <sub>10</sub>	Annual	Calculated from mass of measured particulates	Calculated as 5% of total PM by mass
REF-A-2 CDU-4	PM <sub>10</sub>	Annual	Calculated from mass of measured particulates	Calculated as 5% of total PM by mass
REF-A-4 HPBH	PM <sub>10</sub>	Annual	Calculated from mass of measured particulates	Calculated as 25% of total PM by mass
REF-A-6 Secondary processes	PM <sub>10</sub>	Annual	Calculated from mass of measured particulates	Calculated as 5% of total PM by mass
RLFS sulphur monitoring	Heavy fuel oil surge vessel, V1802; Light fuel tank, T4027	As required by emission limit value calculation and hourly refinery bubble Periodic (i.e. by tank)	ISO method 8754 (1992), PrEN ISO 14596	
ERP-A-1	water vapour content ( <i>unless gas is dried before analysis of emissions</i> )	continuous	BS EN 14181 and BS EN 15267-3	
ERP-A-1	Exhaust gas temperature	Continuous	Traceable to national standards	As agreed in writing with the Environment Agency.
ERP-A-1	Exhaust gas pressure	Continuous	Traceable to national standards	As agreed in writing with the Environment Agency.
ERP-A-1	Exhaust gas oxygen content	Continuous	BS EN 15267-3 BS EN 14181	
Energy Recovery Plant Location close to the Combustion Chamber inner wall or as identified and justified in Application.	Temperature (° C)	Continuous	Traceable to national standards	As agreed in writing with the Environment Agency.

<b>Table S3.5(a) Process monitoring requirements</b>				
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
Refinery Fuel Gas (RFG) Monitoring	Sulphur content	Continuously, or as agreed in writing with the Environment Agency	Continuously sampling chromatographic S gas analyser or Electrochemical cell or as approved in writing 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 a method that identifies the sources of the data used, to be approved in writing by the Environment Agency.	A mass balance shall be undertaken of incoming sources of sulphur to the refinery versus sulphur outputs.
A10 Sulphur Recovery Unit (SRU)	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 shall be $\geq 98.5\%$ (BAT AEPL for an existing unit). All streams containing H <sub>2</sub> S are treated to the BAT AEPL.
A14 Flaring events	Duration of event Total mass of gas flared Mass of SO <sub>2</sub> released Calorific value of the gas flared	When the rate of gas flared exceeds 2.9 tonnes/hour	SO <sub>2</sub> may be determined by analysis of the flare gas or by application of emission factors.	The operator shall identify the root cause of the flaring event and consider ways to prevent or reduce the frequency and duration of reoccurrence.
Ince Coaster Berth VRU BAT Conclusion 52	The Operator shall carry out monitoring in accordance with the monitoring programme for measuring point source emissions of non-methane volatile organic compounds and benzene from the loading and unloading of liquid hydrocarbons, developed in response to IC48.			
<b>Hydrogen Production Plant and Carbon Capture and Storage Plant</b>				

<b>Table S3.5(a) Process monitoring requirements</b>				
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
Natural Gas Metering Package	Mass Flow Rate (Nm <sup>3</sup> /hr or tonnes/hr)	Continuous	Direct mass flow metering or indirect volumetric flow metering with pressure and temperature compensation by method traceable to national standards compliant with UK ETS, as agreed in writing with the Environment Agency as part of pre-operational condition POC5.	
Natural Gas Analyser	Composition and Calorific Value	Continuous	Gas Chromatography to analyser's manufacturer's specification compliant with UK ETS.	
Refinery Off-Gas Metering Package	Mass Flow Rate (Nm <sup>3</sup> /hr or tonnes/hr)	Continuous	Direct mass flow metering or indirect volumetric flow metering with pressure and temperature compensation by method traceable to national standards compliant with UK ETS, as agreed in writing with the Environment Agency as part of pre-operational condition POC5	
Refinery Off-Gas Analyser Package	Composition and Calorific Value	Continuous	Gas Chromatography to analyser's manufacturer's specification compliant with UK ETS.	
Refinery Off-Gas Sulphur Analysers	Sulphur Content	Continuous	Three analysers with a 2 out of 3 voting system as described in response to response to Schedule 5 Notice received on 24/06/2022. Analyser's manufacturer's specification as per documentation provided in response to Schedule 5 Notice received on 26/09/2022 or as otherwise agreed in writing with the Environment Agency	<20 ppm Volume total sulphur

<b>Table S3.5(a) Process monitoring requirements</b>				
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
Electrical power import	Imported electrical power (MWe)	Continuous	Traceable to national standards as agreed in writing with the Environment Agency as part of pre-operational condition POC5	
Carbon Dioxide Metering Package	Exported CO <sub>2</sub> 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 POC5	
Carbon Dioxide compressor discharge	Composition of exported CO <sub>2</sub> , including but not limited to: <ul style="list-style-type: none"> <li>- Water content</li> <li>- H<sub>2</sub> content</li> </ul>	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 POC5	CO <sub>2</sub> transport and storage system specification.
Hydrogen Metering Package	Mass Flow Rate (Nm <sup>3</sup> /hr or tonnes/hr)	Continuous	Direct mass flow metering or indirect volumetric flow metering with pressure and temperature compensation as agreed in writing with the Environment Agency as part of pre-operational condition POC5	
Thermal efficiency	Net Feed Gas Energy Conversion Efficiency (%)	Continuous	Traceable to national standards as agreed in writing with the Environment Agency as part of pre-operational condition POC5	
HPP-A-1 - Feed Fired Heater (X, Y coordinates 344462, 375236)	CO <sub>2</sub> emissions (tonnes/hr)	Continuous	Direct measurement or by calculation method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of POC5	



<b>Table S3.5(a) Process monitoring requirements</b>				
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
HPP-A-2 – Steam Boiler  (X, Y coordinates 344467, 375247)	CO <sub>2</sub> emissions (tonnes/hr)	Continuous	Direct measurement or by calculation method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of POC5	
HPP-A-4 - Emergency Gas Oil Generator	CO <sub>2</sub> emissions (tonnes/year)	Periodic	By calculation method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of POC5	
HPP-A-5 – Firewater Pump	CO <sub>2</sub> emissions (tonnes/year)	Periodic	By calculation method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of POC5	
Process vent - TEG still column for carbon dioxide dehydration	CO <sub>2</sub> emissions (tonnes/year)	Periodic	By calculation method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of POC5	
HPP-A-3 - Flare	<ul style="list-style-type: none"> <li>- Duration of event</li> <li>- Total mass of gas flared</li> <li>- Total mass of CO<sub>2</sub> emissions (tonnes / event)</li> <li>- Total mass of Sulphur emissions (tonnes/event)</li> <li>- Composition and calorific value of the gas flared</li> </ul>	Event specific, total annual	Direct mass flow metering or indirect volumetric flow metering with pressure and temperature compensation by method traceable to national standards. Composition of flared gas to be determined by methodology traceable to national standards compliant with UK ETS, as agreed in writing with the Environment Agency as part of pre-operational condition POC5	The operator shall identify the root cause of the flaring event and consider ways to prevent or reduce the frequency and duration of reoccurrence.

<b>Table S3.5(a) Process monitoring requirements</b>				
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
Venting from pipelines AGI (X, Y coordinates 344557, 375024) Abnormal venting of CO <sub>2</sub> from PSV-002, PSV-0025, BDV-0010, BDV-0001, metering package 10-AAH-U-001	- Duration of event - Total mass of CO <sub>2</sub> 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 POC5	The operator shall identify the root cause of the venting event and consider ways to prevent or reduce the frequency and duration of reoccurrence.
Venting from CO <sub>2</sub> Dehydration (X, Y coordinates 344568, 375338) CO <sub>2</sub> venting during emergency pressure relief (fire) from TEG regeneration skid 10-FAB-U-102	- Duration of event - Total mass of CO <sub>2</sub> 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 POC5	The operator shall identify the root cause of the venting event and consider ways to prevent or reduce the frequency and duration of reoccurrence.
Venting from CO <sub>2</sub> Capture Unit (X, Y coordinates 344538, 375314) CO <sub>2</sub> venting from CO <sub>2</sub> Absorber Column Reflux Drum V-117 (via PCV-0014) and CO <sub>2</sub> venting from CO <sub>2</sub> Compressor Package (C-103)	- Duration of event - Total mass of CO <sub>2</sub> 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 POC5	The operator shall identify the root cause of the venting event and consider ways to prevent or reduce the frequency and duration of reoccurrence.

<b>Table S3.5(a) Process monitoring requirements</b>				
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
Carbon capture performance	Carbon Capture Efficiency (%)	Continuous	Calculation by method traceable to national standards compliant with UK ETS, to be agreed in writing with the Environment Agency as part of POC5	Instantaneous and annual average Carbon Capture Efficiency to be monitored. Annual average Carbon Capture Efficiency to be averaged over 1 year of operations (from 1 <sup>st</sup> of January), including periods of abnormal operations, but excluding venting of CO <sub>2</sub> during periods of time when the CO <sub>2</sub> transport and storage system is not available, due to causes external to the operations of the installation.
HPP-A-4 - Emergency Gas Oil Generator HPP-A-5 – Firewater Pump	Diesel usage	Periodic	Material balance / inventory	
Water efficiency	Water usage (m <sup>3</sup> /hour)	Continuous	<ul style="list-style-type: none"> <li>- Continuous metering with flow meter on main water supply to HPP / CCS plant</li> <li>- Periodic calculation of harvested rainwater based on water material balance</li> </ul>	
Fugitive emissions	Detection of flammable / process gases (hydrocarbon gases, hydrogen, oxygen, carbon monoxide, carbon dioxide, nitrogen)	Continuous	Specification of Fire & Gas Detection system to traceable to national or international standards	

<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
	Diffuse emissions of VOCs (including methane)	Periodic	Quantification of diffuse emissions in accordance with BAT Conclusion 6 and/or according to methodology agreed in writing with the Environment Agency as part of completion of Improvement Condition IC61	
	Diffuse emissions of hydrogen gas	Periodic	Quantification of diffuse emissions in accordance with BAT Conclusion 6 and/or according to methodology agreed in writing with the Environment Agency as part of completion of Improvement Condition IC61	

<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b> <sup>[Note 2]</sup>	<b>Limit (incl. unit)</b> <sup>[Note 2]</sup>	<b>Reference Period</b> <sup>[Note 2]</sup>	<b>Monitoring frequency</b> <sup>[Note 2]</sup>	<b>Monitoring standard or method</b> <sup>[Note 2]</sup>
T1 <sup>[Note 2]</sup> HPP and CCS Demineralisation plant effluent at process monitoring point T1 (Coordinates X, Y: 344022, 375296) to discharge point W3 via CT2 through N38	Flow rate	408 m <sup>3</sup> /d	Continuous	Continuous	MCERTS performance requirements
	COD	100 mg/l	Annual average	Daily (based on 24 hour flow proportional sampling)	BS 6068-2.34 Same as ISO 6060 or BS ISO 15705 <sup>[Note 1]</sup>
	Chromium	0.025 mg/l	Annual average	Monthly (based on 24 hour flow proportional sampling)	BS EN ISO 11885

**Table S3.5(b) Process monitoring requirements – Hydrogen Production Plant and Carbon Capture Plant demineralisation water effluent**

Emission point reference or source or description of point of measurement	Parameter <sup>[Note 2]</sup>	Limit (incl. unit) <sup>[Note 2]</sup>	Reference Period <sup>[Note 2]</sup>	Monitoring frequency <sup>[Note 2]</sup>	Monitoring standard or method <sup>[Note 2]</sup>
	Copper	0.05 mg/l	Annual average	Monthly (based on 24 hour flow proportional sampling)	BS EN ISO 11885
	Zinc	0.3 mg/l	Annual average	Monthly (based on 24 hour flow proportional sampling)	BS EN ISO 11885
	Total phosphorus	3 mg/l	Annual average	Daily (based on 24 hour flow proportional sampling)	BS EN ISO 15681

Note 1 Measurement of TOC and application of a correlation factor may be used as a surrogate for COD. Parallel monitoring of TOC and COD shall be undertaken over a period of 1 year (to allow for seasonal variance) to determine the applicable correlation factor. The TOC correlation factor shall be agreed in writing with the Environment Agency before parallel monitoring of COD can cease.

Note 2 This emission point, including any specified parameters, emission limits and monitoring requirements, shall be confirmed in writing on approval by the Environment Agency of pre-operational condition POC7.

<b>Table S3.6 Residue quality</b>					
<b>Emission point reference or source or description of point of measurement</b>	<b>Parameter</b>	<b>Limit</b>	<b>Monitoring frequency</b>	<b>Monitoring standard or method</b>	<b>Other specifications</b>
Bottom Ash	Total Organic Content (TOC) Loss On Ignition (LOI)	3% (TOC) or 5% ( LOI) of the dry weight of the bottom ash	Quarterly	Environment Agency Guidance, 'TGN M4 – Guidelines for Ash Sampling and Analysis'	
Bottom Ash	Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds, dioxins/furans and dioxin-like PCBs.		Quarterly	Environment Agency Guidance, 'TGN M4 – Guidelines for Ash Sampling and Analysis'	
Bottom Ash	Total soluble fraction and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) soluble fractions		Before use of a new disposal or recycling route	Environment Agency Guidance, 'TGN M4 – Guidelines for Ash Sampling and Analysis'	
APC Residues	Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds, dioxins/furans and dioxin-like PCBs.		Quarterly	Environment Agency Guidance, 'TGN M4 – Guidelines for Ash Sampling and Analysis'	
APC Residues	Total soluble fraction and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) soluble fractions		Before use of a new disposal or recycling route	Environment Agency Guidance, 'TGN M4 – Guidelines for Ash Sampling and Analysis'	

## Schedule 4 - Reporting

Table S4.1 Reporting of monitoring data			
Parameter	Emission or monitoring point/reference	Reporting period	Period begins
<b>Air</b>			
Emissions to air Parameters as required by condition 3.5.1.	REF-A-1, REF-A-2, REF-A-3, REF-A-4, REF-A-5, REF-A-6, REF-A-7, REF-A-8, REF-A-9, REF-A-10, REF-A-11, REF-A-14 ERP-A-1	Quarterly 1 Jan, 1 Apr, 1 Jul and 1 Oct	01/04/17
Emissions to air – Oxides of nitrogen	REF-A-4, HPP-A-1, HPP-A-2	Annually	1 January <sup>Note 1</sup>
Emissions to air – Sulphur dioxide	HPP-A-1, HPP-A-2	Annually	1 January <sup>Note 1</sup>
Emissions to air – Carbon monoxide	HPP-A-1, HPP-A-2	Every 6 months	1 January 1 July <sup>Note 1</sup>
Emissions to air – Oxides of nitrogen	HPP-A-4	Every 1500 hours of operation or once every five years (whichever comes first)	1 January <sup>Note 1</sup>
Emissions to air – Carbon monoxide	HPP-A-4	Every 1500 hours of operation or once every five years (whichever comes first)	1 January <sup>Note 1</sup>
Emissions to air – PM <sub>10</sub>	REF-A-1, REF-A-2, REF-A-4, REF-A-6	Annually	1 January
Emissions to air Parameters as required by condition 3.5.1.	REF-A-12	Every two years (on maintenance turnaround)	01/01/2008
Emissions to air – Dioxins / furans (I-TEQ), Cd, Tl, Hg, metals Parameters as required by condition 3.5.1.	ERP-A-1	Every 6 months	01/01/2008
Emissions to air – Dioxins / furans, dioxin-like PCBs & PAH & Class B VOC Parameters as required by condition 3.5.1.	ERP-A-1, ERP-A-2	Annually	1 January
Temperature	ERP-A-1	Quarterly	1 January
Emissions to air – Sulphur dioxide	Installation	Annually	1 January
Emissions to air – sulphur dioxide Parameters as required by condition 3.5.1, refinery bubble.	Refinery bubble as table S3.1(d)	Quarterly 1 Jan, 1 Apr, 1 Jul and 1 Oct	01/04/2017 Applicable to 28/10/2018

<b>Table S4.1 Reporting of monitoring data</b>			
<b>Parameter</b>	<b>Emission or monitoring point/reference</b>	<b>Reporting period</b>	<b>Period begins</b>
Emissions to air – sulphur dioxide Parameters as required by condition 3.7.2.	All emission points specified in the integrated emissions management technique for SO <sub>2</sub> that is approved in writing by the Environment Agency, in accordance with condition 3.7.2 (Refinery bubble as table S3.1(d))	Quarterly 1 Jan, 1 Apr, 1 Jul and 1 Oct	Applicable from 28/10/2018
Emissions to air – oxides of nitrogen Parameters as required by condition 3.7.1, refinery bubble.	All emission points specified in the integrated emissions management technique for NO <sub>x</sub> that is approved in writing by the Environment Agency, in accordance with condition 3.7.1 (Refinery bubble as table S3.1(d))	Quarterly 1 Jan, 1 Apr, 1 Jul and 1 Oct	Applicable from 28/10/2018
Note 1 The first monitoring measurements shall be carried out within four months of the issue date of the permit variation V013 authorising the new MCP, or the date when the new MCP is first put into operation, whichever is later.			
<b>Residues</b>			
TOC or LOI Parameters as required by condition 3.5.1	Bottom Ash	Quarterly	1 Jan, 1 Apr, 1 Jul and 1 Oct
Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds, dioxins/furans and dioxin-like PCBs Parameters as required by condition 3.5.1	Bottom Ash	Quarterly	1 Jan, 1 Apr, 1 Jul and 1 Oct
Total soluble fraction and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) soluble fractions Parameters as required by condition 3.5.1	Bottom Ash	Before use of a new disposal or recycling route	
Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds, dioxins/furans and dioxin-like PCBs Parameters as required by condition 3.5.1	APC Residues	Quarterly	1 Jan, 1 Apr, 1 Jul and 1 Oct
Total soluble fraction and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) soluble fractions Parameters as required by condition 3.5.1	APC Residues	Before use of a new disposal or recycling route	



<b>Table S4.1 Reporting of monitoring data</b>			
<b>Parameter</b>	<b>Emission or monitoring point/reference</b>	<b>Reporting period</b>	<b>Period begins</b>
Functioning and monitoring of the incineration plant as required by condition 4.2.2		Annually	1 January
<b>Water</b>			
Emissions to water Parameters as required by condition 3.5.1	W1, W2, W3, W4 W9 (prior to discharge to the River Gowy)	Quarterly	01/04/2017
Emissions to water (HPP and CCS) Parameters as required by condition 3.5.1	Process monitoring point T1	Annually	1 January
Emissions to water Parameters as required by condition 3.5.1 – Oil in water	Installation	Annually	1 January
<b>Sewer</b>			
Emissions to sewer Parameters as required by condition 3.5.1	S1	Quarterly	In accordance with table S3.3(a) of this permit
<b>Other</b>			
LDAR	Installation wide	Annual	01/01/2008 up to 28/10/2018
Diffuse VOCs in accordance with BAT Conclusion 6	Installation wide	Annual	From 28/10/2018
Sulphur monitoring for refinery liquid fuel system Parameters as required by condition 3.5.1	Heavy fuel oil surge vessel, V1802; Light fuel tank, T4027	Quarterly	01/04/2017
Sulphur monitoring for refinery fuel gas Parameters as required by condition 3.5.1	RFG fuel drums, V4808 and V4809	Quarterly	01/04/2017
Sulphur recovery unit Parameters as required by condition 3.5.1	SRU percentage recovery	Quarterly	01/04/2017
Sulphur Recovery Unit	Refinery sulphur balance and SRU availability	Quarterly	01/01/2008
Emissions to air – Refinery Flare Sour gas and hydrogen sulphide	REF-A-14	Quarterly	01/04/2017
Review of NOx factors	Emission points identified in response to IC10 in table S1.3 of the permit	Annual	01/04/2017
Non-methane VOCs and benzene	Ince Coaster Berth VRU	In accordance with table S3.5 of this permit	In accordance with table S3.5 of this permit
<b>Hydrogen Production Plant and Carbon Capture and Storage Plant</b>			

<b>Table S4.1 Reporting of monitoring data</b>			
<b>Parameter</b>	<b>Emission or monitoring point/reference</b>	<b>Reporting period</b>	<b>Period begins</b>
<ul style="list-style-type: none"> <li>- Number of flaring events</li> <li>- Duration of flaring events</li> <li>- Root cause analysis for each event and preventative / frequency reduction measures</li> <li>- Total mass of gas flared in each event</li> <li>- Total mass of CO<sub>2</sub> emissions in each event</li> <li>- Total mass of Sulphur emissions in each event</li> <li>- Calorific value of the gas flared in each event</li> </ul>	HPP-A-3 - Flare <sup>[Note 1]</sup>	Annual	1 January
<ul style="list-style-type: none"> <li>- Number of events</li> <li>- Duration of events</li> <li>- Root cause analysis for each event and preventative / frequency reduction measures</li> <li>- Total mass of CO<sub>2</sub> emissions (tonnes / event)</li> </ul>	Venting from pipelines AGI  (X, Y coordinates 344557, 375024) Abnormal venting of CO <sub>2</sub> from PSV-002, PSV-0025, BDV-0010, BDV-0001, metering package 10-AAH-U-001	Annual	1 January
<ul style="list-style-type: none"> <li>- Number of events</li> <li>- Duration of events</li> <li>- Root cause analysis for each event and preventative / frequency reduction measures</li> <li>- Total mass of CO<sub>2</sub> emissions (tonnes / event)</li> </ul>	Venting from CO <sub>2</sub> Dehydration  (X, Y coordinates 344568, 375338) CO <sub>2</sub> venting during emergency pressure relief (fire) from TEG regeneration skid 10-FAB-U-102	Annual	1 January
<ul style="list-style-type: none"> <li>- Number of events</li> <li>- Duration of events</li> <li>- Root cause analysis for each event and preventative / frequency reduction measures</li> <li>- Total mass of CO<sub>2</sub> emissions (tonnes / event)</li> </ul>	Venting from CO <sub>2</sub> Capture Unit (X, Y coordinates 344538, 375314) CO <sub>2</sub> venting from CO <sub>2</sub> Absorber Column Reflux Drum V-117 (via PCV-0014) and CO <sub>2</sub> venting from CO <sub>2</sub> Compressor Package (C-103)	Annual	1 January
Diffuse emissions of methane and non-methane VOCs	HPP and CCS plants	Annual	1 January
Diffuse emissions of hydrogen	HPP and CCS plants	Annual	1 January
Note 1 The reporting threshold and reporting frequency specified by conditions 4.2.6 and 4.2.8 do not apply to HPP-A-3			

<b>Table S4.2 Annual production/treatment (Energy Recovery Plant)</b>	
<b>Parameter</b>	<b>Units</b>
Hazardous waste incinerated	tonnes
Waste heat utilised by the installation	KWh

<b>Table S4.3 Performance parameters</b>		
<b>Parameter</b>	<b>Frequency of assessment</b>	<b>Units</b>
Crude oil and other oil import (i.e. feedstocks)	Annually	tonnes
Water usage	Annually	Tonnes/ tonne feedstock
Energy usage (electrical)	Annually	MWh/ tonne feedstock
Energy usage (all fuels)	Annually	MJ/ tonne feedstock
Total release of oil to water per tonne of feedstock	Annually	g oil/ 1000 tonnes feedstock
<b>Energy Recovery Plant</b>		
Fuel oil consumption	Annually	Kg / tonne of waste incinerated
Mass of Bottom Ash produced	Annually	Kg / tonne of waste incinerated
Mass of APC residues produced	Annually	Kg / tonne of waste incinerated
Activated Carbon consumption	Annually	Kg / tonne of waste incinerated
[Lime / Sodium Bicarbonate] consumption	Annually	Kg / tonne of waste incinerated
Periods of abnormal operation	Annually	No of occasions and cumulative hours for current calendar year for each line.
<b>Hydrogen Production Plant and Carbon Capture and Storage Plant</b>		
Natural gas usage	Annually	Nm <sup>3</sup>
Natural gas usage (net thermal based on Lower Heating Value)	Annually	MJ
Refinery Off-Gas usage	Annually	Nm <sup>3</sup>
Refinery Off-Gas usage (net thermal based on Lower Heating Value)	Annually	MJ
Hydrogen production	Annually	Tonnes
Hydrogen production (thermal based on Lower Heating Value)	Annually	MJ
Energy usage (electrical)	Annually	MWh
Energy usage (electrical)	Annually	MJ / kg H <sub>2</sub>
Exported CO <sub>2</sub>	Annually	Tonnes
Emitted CO <sub>2</sub>	Annually	Tonnes
Net Feed Gas Energy Conversion Efficiency – Annual average	Annually	%
Carbon Capture Efficiency Annual average as specified in Table S3.5(a)	Annually	%
Water usage	Annually	Kg H <sub>2</sub> O / kg H <sub>2</sub>

<b>Table S4.4 IED Chapter III Performance parameters</b>		
<b>Parameter</b>	<b>Frequency of assessment</b>	<b>Units</b>
Annual fuel usage for each LCP	Annually	TJ

<b>Table S4.4 IED Chapter III Performance parameters</b>		
<b>Parameter</b>	<b>Frequency of assessment</b>	<b>Units</b>
Total emission to air of NO <sub>x</sub> for each LCP	Annually	Tonnes
Total emission to air of SO <sub>2</sub> for each LCP	Annually	Tonnes
Total emission to air of CO for each LCP	Annually	Tonnes
Total emission to air of dust for each LCP	Annually	Tonnes
Operating hours for each LCP	Annually	hour

<b>Table S4.5 Reporting forms or other form as agreed in writing by the Agency</b>			
<b>Media/parameter</b>	<b>Reporting format</b>	<b>Frequency</b>	<b>Date of form</b>
<b>Chapter III of the IED</b>			
Air and Energy - LCP	Form IED AR1 – energy usage and emissions for the year (Table S4.4)	Annually	31/12/2015
Air – LCP	Form IED CON1 (LCP boilers) - continuous monitoring or other form as agreed in writing by the Agency	Quarterly	31/12/2015
Air – LCP	Form IED PM1 - discontinuous monitoring or other form as agreed in writing by the Agency	6 monthly	31/12/2015
Air – LCP	Form IEM CEM1 - continuous measurement systems invalidation log or other form as agreed in writing by the Agency	Quarterly	31/12/2015
Air – LCP	Form IEM REM1 - installation resource efficiency metrics for Electricity Supply Industry sub-sector	Annually	31/12/2015
<b>Refinery</b>			
Air	Form Air 1 – CO boiler	Quarterly	2018
Air	Form Air 2 – periodic NO <sub>x</sub> and SO <sub>2</sub>	Quarterly	2018
Air	Form Air 3 – periodic Ni, Sb, V	6 monthly	2018
Air	Form Air 4 – dioxins/furans A-5	Annually	2018
Air	Form Air 5 – MPBH A-12	Every two years post maintenance	2018
Air	Form Air 6 - refinery sulphur balance, SRU availability and efficiency and fuel analysis	Quarterly	2018
Air	Form Air 8 – Periodic NO <sub>x</sub> , SO <sub>2</sub> , CO for HPP emission points HPP-A-1, HPP-A-2, HPP-A-4, or other form as agreed in writing by the Agency	6 monthly	2023
Air	Form Air 9 – Flaring and venting emissions from HPP-A-3 and HPP and CCS venting points, or other form as agreed in writing by the Agency	Annually	2023
Air - Flares	Form Air F1: reporting form for Non-Routine Flaring	Quarterly	2018
Air - Flares	Form Air F2: reporting form for total quarterly flaring	Quarterly	2018

<b>Table S4.5 Reporting forms or other form as agreed in writing by the Agency</b>			
<b>Media/parameter</b>	<b>Reporting format</b>	<b>Frequency</b>	<b>Date of form</b>
Air – NOx bubble	Form BREF NOx IEM: reporting form for compliance with the monthly NOx bubble	Quarterly	2018
Air – SO <sub>2</sub> bubble	Form BREF SO <sub>2</sub> IEM – reporting form for compliance with the monthly SO <sub>2</sub> bubble	Quarterly	2018
<b>EfW</b>			
Air	Forms EfW 1 to 7	Quarterly	2018
Air	Forms EfW 8	Annually	2018
Waste	Form EfW R1	Annually	2018
Raw materials	Form EfW WU/RM1	Annually	2018
Residues	Forms EfW Residues 1 and 2	Quarterly	2018
Performance	Forms EfW Performance 1	Annually	2018
<b>Effluent</b>			
Water	Form Water – 1 or other form as agreed in writing by the Agency	Quarterly	2018
Water	Form Water – 2 – Demineralisation effluent Hydrogen Production Plant and Carbon Capture and Storage Plant at process monitoring point T1, or other form as agreed in writing by the Agency	Annually	
Sewer	Form Sewer – 1 or other form as agreed in writing by the Agency	Quarterly	2018
<b>Annual limits</b>			
Air/water	Form Annual limits	Annually	2018
<b>Process/performance</b>			
Air	Form Process 1 (particulate)	Annually	2018
-	Form Performance 1	Annually	2018
Water usage	Form Water usage1 or other form as agreed in writing by the Agency	Annually	01/01/2008
Energy usage	Form Energy 1 or other form as agreed in writing by the Agency	Annually	01/01/2008
Waste return	Form Waste 1 or other form as agreed in writing by the Agency	Annually	01/01/2008
Performance	Form Performance 2 – Hydrogen Production Plant and Carbon Capture and Storage Plant, or other form as agreed in writing by the Agency	Annually	

## 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	<b>EPR/FP3139FN</b>
Name of operator	<b>Essar Oil (UK) Limited</b>
Location of Facility	<b>Stanlow Manufacturing Complex PO Box 3 Ellesmere Port Cheshire CH65 4HB</b>
Time and date of the detection	

<b>(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</b>	
<b>To be notified within 24 hours of detection</b>	
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>(b) Notification requirements for the breach of a limit</b>	
<b>To be notified within 24 hours of detection unless otherwise specified below</b>	
Emission point reference/ source	
Parameter(s)	
Limit	

Measured value and uncertainty	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

<b>Time periods for notification following detection of a breach of a limit</b>	
<b>Parameter</b>	<b>Notification period</b>

<b>(c) Notification requirements for the breach of permit conditions not related to limits</b>	
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.	

<b>(d) Notification requirements for the detection of any significant adverse environmental effect</b>	
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.	
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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.	

<b>Name*</b>	
<b>Post</b>	
<b>Signature</b>	
<b>Date</b>	

*\* authorised to sign on behalf of the operator*



## Schedule 6 - Interpretation

*“abatement equipment”* means that equipment dedicated to the removal of polluting substances from releases from the installation to air or water media.

*“abnormal operation”*, when applied to the incinerator, means any technically unavoidable stoppages, disturbances, or failures of the abatement plant or the measurement devices [other than continuous emission monitors] for releases to air of particulates, TOC and/or CO, during which the concentrations in the discharges into air and the purified waste water of the regulated substances may exceed the normal emission limit values.

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

*“Acid gas”* (or *“sour gas”*) means an off-gas that contains high levels of hydrogen sulphide (H<sub>2</sub>S).

*“annually”* means once every year.

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

*“APC residues”* means air pollution control residues.

*“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.

*“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.

*“back up fuel”* means alternative liquid fuels that are used as back-up only to provide for exceptional periods as described in section 6 II of the “MFF Protocol”

*“background concentration”* means such concentration of that substance as is present in:

- for emissions to surface water, the surface water quality up-gradient of the site; or
- for emissions to sewer, the surface water quality up-gradient of the sewage treatment works discharge.

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

*“BAT AEL”* means the range of achievable emission levels associated with application of the best available techniques.

*“BAT AEPL”* means BAT-associated environmental performance levels.

*“bi-annual”* means twice per year with at least five months between tests.

*“bottom ash”* means ash from the incinerator.

*“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 value, which when complied with will result in equivalent emission levels to those that would have been released when complying with each BREF BATAEL separately.

*“calendar monthly mean”* means the value across a calendar month of all hourly means.

*“Carbon Capture Efficiency”* is defined as the mass of CO<sub>2</sub> equivalent captured for storage, as a percentage of the mass of CO<sub>2</sub> equivalent in all feed gas (natural gas and refinery off-gas) fed to the Hydrogen Production Plant and Carbon Capture Plant, including any natural gas used in combustion plants.

*“CEM”* continuous emission monitor.

*“CEN”* means Comité Européen de Normalisation.

*“daily average”* for releases of substances to air means the average of half-hourly averages over a calendar day during normal operation. Where any of abnormal operation, start up or shut down occur during the day in such a way that there are less than 43 half-hourly averages recorded during normal operation, no daily average shall be recorded for that day.

*“disposal”* means any of the operations provided for in Annex I to Directive 2008/98/EC of the European Parliament and of the Council on waste.

*“dioxin and furans”* means polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans.

*“DLN”* means dry, low NO<sub>x</sub> burners.

*“DSD”* means Dangerous Substances Directive.

*“Duty of Care”* shall have the meaning given to it in the Environmental Protection Act 1990.

*“ELV”* means Emission Limit Value.

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

*“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.

*“fugitive emission”* means an emission to air, water or land from the activities which is not controlled by an emission limit.

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

*“hazardous property”* has the meaning in Annex III of the Waste Framework Directive.

*“incineration line”* means all of the incineration equipment related to a common discharge to air location.

*“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 principal of delivering compliance with a number of BREF BATAELs for the same pollutant, by setting a single overarching “bubble emission limit”.

*“invalid day”* means any day in which more than three hourly average values are invalid.

*“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.

*“ISO”* means International Standards Organisation.

*“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 MWth or more, based on gross calorific value.

*“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.

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

*"LOI"* means loss on ignition a technique used to determine the combustible material by heating the ash residue to a high temperature.

*"MCERTS"* means the Environment Agency's Monitoring Certification Scheme.

*"mcr"* means maximum continuous rating.

*"Medium Combustion Plant"* or *"MCP"* means a combustion plant with a rated thermal input equal to or greater than 1 MW but less than 50 MW.

*"Medium Combustion Plant Directive"* or *"MCPD"* means Directive 2015/2193/EU of the European Parliament and of the Council on the limitation of emissions of certain pollutants into the air from medium combustion plants, as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016.

*"MFF Protocol"* means 'IED Chapter III Protocol for Multi-fuel Firing Refinery Combustion Plants granted a Permit prior to 7<sup>th</sup> January 2013'. Version 5 or any later version unless otherwise agreed in writing by the Environment Agency.

*"monthly average"* for emissions to air, the BAT AELs refer to monthly average values, for continuous measurements. This means the averages of all valid hourly average values measured over a period of one month.

*"monthly/yearly average"* for emissions to water, the BAT AELs refer to yearly averages. This means, the average of all daily averages obtained within a year/month, weighted according to the daily flows.

*"Multi-fuel firing"* or *"MFF"* means the capability of burning more than one type of fuel.

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

*"ncv"* means net calorific value.

*"Net Feed Gas Energy Conversion Efficiency"* (%) is defined as the ratio multiplied by 100 between:

- The 'Net energy content of the hydrogen product' (on Lower Heating Value basis); and
- The 'Net energy content' (on Lower Heating Value basis) of the feed gas, plus the 'electrical power import' figure expressed as the equivalent net energy content of the hydrogen product that would be necessary to generate the electrical power input required by the HPP and CCS plant, at an assumed typical net electrical efficiency of 58.5%;

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

*"notify without delay"* and *"notified without delay"* means that a telephone call can be used, whereas all other reports and notifications must be supplied in writing, either electronically or on paper.

*"off-gas"* 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.

*"PAH"* means poly-cyclic aromatic hydrocarbon, and comprises anthanthrene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[b]naph(2,1-d)thiophene, benzo[c]phenanthrene,

benzo[ghi]perylene, benzo[a]pyrene, cholanthrene, chrysene, cyclopenta[c,d]pyrene, dibenzo[ah]anthracene, dibenzo[a,i]pyrene fluoranthene, Indo[1,2,3-cd]pyrene, naphthalene.

“PCB” means polychlorinated biphenyl dioxin-like PCBs are the non-ortho and mono-ortho PCBs listed in the table below.

“quarterly” for reporting/sampling means after/during each 3 month period, January to March; April to June; July to September and October to December and, when sampling, with at least 2 months between each sampling date.

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

“recovery” means any of the operations provided for in Annex II to Directive 2008/98/EC of the European Parliament and of the Council on waste.

“RFG-refinery fuel gas” means 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.

“shut-down”, when applied to the incinerator, is any period where the plant is being returned to a non-operational state and there is no waste being burned.

“SRU” means sulphur recovery unit.

“standard contribution value” means the typical flue gas flow-rate, multiplied by the typical emission concentration, produced by a unit during normal operation, which is specified for the purpose of defining the contribution of that unit to the “bubble emission limit”.

“start-up”, when applied to the incinerator, is any period where the plant has been non-operational, after igniting the auxiliary burner until waste has been fed to the incinerator in sufficient quantity to initiate steady-state conditions.

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

“TOC” means *Total Organic Carbon*. In respect of releases to air, this means the gaseous and vaporous organic substances, expressed as TOC. In respect of bottom ash, this means the total carbon content of all organic species present in the ash (excluding carbon in elemental form).

“UK ETS” means UK Emissions Trading Scheme established according to the Greenhouse Gas Emissions Trading Scheme Order 2020.

“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.

“Waste Framework Directive” or “WFD” means Waste Framework Directive 2008/98/EC of the European Parliament and of the Council on waste, as read in accordance with Schedule 1A to the Environmental Permitting (England and Wales) Regulations 2016.

“year” means calendar year ending 31 December.

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, the concentration at a temperature of 273K and at a pressure of 101.3 kPa, with no correction for water vapour content.
- (d) in relation to gases from incineration plants other than those burning waste oil, the concentration in dry air at a temperature of 273K, at a pressure of 101.3 kPa and with an oxygen content of 11% dry.
- (e) where hazardous wastes are burned in an incineration or co-incineration plant and the emissions of pollutants are reduced by gas treatment, standardisation of the gas with respect to oxygen content shall be carried out only if the oxygen concentration measured over the same period exceeds the relevant oxygen content defined in conditions [(a) – (c)] above. In other cases, the measured emissions shall be standardised only for moisture, pressure and temperature.

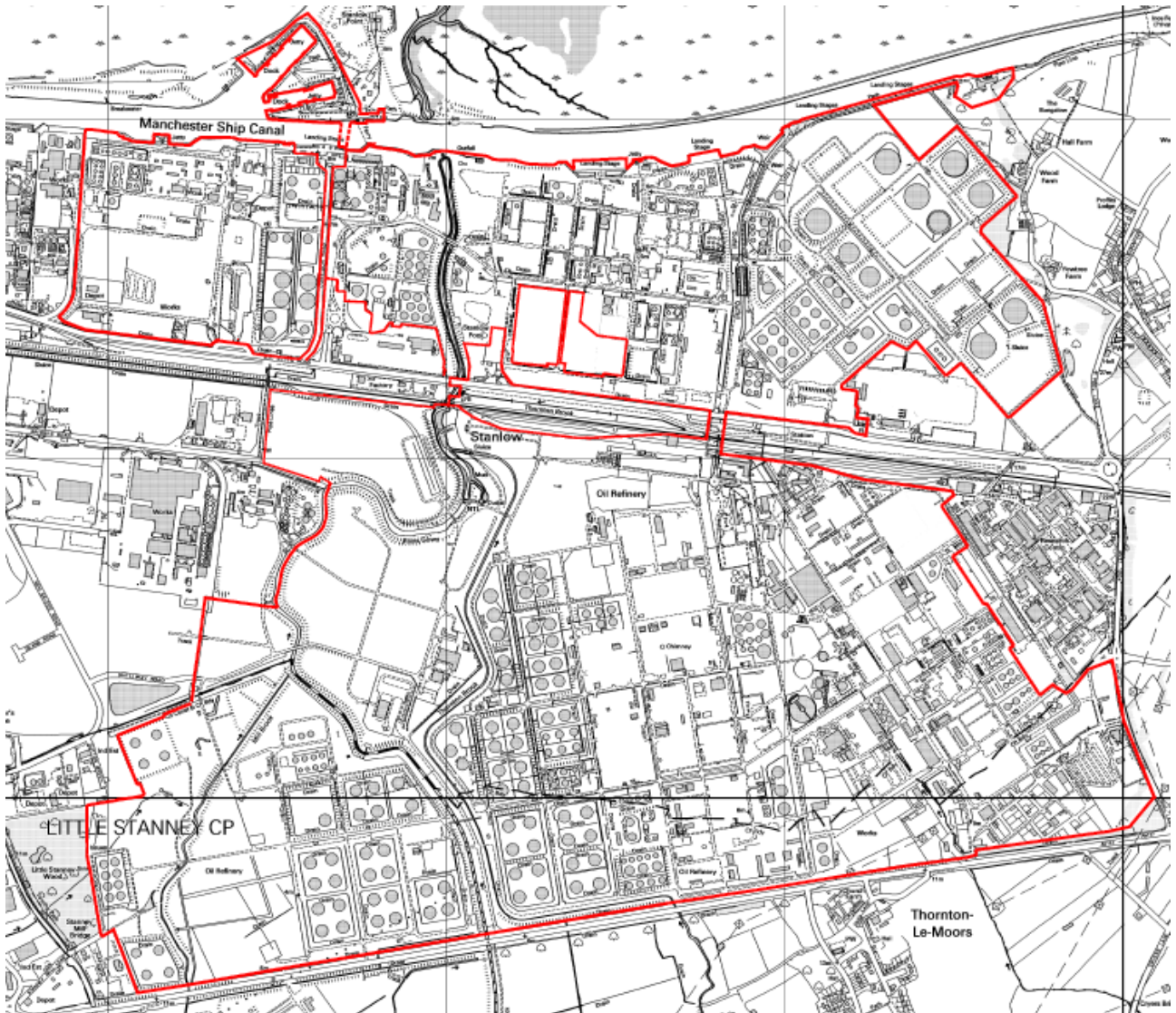
For dioxins/furans and dioxin-like PCBs the determination of the toxic equivalence concentration (I-TEQ, & WHO-TEQ for dioxins/furans, WHO-TEQ for dioxin-like PCBs) stated as a release limit and/ or reporting requirement, the mass concentrations of the following congeners have to be multiplied with their respective toxic equivalence factors before summing. When reporting on measurements of dioxins/furans and dioxin-like PCBs, the toxic equivalence concentrations should be reported as a range based on: all congeners less than the detection limit assumed to be zero as a minimum, and all congeners less than the detection limit assumed to be at the detection limit as a maximum.

<b>TEF schemes for dioxins and furans</b>				
<b>Congener</b>	<b>I-TEF(1990)</b>	<b>WHO-TEF (1997/8)</b>		
		<b>Humans / Mammals</b>	<b>Fish</b>	<b>Birds</b>
<b>Dioxins</b>				
2,3,7,8-TCDD	1	1	1	1
1,2,3,7,8-PeCDD	0.5	1	1	1
1,2,3,4,7,8-HxCDD	0.1	0.1	0.5	0.05
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	0.01
1,2,3,7,8,9-HxCDD	0.1	0.1	0.01	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01	0.001	<0.001
OCDD	0.001	0.0001	-	-
<b>Furans</b>				
2,3,7,8-TCDF	0.1	0.1	0.05	1
1,2,3,7,8-PeCDF	0.05	0.05	0.05	0.1
2,3,4,7,8-PeCDF	0.5	0.5	0.5	1
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	0.1
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	0.01
OCDF	0.001	0.0001	0.0001	0.0001

<b>TEF schemes for dioxin-like PCBs</b>			
<b>Congener</b>	<b>WHO-TEF (1997/8)</b>		
	<b>Humans / mammals</b>	<b>Fish</b>	<b>Birds</b>
<b>Non-ortho PCBs</b>			
3,4,4',5-TCB (81)	0.0001	0.0005	0.1
3,3',4,4'-TCB (77)	0.0001	0.0001	0.05
3,3',4,4',5 - PeCB (126)	0.1	0.005	0.1
3,3',4,4',5,5'-HxCB(169)	0.01	0.00005	0.001
<b>Mono-ortho PCBs</b>			
2,3,3',4,4'-PeCB (105)	0.0001	<0.000005	0.0001
2,3,4,4',5-PeCB (114)	0.0005	<0.000005	0.0001
2,3',4,4',5-PeCB (118)	0.0001	<0.000005	0.00001
2',3,4,4',5-PeCB (123)	0.0001	<0.000005	0.00001
2,3,3',4,4',5-HxCB (156)	0.0005	<0.000005	0.0001
2,3,3',4,4',5'-HxCB (157)	0.0005	<0.000005	0.0001
2,3',4,4',5,5'-HxCB (167)	0.00001	<0.000005	0.00001
2,3,3',4,4',5,5'-HpCB (189)	0.0001	<0.000005	0.00001

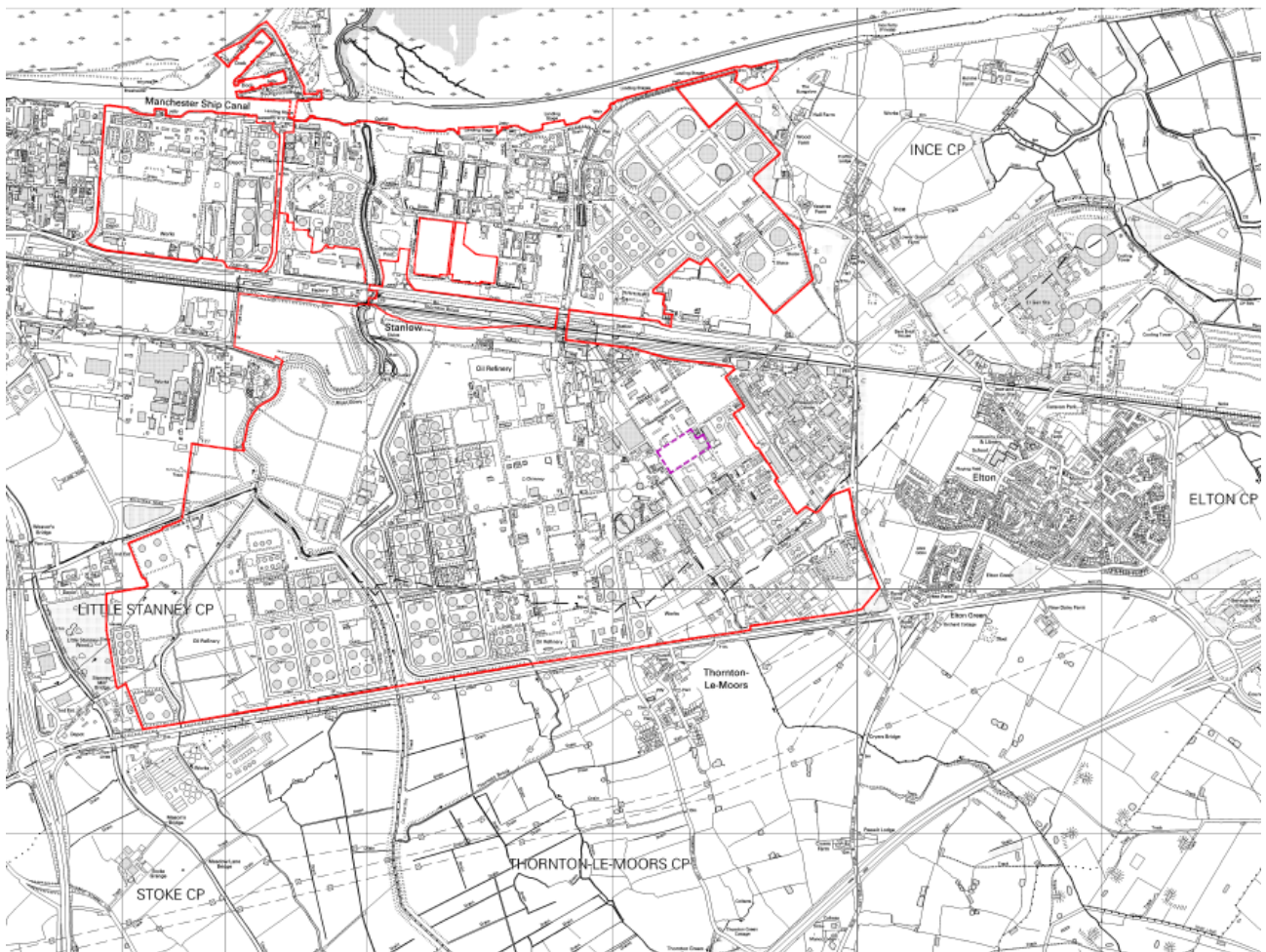
# Schedule 7 - Site plan

## Installation boundary





## Site location



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**END OF PERMIT**

# Annex to conditions – Derogation under Industrial Emissions Directive

Derogation under Article 15(4) of Industrial Emissions Directive

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

**Variation EPR/FP3139FN/V009 issued 26/09/2018**

## Operating Techniques

We have considered the Operator's proposed techniques and its comparison against other relevant techniques as described in the BAT Conclusions in the Commission Implementing Decision 2014/738/EU for the Refining of Mineral Oil and Gas. Our full reasoning is given in our decision document that accompanies this permit determination.

The BAT Conclusions for the Refining of Mineral Oil and Gas were published on 28 October 2014. Permits must be reviewed and Operators must comply with BAT (Associated Emission Levels) AELs by 28 October 2018.

The Operator has requested derogations from BAT AELs for four of the BAT conclusions, based on the technical characteristics of the Installation. The proposed techniques will result in emissions for which the appropriate emissions limits are less stringent than those associated with the best available techniques as described in the BAT Conclusions.

The relevant BAT Conclusions and the duration of the derogation requests are as follows:

BAT Conclusion	Derogation request
BAT 12	Time limited to 30 September 2021.
BAT 27	Non time limited until review of the permit is triggered by an event stipulated in article 21 of the Industrial Emissions Directive 2010.
BAT 34 (CDU-4)	Time limited to 31 December 2022.
BAT 52	Time limited to 31 December 2020.

A summary of each derogation request is provided below.

### **BAT 12 – Reduce pollutants in waste water discharge**

To reduce emission loads of pollutants in the waste water discharge to the receiving water body, BAT is to remove insoluble substances by recovering oil, suspended solids and dispersed oil and to remove soluble substances using biological treatment and clarification.

#### Technical characteristics

Due to the size of site and the range of activities, the Installation has a range of existing effluent management systems and technologies in place.

The previous permit authorised 16 discharges to surface water (mostly to the River Gowy & its tributaries and the Manchester Ship Canal (MSC)) which all eventually flow into the River Mersey.

The Operator has had a longstanding commitment to improve effluent treatment across the Installation. Derogations were sought from the BAT AELs for a number of parameters at emission points W1 to W4 until 30 September 2021, based on the technical characteristics of the Installation.

Parameter mg/l	BAT AEL (yearly average)	W1		W2		W3		W4	
		Current mg/l	Proposed mg/l	Current mg/l	Proposed mg/l	Current mg/l	Proposed mg/l	Current mg/l	Proposed mg/l
Hydrocarbon oil index (HOI)	0.1 – 2.5	10	10	10	10	10	10	10	10
Total suspended solids (TSS)	5 – 25	-	-	45	45	45	45	-	-
Chemical oxygen demand (COD)	30 – 125	-	-	250	250	-	-	-	-
Total nitrogen expressed as N	1 – 25	-	-	-	-	-	-	No limit	No limit
Lead expressed as Pb	0.005 – 0.03	-	-	-	-	-	-	No limit	No limit
Cadmium expressed as Cd	0.002 – 0.008	-	-	-	-	-	-	No limit	No limit
Nickel expressed as Ni	0.005 – 0.1	-	-	-	-	-	-	No limit	No limit
Mercury expressed as Hg	0.0001 – 0.001	-	-	-	-	-	-	No limit	No limit
Benzene	0.001 – 0.05	-	-	-	-	No limit	No limit	-	-

Their proposed solution for compliance requires the use of a third party to treat their effluent at a local waste water treatment works (WwTW). This will still require significant on site works which will not be completed until December 2020. Allowing nine months for commissioning of the third party facilities gives an overall project completion date of 30 September 2021. The WWTW has committed to treating this effluent, with their project anticipated to be complete by 31 March 2020.

Details of the additional treatment are provided below in the 'proposed derogation'.

The project for the proposed derogation has been underway for a number of years already with commitment and buy in from both parties. Given the scale and nature of the works, and the progress to date, there is no other clear alternative, other than tankering the effluent off-site for disposal.

The Installation is unique because the age and configuration of the refinery's effluent management systems makes it more technically difficult and costly to comply.

The Operator has supplied a valid derogation request against the BAT conclusion, BAT 12 based on the technical characteristics of the Installation.

#### Options

The Operator has described two relevant options for achieving the BAT AELs and justified the screening out of seven other options. The two options for meeting the BAT AEL are:

- 1) BAT AELs – Dispose of effluent from SDAF, NDAF, PDAF units and T1402 off-site by road tanker by 2018. This is a temporary solution to dispose of effluent in the interim period until the WwTW can accept effluent by no later than 30 September 2021. BAT achieved by 28 October 2018.
- 2) Proposed derogation - bio-treatment process located at off-site, WwTW by 30 September 2021. Transfer of effluent from SDAF, NDAF, PDAF and T1402 to the WwTW for biological treatment with BAT achieved no later than 30 September 2021.

The proposed derogation and BAT AEL option were taken forward to conduct a cost benefit analysis (CBA).

#### Permit conditions

We have set the following requirements:

- Table S1.3 of this permit sets an improvement condition:  
To address any potential uncertainties about the quality of the remaining surface water within the intermittent discharges, which will no longer receive DAF treatment. This will include a review of these releases to confirm the requirement for any future monitoring that may be required to determine the significance of any residual impacts.  
  
That delivers the requirements of the Water Framework Directive (WFD).  
  
That tracks progress of upgrades and new plant fitting as proposed. The Operator will be required to provide regular updates on progress for achieving the BAT AELs by 30 September 2021.
- Table S3.2(a) of this permit maintains the current permit limits for a number of parameters at emission points W1 to W4 in the interim period. This means that there will be no backsliding / deterioration.
- Table S3.2(b) of this permit sets the BAT AELs for all relevant parameters at all relevant emission points, effective no later than 30 September 2021.

#### Conclusion

The Environment Agency has reviewed the derogation request and concluded that:

We are satisfied that the Operator has demonstrated that the cost of complying with the BAT AELs by 28 October 2018 by tankering effluent off-site, is disproportionate to the value of damage to the environment caused by allowing the current emissions for a number of parameters to continue until 30 September 2021.

That allowing the proposed derogation would not cause any deterioration from the current situation, by maintaining the current permit limits i.e. no backsliding / deterioration.

It is anticipated that the on-site “upstream” and “downstream” improvements will be completed by December 2020. This will result in improvements in the quality of some effluents prior to 30 September 2021.

A contractual commitment has also been made by the third party to completing the work by 31 March 2020.

## **BAT 27 – Reduce CO emissions to air from catalytic cracking**

To reduce CO emissions to air from the catalytic cracking process (regenerator) at emission point A-11 which operates in the partial combustion mode, using one or a combination of techniques as described in the BAT Conclusions.

The catalytic cracking unit (CCU) is a Long Residue Catalytic Cracker consisting of the reactor and regenerator section, the main fractionator distillation column and a CO boiler.

The primary purpose of the CO boiler is to reduce CO emissions. A derogation is sought from the CO BAT AEL from emission point A-11 based on the technical characteristics of the Installation until a review of the permit is triggered by an event stipulated in article 21 of the Industrial Emissions Directive 2010.

### Technical characteristics

The Installation is unique because of the age and throughput of the catalytic cracker and CO boiler; specifically there is a play off between CO emissions and NOx emissions from the catalytic cracker due to operation at high throughput and high temperatures which means that any reduction in CO emissions results in an increase in NOx emissions.

The operation at a high throughput generates a large quantity of CO. Increased CO destruction would further raise the operating temperature, generating more thermal NOx. For this reason the derogation is requested until the next permit review i.e. for the life-time of the BREF.

A derogation from the BAT AEL for the life-time of the BREF is sought as follows:

<b>BAT AEL (mg/Nm<sup>3</sup>)</b>	<b>Proposed limit (mg/Nm<sup>3</sup>)</b>
<b>Monthly average</b>	<b>Monthly average</b>
≤ 100	1,300

The Operator has supplied a valid derogation request against the BAT conclusion, BAT 27 based on the technical characteristics of the Installation.

### Options

The Operator has described three relevant options for achieving the BAT AEL and justified the screening out of one of those options. The BAT AEL options and proposed derogation are:

1) BAT AEL - BAT for CO achieved 2018

Reduce CO emissions at the expense of increasing NOx emissions up to the BAT AEL of 400 mg/Nm<sup>3</sup>; however it may not be practical or possible to meet both BAT AELs consistently.

2) Install a new CO boiler - BAT achieved 2022 (earliest)

A CO boiler is designed to meet BAT AELs for CO and NOx. This option assumes that the new CO boiler is installed during periodic maintenance in 2022, which is likely to involve an extended shut-down.

3) Proposed derogation, no change - Continue operation of the existing CO boiler, with CO emissions exceeding the BAT AEL.

The derogation request includes a proposed non time limited ELV of 1,300 mg/Nm<sup>3</sup> for CO. The Operator are not proposing to make any modifications to reduce CO emissions at this time, however they commit to completing further work to investigate the impact on CO and NOx emissions of modifications to the air flow within the CO Boiler. Practicality of making changes (i.e. internal changes to

combustion chamber) was assessed during the first quarter of 2018. Any modifications based on the findings would need to be designed for implementation in a later refinery maintenance window. This will form an important part of ongoing improvements at the site.

The proposed derogation and BAT AEL options were taken forward to conduct a CBA.

#### Permit conditions

We have set the following requirements:

- Table S1.3 of this permit sets an improvement condition:

Requiring the Operator to complete further work to investigate the impact on CO and NO<sub>x</sub> emissions of modifications to the air flow within the CO Boiler. The practicality of making changes (i.e. internal changes to combustion chamber) was assessed during periodic maintenance in the first quarter of 2018. Modifications based on the findings need to then be designed for implementation in a later refinery maintenance window.

- Table S3.1(a) of this permit sets a CO limit of 1,300 mg/Nm<sup>3</sup> from 28 October 2018. Previously no limit was set which is reflected in Table S3.1 of variation EPR/FP3139FN/V009, and was applicable until 28 October 2018.

#### Conclusion

The Environment Agency has reviewed the derogation request and concluded that:

We are satisfied that the Operator has demonstrated that the cost of complying with the BAT AEL by 28 October 2018 (which will result in an increase in NO<sub>x</sub> emissions) or by 2022 (by replacing the CO boiler during an extended shut-down) is disproportionate to the damage to the environment caused by allowing emissions of CO to continue at their current concentration of 1,300 mg/Nm<sup>3</sup> until the next permit review.

There are no local issues with CO and the impact from CO emissions at their current level screen out as insignificant.

Allowing the proposed derogation would not cause any significant pollution or prevent a high level of protection of the environment as a whole to be achieved.

The impact of increasing NO<sub>x</sub> emissions as a result of a reduction in CO is more significant. The UK is committed to achieving reductions in NO<sub>x</sub> emissions and therefore it is difficult to justify a reduction in CO at the expense of an increase in NO<sub>x</sub> emissions.

BAT 24 also requires the operator to reduce NO<sub>x</sub> emissions to air from the same emission point and sets a BAT AEL of 100 to 400 mg/Nm<sup>3</sup>, a level the plant can meet without the need for a derogation.

#### **BAT 34 (CDU-4) – Reduce NO<sub>x</sub> emissions from combustion**

BAT Conclusion 34 requires a reduction in oxides of nitrogen (NO<sub>x</sub>) emissions to air from combustion units to meet the NO<sub>x</sub> BAT AELs set out in Tables 10 and 11 of the BAT Conclusion.

A derogation from the BAT Conclusion 34 NO<sub>x</sub> AELs is requested for three of the four furnaces (combustion units) on the crude distillation unit (CDU-4) using one or a combination of primary and secondary techniques as described by the BAT Conclusion.

The combustion units requiring a derogation are identified as F201 A (58.9 MW), F201 B (58.9 MW) and F201 C (49 MW).

Combustion unit F202 is not part of this derogation and will achieve compliance with BAT through BAT Conclusion 57.

All four combustion units are fitted with conventional burners i.e. not low NO<sub>x</sub> and all discharge through a common stack at emission point reference A-2.

Fractional distillation or “fractionation” is the key unit operation within a CDU, where the crude oil is distilled into different fractions or components. This takes a significant amount of heat, supplied by the four combustion units.

BAT Conclusion 57

In order to achieve an overall reduction of NOx emissions to air from combustion units (and other applicable units), BAT is to use an integrated emission management technique as an **alternative to applying BAT 34**.

The technique consists of managing NOx emissions from several or all combustion units (and other units) on a refinery site in an integrated manner, by implementing and operating the most appropriate combination of BAT across the different units concerned and monitoring the effectiveness thereof, in such a way that the resulting total emissions are equal to or lower than the emissions that would be achieved through a unit-by-unit application of the BAT AELs referred to in BAT 34.

Technical characteristics

CDU-4 combustion units were commissioned in 1973 at which time they were not designed to meet current emission limits. The four combustion units are equipped with conventional burners i.e. not low NOx and the Operator is required to upgrade three of the combustion units. The most cost-effective solution is to upgrade them during their normal maintenance times. Upgrading them all during the next planned maintenance event in 2022 is considered a valid technical characteristic for seeking a derogation that will deliver compliance in 2022.

It is not possible to shut down CDU-4 independent of the rest of the refinery as it is the primary unit which supplies feed-stocks to the other units.

The high hydrogen content of the RFG and the high air pre-heating also increases NOx emissions. The BAT Conclusion makes an allowance for this, see Note 1 to the tables below.

Derogations from the BAT AELs are sought as follows:

Gas firing

<b>BAT AEL (mg/Nm<sup>3</sup>) Monthly average</b>	<b>Applicable BAT AEL (mg/Nm<sup>3</sup>) Monthly average</b>	<b>Proposed limit (mg/Nm<sup>3</sup>) Monthly average</b>
150 <sup>Note 1</sup>	200	300

Note 1: For an existing unit using high air pre-heat (i.e. > 200 °C) or with H<sub>2</sub> content in the fuel gas higher than 50 %, the upper end of the BAT-AEL range is 200 mg/Nm<sup>3</sup>.

Multi-fuel firing

<b>BAT AEL (mg/Nm<sup>3</sup>) Monthly average</b>	<b>Applicable BAT AEL (mg/Nm<sup>3</sup>) Monthly average</b>	<b>Proposed limit (mg/Nm<sup>3</sup>) Monthly average</b>
300 <sup>Note 1</sup>	Up to 450	450

Note 1: For existing units < 100 MW firing fuel oil with a nitrogen content higher than 0,5 % (w/w) or with liquid firing > 50 % or using air preheating, values up to 450 mg/Nm<sup>3</sup> may occur.

The Operator has supplied a valid derogation request against the BAT conclusion, BAT 34 based on the technical characteristics of the Installation.

## Options

The Operator has described three relevant options for achieving the BAT AEL with all options taken forward to conduct a CBA.

1) BAT AEL option - Shut-down refinery to install low NO<sub>x</sub> burners

This option is based on shutting the refinery down in October 2018 to install low NO<sub>x</sub> burners on three of the four combustion units. The Operator estimated that a 12 month shut-down would be required.

We also carried out the CBA assessment with a three month refinery shut-down.

2) Proposed option – Low NO<sub>x</sub> burners on three combustion units

The proposed solution is to install low NO<sub>x</sub> burners on three of the CDU-4 combustion units during the next planned maintenance event in 2022. This date is the earliest date by which the three combustion units can be modified.

3) Low NO<sub>x</sub> burners on two combustion units

Installing low NO<sub>x</sub> burners on two of the combustion units to achieve lower NO<sub>x</sub> emissions. Low NO<sub>x</sub> burners would be installed during the next planned maintenance event in 2022. It is unlikely that this option will be able to consistently meet the BAT AELs.

## Permit conditions

We have set the following requirements:

- Table S1.3 of this permit sets an improvement condition requiring periodic updates on the modification programme to ensure that the project proposal for delivery of the improvements are on track for 2022.
- Table S3.1 of variation EPR/FP3139FN/V009 retained the current NO<sub>x</sub> limits on the basis of no backsliding / deterioration.
- Table S3.1(a) of this permit sets the BAT AELs following completion of the improvements in 2022. It also requires demonstration by calculation that the relevant BAT AELs are met by each combustion unit.

## Conclusion

The Environment Agency has reviewed the derogation request and concluded that:

We are satisfied that the Operator has demonstrated that the cost of complying with the BAT AELs for gas and liquid fuel firing by 28 October 2018 by shutting down the refinery (for a three month or a 12 month period), is disproportionate to the value of damage to the environment caused by allowing NO<sub>x</sub> emissions to continue at their current levels (of 300 mg/Nm<sup>3</sup> for gas firing and 450 mg/Nm<sup>3</sup> for liquid fuel firing) until completion of the improvements in 2022.

That allowing the proposed derogation would not cause any deterioration from the current situation, by maintaining the current permit limits i.e. no backsliding / deterioration.

## **BAT 52 - Reduce emissions of VOCs from loading/unloading operations**

To reduce emissions of Volatile Organic Compounds (VOCs) to air from loading and unloading operations for sea going vessels, BAT is to use vapour recovery. The applicability limit is relevant to facilities transferring more than 1 million m<sup>3</sup> / annum from sea going vessels.

Crude oil is received from a separate EPR installation (EPR/YP3238FT) at the Tranmere Oil Terminal on the Mersey, 13.5 km to the north west of the Stanlow Manufacturing complex. The Tranmere Oil Terminal, is more accessible to ships and road vehicles and used for the storage of hydrocarbon based



liquids which are loaded and unloaded from ships. These liquids are transferred by pipelines to and from Stanlow. Tranmere is covered under a separate permit, which is not part of the review of this derogation.

Throughput at the White Oil Docks berth on the Manchester Ship Canal (MSC) is currently above the threshold. The Operator is implementing a project independent of this derogation to provide more resilience & flexibility within all the berths Stanlow use. This will move some loading operations from White Oil Docks on the MSC to the Tranmere Terminal by the end of 2020. At that point, throughput at White Oil Docks will fall below threshold. The project includes the construction of a BAT 52 compliant vapour recovery unit (VRU) at Tranmere.

#### Technical characteristics

The construction cost of a VRU at White Oil Docks would be higher than normally encountered due to the complex location of the Dock on Stanlow Island, located on the opposite side of the MSC to the refinery. There is no road access to Stanlow Island, therefore all equipment & resources would have to be moved using floating cranes & barges. This significantly increases the cost of the project compared with the proposed installation of a VRU at Tranmere in 2020, a much less complex location.

The BAT AELs for emissions to air of non-methane VOCs (NMVOCs) and benzene will not apply after 31 December 2020 following completion of the VRU at Tranmere. The duration that emissions would be above the BAT AELs would be 27 months i.e. October 2018 to December 2020.

Derogations from the BAT AELs are sought as follows:

Parameter	BAT AEL Monthly average	Current limit	Proposed limit
NMVOCs	0.15 – 10 g/Nm <sup>3</sup>	No limit	No limit
Benzene	<1 mg/Nm <sup>3</sup>	No limit	No limit

The Operator has supplied a valid derogation request against the BAT conclusion, BAT 52 based on the technical characteristics of the Installation.

#### Options

The Operator has described three relevant options for achieving the BAT AEL as follows:

- 1) BAT AEL option - Limit loading / unloading rates  
The BAT AELs are not applicable to loading / unloading operations for sea-going vessels with an annual throughput < 1 million m<sup>3</sup>/annum. The cost of capping imports and exports has been included. BAT achieved 2018.
- 2) Install VRU at White Oil Docks  
An option to install a VRU at this location has been considered. It would take approximately two years to progress a project to install a VRU. Thus a VRU could not be installed until the end of 2019, which is later than the date required by the BREF. The BAT AELs would not be applicable after 31 December 2020 once the loading / unloading operations fall below the 1 million m<sup>3</sup> / annum threshold. Whilst this is the case, the assessment is based on the VRU being in operation at White Oil Docks for the life-time of the plant i.e. 20 years. BAT achieved 1 January 2020
- 3) Proposed derogation  
To move some loading / unloading operations to Tranmere by the end of 2020. This would result in loading/unloading rates falling below the 1 million m<sup>3</sup> / annum at White Oil Docks, therefore BAT AELs would not be applicable. Emissions during the period October 2018 to December 2020 would not meet the BAT AELs. BAT achieved 1 January 2021.

The proposed derogation and the other two options were taken forward to conduct a CBA.

#### Permit conditions

We have set the following requirements:

- Table S1.3 of this permit sets an improvement condition requiring a regular review of the progress towards achieving compliance with BAT 52.
- Table S1.1 of this permit limits the loading / unloading at White Oil Docks to <1 million m<sup>3</sup>/annum from 1 January 2021.
- The proposed derogation will require a variation to the Tranmere permit to include the installation of VRU in accordance with BAT 52.
- The increased loading / unloading at Tranmere cannot take place until a variation has been issued which authorises this change.
- The Operator will be unable to transfer loading / unloading movements to Tranmere until the Tranmere permit is varied.

#### Conclusion

The Environment Agency has reviewed the derogation request and concluded that:

We are satisfied that the Operator has demonstrated that the cost of complying with the BAT AEL by limiting loading / unloading or installing VRU at White Oil Docks is disproportionate to the value of damage to the environment caused by allowing VOC emissions to continue at their current levels until 31 December 2020.

Emissions will reduce significantly from 01 January 2021 when some of the loading / unloading operations move to the Tranmere Terminal. The impact from current operations is low and will be reduced from 01 January 2021.

### **Variation EPR/FP3139FN/V011 issued 12/05/2022**

#### **Operating Techniques**

We have considered the Operator's proposed techniques and its comparison against other relevant techniques as described in the BAT Conclusions in the Commission Implementing Decision 2014/738/EU for the Refining of Mineral Oil and Gas. Our full reasoning is given in our decision document that accompanies this permit determination.

The BAT Conclusions for the Refining of Mineral Oil and Gas were published on 28 October 2014. Permits must be reviewed and Operators must comply with BAT (Associated Emission Levels) AELs by 28 October 2018.

As part of variation application EPR/FP3139FN/V011 the Operator has requested derogation from BAT AELs for one of the BAT conclusions, based on the technical characteristics of the Installation. The proposed techniques will result in emissions for which the appropriate emissions limits are less stringent than those associated with the best available techniques as described in the BAT Conclusions.

The relevant BAT Conclusion and the duration of the derogation request is as follows:

<b>BAT Conclusion</b>	<b>Derogation request</b>
<b>BAT 52</b>	Time limited to 31 August 2024.

A summary of this derogation request is provided below.

The Operator requested a time limited derogation from BAT Conclusion 52 of the Refining of Mineral Oil and Gas BAT conclusions, which specifies the techniques to prevent or reduce VOC emissions to air from loading and unloading operations of volatile liquid hydrocarbon compounds and sets the BAT-associated emission levels (BAT-AELs) for emissions of non-methane VOC (NMVOC) and benzene.

The scope of the derogation request covers the importing and exporting activities of liquid hydrocarbons at the facility called White Oil Docks.

The decision is made on the basis of technical characteristics of the activities in the scope of the derogation.

This is a second derogation request for this activity as a similar time limited derogation had been granted to the operator on 26/09/2018 expiring on 31/12/2020. The derogation granted in 2018 relied on the reduction of throughput at the White Oil Docks below the applicability threshold of 1 million m<sup>3</sup>/y by 31/12/2020. This was dependent on the completion of the independent project to transfer most of the loading and unloading operations to the Tranmere Oil Terminal (referred in the following as the 'Mogas Export Project').

The Operator provided evidence of the progress they had made on the Mogas Export Project, including design and tendering documents and significant commitment of capital with the previous engineering contractor. The Operator has claimed that the Mogas Export Project was disrupted in 2020 due to the effects of the COVID-19 pandemic on the availability of engineering personnel and its effects on the global market conditions for oil refining with a negative impact on the Operator's business.

The Operator described four relevant options for achieving the BAT-AELs or achieving compliance by making the BAT conclusion non-applicable to the operations of the activity. They proposed to continue with the existing unabated ship loading/unloading operations at the White Oil Docks with a throughput exceeding 1 million m<sup>3</sup>/y until 31/08/2024. The emissions will continue to be unabated, and therefore not subject to emission limits for NMVOC and benzene, during the derogation period.

After this deadline, part of the ship loading/unloading operations will be moved over to the Tranmere Oil Terminal, where a Vapour Recovery Unit (VRU) compliant with BAT 52 and the associated BAT-AELs will be constructed as the result of a project **independent of this derogation** (referred to as 'the Mogas Export Project').

The Environment Agency has reviewed the request and concluded that:

**Summary of the first stage assessment** The Operator has supplied a valid derogation request against BAT Conclusion 52 of the Mineral Oil Refining BAT conclusions. The derogation request is based on geographical location and technical characteristics. We have taken forward the technical characteristics' criterion, although we agree that the geographic and technical criteria partially overlap in this case.

The Operator has described four relevant options for either: meeting the BAT-AELs; or achieving compliance by making the BAT conclusion non-applicable to the operations of the activity in the scope of the derogation by virtue of reducing the operational throughput at the White Oil Docks.

These four options were taken forward and assessed in a cost benefit analysis (CBA). Two options would potentially make the installation immediately compliant; another option would achieve compliance in 2023, whereas the proposed option will achieve compliance in 2024.

**Summary of the second stage assessment** We consider that the Operator has provided a credible argument that the increased costs linked to the technical characteristics are disproportionate for achieving the BAT-AEL.

An appropriate range of options were reviewed and those identified as technically viable were considered further. Viable options were taken forward for Cost Benefit Analysis (CBA), were adequately described in the CBA and the cost of the BAT AEL option and other options was confirmed as disproportionate compared to the environmental benefits. The Cost Benefit Analysis using central assumptions shows negative NPVs for the BAT AEL of £72 million and for the other options of £5 million (option 3) and £85

million (option 4) and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

In making this conclusion, we have also taken into account the results of an additional retrospective cost-benefits analysis showing that the costs of meeting the BAT-AEL in October 2018 would have outweighed the monetised benefits in comparison to the currently proposed derogation which delivers compliance in September 2024. The Cost Benefit Analysis for this retrospective BAT AEL sensitivity scenario shows, using central assumptions, a negative NPV of £9.11 million.

**Summary of risks of allowing a derogation** We are satisfied that the Operator has demonstrated that the proposed derogation is not likely to cause significant pollution of the environment or harm to human health. Allowing the derogation will not increase the emissions from loading / unloading at the site and therefore presents no additional risk compared to the previously permitted operations.

**Final considerations and permit conditions.** The Environment Agency has therefore allowed this derogation subject to the permit conditions set out in Consolidated Variation Notice EPR/FP3139FN/V011: conditions to restrict the operations of the White Oil Docks in the case that the Operator fails to provide evidence of sufficient progress of the MOGAS Export Project. The Operator will need to report progress 6-monthly in response to improvement conditions set out by this permit variation and seek approval from the Environment Agency to operate above the throughput applicability threshold of BAT-52 (pro-rated as 500,000 m<sup>3</sup> for 6 months operations) in the following six months.

Should the Environment Agency not be satisfied with the progress reported by the Operator, the limits of the activity specified in the permit will restrict operations to the applicability threshold of BAT conclusion 52, starting from the six months after the reporting period when insufficient progress has been reported.

#### Variation EPR/FP3139FN/V012 issued 15/11/2022

##### Operating Techniques

We have considered the Operator's proposed techniques and its comparison against other relevant techniques as described in the BAT Conclusions in the Commission Implementing Decision 2014/738/EU for the Refining of Mineral Oil and Gas. Our full reasoning is given in our decision document that accompanies this permit determination.

The BAT Conclusions for the Refining of Mineral Oil and Gas were published on 28 October 2014. Permits must be reviewed and Operators must comply with BAT (Associated Emission Levels) AELs by 28 October 2018.

As part of variation application EPR/FP3139FN/V012 the Operator has requested derogation from BAT AELs for one of the BAT conclusions, based on the technical characteristics of the Installation. The proposed techniques will result in emissions for which the appropriate emissions limits are less stringent than those associated with the best available techniques as described in the BAT Conclusions.

The relevant BAT Conclusion and the duration of the derogation request is as follows:

BAT Conclusion	Derogation request
BAT 12	Time limited to 31 December 2022.

A summary of this derogation request is provided below.

The Operator requested a time limited derogation from BAT Conclusion 12 of the Refining of Mineral Oil and Gas BAT conclusions, which specifies the techniques to reduce the emission load of pollutants in the waste water discharge to the receiving water body.

The decision is made based on technical characteristics of the activities in the scope of the derogation.

This is a second derogation request as a similar time-limited derogation had been granted to the operator on 26/09/18 (variation No. EPR/FP3139FN/V009) expiring on 30/09/2021

Essar's Stanlow Refinery is unique because the age and configuration of the refinery's effluent management systems makes it more technically difficult and costly to comply. The reasons for this are summarised below:

- The existing Rotating Biological Contactors are not capable of meeting the BAT AELs and in some places there is no biological treatment of effluent streams. Activated sludge treatment of a blended effluent stream is required but that technique does not work effectively with the very variable strength effluent streams found on site at Stanlow.
- Essar have proposed that the best technical and environmental solution is for off-site treatment at a third party Waste Water Treatment Plant (WWTW). This will still require significant on site works which, at the point of submitting this variation application, was expected to be completed in April 2022. An update provided in June 2022 confirmed the project was on schedule.
- Allowing nine months for commissioning of the third party facilities gives an overall project completion date of 31 December 2022.
- The third party's WWTW has committed to treating this effluent, with their project anticipated to be complete by 31 March 2022.
- The cost of off-site disposal by road tanker is disproportionately expensive.

Essar have made significant progress on design and installation of the project, however due to the delays associated with COVID-19 the Essar construction works were not completed until 30 April 2022. The United Utilities facilities require 8 months for commissioning which gives a project completion date of 31 December 2022.

The Environment Agency has reviewed the request and concluded that:

**Summary of the first stage assessment** The Operator has supplied a valid derogation request against BAT Conclusion 12 of the Mineral Oil Refining BAT conclusions. The derogation request is based on technical characteristics. We have taken forward the technical characteristics' criterion.

The Operator has described two relevant options for: meeting the BAT-AELs.

These two options were taken forward and assessed in a cost benefit analysis (CBA). One option would potentially make the installation immediately compliant, whereas the proposed option will achieve compliance by 31/12/22.

**Summary of the second stage assessment** We consider that the Operator has provided a credible argument that the increased costs linked to the technical characteristics are disproportionate for achieving the BAT-AEL.

The options were reviewed and considered further. The options taken forward for cost benefit analysis were adequately described in the CBA and the cost of the BAT AEL option and the other options was confirmed as disproportionate compared to the environmental benefits. The CBA using central assumptions shows negative Net Present Values (NPVs) for the BAT AEL of £1.7 billion and therefore the cost of compliance is disproportionate compared to the environmental benefit achieved.

**Summary of risks of allowing a derogation** We are satisfied that the Operator has demonstrated that the proposed derogation is not likely to cause significant pollution of the environment or harm to human

health. Allowing the derogation will not increase the emissions from the site and therefore presents no additional risk compared to the previously permitted operations.

**Final considerations and permit conditions.** The Environment Agency is therefore minded to allow this derogation request subject to the following conditions:

- The operating techniques for this BAT Conclusion will be incorporated into the permit.
- All work to comply with the applicable BAT-AELs for the installation is completed by 31 December 2022. The BAT-AELs will not be applicable until this deadline.

All existing permit emission limit values (ELVs) will remain in force.