Environment Agency

Review of an Environmental Permit for an Installation subject to Chapter II of the Industrial Emissions Directive under the Environmental Permitting (England & Wales) Regulations 2016 (as amended)

Decision document recording our decision-making process following review of a permit

The Permit number is: EPR/BS8656IX
The Operator is: Huntsman Polyurethanes (UK) Limited
The Installation is: Huntsman Polyurethanes (UK) Limited
This Variation Notice number is: EPR/BS8656IX/V009

What this document is about

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

We have reviewed the permit for this installation against the revised BAT Conclusions for the Large Volume Organic Chemicals industry sector published on 07 December 2017 in the Official Journal of the European Union.
Where appropriate, we also considered other relevant BAT Conclusions published prior to this date but not previously included in a permit review for the Installation:
Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector. Published 09 June 2016

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

It explains how we have reviewed and considered the techniques used by the operator in the operation and control of the plant and activities of the installation. This review has been undertaken with reference to the decision made by the European Commission establishing best available techniques (BAT) conclusions (BATc) for Production of Large Volume Organic Chemicals, and Common Waste Water And Waste Gas Treatment/Management Systems in the Chemical Sector as detailed in documents reference C(2017) 7469, and C(2016) 3127 respectively. It is our record of our decision-making process and shows how we have taken into account all relevant factors in reaching our position.

As well as considering the review of the operating techniques used by the operator for the operation of the plant and activities of the installation, the consolidated variation notice

takes into account and brings together in a single document all previous variations that relate to the original permit issue. Where this has not already been done, it also modernises the entire permit to reflect the conditions contained in our current generic permit template.

The introduction of new template conditions makes the permit consistent with our current general approach and with other permits issued to installations in this sector. Although the wording of some conditions has changed, while others have been deleted because of the new regulatory approach, it does not reduce the level of environmental protection achieved by the permit in any way. In this document we therefore address only our determination of substantive issues relating to the new BAT Conclusions.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future.

How this document is structured

1. Our proposed decision
2. How we reached our decision
3. The legal framework
4. Annex 1– Annex 1: decision checklist regarding relevant BAT Conclusions.
5. Annex 2 – Assessment, determination and decision where an application(s) for Derogation from BAT Conclusions with associated emission levels (AEL) has been requested..
6. Annex 3 – Improvement Conditions

1 Our decision

We have decided to issue the variation notice to the operator. This will allow it to continue to operate the Installation, subject to the conditions in the consolidated variation notice that updates the whole permit.

The operator has requested a derogation from the requirements of BAT Conclusion 12 (Table 3, BAT-AEL for Chromium and Nickel) as identified in the Common Waste Water and Waste Gas Treatment/Management Systems in the Chemicals Sector BAT Conclusions Document.

We have decided to issue the variation notice with the aforementioned BAT-AELs (Chromium and Nickel) included whilst a derogation application is prepared for submission. There has been a delay in this submission as in order to be able to complete a cost benefit analysis (to support the derogation application) for the emissions of Chromium and Nickel into the River Tees, a robust model of these emissions needs to be completed to assess the environmental risk. At the time of writing we have only received a H1 assessment which after a determination audit showed that detailed modelling is required, as the discharge does not pass Test 3 or Test 4 of the H1 TraC (Transitional and Coastal Waters) water emissions assessment. We consider that, in reaching our decision, we have taken into account all relevant considerations and legal requirements and that the varied permit will ensure that a high level of protection is provided for the environment and human health.

The consolidated variation notice contains many conditions taken from our standard environmental permit template including the relevant annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the notice, we have considered the techniques identified by the operator for the operation of their installation, and have accepted that the details are sufficient and satisfactory to make those standard conditions appropriate. This document does, however, provide an explanation of our use of “tailor-made” or installation-specific conditions, or where our permit template provides two or more options.

2 How we reached our decision

2.1 Requesting information to demonstrate compliance with BAT Conclusion techniques

We issued a notice under regulation 61(1) of the Environmental Permitting (England and Wales) Regulations 2016 (a Regulation 61 Notice) on 4th May 2018 requiring the operator to provide information to demonstrate where the operation of their installation currently meets, or how it will subsequently meet, the revised standards described in the relevant BAT Conclusions document.
The notice required that where the revised standards are not currently met, the operator should provide information that

- Describes the techniques that will be implemented before 07/12/21 which will then ensure that operations meet the revised standard, or
- justifies why standards will not be met by 07/12/21, and confirmation of the date when the operation of those processes will cease within the installation or an explanation of why the revised BAT standard is not applicable to those processes, or
- justifies why an alternative technique will achieve the same level of environmental protection equivalent to the revised standard described in the BAT Conclusions.

Where the operator proposed that they were not intending to meet a BAT standard that also included a BAT Associated Emission Level (BAT AEL) described in the BAT Conclusions Document, the Regulation 61 notice required that the operator make a formal request for derogation from compliance with that AEL (as provisioned by Article 15(4) of IED). In this circumstance, the notice identified that any such request for derogation must be supported and justified by sufficient technical and commercial information that would enable us to determine acceptability of the derogation request.

The Regulation 61 notice response from the Operator was received on 26th April 2019.

We considered it was in the correct form and contained sufficient information for us to begin our determination of the permit review but not that it necessarily contained all the information we would need to complete that determination.

The Operator made no claim for commercial confidentiality. We have not received any information in relation to the Regulation 61 Notice response that appears to be confidential in relation to any party.

2.2 Review of our own information in respect to the capability of the installation to meet revised standards included in the BAT Conclusions document

Based on our records and previous experience in the regulation of the installation we consider that the operator will be able to comply with the techniques and standards described in the BAT Conclusions other than for those techniques and requirements described in BAT Conclusion 10 - 12 of the Common Waste Water and Waste Gas Treatment/Management Systems in the Chemicals Sector BAT Conclusions Document. In relation to these BAT Conclusions, we do not fully agree with the operator in respect of their current stated capability as recorded in their regulation 61 Notice response. We have therefore included Improvement Conditions IC17 & IC18 in the consolidated variation notice to ensure that the requirements of the BAT Conclusion are delivered as soon as practicable.

2.3 Requests for further information during determination

Although we were able to consider the Regulation 61 notice response generally satisfactory at receipt, we did in fact need more information in order to complete our permit review assessment, and issued a further information request on 13th July 2020. A copy of the further information request was placed on our public register.

In addition to the responses to our further information request, we received additional information during the determination from

- Craig Dunnett, 1st October 2020
- Craig Dunnett, 17th June 2021
- Craig Dunnett, 20th August 2021
- Craig Dunnett, 28th March 2022
- Craig Dunnett, 30th March 2022
- Craig Dunnett, 31st March 2022
- Craig Dunnett, 12th May 2022 (derogation request)

We made a copy of this information available to the public in the same way as the responses to our information request.

2.4 Condition of Soil and Groundwater

Articles 16 and 22 of the Industrial Emissions Directive (IED) require that a quantified baseline is established for the level of contamination of soil and groundwater with hazardous substances, in order that a comparison can be made on final cessation of activities.

We have used the Large Volume Organic Chemicals permit review to regulate against the above IED requirements. Our Regulation 61 notice required operators, where the activity of the installation involved the use, production or release of a relevant hazardous substance (as defined in Article 3(18) of the Industrial Emissions Directive), to carry out a risk assessment considering the possibility of soil and groundwater contamination at the installation with such substances. Where any risk of such contamination was established we requested that the operator either:

- prepare and submit a baseline report containing information necessary to determine the current state of soil and groundwater contamination; or

- provide a summary report referring to information previously submitted where they were satisfied that such information represented the current state of soil and groundwater contamination so as to enable a quantified comparison to be made with the state of soil and groundwater contamination upon definitive cessation the activity.

Where operators concluded that there were no risks of soil or groundwater contamination (due to there not being any release of hazardous substances), they were required to provide a copy of the risk assessment.

The operator has confirmed that a soil and groundwater baseline was submitted to the EA, 52178-001-734/DK/rc dated 26 Feb 2003.

This baseline excavation showed generally low levels of contamination with the exception of a single aniline concentration detected in one borehole. Some limited evidence of hydrocarbons was detected in several boreholes, largely considered to have resulted from historic sources of contamination.

A review of the spillage register does indicate that several spills have occurred since the completion of the baseline in 2003 although the majority of the spills were either small volumes or contained within bunds.

As a result it is considered likely that the condition of the soil and groundwater will not have significantly deteriorated although no recent monitoring has been completed to confirm this.

It has been proposed (and accepted) that the operator complete additional soil and groundwater monitoring to focus on those areas where there is an increased risk of contamination. Permanent groundwater monitoring wells will be installed to permit future groundwater monitoring. The details of the scope of work are yet to be agreed and the sampling strategy will be developed in consultation with the local Environment Agency officer.

2.5 Surface Water Pollution Risk Assessment

As part of our delivery of the Water Framework Directive (WFD) requirements, we need to identify and assess the impact of all sources of hazardous pollutants to surface waters from regulated industry. We use the term 'hazardous pollutants' to collectively describe substances covered by the EQSD[1] (priority hazardous substances, priority substances and "other pollutants"). It also applies to the specific pollutants listed in the 2015 Directions[2], and substances which have operational (non-statutory) Environmental Quality Standards (EQS).

For all installations with discharges to surface water and/or sewer we required the operator, via our Regulation 61 notice, to provide a summary report of the current hazardous pollutant releases referring to the series of screening tests, which are described in our H1 risk assessment guidance, which would allow us to assess whether the emissions of hazardous pollutants from the installation are significant.

There are two discharges to surface water from the site, one indirect (via Bran Sands, uWWTP) and one direct (into the Tees Estuary). As the Tees Estuary is a TraC water and protected habitat (SAC, SSSI, Ramsar) any direct emissions must be modelled, at the time of writing no modelling has been submitted (for emissions that are discharged in concentrations above their relevant EQS) and so as a result improvement condition IC18 has been included into the permit.

3 The legal framework

The consolidated variation notice will be issued, under Regulations 18 and 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

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

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

[1] Environmental Quality Standards Directive (EQSD) (2008/105/EC, as amended by 2013/39/EU)
[2] The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015

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

We have set emission limit values (ELV's) in line with the BAT Conclusions, unless a tighter, i.e. more stringent, limit was previously imposed and these limits have been carried forward. For emissions to each relevant environmental receptor (i.e. air, or surface water), the emission limits and monitoring requirements have been incorporated into the consolidated variation notice Schedule 3 – Emissions and Monitoring.

Annex 1: decision checklist regarding relevant BAT Conclusions

BAT Conclusions for the Large Volume Organic Chemicals industry sector were published by the European Commission on 07 December 2017. There are 19 General BAT Conclusions and a further 71 BAT Conclusions in 10 subsector-specific sections.

Where appropriate, we also considered other relevant BAT Conclusions published prior to this date but not previously included in a permit review for the Installation; 23 BAT Conclusions for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector. This annex provides a record of decisions made in relation to each relevant BAT Conclusion applicable to the installation. This annex should be read in conjunction with the consolidated variation notice.

The overall status of compliance with the BAT conclusion is indicated in the table as

NA Not Applicable
CC Currently Compliant
FC Compliant in the future (within 4 years of publication of LVOC BAT conclusions)
NC Not Compliant

BAT Conclusion No	Summary of BAT Conclusion requirement for Production of Large Volume Organic Chemicals	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	BAT Conclusions that are not applicable to this installation	**NA**	LVOC BAT Conclusion 1, 3, 4, 5 and 6 are not applicable as there are no process furnaces used at this installation. LVOC BAT Conclusion 7 is not applicable as there is no SCR or SNCR at this installation. LVOC BAT Conclusions 11 is not applicable as there are no sources of dust emission on-site. LVOC BAT Conclusions 20 to 23 inclusive are not applicable as there is no production of lower olefins at this installation. LVOC BAT Conclusions 24 to 30 inclusive are not applicable as there is no production of aromatics at this installation. LVOC BAT Conclusions 31 to 44 inclusive are not applicable as there is no production of ethylbenzene and styrene monomer at this installation. LVOC BAT Conclusions 45 to 47 inclusive are not applicable as there is no production of formaldehyde at this installation. LVOC BAT Conclusions 48 to 55 inclusive are not applicable as there is no production of ethylene oxide and ethylene glycols at this installation. LVOC BAT Conclusions 56 to 60 inclusive are not applicable as there is no production of phenol at this installation. LVOC BAT Conclusions 61 to 63 inclusive are not applicable

			as there is no production of ethanolamine at this installation. LVOC BAT Conclusions 64 to 74 inclusive are not applicable as there is no production of toluene diisocyanate(TDI) and methylene diphenyl diisocyanate (MDI) at this installation. LVOC BAT Conclusions 76 to 85 inclusive are not applicable as there is no production of ethylene dichloride and vinyl chloride monomer at this installation. LVOC BAT Conclusions 86 to 90 inclusive are not applicable as there is no production of hydrogen peroxide at this installation.
2	Monitor channelled emissions to air other than from process furnaces/heaters in accordance with the described standards and minimum frequencies	**CC**	Reg 61 Response states: • 'as of December 2018 the vent gases from both processes (Nitrobenzene and Aniline) will be diverted to the separately permitted Energy Centre (operated by Equans) and used for raising steam. • • Emission points (*currently diverted to ThOx, to be diverted to Equans): • V1 – Thermal Oxidiser Vent • V2 – Sulphuric Acid Tank Vent • V3 – Caustic Storage Tank Vent • V4 – Effluent Neutraliser Tank Vent • V5 – Caustic Head Tank • V6 – NOx Scrubber Vent* • V7 – Strong Effluent Tank Vent* • V8 - Aliphatics Tank Vent • A1 – D-3001 Reactor Vent • A2a – D-3002 Reactor Vent • A2b – D-3003 Reactor Vent • A2c – D-3004 Reactor Vent • A3 – CHA Reactor Vent • A4 – Phase 1 Tank Vent • A5 – Purge Still Tanks System • A6 – Vacuum Pumps • A7 – Amine Water Column Vent Stack • A8 – Purge Still Separator Vent • A9 – Aniline Plant Furnace Vent • A10 – Refined Amine Tanks Common Vent • A11 – MNB Storage Tanks Vent • A12 – CHA Aniline Feed Tank Vent • A13 – Crude CHA Storage Tank Vent • A14 – F-3064 (a) Tanker Loading Vent

			• A15 – F-3064 (b)Tanker Loading Vent
			• A16 – F-3062 Tanker Loading Vent
			• A17 – F-3063 Tanker Loading Vent
			• A18 - No 5 Bay Vent
			• A20 – Aniline Catalyst Slurry Vessel Vent
			• A21 – Aniline Catalyst Drum Charging System Vent
			• A22 – Amine Catalyst Charging System Vent
			• A23 – CHA Catalyst Laminar Flow Booth
			• A24 – Amine Catalyst Charging System Vent
			• A25 – No 2 D/H Still Overheads Separator Vent
			• A26 (1) – No 5 Aniline Reactor Purge Gas Vent
			• A26 (2) – Aniline Reactors (1-5) Purge Gas Vent*
			•
			• Relevant pollutant emissions:
			• Benzene (monthly)
			• A6 – in permit (quarterly)
			• CO (ThOx) (monthly)
			• V1 - if still in use (continuous – hourly averages)
			• Dust (monthly)
			• A9 (particulates) – currently in the permit (quarterly monitoring) – this emission point was the vent from the Aniline Furnace. The furnace ceased operation in December 2005 and was demolished in May 2006. This was formally communicated to the Environment Agency as modification AN1436.
			• Gaseous Chlorides (expressed as HCl) (monthly) – not currently in permit, no gaseous chloride emissions.
			• NOx (ThOx) (monthly)
			  ○ V1 (continuous, hourly averages)
			• SO2 (monthly)
			  ○ V1 (continuous, hourly averages)
			• TVOC (monthly)
			  ○ A7 – in permit (quarterly)
			Reg 61 Response states:
			The emission points that are routed to the Thermal Oxidiser are as follows:-
			- NOx Scrubber Vent (V6)
			- Strong Effluent Tank (V7)
			- Aniline Reactors Purge Gas Vent (A26)
			These emission points are planned to be routed to Equans, once the facility is successfully commissioned, allowing the thermal oxidiser and release point V1 to be decommissioned.

			Reg 61 Response also leans on Footnote 2 of the BAT 2 table which states: "*the minimum monitoring frequency for periodic measurements may be reduced to once every year, if the emission levels are proven to be sufficiently stable.*" By saying: Given that the permit monitoring parameters have been fixed and met for a number of years, Huntsman considers that no change is required. The Environment Agency accepts this.
8	Increase resource efficiency/reduce the pollutant load on final waste gas treatment by using one or a combination of the described techniques on process off-gas streams (8a/b take precedence over 9)	**CC**	Operator response: a) Hydrogen recovery has been optimised over the years of operation of the site, but further improvements are considered not currently available for the site due to contamination levels. b) Polisher (low level reactor) installed into the Aniline process in Q2/Q3 2017 to remove nitrobenzene from the crude aniline. c) Not applicable to the process d) Not applicable to the process e) Not applicable to the process f) Catalyst maintenance keeps entrained liquids/solids to a minimum
9	Increase energy efficiency/reduce the pollutant load on final waste gas treatment by sending process off-gas streams of sufficient calorific value to a combustion unit	**CC**	Operator response: The oxidiser (Thox) plant receives all vent gases from the Nitrobenzene process and some of the vent gases from the Aniline process. During 2019, the vent gases currently channelled to the Thox plant will be diverted to the separately permitted Energy Centre (operated by EQANS) and used for raising steam **(however this hasn't happened yet)**. Following a c. 6 month commissioning phase of the Energy Centre, it is expected that the Thox plant will be decommissioned and demolished. The selection of the Energy Centre as a means of managing the waste gas streams from the Wilton site has been BAT reviewed and approved in its recent permit determination and issue. However the vent gases weren't diverted in 2019, but this is still the ultimate plan. As a result IC19 has been included into the permit to address this.
10	Reduce channelled emissions of organic compounds to air by using one or a combination of the described techniques.	**CC**	Operator response: Emission point A4 is abated by a water filled lute pot upstream of it. **Utilises wet scrubbing (BAT 10c)** Emission point A5 is the Purge Tanks vent header and has no abatement, however there is not a continuous flow through this vent.

			The system needs to remain under pressure because low pressure in the header causes air to be drawn in through the vacuum valves, and potentially leads to an explosive atmosphere in two of the tanks. The pressure in the header is controlled by two nitrogen flows – one via a PCV and one via a PRV. The pressure valve PD30268 has a set point of 5" wg and provides the back pressure for the header. If the header pressure reaches 5" wg then PD30268 will lift to relieve the excess pressure to protect the tanks. The normal operating pressure varies from 2" to 4.5" wg and vent opening is designed to not be continuous. The emission point is spot sampled quarterly and is sampled when the valve is open. These results are included in our annual emissions reporting. **No abatement required as this is an emergency relief vent only.** Emission point A6: VOC release is controlled through various techniques. The VOC's that are present in the exhaust gas from the vacuum pumps are Benzene, Aniline and Cyclohexylamine. Mononitrobenzene is sprayed into the Vacuum Pump Spray Scrubber, F3080, to scrub out the gaseous VOC's from the exhaust of the vacuum pumps and a small proportion is lost as vapour through vent A6. Emissions of Mononitrobenzene are controlled from emission point A6 by various techniques. The scrubbed vapour exiting the Vacuum Pump Spray Scrubber passes through a demister pad before it enters the vent line. This demister pad will remove any entrained NB liquid droplets from the vapour phase, these droplets in the pad help to remove some further Mononitrobenzene vapour, and the liquid is returned to the Scrubber. The vent line itself is a long unlagged line that has a gradient drop back towards the Scrubber. Mononitrobenzene condenses at atmospheric temperature from vapour to liquid onto the internal pipe wall and this flows back down into the Scrubber. Mononitrobenzene has proven to be the preferred solvent for this scrubbing process prior to the A6 release point due to its properties, it is an on-site source and works efficiently for this plant design. Mononitrobenzene is used to scrub vapours of Benzene, Aniline, and Cyclohexylamine because it is an excellent solvent for all of the above VOC's. There are no other substances on plant that would provide as high a scrubbing efficiency as mononitrobenzene. Aniline has been considered but is not as efficient as Mononitrobenzene. Mononitrobenzene is readily available on plant and can be returned back to the process from the Vac Pump Spray Scrubber and so it creates a circular system and waste free process.

			Addition of further solvents to the process to use as a scrubber liquid would require additional equipment to separate and collect contaminated washings and lead to additional waste streams requiring storage and treatment. More efficient scrubbing solvents are likely to be lighter density and would lead to higher VOC emissions and require further abatement steps. **Utilises wet scrubbing and condensation (BAT 10a and c).** Emission point A7 has a two stage wet scrubber, the first stage has nitrobenzene as a liquor to capture organic compounds, the second stage has water to capture ammonia. **Utilises wet scrubbing (BAT 10c)** The thermal oxidiser (Thox) plant receives all vent gases from the Nitrobenzene process and some of the vent gases from the Aniline process. During 2019, the vent gases currently channelled to the Thox plant will be diverted to the separately permitted Energy Centre (operated by Equans) and used for raising steam **(however this has not yet happened)**. Following a c. 6 month commissioning phase of the Energy Centre, it is expected that the Thox plant will be decommissioned and demolished. The selection of the Energy Centre as a means of managing the waste gas streams from the Wilton site has been BAT reviewed and approved in its recent permit determination and issue. **Currently utilises Thermal Oxidiser (BAT 10e).**
11	Reduce channelled dust emissions to air, by using one or a combination of the described techniques.	**NA**	Operator response: There are no sources of dust emissions from the Wilton site. There are no PM10 limits or requirements for monitoring for PM10 for the Thox plant.
12	Reduce emissions to air of sulphur dioxide and other acid gases (e.g. HCl), by using wet scrubbing.	**FC**	Operator response: Thermal oxidiser: The thermal oxidiser (Thox) plant receives all vent gases from the Nitrobenzene process and some of the vent gases from the Aniline process. The only source of sulphur in the process is H2SO4 in the nitrobenzene process, however carryover to the vent gases is very low. Ultimately the vent gases currently channelled to the Thox plant will be diverted to the separately permitted Energy Centre (operated by Equans) and used for raising steam. Following a c. 6 month commissioning phase of the Energy Centre, it is expected that the Thox plant will be decommissioned and demolished. Should the vent gases not be re-routed to Equans for any reason, the submission of a report addressing this BAT conclusion is required by IC19.

13	Reduce NO_x, CO and SO_2 emissions from thermal oxidisers by using a combination of the described techniques	**CC (NO_x),** **FC (CO & SO_2)**	Operator response: Thermal oxidiser: The thermal oxidiser (ThOx) plant receives all vent gases from the Nitrobenzene process and some of the vent gases from the Aniline process. NOx levels are directly related to NH3 carry over from the hydrogenation step in the Aniline process. Typical emissions are 400-500 mg/Nm3 compared to a limit of 800 mg/Nm3. The only source of sulphur in the process is H2SO4 in the nitrobenzene process, however carryover to the vent gases is very low. . During 2019, the vent gases currently channelled to the Thox plant will be diverted to the separately permitted Energy Centre (operated by Equans) and used for raising steam **(however this has not yet happened)**. Following a c. 6 month commissioning phase of the Energy Centre, it is expected that the Thox plant will be decommissioned and demolished. The selection of the Energy Centre as a means of managing the waste gas streams from the Wilton site has been BAT reviewed and approved in its recent permit determination and issue. **In the meantime the NO_x ELV for the Thermal Oxidiser (V1) will be reduced to 700 mg/m^3 . Modelling of emissions to air show an emission concentration of 700 mg/m^3 for NOx to have a process contribution (PC) of 1% or less. Improvement Condition IC19 requires a report is submitted confirming the achievement of the re-routing of process vent gases to Equans Services Limited and a requirement to submit an assessment to address this BAT conclusion (with respect to emissions of CO and SO_2) should the vent gases not be routed to Equans for any reason.**
14	Reduce the waste water volume, the pollutant loads discharged to a suitable final treatment (typically biological treatment), and emissions to water, by using appropriate techniques based on the information provided by the inventory of waste water streams specified in the CWW BAT conclusions.	**FC**	Operator response: Plant controls are used to manage the pollutant loading on the two effluent discharge streams. Nitrobenzene process: - Process strong effluent (from the 2nd wash) is diluted with process water from the aniline plant and then sent offsite to biological treatment through trade effluent consent with Northumbrian Water at Bran Sands. There is an inline monitor (pH and turbidity) on the discharge to sewer. - Process weak effluent (from the 1st wash) is adjusted for pH, steam stripped to remove organics and then sent to Sembcorp Utilities under a trade effluent consent. There are two inline monitors (pH and TOC) on the discharge. Sembcorp has a series of buffer vessels in the event of off-spec product being received to protect the discharge to estuary. Aniline process: - Process weak effluent (from the amine water steam stripping column) is sent to Sembcorp Utilities as for the Nitrobenzene process. Residues from the dehydration stills and refining stills purge processes are sent for energy recovery as CEM fuel.

			The need for additional on-site effluent treatment is currently unknown, resulting in the inclusion of IC18 into the permit. Please see section 2.5 of this document for more details.
15	Increase resource efficiency when using catalysts by using a combination of the described techniques.	**CC**	Operator response: The Aniline process uses a solid Nickel catalyst in the reduction process step. Nickel is the most effective catalyst available (has been tested extensively over many years). Unreacted nitrobenzene in the crude aniline is tracked in the feed to the Aniline dehydration section and is an indicator of the performance of the Nickel catalyst. Changeout of the catalyst is triggered by performance reduction.
16	Increase resource efficiency by recovery and reuse of organic solvents.	**CC**	Operator response: Nitrobenzene process: Benzene is a raw material in the Nitrobenzene process. There is a recovery washing and purification process of the crude nitrobenzene which recirculates any recovered benzene back into the raw material input stream. Aniline process: There is an aniline recovery step in the Aniline process through the Amine Water phase separator.
17	Prevent, or where not practicable reduce, waste for disposal by using a combination of the described techniques.	**CC**	Operator response: Aniline process: Residues from the dehydration stills and refining stills purge processes are sent for energy recovery as CEM fuel. The Nickel catalyst is sent for energy recovery as CEM fuel. Recovery of the catalyst is not economically viable as it is not possible to separate it effectively from the heavy aromatic tars from the aniline reactor The site tracks closely all the wastes generated. This is an annual report to the EA and also feeds back into the business and is used to identify waste minimisation opportunities going forward.
18	Prevent or reduce emissions from equipment malfunctions, by using all the described techniques.	**CC**	Operator response: a - The site has a register of critical equipment and a procedure for identifying/reviewing criticality b - The site operates a bulk storage asset integrity programme as part of the preventative maintenance regime. c - The site carries critical spares. The site has undertaken a detailed review of the critical equipment from a safety and environmental stand point. This review has included human factors measures in addition to physical equipment reviews.
19	Prevent or reduce emissions to air and water occurring during other than normal operating conditions, by implementing measures commensurate with the relevance of potential pollutant releases	**CC**	Operator response: There is a defined start-up procedure. Waste gases cannot be sent to the Thox until the Thox is at a certain temperature due to interlocks. Process interlocks include raw material (organics) feed loss, air loss.

	for: i) Start up and shutdown operations ii) Other circumstances		Role play 'other than normal operating conditions' scenarios as a means of training of operational teams.

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
1	To improve overall environmental performance implement and adhere to an EMS incorporating all the described features.	**CC**	Operator response: The site operates an EMS, embedded in the site's operating procedures.
2	To facilitate reduction of emissions to water and air and water usage, establish and maintain an inventory of waste water and waste gas streams as part of BAT1 EMS incorporating the described features.	**CC**	Operator response: The following reports and procedures provide the required information. *COMAH Report:* Section 2.2 - Dangerous Substances 2.2.1 Names and Maximum Quantities 2.2.2 Physical and Chemical Behaviours 2.2.3 Immediate and Delayed Harm to People and the Environment Huntsman Polyurethane Management Procedures (HPMP): 1701 G - Management of the Installations Drainage and Effluent Systems 1702 N - Management of Waste Materials for Off-Site Disposal 1741 B - Management of Emissions to Air. Appendix 5 of the response to the RFI letter are updated the two summary tables for Air and Water emission points found on the site.
3	For relevant emissions to water monitor key process parameters at key locations.	**FC**	**Please see the Key Issues section.**
4	Monitor emissions to water in accordance with the described standards and minimum frequencies.	**FC**	Initial operator response: There are no direct emissions to surface water, or river. Annual reporting to EA as per the requirements of the permit based on test reports from Northumbrian Water and Sembcorp. Water monitoring of these effluents for relevant parameters (as identified by BAT 2) are required for both discharges. In response to the RFI letter sent to the operator we have received confirmation that relevant monitoring at minimum frequencies will be

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			carried out. Relevant BAT-AELs and Improvement Conditions (17 & 18) have been set in the permit to address this BAT conclusion. **See Key Issues section for further details.**
5	Periodically monitor diffuse VOC emissions to air from relevant sources using a combination (or for large amounts – all) of the described techniques.	**CC**	Operator response: Permit requirement for fugitive VOC emissions - submitted annually to the EA. The site operates using option III *(III. calculations of emissions based on emissions factors periodically validated (e.g. once every two years) by measurements)*. TVOCs are reported every 36 months annually based on calculations from previous monitoring results and annual sniff testing.
6	Periodically monitor odour emissions from relevant sources using the described standards.	**CC**	Operator response: No odour emissions from site. No requirement for monitoring. No substantiated odour issues from the site.
7	Reduce usage of water and the generation of waste water, by reducing the volume and/or pollutant load of waste water streams, enhancing the reuse of waste water within the production process and recovery and reuse of raw materials.	**CC**	Operator response: Plant controls are used to manage the pollutant loading on the two effluent discharge streams. Nitrobenzene process: - Process strong effluent (from the 2nd wash) is diluted with process water from the aniline plant and then sent offsite to biological treatment through trade effluent consent with Northumbrian Water at Bran Sands. There is an inline monitor (pH and turbidity) on the discharge to sewer. - Process weak effluent (from the 1st wash) is adjusted for pH, steam stripped to remove organics and then sent to Sembcorp Utilities under a trade effluent consent. There are two inline monitors (pH and TOC) on the discharge. Sembcorp has a series of buffer vessels in the event of off-spec

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			product being received to protect the discharge to estuary. Aniline process: - Process weak effluent (from the amine water steam stripping column) is sent to Sembcorp Utilities as for the Nitrobenzene process. Residues from the dehydration stills and refining stills purge processes are sent for energy recovery as CEM fuel. The EA were concerned over the effectiveness of steam stripping for these VOCs and requested clarification/confirmation in a RFI letter. The operator response was as follows: Mononitrobenzene is removed from the weak effluent along with Benzene by steam stripping. This is the pre-treatment process and removes the majority of the Mononitrobenzene and Benzene. The effluent treatment system is a counter-current steam stripping process where a wastewater stream containing some volatile organic species, including Mononitrobenzene and Benzene, enters the top of a stripping column. Steam is introduced counter-currently into the bottom to act as the stripping medium. As the partial vapour pressure of the organic is higher in the liquid phase than the vapour phase, mass transfer occurs. As the wastewater proceeds down the column it becomes leaner in organic material and the vapour, which rises up, becomes richer in organic material. In this way relatively organic free water is collected at the bottom of the column. The designed efficiency of Mononitrobenzene removal is > 99.5% - see Appendix 6 (of the RFI response).
8	Prevent the contamination of uncontaminated water reduce emissions to water, by segregating uncontaminated	**FC**	Operator response: The site has combined wastewater and stormwater drainage. Process areas are bunded. External bunds are periodically checked for presence of water - this is

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	waste water streams from waste water streams that require treatment.		pumped to the Sembcorp drain following a test for contamination. The site's hazardous materials offloading area is self-contained in respect of drainage - there is sufficient storage volume in this area to contain a spill during offloading. All other areas of site are hard surfaced with impermeable surfacing. Surface water drains to Sembcorp drain. **Improvement Condition IC20 has been included into the permit to address this 'Narrative BAT'.**
9	Prevent uncontrolled emissions to water by providing an appropriate buffer storage capacity for waste water incurred during other than normal operating conditions based on a risk assessment, and taking appropriate further measures.	**CC**	Operator response: Sembcorp has a series of buffer vessels in the event of off-spec product being received to protect the discharge to estuary. *The site has carried out a bulk storage bunding review. This has confirmed that there is more than adequate capacity for failure and firewater (>110%).* *See COMAH report sections:* - Section 5.1.1 provides details of bulk storage and bunding for the Nitrobenzene plant - Section 5.1.2 provides details of bulk storage and bunding for the Aniline plant - Section 5.3.10 provides details of the bulk storage and bunding for the effluent storage - Section 4.3.2.5 Domino Assessment - Fire water run-off - Section 5.1.3.6 includes details of site drainage, including the management of firewater. **An appropriate buffer storage has been confirmed, details of site drainage and management of firewater included in COMAH report.**
10	Reduce emissions to water, by using an integrated waste water management and treatment strategy that includes an	**CC**	Operator response: Water is not used as a raw material, it is a by-product of the process and is managed accordingly with phase separation and steam stripping used to strip product from the water. The response to BAT 3

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
	appropriate combination of the described techniques (in the priority order given).		provides details of waste water management for the site. We requested further information to support the response to BAT conclusion and received the following: BAT 10 recommends using one or a combination of appropriate techniques for water effluent treatment. The site uses process-integrated techniques and recovery of pollutants at source for each of the waste streams and also waste water pre-treatment for the mononitrobenzene plant effluent (pH balancing). Final waste water treatment of the strong effluent is completed by Bran Sands. S1 (Sembcorp) effluent management and treatment strategy. There are two effluent streams that make up the S1 flow into the Sembcorp drain: Mononitrobenzene plant effluent and Aniline plant effluent. The mononitrobenzene plant effluent comes from the first washing stage of the Mononitrobenzene process. Here, crude mononitrobenzene is contacted with water in a static mixer in order to remove mineral acids from the crude mononitrobenzene. The water and Mononitrobenzene phases are allowed to phase separate in a decanter vessel. The water phase, known as weak effluent, overflows an internal weir plate and is then sent to the Effluent Stripper Storage Tank. This tank has a sloped base that allows any entrained mononitrobenzene in the weak effluent to settle out and collect here and then be reworked back to the washing section of the process. The weak effluent is then steam stripped using live steam injection to remove organics (mainly mononitrobenzene and benzene) and then this is pH adjusted before being sent to Sembcorp as part the sites S1 emission. The Aniline plant effluent mainly consists of the 'bottoms' stream from the amine water stripping column. This column uses live steam injection to remove organics (mainly benzene, aniline and mononitrobenzene) from the amine water feed stream. A small flow of this feed stream (300-500 kg/hr) is discharged directly into the aniline plant drain in order to purge ammonia from the amine water system. This small feed stream purge and the 'bottoms' stream are then sent to Sembcorp as part of the SI emission. S2 (Bran Sands) effluent management and treatment strategy.

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			The S2 effluent is comprised solely of Strong Effluent from the Mononitrobenzene Process. Strong effluent comes from the second washing stage of the Mononitrobenzene process. Here, the crude mononitrobenzene is contacted with an 8% aqueous solution of sodium hydroxide in a static mixer in order to remove nitrophenols from the crude mononitrobenzene. The water and mononitrobenzene phases are allowed to separate in a decanter vessel. The water phase, known as strong effluent, overflows an internal weir plate and is then pumped to the Strong Effluent Storage Tank via a shell and tube heat exchanger. There is a large residence time (hours) in this tank which allows any entrained mononitrobenzene to settle out from the strong effluent and be reworked back into the washing section of the process. The shell and tube heat exchanger reduces the temperature of the strong effluent by approximately 20 Deg C. This reduces the solubility of mononitrobenzene in the strong effluent thus enabling more of the entrained mononitrobenzene to settle out in the storage tank and be recovered. The strong effluent is then pumped to the Dilute Strong Effluent Storage Tank where it is diluted 1:1 with process water from the aniline plant. This is to ensure that the mononitrobenzene concentration in the strong effluent remains below its solubility limit. At higher concentrations, there is phase separation of mononitrobenzene and this negatively impacts operations and efficiency at the effluent treatment plant. The dilute strong effluent is then pumped offsite for biological treatment at Bran Sands.
11	Reduce emissions to water, by pre-treating waste water that contains pollutants that cannot be dealt with adequately during final waste water treatment using appropriate techniques as part of an integrated waste water management and treatment strategy.	**FC**	Operator response: There is no final effluent treatment on site. The site discharges to both Northumbrian Water and to Sembcorp Utilities under trade effluent consents. Plant controls are used to manage the pollutant loading on the two effluent discharge streams. Nitrobenzene process: - Process strong effluent (from the 2nd wash) is diluted with process water from the aniline plant and then sent offsite to biological treatment through trade effluent consent with Northumbrian Water at Bran Sands. There is an inline monitor (pH, and turbidity) on the discharge to sewer. - Process weak effluent (from the 1st wash) is adjusted for pH, steam stripped to remove organics and then sent to Sembcorp Utilities under a trade effluent consent. There are two inline monitors (pH and

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			TOC) on the discharge. Sembcorp has a series of buffer vessels in the event of off-spec product being received to protect the discharge to estuary. Aniline process: - Process weak effluent (from the amine water steam stripping column) is sent to Sembcorp Utilities as for the Nitrobenzene process. Residues from the dehydration stills and refining stills purge processes are sent for energy recovery as CEM fuel. **Improvement Condition IC18 has been included into the permit to address this BAT conclusion.**
12	Reduce emissions to water, by using an appropriate combination of the described final waste water treatment techniques.	**FC**	Operator response: 'There is no final effluent treatment on site. The site discharges to both Northumbrian Water and to Sembcorp Utilities under trade effluent consents. **Improvement Condition IC18 has been included into the permit to address this BAT conclusion.**
13	Prevent or, where this is not practicable, reduce the quantity of waste being sent for disposal by setting up and implementing a waste management plan as part of the environmental management system (see BAT 1) that, in order of priority, ensures that waste is prevented, prepared for reuse, recycled or otherwise recovered.	**CC**	Operator response: Aniline process: Residues from the dehydration stills and refining stills purge processes are sent for energy recovery as CEM fuel. The Nickel catalyst is sent for energy recovery as CEM fuel. Recovery of the catalyst is not economically viable as it is not possible to separate it effectively from the heavy aromatic tars from the aniline reactor The site tracks closely all the wastes generated. This is an annual report to the EA and also feeds back into the business and is used to identify waste minimisation opportunities going forward.

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
14	Reduce the volume of waste water sludge requiring further treatment or disposal, and reduce its potential environmental impact, by using one or a combination of the described techniques.		Operator response: There is no final effluent treatment on site. The site discharges to both Northumbrian Water and to Sembcorp Utilities under trade effluent consents. **Whether this is a requirement or not will depend on the outcome of the emissions to water risk assessment.** **Improvement Condition IC18 has been included into the permit to address this BAT conclusion.**
15	Facilitate the recovery of compounds and the reduction of emissions to air, by enclosing the emission sources and treating the emissions, where possible.	**NA / FC**	Operator response: Site operates a fully enclosed process and emissions are discharged through the Thox plant or other permitted emission points. For more detail see the LVOC BREF review - BAT 3-8 **Whether this is still applicable depends on whether the ThOx plant is still in use.** **Improvement Condition IC19 has been included into the permit to address this BAT conclusion.**
16	Reduce emissions to air, by using an integrated waste gas management and treatment strategy that includes process-integrated and waste gas treatment techniques.	**FC**	Operator response: The process is designed to minimise waste gases and maximise production. Site operates a fully enclosed process and emissions discharged through the Thox plant or other permitted emission points. For more detail see the LVOC BREF review - BAT 3-8 **Whether this is still applicable depends on**

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			whether the ThOx plant is still in use. **Improvement Condition IC19 has been included into the permit to address this BAT conclusion.**
17	Prevent emissions to air from flares, by using flaring only for safety reasons or non-routine operational conditions (e.g. start-ups, shutdowns) using one or both of the described techniques.	**NA**	Operator response: Not applicable - no flaring on site
18	Reduce emissions to air from flares when flaring is unavoidable, by using one or both of the described techniques.	**NA**	Operator response: Not applicable - no flaring on site
19	Prevent or, where that is not practicable, reduce diffuse VOC emissions to air, by using a combination of the described techniques.		Operator response: Permit requirement for fugitive VOC emissions - submitted annually to the EA. The site monitors using technique III - calculations of emissions based on emissions factors periodically validated (e.g. once every two years) by measurements. TVOCs are reported annually based on calculations from previous monitoring results and annual sniff testing. **A LDAR summary has been provided, and accepted, in response to this BAT Conclusion.**
20	Prevent or, where that is not practicable, reduce odour emissions, by setting up, implementing and regularly reviewing an odour management plan, as part of the environmental management system (see BAT 1), that includes all of the described elements:	**NA**	Operator response: No odour emissions from site. No requirement for monitoring in the permit. **No odour problems and/or substantiated complaints.**

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
21	Prevent or, where that is not practicable, reduce odour emissions from waste water collection and treatment and from sludge treatment, by using one or a combination of the described techniques.	**FC**	Operator response: Not applicable - no WWTP on site. **This is currently not applicable but may be applicable depending on the outcome of Improvement Condition IC18. A report which shows whether the site are compliant with this BATc is incorporated into IC18 as a requirement.**
22	Prevent or, where that is not practicable, reduce noise emissions, by setting up and implementing a noise management plan, as part of the environmental management system (see BAT 1), that includes all of the described elements:	**CC**	Operator response: The site is located on a large industrial estate and has no proximate noise sensitive receptors. There is noise generating equipment on site (e.g. compressors, agitators, hydrogen let down valves), however these are contained within noise-insulated enclosures where practicable. Site operates a noise monitoring programme alongside the wider Wilton estate noise monitoring programme. No noise concerns have been raised by either the regulator or local residents. There are no permit requirements for noise monitoring.
23	Prevent or, where that is not practicable, reduce noise emissions, by using one or a combination of the described techniques.	**CC**	Operator response: The site is located on a large industrial estate and has no proximate noise sensitive receptors. There is noise generating equipment on site (e.g. compressors, agitators, hydrogen let down valves), however these are contained within noise-insulated enclosures where practicable. Site operates a noise monitoring programme alongside the wider Wilton estate noise monitoring programme. No noise concerns have been raised by either the regulator or local residents. There are no

BAT Conclusion No	Summary of BAT Conclusion requirement for Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector	Status NA/ CC / FC / NC	Assessment of the installation capability and any alternative techniques proposed by the operator to demonstrate compliance with the BAT Conclusion requirement
			permit requirements for noise monitoring.

Key Issues

CWW BAT 3 & 4

Operator response:

Plant controls are used to manage the pollutant loading on the two effluent discharge streams. Nitrobenzene process: - Process strong effluent (from the 2nd wash) is diluted with process water from the aniline plant and then sent offsite to biological treatment through trade effluent consent with Northumbrian Water at Bran Sands. There is an inline monitor (pH and turbidity) on the discharge to sewer. - Process weak effluent (from the 1st wash) is adjusted for pH, steam stripped to remove organics and then sent to Sembcorp Utilities under a trade effluent consent. There are two inline monitors (pH and TOC) on the discharge. Sembcorp has a series of buffer vessels in the event of off-spec product being received to protect the discharge to estuary.
Aniline process: - Process weak effluent (from the amine water steam stripping column) is sent to Sembcorp Utilities as for the Nitrobenzene process. Residues from the dehydration stills and refining stills purge processes are sent for energy recovery as CEM fuel.

Water monitoring of these effluents for relevant parameters (as identified by BAT 2) are required for both discharges.

Further information about the monitoring of emissions to water was requested in a Request For Information letter (dated 13th July 2020), the response (dated 24th March 2020) was as follows:

S1 (Sembcorp) effluent from the Aniline Plant
This effluent has continuous monitoring for TOC, Flow, pH, Ammonia and Temperature.

A daily composite sample is sent to Sembcorp Laboratories to test for TOC (Daily). Sembcorp also test a daily composite sample on a less frequent basis for Ammonia (weekly), BOD (weekly), Hg (Monthly), Phenols (monthly), Cd (quarterly) and TSS (yearly).
Monthly samples are analysed in Huntsman laboratories for Benzene, Aniline, Mononitrobenzene, Cyclohexylamine, all nitrophenols, formate, nitrate, nitrite, sulphate, oxalate and ammonia.

Huntsman currently do not analyse at the minimum monitoring frequency stated in BAT 4 for – Total N, TSS and Nickel. Additional analysis for daily composite analysis on Total N, TSS and a monthly analysis for Nickel was requested from Sembcorp from January 2022.

S1 (Sembcorp) effluent from the Mononitrobenzene Plant
This effluent has continuous monitoring for TOC, Flow, pH and temperature.

A daily composite sample is sent to Sembcorp Laboratories to test for TOC (Daily). Sembcorp also test a daily composite sample on a less frequent basis for Ammonia (weekly), BOD (weekly), Hg (Monthly), Cd (quarterly) and TSS (yearly).

Monthly samples are analysed in Huntsman laboratories for Benzene, Mononitrobenzene, all nitrophenols, formate, nitrate, nitrite, sulphate, and oxalate.

Huntsman currently do not analyse at the minimum monitoring frequency stated in BAT 4 for – Total N and TSS. As above, additional analysis for daily composite analysis on Total N and TSS was requested from Sembcorp from January 2022.

S2 (Bran Sands) Strong Effluent
This effluent has continuous monitoring for Flow, pH, Density and Temperature.
NWL take a daily composite sample from the Huntsman pipe at the inlet to their facility and analyse for the following: COD (daily), nitrate (daily), nitrite (daily), sulphate (daily), Benzene (daily), Alkalinity (daily), Metals (weekly), TSS (daily), Aniline (daily), Mononitrobenzene (daily), Ammonia (daily) and pH (daily).
A 12 Hourly spot sample is taken on site at Huntsman and analysed for Benzene, Aniline, cyclohexylamine, Mononitrobenzene, all Nitrophenols and pH.
On a returned daily composite sample from NWL, Huntsman carry out a COD test in its site laboratory.
Huntsman currently do analyse at, or above the minimum monitoring frequency stated in BAT 4 for: Flow, pH, Temperature, COD, Total N, TSS and Nickel. We will also request testing is added for TOC from January 2022.

- Emission point S1
    - Flow, pH, temperature, Total Nitrogen (TN), Total Suspended Solids (TSS), Absorbable Organically bound halogens (AOX), Chromium (Cr), Copper (Cu), Nickel (Ni), and Zinc (Zn) monitoring requirements have been included into table S3.2 to comply with CWW BAT 3 & 4
    - Flow, pH and temperature monitoring requirements have been include into table S3.2
    - ELVs for TOC, TSS, AOX, Cr, Cu, Ni and Zn have been included into table S3.2 the permit to comply with BAT-AELs found in CWW BAT 12
    - Monitoring methods for Cadmium (Cd) and Mercury (Hg) have been amended in table S3.2 to comply with BAT-AELs found in CWW BAT 12
- Emission point S2
    - Flow monitoring requirements have been include into table S3.3 to comply with CWW BAT 3
    - Monitoring methods for Cadmium (Cd) and Mercury (Hg) have been amended in table S3.3 to comply with BAT-AELs found in CWW BAT 12

We have set the emissions limit values at the top end of the BAT-AEL range in line with section 4.35 of Defra's Industrial emissions Directive EPR Guidance on Part A installations which states: *Where the BAT AELs are expressed as a range, the ELV should be set on the basis of the top of the relevant BAT-AEL range – that is to say, at the highest associated emission level - unless the installation is demonstrably capable of compliance with a substantially lower ELV, based on the BAT proposed by the operator, or exceptional environmental considerations compel a tighter ELV.*

We have set Improvement Condition IC18 which will determine whether tighter ELVs need to be set, and the operator has not proposed any lower ELVs, and so we have set the ELVs at the top end of the BAT-AEL ranges.

This may change following the completion of Improvement Conditions IC17 & IC18.

Annex 2: Assessment, determination and decision where an application(s) for Derogation from BAT Conclusions with associated emission levels (AEL) has been requested.

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

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

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

(b) the technical characteristics of the installation concerned.

The competent authority shall document in an annex to the permit conditions the reasons for the application of the first subparagraph including the result of the assessment and the justification for the conditions imposed. '

A summary of any derogation granted is also recorded in an Annex to the consolidated variation notice in accordance with the requirement of IED Article 15(4) as described above.

1.

As part of their Regulation 61 Notice response, the operator has requested a derogation from compliance with the AEL values included in the following BAT Conclusion as detailed below.

Common Waste Water BAT Conclusion numbers 10 – 12, Chromium – 25ug/m3 and Nickel – 50ug/m3.

The basis of the request relative to the three criteria in Article 15(4) is 'the technical characteristics of the installation concerned'

2.

A derogation has been requested, however detailed information has not yet been submitted as this request arose following confirmatory monitoring late on in the determination of the permit review.

As a result the derogation will be assessed under IC17 after issue of the variation, and the result is not yet known.

3.

A derogation has been requested, however detailed information has not yet been submitted as this request arose following confirmatory monitoring late on in the determination of the permit review.

As a result the derogation will be assessed under IC17 after issue of the variation, and the result is not yet known.

4.

As part of their response they stated that the reason for their derogation request is as follows:
The Huntsman production process relies upon large quantities of Nitric Acid that has trace contamination of chromium and nickel. The process does not add any additional contribution and the contamination is passed through, resulting in an emission concentration in excess of the respective BAT-AELs.

An options appraisal and engineering review since the release concentration was identified in November 2021 is continuing. Findings to date indicate that if the site were to treat the effluent to reduce the marginally elevated chromium and nickel emissions down to the BAT-AEL levels, this would result in increases in additional raw material use for the treatment process and consequent release into the Tees Estuary, increased energy usage; and increased waste arisings from the installation as a whole. The result would be a transfer of impact from the release of chromium and nickel to the impact from the treatment process, disproportionate to the scale of the reduction of the contaminant metals. Reducing the emissions of one pollutant would be more than offset by the increase in the emissions of another.

No other Nitric Acid suppliers exist in the UK for the quantity required and therefore substitution of raw material (if indeed it would result in a lower level of contamination) would require import of a large volume of a dangerous substance from outside of the UK. Substitution is not considered a viable option for this reason.

The contamination of the Nitric Acid and the potential means of removing it from Huntsman's effluent is not expected to alter over time, therefore Huntsman considers a non-time-limited derogation process is justified for the BAT-AELs for chromium and nickel on the technical grounds.

5.

A derogation has been requested, however detailed information has not yet been submitted as this request arose following confirmatory monitoring late on in the determination of the permit review.

As a result the derogation will be assessed under IC17 after issue of the variation, and the result is not yet known.

Annex 3: Improvement Conditions

Based on the information in the Operator's Regulation 61 Notice response and our own records of the capability and performance of the installation at this site, we consider that we need to set improvement conditions so that the outcome of the techniques detailed in the BAT Conclusions are achieved by the installation. These improvement conditions are set

out below - justifications for them is provided at the relevant section of the decision document (Annex 1 or Annex 2).

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

Table S1.3 Improvement Programme Requirements		
Reference	**Requirement**	**Date**
IC1 – 16	-	Complete
IC17	Derogation for Chromium and Nickel The operator shall submit, for approval by the Environment Agency, reports setting out progress to achieving the BAT conclusion AELs or justification, including a detailed cost benefit assessment, of why the costs of treatment outweigh the environmental benefits, where a derogation has been applied for. The report shall include, but not be limited to, the following: 1) Current performance against the BATc AELs. 2) Methodology for reaching the AELs or justification, including a detailed cost benefit analysis (www.gov.uk/government/publications/industrial-emissions-directive-derogation-cost-benefit-analysis-tool) 3) Why the costs of treatment outweigh the environmental benefits. 4) Associated targets / timelines for reaching compliance of the BAT-AELs by **07/12/2023** (or otherwise agreed in writing with the Environment Agency) or justification, including a detailed cost benefit analysis, of why the costs of treatment outweigh the environmental benefits, for discharges from the MNB and Aniline Plant to emission point S1. The report shall address the following BAT Conclusion: • *Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector BAT Conclusions Document (*https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1579188127132&uri=CELEX%3A32016D0902) section 3.4, Table 1 (compliance with BAT-AEL for Cr and Ni, emission point S1) under **BAT 12** (waste water treatment). Refer to BAT Conclusions for a full description of the BAT requirement. *Approval of reports under this Improvement Condition*	Progress report by 07/01/2023 then at monthly intervals until the derogation submission is complete, which shall be no later than 07/06/2023. Final report by 07/07/2023 unless otherwise agreed in writing with the Environment Agency.

	does not preclude the need for permit variation application(s) to operate the developed strategy and/or include any necessary ELVs.	
IC18	Surface water pollution risk assessment The operator shall submit a written report to the Environment Agency for approval that includes: The results of an assessment of the impact (using detailed modelling: https://assets.publishing.service.gov.uk/government/uploads/attachment_data/file/509313/LIT_10419.pdf) of the emissions to Transitional and Coastal surface waters from emission points S1 and S2 on the site. The report shall: (a) be based on representative emissions data for any relevant hazardous chemicals and elements and any other relevant substances (i.e. that the effluent is 'liable to contain') that are discharged at concentrations (ensuring the application of Sewage Treatment Reduction Factors, STRF, for discharges to emission point S2) above their relevant EQSs (Environmental Quality Standards) or PNECs (predicted no effect concentrations), Total Suspended Solids and Ammoniacal Nitrogen; (b) include the raw data used in the impact assessment; (c) include proposals for a waste water management and treatment strategy in line with *Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector BAT Conclusions Document (*https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1579188127132&uri=CELEX%3A32016D0902, **BAT points 10-12**, to mitigate the impact of any emissions where the assessment determines they are liable to cause pollution, including timescales for implementation of individual measures; and (d) include proposals for ELVs and a monitoring plan to mitigate the impact of any emissions where the assessment determines they are liable to cause pollution. Ensure to include the parameters to be monitored, frequencies of monitoring and methods to be used. *Approval of reports under this Improvement Condition does not preclude the need for permit variation application(s) to operate the developed strategy and/or include any necessary ELVs.*	Progress report by 07/01/2023 then at monthly intervals until the risk assessment is complete and compliance with the narrative BAT (points 10-12) is reached, which shall be no later than 07/06/2023. Final report by 07/07/2023 unless otherwise agreed in writing with the Environment Agency.
IC19	Re-routing of process vent gases from the on-site Thermal Oxidiser to Equans Services Limited. The operator shall submit, for approval by the Environment Agency, a report confirming achievement of the re-routing of process vent gases to Equans Services Limited. The report shall include, but not be limited to, the following:	6 months from permit issue.

	• confirmation that the process vent gases are no longer routed to the on-site thermal oxidiser and the thermal oxidiser is permanently isolated from receiving the process vent gases • Date that the vent gases were routed to Equans Services Limited • An updated site plan which includes the pipework to Equans Services Limited A plan including dates of implementation for the decommissioning and/or demolition of the Thermal Oxidiser. Should the vent gases not be routed to Equans, for any reason, the operator shall submit a report that: • assesses emissions of Carbon Monoxide, Sulphur Dioxide (and any other relevant acid gas emissions, e.g. HCl) from the Thermal Oxidiser, and • include proposals for ELVs and a monitoring plan to mitigate the impact (using wet scrubbing as required by LVOC BAT conclusion 12 or a combination of the described techniques in LVOC BAT conclusion 13) of any emissions where the assessment determines they are liable to cause pollution. Ensure to include the parameters to be monitored, frequencies of monitoring and methods to be used.	
IC20	The operator shall submit, for approval by Environment Agency, a report setting out progress to achieving the 'Narrative' BAT where BAT is currently not achieved. The report shall include, but not be limited to, the following: • Methodology for achieving BAT or justification as to why this is deemed unnecessary • Associated targets / timelines for reaching compliance (where relevant) • Any alterations to the initial plan (in progress reports).. The report shall address the following BAT Conclusion: • Common waste water and waste gas treatment/management systems in the chemical sector **BAT 8** segregation of uncontaminated waste water and reduction of emissions to water from S1 & S2). Refer to BAT Conclusions for a full description of the BAT requirement. You must implement the report as agreed, and from the date stipulated by the Environment Agency.	6 months from permit issue, unless otherwise agreed in writing with the Environment Agency.
IC21	Submit a written plan to the Environment Agency for technical assessment and agreement. The plan must contain details of additional soil and groundwater monitoring programme to focus	6 months from permit issue.

	on areas where there is an increased risk of contamination from the site, as described in condition 3.1.3. permanent groundwater monitoring wells will be installed to permit future groundwater monitoring. The plan must contain dates for the implementation of individual measures. The notification requirements of condition 2.4.2 will be deemed to have been complied with on submission of the plan. You must implement the plan as agreed, and from the date stipulated by the Environment Agency.	