Permitting decisions

Variation (Substantial)

We have decided to grant the variation for AGC Chemicals Europe, Hillhouse operated by AGC Chemicals Europe Limited.

The variation number is EPR/BU5453IY/V004

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It summarises the decision making process in the decision checklist to show how all relevant factors have been taken in to account.

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how all relevant factors have been taken into account
- shows how we have considered the consultation responses

Unless the decision document specifies otherwise we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit and the variation notice. The introductory note summarises what the variation covers.

Key issues of the decision

1 The installation

1.1 Description of the changes to the installation

1.1.1 Thermal treatment plant

This variation is required for the addition of a thermal treatment plant required to treat the off-gases and a specific liquid residue stream, produced at the installation during the production process. The thermal treatment plant is subject to the Environmental Permitting Regulations (EPR) because it is an activity listed in Part 1 of Schedule 1:

Section 5.1 Part A(1)(c)	Incineration of gaseous compounds containing halogens.

The facility could also have been categorised as a small waste incineration plant (SWIP); however we considered Section 5.1 Part A(1)(c) to be the most apt description. This was based on the nature of gases being treated, and the fact that based on maximum throughput values, these are the principle input, compared to the liquid waste (see below).

Table 3.1 Quantities to be treated

Source	Average (kg/h)	Maximum (kg/h)
Low boiler stack	6.4	22
Waste acid stack	5.5	10
ETFE plant purges	4.7	10
High boilers	24.5	28
Total	**41.1**	**70.0**

Chapter IV of the Industrial Emissions Directive (IED) is applicable to the incineration of solid or liquid waste (not gases, see below). Whilst the chosen/most apt listed activity is for gases, the thermal treatment plant will also treat liquid residue. Given that the two waste streams will be mixed, Chapter IV will apply to the thermal treatment of both gases and liquids. These requirements are considered further in the relevant sections of this document.

CHAPTER IV

SPECIAL PROVISIONS FOR WASTE INCINERATION PLANTS AND WASTE CO-INCINERATION PLANTS

Article 42

Scope

1. This Chapter shall apply to waste incineration plants and waste co-incineration plants which incinerate or co-incinerate solid or liquid waste.

1.1.2 Waste types for thermal treatment

Liquid waste/residue

The liquid residue (high boilers waste stream) is categorised as hazardous, with the content of halogenated organic substances exceeding 1% (as chlorine). For hazardous wastes we would include limits on throughputs, calorific values and pollutant compositions.

We have included the typical throughputs as specified in the application in Table S2.2 of the permit.

Regarding the calorific value (CV) the operator confirmed that α pinene, a constituent only of the high boilers waste stream (50% w/w) has a CV of 46 MJ/kg. The high boilers waste stream as a whole has a CV of ~23 MJ/kg since the other constituents, primarily perfluorocarbons (PFCs), do not have any calorific value.

They also confirm that due to the nature of the PTFE production process, the composition of the high boilers waste stream is relatively homogeneous, particularly with respect to the α pinene, which is added (rather than produced as part of the process) in controlled quantities as a reaction inhibitor. Therefore, the CV will not vary appreciably from this value.

We have included a CV of ~23 MJ/kg in Table S2.2 of the permit.

Regarding the pollutant compositions i.e. maximum contents of polychlorinated biphenyls (PCB), pentachlorophenol (PCP), chlorine and fluorine, the operator confirmed that α pinene is a hydrocarbon and does not have any chlorine or fluorine content.

The composition of the high boilers waste stream is provided in Appendix B of the application technical supporting information report. The operator confirms that PCBs or PCP are not present in the waste stream and formation during combustion would be negligible due to the high temperature combustion process, rapid quenching through the synthesis temperature zone and the absence of metals to catalyse the formation reactions in the oxidiser off-gases.

They also confirm that due to the high temperatures in the combustion chamber, the chlorinated and fluorinated compounds in the waste streams will be converted to hydrogen chloride (HCl) and hydrogen fluoride (HF), respectively, and their emission levels will be no higher than the levels specified by IED Annex VI. In addition, the α pinene supplier (DRT) confirmed that the α pinene does not contain any polychlorinated biphenyls, pentachlorophenol, chlorine and fluorine.

On this basis, we have not included compositions for these pollutants; however we have included the nominal composition of the liquid waste stream in Table S2.2 of the permit.

Gaseous waste streams/off-gases

We have included the nominal composition and typical throughput for each gaseous waste stream in Table S2.2 of the permit.

1.1.3 Other activities

Listed activities already taking place at the facility are:

Section 4.1 Part A(1)(a)(vi)	The manufacture of Tetrafluoroethylene (TFE) from chlorodifluoromethane.
Section 4.1 Part A(1)(a)(viii)	TFE is polymerised to produce the finished product Polytetrafluoroethylene (PTFE) (capacity 4000 tonnes per year) and Ethylene-Tetrafluoroethylene (ETFE) (capacity 1000 tonnes per year).
Section 5.3 Part A(1)(a)(ii)	Effluent treatment - waste acid neutralisation (WAN)
Section 5.4 Part A(1)(a)(ii)	Effluent treatment - solids removal and pH adjustment

2 Environmental impact

2.1 Assessment methodology

A methodology for risk assessment of point source emissions to air is set out in our guidance 'Air emissions risk assessment for your environmental permit' and has the following steps:

- Describe emissions and receptors
- Calculate process contributions
- Screen out insignificant emissions that do not warrant further investigation
- Decide if detailed air modelling is needed
- Assess emissions against relevant standards
- Summarise the effects of emissions

The methodology uses a concept of "process contribution (PC)", which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The methodology provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

2.1.1 Use of air dispersion modelling

For this type of application, we require the applicant to submit a full air dispersion model as part of their application. Air dispersion modelling enables the PC to be predicted at any environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES).

Where an Ambient Air Directive (AAD) Limit Value exists, the relevant standard is the AAD Limit Value. Where an AAD Limit Value does not exist, AAD target values, UK Air Quality Strategy (AQS) Objectives or Environmental Assessment Levels (EALs) are used. Our web guide sets out EALs which have been derived to provide a similar level of protection to Human Health and the Environment as the AAD limit values, AAD target and AQS objectives. In a very small number of cases, e.g. for emissions of lead, the AQS objective is more stringent that the AAD value. In such cases, we use the AQS objective for our assessment.

AAD target values, AQS objectives and EALs do not have the same legal status as AAD limit values, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with them. However, they are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are considered **Insignificant** if:

- the **long-term** process contribution is less than **1%** of the relevant ES; and
- the **short-term** process contribution is less than **10%** of the relevant ES.

The **long term** 1% process contribution insignificance threshold is based on the judgements that:

- It is unlikely that an emission at this level will make a significant contribution to air quality;
- The threshold provides a substantial safety margin to protect health and the environment.

The **short term** 10% process contribution insignificance threshold is based on the judgements that:

- spatial and temporal conditions mean that short term process contributions are transient and limited in comparison with long term process contributions;
- the threshold provides a substantial safety margin to protect health and the environment.

Where an emission is screened out in this way, we would normally consider that the applicant's proposals for the prevention and control of the emission to be BAT. That is because if the impact of the emission is already insignificant, it follows that any further reduction in this emission will also be insignificant.

However, where an emission cannot be screened out as insignificant, it does not mean it will necessarily be significant.

For those pollutants which do not screen out as insignificant, we determine whether exceedences of the relevant ES are likely. This is done through detailed audit and review of the applicant's air dispersion modelling taking background concentrations and modelling uncertainties into account. Where an exceedance of an AAD limit value is identified, we may require the applicant to go beyond what would normally be considered BAT for the Installation or we may refuse the application if the applicant is unable to provide suitable proposals. Whether or not exceedences are considered likely, the application is subject to the requirement to operate in accordance with BAT.

2.2 Assessment of impact on air quality

The applicant's assessment of the impact of air quality is set out in document ref. 34321 Final Report 17062i1, dated February 2017 provided with the application. The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the thermal treatment plant.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the thermal treatment plant stack and its impact on local air quality.

The applicant has assessed the installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the installations stack emissions using the ADMS 5.1 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used five years of meteorological data collected from the weather station at Blackpool Airport between 2009 and 2013. The impact of the terrain surrounding the site upon plume dispersion was not considered in the dispersion modelling.

The air impact assessments, and the dispersion modelling upon which they were based, employed the following assumptions.

- First, they assumed that the emission limit values (ELVs) in the permit for the thermal treatment plant would be the maximum permitted by Article 46(2) and Annex VI of the IED. These substances are:
    - Oxides of nitrogen (NO_x), expressed as NO_2
    - Total dust
    - Carbon monoxide (CO)
    - Hydrogen chloride (HCl)
    - Hydrogen fluoride (HF)
    - Gaseous and vaporous organic substances, expressed as Total Organic Carbon (TOC)
- Second, they assumed that the thermal treatment plant operates continuously at the relevant long-term or short-term ELVs, i.e. the maximum permitted emission rate.
- Third, the model did not consider emissions of substances that the applicant considered would not be present in the releases. These substances are:
    - Sulphur dioxide (SO_2)
    - Metals (cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), vanadium (V) and their compounds)
    - Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans)
    - Polycyclic aromatic hydrocarbons (PAH) and Polychlorinated biphenyls (PCBs).

The applicant confirms that these substances are not present in the input fuels or waste streams. We accept this approach; however limits will be required in the permit for SO_2, metals and dioxins/furans in accordance with Annexes IV and VI of the IED.

For PAH and PCB Annex VI of the IED does not prescribe ELVs. The applicant confirmed by email 9 May 2017 that these parameters will not be present in the exhaust gases, so we accept that assessment is not required.

We undertook our own sensitivity analysis for dioxins and furans and metals and have determined these to be low risk.

We are in agreement with this approach. The assumptions underpinning the model have been checked and are reasonably precautionary.

The applicant has used the Defra background maps to establish the background pollutant concentrations. This data is summarised in the application and has been used by the applicant to establish the background (or existing) air quality against which to measure the potential impact of the thermal treatment plant.

The applicant has modelled the concentration of key pollutants at a number of specified locations within the surrounding area, presenting the results for the worst case, most impacted receptor.

The way in which the applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been reviewed by the Environment Agency's modelling specialists to establish the robustness of the applicant's air impact assessment. The output from the model has then been used to inform further assessment of health impacts and impact on habitats and conservation sites.

Our review of the applicant's assessment leads us to agree with the applicant's conclusions.

The applicant did not provide a human health impact assessment; however due to the small scale of the thermal treatment plant we carried out our own sensitivity analysis. Based on a worst case scenario we determined this as low risk.

The applicant's modelling predictions are summarised in the following sections.

2.2.1 Assessment of air dispersion modelling outputs

The applicant's modelling predictions are summarised in the tables below.

The applicant's modelling predicted pollutant concentrations at discrete receptors. The tables below show the ground level concentrations at the most impacted receptor.

Whilst we have used the applicant's modelling predictions in the table below, we have made our own simple verification calculation of the percentage PC and predicted environmental concentration (PEC). These are the numbers shown in the tables below and so may be very slightly different to those shown in the application. Any such minor discrepancies do not materially impact on our conclusions.

Pollutant	**ES**		**Back-ground**	**Process Contribution (PC)**		**Predicted Environmental Concentration (PEC) [8]**	
	µg/m³		**µg/m³**	**µg/m³**	**% of EAL**	**µg/m³**	**% of EAL**
NO_2	40	1	11.6	0.1	0.25	-	-
	200	2	23.2	1.21	0.61	-	-
PM_{10}	40	1	11.38	0.01	0.03	-	-
	50	3	22.76	0.03	0.06	-	-
$PM_{2.5}$	25	1	8.25	0.01	0.04	-	-
HCl	750	4	-	0.29	0.04	-	-
HF	16	5	-	0.01	0.06	-	-
	160	4	-	0.01	0.01	-	-
CO	10000	6	270	1.0	0.01	-	-
	30000	7	540	1.47	0.00	-	-
TOC [9]	2.25	1	-	0.01	0.44	-	-

1 Annual Mean
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 1-hour average
5 Monthly average
6 Maximum daily running 8-hour mean
7 1-hour maximum
8 PEC not required as PCs are considered insignificant
9 TOC as 1,3 butadiene

(i) Screening out emissions which are insignificant

From the table above, all the emissions can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES.

Therefore we consider the applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the installation subject to the detailed audit referred to below.

The applicant has used the ES for benzene for their assessment of the impact of TOC. We have used the ES for 1,3 butadiene, having the lowest ES of organic species likely to be present in TOC (other than PAH, PCBs, dioxins and furans). This does not affect the results of the screening of emissions.

(ii) Particulates smaller than 2.5 microns

The operator will be required to monitor particulate emissions using the method set out in the permit. This method requires that the filter efficiency must be at least 99.5 % on a test aerosol with a mean particle diameter of 0.3 μm, at the maximum flow rate anticipated. The filter efficiency for larger particles will be at least as high as this. This means that particulate monitoring data effectively captures everything above 0.3 μm and much of what is smaller. It is not expected that particles smaller than 0.3 μm will contribute significantly to the mass release rate / concentration of particulates because of their very small mass, even if present. This means that emissions monitoring data can be relied upon to measure the true mass emission rate of particulates.

Nano-particles are considered to refer to those particulates less than 0.1 μm in diameter ($PM_{0.1}$). Questions are often raised about the effect of nano-particles on human health, in particular on children's health, because of their high surface to volume ratio, making them more reactive, and their very small size, giving them the potential to penetrate cell walls of living organisms. The small size also means there will be a larger number of small particles for a given mass concentration. However the Health Protection Agency (HPA) statement (referenced below) says that due to the small effects of incinerators on local concentration of particles, it is highly unlikely that there will be detectable effects of any particular incinerator on local infant mortality.

The HPA (now Public Health England (PHE)) addresses the issue of the health effects of particulates in their September 2009 statement 'The Impact on Health of Emissions to Air from Municipal Incinerators'. It refers to the coefficients linking PM_{10} and $PM_{2.5}$ with effects on health derived by COMEAP and goes on to say that if these coefficients are applied to small increases in concentrations produced, locally, by incinerators; the estimated effects on health are likely to be small. PHE note that the coefficients that allow the use of number concentrations in impact calculations have not yet been defined because the national experts have not judged that the evidence is sufficient to do so. This is an area being kept under review by COMEAP.

In December 2010, COMEAP published a report on The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. It says that "a policy which aims to reduce the annual average concentration of $PM_{2.5}$ by 1 μg/m^3 would result in an increase in life expectancy of 20 days for people born in 2008." However, "The Committee stresses the need for careful interpretation of these metrics to avoid incorrect inferences being drawn – they are valid representations of population aggregate or average effects, but they can be misleading when interpreted as reflecting the experience of individuals."

PHE also point out that in 2007 incinerators contributed 0.02% to ambient ground level PM_{10} levels compared with 18% for road traffic and 22% for industry in general. PHE noted that in a sample collected in a day at a typical urban area the proportion of $PM_{0.1}$ is around 5-10% of PM_{10}. It goes on to say that PM_{10} includes and exceeds $PM_{2.5}$ which in turn includes and exceeds $PM_{0.1}$.

This is consistent with the assessment of this application which shows emissions of PM_{10} to air to be insignificant.

We take the view, based on the foregoing evidence, that techniques which control the release of particulates to levels which will not cause harm to human health will also control the release of fine particulate matter to a level which will not cause harm to human health.

(iii) Emissions of dioxins/furans

We undertook our own sensitivity analysis for dioxins/furans and dioxin like PCBs and have determined these to be low risk.

There is no ES for dioxins and furans as the principal exposure route for these substances is by ingestion and the risk to human health is through the accumulation of these substances in the body over an extended period of time. This is assessed by carrying out a Human Health Risk Assessment (HHRA). The applicant did not provide a HHRA. We carried out modelling for human intake of dioxins, furans and dioxin-like PCBs using empirical calculations based on both HHRAP and HMIP 1996 methodologies. Based upon conservative intake assumptions from all pathways, including inhalation and worst case dispersion modelling; we predict that the impact is not likely to contribute significantly to the Committee of Toxicology (COT) Tolerable Daily Intake (TDI). Our modelling shows that this is likely to be low risk and therefore it would not be necessary for the applicant to complete a HHRA.

Therefore we consider the applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the installation.

(iv) Assessment of emissions of metals

The applicant confirms metals are not present in the input fuels or waste streams. We undertook our own sensitivity analysis for metals and have determined these to be low risk.

Annex VI of IED sets three limits for metal emissions:

- An emission limit value of 0.05 mg/m^3 for mercury and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.05 mg/m^3 for cadmium and thallium and their compounds (formerly WID group 2 metals).
- An aggregate emission limit of 0.5 mg/m^3 for Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (formerly WID group 3 metals).

In addition the UK is a Party to the Heavy Metals Protocol within the framework of the UN-ECE Convention on long-range trans-boundary air pollution. Compliance with the IED Annex VI emission limits for metals along with the application of BAT also ensures that these requirements are met.

From our own modelling, emissions of arsenic and chromium required further assessment as they did not screen out at stages 1 and 2 of our 2012 "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4". We used the emission concentrations outlined in stage 3 of this guidance and have determined the risk to be low.

Therefore we consider the applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the installation.

2.3 Impact on Habitats sites, SSSIs and non-statutory conservation sites

2.3.1 Sites considered

The following Habitats (i.e. Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar) sites are located within 10Km of the installation:

- Morecambe Bay SPA (Estuary 1, 2 and 3)
- Morecambe Bay SAC
- Morecambe Bay Ramsar
- Liverpool Bay SPA

The following Sites of Special Scientific Interest (SSSI) is located within 2Km of the Installation:

- Morecambe Bay (Estuary 1, 2 and 3)

The following non-statutory local wildlife sites (LWS) are located within 2Km of the installation:

- Fleetwood Farm Fields
- Burglars Alley Field
- Skippool Marsh and Thornton
- Fleetwood Railway Branch Line

Conservation sites are protected in law by legislation. The Habitats Directive provides the highest level of protection for SACs and SPAs, domestic legislation provides a lower but important level of protection for SSSIs. Finally the Environment Act provides more generalised protection for flora and fauna rather than for specifically named conservation designations. It is under the Environment Act that we assess other sites (such as local wildlife sites) which prevents us from permitting something that will result in significant pollution; and which offers levels of protection proportionate with other European and national legislation. However, it should not be assumed that because levels of protection are less stringent for these other sites that they are not of considerable importance. Local sites link and support EU and national nature conservation sites together and hence help to maintain the UK's biodiversity resilience.

For SACs SPAs, Ramsars and SSSIs we consider the contribution PC and the background levels in making an assessment of impact. In assessing these other sites under the Environment Act we look at the impact from the installation alone in order to determine whether it would cause significant pollution. This is a proportionate approach, in line with the levels of protection offered by the conservation legislation to protect these other sites (which are generally more numerous than Natura 2000 or SSSIs) whilst ensuring that we do not restrict development.

Critical levels and loads are set to protect the most vulnerable habitat types. Thresholds change in accordance with the levels of protection afforded by the legislation. Therefore the thresholds for SAC, SPA and SSSI features are more stringent than those for other nature conservation sites.

Therefore we would generally conclude that the installation is not causing significant pollution at these other sites if the PC is less than the relevant critical level or critical load, provided that the applicant is using BAT to control emissions.

2.3.2 Habitats, SSSI and non-statutory sites assessment

The applicant's assessments were reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that:

- there would be no likely significant effect on the interest features of the protected sites;
- that the proposal does not damage the special features of the SSSIs;
- that the proposal is not causing significant pollution at non-statutory sites.

The model did not consider the impact from SO_2 emissions. Appendix 6 in Part C3 of the application form confirms that there is no sulphur in the input fuels or waste streams. We accept this approach; however a limit will be required in the permit in accordance with Annexes IV and VI of the IED.

The model did not consider Fleetwood Farm Fields, Burglars Alley Field and Skippool Marsh and Thornton LWS; however our audit confirms that this is unlikely to affect conclusions.

Morecambe Bay SPA Estuary 1/Ramsar/SSSI

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[1]						
NO_x Annual	30	11.6	0.02	0.07	-	-
NO_x Daily Mean	75	23.2	0.14	0.19	-	-
HF Weekly Mean	0.5	-	<0.01	<2.00	-	-
HF Daily Mean	5	-	<0.01	<0.20	-	-
Deposition Impacts[1]						
Nitrogen Deposition (kg N/ha/yr)	8	-	<0.1	<1.25	-	-
Acidification (Keq/ha/yr)	$CL_{min}N$ 0.223	0.91	<0.01	<4.48	0.91	408
	$CL_{max}N$ 0.643	0.91	<0.01	<1.55	0.91	141.5

(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Morecambe Bay SPA Estuary 2/Ramsar/SSSI

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[1]						
NO_x Annual	30	11.6	0.02	0.07	-	-
NO_x Daily Mean	75	23.2	0.19	0.25		
HF Weekly Mean	0.5		<0.01	<2.00		
HF Daily Mean	5		<0.01	<0.20		
Deposition Impacts[1]						
Nitrogen Deposition (kg N/ha/yr)	8	-	<0.1	<1.25	-	-
Acidification (Keq/ha/yr)	$CL_{min}N$ 0.223	0.91	<0.01	<4.48	0.91	408
	$CL_{max}N$ 0.643	0.91	<0.01	<1.55	0.91	141.5

(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Morecambe Bay SPA Estuary 3/Ramsar/SSSI

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[1]						
NO_x Annual	30	11.6	0.01	0.03	-	-
NO_x Daily Mean	75	23.2	0.08	0.11		
HF Weekly Mean	0.5		<0.01	<2.00		
HF Daily Mean	5		<0.01	<0.20		
Deposition Impacts[1]						
Nitrogen Deposition (kg N/ha/yr)	8	-	<0.1	<1.25	-	-
Acidification (Keq/ha/yr)	$CL_{min}N$ 0.223	0.91	<0.01	<4.48	0.91	408
	$CL_{max}N$ 0.643	0.91	<0.01	<1.55	0.91	141.5

(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Morecambe Bay SAC/SSSI

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[1]						
NO_x Annual	30	11.6	<0.01	<0.03	-	-
NO_x Daily Mean	75	23.2	0.01	0.01		
HF Weekly Mean	0.5		<0.01	<2.00		
HF Daily Mean	5		<0.01	<0.20		
Deposition Impacts[1]						
Nitrogen Deposition (kg N/ha/yr)	8	-	<0.1	<1.25	-	-
Acidification (Keq/ha/yr)	$CL_{min}N$ 0.223	0.91	<0.01	<4.48	0.91	408
	$CL_{max}N$ 0.643	0.91	<0.01	<1.55	0.91	141.5

(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Liverpool Bay SPA

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[1]						
NO_x Annual	30	11.6	<0.01	<0.03	-	-
NO_x Daily Mean	75	23.2	0.05	0.07		
HF Weekly Mean	0.5		<0.01	<2.00		
HF Daily Mean	5		<0.01	<0.20		
Deposition Impacts[1]						
Nitrogen Deposition (kg N/ha/yr)	3	-	<0.1	<3.33	-	-
Acidification (Keq/ha/yr)	Not sensitive to acid deposition					

(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

Fleetwood Railway Branch Line LWS

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[1]						
NO_x Annual	30	11.6	0.20	0.67	-	-
NO_x Daily Mean	75	23.2	1.68	2.24		
HF Weekly Mean	0.5		<0.01	<2.00		
HF Daily Mean	5		0.01	0.20		
Deposition Impacts[1]						
Nitrogen Deposition (kg N/ha/yr)	No information available					
Acidification (Keq/ha/yr)						

(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.

(i) Screening out emissions which are insignificant

From the tables above, the following emissions can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES (<100% of the ES for non-statutory sites).

NOx and short term HF (daily mean) at Habitats and SSSIs.

NOx and HF at the LWS.

Therefore we consider the applicant’s proposals for preventing and minimising the emissions of these substances to be BAT for the installation.

(ii) Emissions unlikely to have a significant effect/damage special features

Also from the tables above the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to have a significant effect on the interest features of the protected sites or damage the special features of the SSSIs (taking expected modelling uncertainties into account).

HF (weekly mean), nitrogen deposition and acidification.

For these releases, PCs have been reported at <0.01 μg/m^3 and <0.1 μg/m^3, with calculations then based on the absolute number and resulting PCs as a % of the ES, all being reported at less than (<) the stated figure as follows:

HF <2.00

Nitrogen deposition <1.25 and <3.33

Acidification <1.55 to <4.48

We have carefully scrutinised the applicant's proposals for preventing and minimising the emissions of these substances and consider they are applying BAT for the installation.

We recorded our assessments on an Appendix 11-Habitats Directive form and a CROW Appendix 4 form. We sent the Habitats Directive form to Natural England for information only. Both forms can be found on the public register.

2.4 Impact of abnormal operations

Article 50(4)(c) of IED requires that waste incineration and co-incineration plants shall operate an automatic system to prevent waste feed whenever any of the continuous emission monitors show that an emission limit value (ELV) is exceeded due to disturbances or failures of the purification devices. Notwithstanding this, Article 46(6) allows for the continued incineration and co-incineration of waste under such conditions provided that this period does not (in any circumstances) exceed 4 hours uninterrupted continuous operation or the cumulative period of operation does not exceed 60 hours in a calendar year. This is a recognition that the emissions during transient states (e.g. start-up and shut-down) are higher than during steady-state operation, and the overall environmental impact of continued operation with a limited exceedance of an ELV may be less than that of a partial shut-down and re-start.

For incineration plant, IED sets backstop limits for particulates, CO and TOC which must continue to be met at all times. The CO and TOC limits are the same as for normal operation, and are intended to ensure that good combustion conditions are maintained. The backstop limit for particulates is 150 mg/m^3 (as a half hourly average) which is five times the limit in normal operation.

Article 45(1)(f) requires that the permit shall specify the maximum permissible period of any technically unavoidable stoppages, disturbances, or failures of the purification devices or the measurement devices, during which the concentrations in the discharges into the air may exceed the prescribed emission limit values. In this case we have decided to set the time limit at 4 hours, which is the maximum period prescribed by Article 46(6) of the IED.

These abnormal operations are limited to no more than a period of 4 hours continuous operation and no more than 60 hour aggregated operation in any calendar year. This is less than 1% of total operating hours and so abnormal operating conditions are not expected to have any significant long term environmental impact unless the background conditions were already close to, or exceeding, an ES. For the most part therefore consideration of abnormal operations is limited to consideration of its impact on short term ESs.

In making an assessment of abnormal operations the applicant considered a total failure of the abatement plant which is reported to be 90% efficient.

The applicant considered abnormal emissions for NO_2, CO, HCl and HF.

The limit for CO is the same during abnormal operation so we didn't include this parameter in our assessment below. We did however include particulates with a limit five times that of normal operation.

The following worst case scenario has been assumed for those pollutants which do not have an abnormal ELV:

- NO_x emissions of 2000 mg/m^3 (5 x normal)
- HCl emissions of 100 mg/m^3 (10 x normal)
- HF emissions of 10 mg/m^3 (1.7 x normal)

This is a worst case scenario in that these abnormal conditions include a number of different equipment failures not all of which will necessarily result in an adverse impact on the environment (e.g. a failure of a monitoring instrument does not necessarily mean that the incinerator or abatement plant is malfunctioning). This analysis assumes that any failure of any equipment results in all the negative impacts set out above occurring simultaneously.

The result of the short-term environmental impact is summarised in the table below.

Assessment of Emissions to Air - Abnormal

Pollutant	ES		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m^3		µg/m^3	µg/m^3	% of EAL	µg/m^3	% of EAL
NO_2	200	1	23.20	48.40	24.20	71.60	35.80
PM_{10}	50	2	-	0.15	0.30	-	-
HCl	750	3	-	11.60	1.55	-	-
HF	160	3	-	0.40	0.25	-	-

1 99.79th %ile of 1-hour means

2 90.41st %ile of 24-hour means

3 1-hour average

From the table above the emissions of the following substances can still be considered insignificant, in that the PC is still <10% of the short-term ES.

PM_{10}, HCl and HF

Also from the table above NO_2 emissions which were not screened out as insignificant, have been assessed as being unlikely to give rise to significant pollution in that the PEC is less than 100% of short term ES.

We have not assessed the impact of abnormal operations against long term ESs for the reasons set out above.

We tested sensitivity to dioxins and dioxin like PCBs which were not considered and concluded that they were low risk to human health.

3. Application of Best Available Techniques

3.1 Scope of Consideration

In this section, we explain how we have determined whether the applicant's proposals are the Best Available Techniques (BAT) for this installation.

- The first issue we address is the fundamental choice of emissions control technology for the destruction of chlorinated and fluorinated contaminants. There are a number of alternatives, and the applicant has explained why it has chosen one particular kind for this installation.
- We then address the treatment of the hot flue gases leaving the secondary combustion zone of the thermal treatment plant.
- We have also considered the Global Warming Potential (GWP) by comparison of the proposed plant with the current situation i.e. venting of gases and off-site disposal/recovery of liquid wastes.
- Finally, the prevention and minimisation of Persistent Organic Pollutants (POPs) must be considered, as we explain below.

3.1.1 BAT and emissions control – destruction of chlorinated and fluorinated contaminants

The prime function of the thermal treatment plant is to treat the off-gases and a specific liquid residue stream, produced at the installation during the production process, which contain chlorinated and fluorinated contaminants.

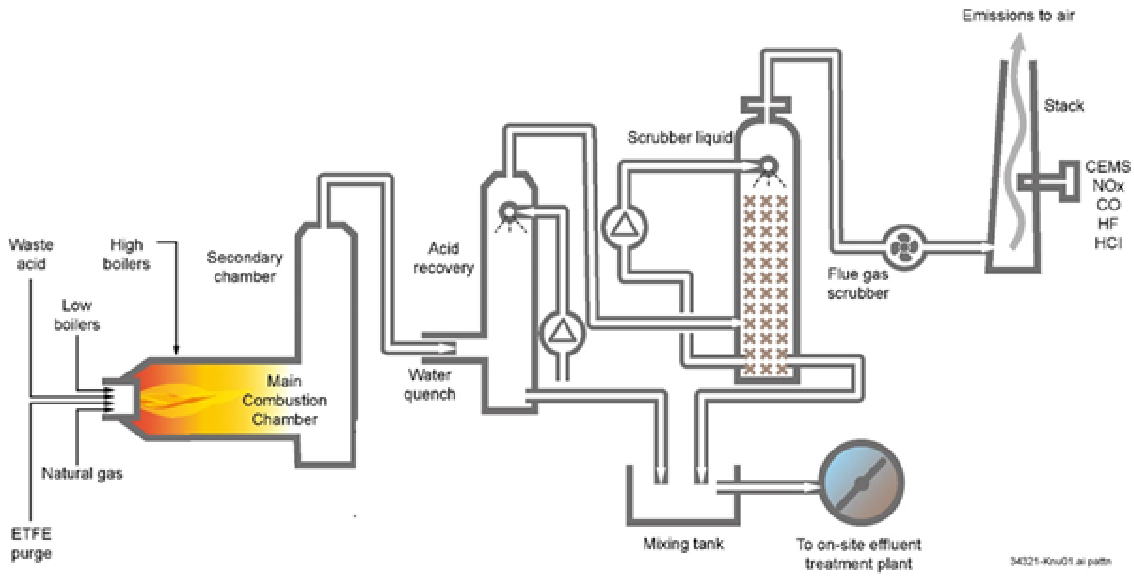
The applicant has identified six major techniques that are used commercially for the capture and/or destruction of chlorinated and fluorinated contaminants, namely:

- Adsorption onto solid surfaces;
- Absorption into liquids;
- Biological oxidation to form nontoxic compounds;
- Thermal oxidation to form nontoxic compounds;
- Chemical conversion/reduction to form nontoxic compounds; and
- Condensation of vapours to form liquids.

Following a detailed evaluation, thermal oxidation and chemical conversion technologies were considered in more detail. Thermal oxidation was chosen by the applicant because it is proven on a commercial scale for the types of compounds to be treated.

A simplified flow diagram is shown below:

Figure 3.2   Thermal Treatment Plant - Simplified Flow Diagram



The thermal treatment plant will operate using natural gas as the support fuel. The main fuel to sustain the combustion will be the α-pinene, which is the main component of the liquid residue high boilers stream. This will minimise the use of the support fuel while maintaining temperatures to ensure effective destruction of the other waste streams. Start-up and shut-down will use natural gas to ensure that the waste streams are only present when the secondary chamber is above 1100°C, ensuring complete combustion of the chlorinated and fluorinated hydrocarbons.

The off-gases streams will be fed via injection nozzles downstream of the main burner. To ensure that the gaseous streams are transported from the existing waste acid vent to the thermal treatment plant, additional air, where necessary, will be added at the process vent. This will then provide the main source of combustion air for the thermal treatment process. Additional combustion air will be supplied by a separate combustion air fan mounted near the thermal treatment plant.

For planned maintenance periods the thermal treatment plant will be shut-down and vented to ensure there are no residual gases present. If an unplanned event occurs critical parts of the thermal treatment plant will operate on electricity generated by a small stand-by diesel generator. Then the system and supply pipework may be back purged, where possible, with nitrogen or air to remove the waste gases. When the thermal treatment plant is not operating due to an unplanned event and the production process is operational, the process air from the waste vents will be discharged into the atmosphere as is currently permitted. The high boiler waste drums will be filled during an unplanned stoppage and then either fed in to the thermal treatment plant following restart to reduce the on-site inventory or exported off site to an appropriately permitted hazardous waste incinerator, as is currently the case.

It is expected that the thermal treatment plant will achieve an availability level of greater than 90% of the installation production hours. Planned maintenance will coincide with the process shut-down periods to maximise the abatement of the waste gas streams. The permit requires the availability to be recorded and reported.

No other wastes will be imported on to site with the thermal treatment plant dedicated to processing production off-gases and the liquid residue from the high boiler:

- Low boiler stack off-gases,
- Waste acid stack off-gases,
- ETFE Purge off-gases, and
- High boiler liquid residues.

3.1.2 Treatment of the hot flue gases leaving the secondary combustion zone

On leaving the secondary combustion zone the hot flue gases will pass into the flue gas treatment system, prior to discharge to atmosphere via a 25 metre stack. The flue treatment includes:

- Flue gas quench;
- Acid recovery column; and
- Alkaline scrubber.

The flue gas from the thermal treatment plant will contain a range of pollutants, including HF, HCl, CO, TOC and NO_x. The applicant carried out a detailed feasibility study of the pollutants expected to be released and wet scrubbing was selected as the most appropriate and BAT for this installation. Some emissions will also be minimised at source by good process design. A summary of this assessment is given in Table 5.7 of the application supporting information, see below.

Therefore, after leaving the secondary combustion zone the gases enter the flue gas quench column where water is sprayed into the flue gas stream to reduce the temperature. The water spray will also remove HF and HCl from the gas stream. The quench and acid removal utilises two separate packed stages, each with a dedicated water circuit. Excess cooling water is recirculated to the effluent quench tank. A proportion of the quench water will be replaced with fresh make up water with the blow-down going to the existing on-site effluent treatment tank following an alkaline neutralisation step.

Finally, the gases will pass to the alkaline scrubber that will remove any residual HF and HCl to ensure the emission limit values can be achieved.

The liquid waste from the scrubber will pass to the neutralisation tank where it will mix with the liquid waste from the acid removal column, this will ensure an acidic wastewater effluent will be discharged to the on-site effluent treatment plant (ETP). The ETP is designed to treat acid liquid wastewater from the main production facility and is covered by the existing permit. The releases from this process will not result in any changes to the existing emission limit values from the existing ETP discharge at W1. Emission limits have been set in accordance with Chapter IV of the IED for the effluent discharge from the scrubber, defined as W4 (See Section 4 below).

Table 5.7 Techniques/Technologies for the Control of Point Source Emissions to Air

Substance	Possible Techniques/Technology
Particulate matter	Wet scrubbing (if formed)
Hydrogen chloride	Wet scrubbing using caustic soda (sodium hydroxide) or similar.
Hydrogen fluoride	Wet scrubbing using caustic soda (sodium hydroxide) or similar.
Oxides of nitrogen (as NO_2)	Combustion air control and if required. Selective non catalytic reduction to ensure compliance with permit emission limits.
Carbon monoxide	Combustion air control.
Volatile organic compounds (as C)	Combustion air control.
Dioxins and furans (I-TEQ)	Combustion design to reduce de novo synthesis, and wet scrubbing.

The Technical Guidance Note points to a range of technologies being BAT subject to circumstances of the installation.

<u>Particulate Matter</u>

Particulate matter				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Bag / Fabric filters (BF)	Reliable abatement of particulate matter to below $5mg/m^3$	Max temp 250°C	Multiple compartments Bag burst detectors	Most plants
Wet scrubbing	May reduce acid gases simultaneously.	Not normally BAT. Liquid effluent produced	Require reheat to prevent visible plume and dew point problems.	Where scrubbing required for other pollutants
Ceramic filters	High temperature applications Smaller plant.	May "blind" more than fabric filters		Small plant. High temperature gas cleaning required.
Electrostatic precipitators	Low pressure gradient. Use with BF may reduce the energy consumption of the induced draft fan.	Not normally BAT.		When used with other particulate abatement plant

The applicant does not expect particulates to be formed; however if they are, the wet scrubbing proposed will also abate the particulate matter.

Emissions of particulate matter have been previously screened out as insignificant, and so the Environment Agency agrees that the applicant's proposed technique is BAT for the installation.

Oxides of Nitrogen

Oxides of Nitrogen : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low NOx burners	Reduces NOx at source		Start-up, supplementary firing.	Where auxiliary burners required.
Starved air systems	Reduce CO simultaneously.			Pyrolysis, Gasification systems.
Optimise primary and secondary air injection				All plant.
Flue Gas Recirculation (FGR)	Reduces the consumption of reagents used for secondary NOx control. May increase overall energy recovery	Some applications experience corrosion problems.		All plant unless impractical in design (needs to be demonstrated)

Oxides of Nitrogen : Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Selective catalytic reduction (SCR)	NOx emissions < 70mg/ m^3 Reduces CO, VOC, dioxins	Expensive. Re-heat required – reduces plant efficiency		All plant
Selective non-catalytic reduction (SNCR)	NOx emissions typically 150 - 180mg/m^3	Relies on an optimum temperature around 900 °C, and sufficient retention time for reduction May lead to Ammonia slip	Port injection location	All plant unless lower NOx release required for local environmental protection.
Reagent Type: Ammonia	Likely to be BAT Lower nitrous oxide formation	More difficult to handle Narrower temperature window		All plant
Reagent Type: Urea	Likely to be BAT			All plant

The applicant proposes to implement the following primary measures:

- Low NO_x burners – this technique reduces NO_x at source and is defined as BAT where auxiliary burners are required.
- Optimise air injection – this technique is BAT for all plant.

The applicant does not propose:

- Flue gas recirculation (FGR) – this technique reduces the consumption of reagents for secondary NO_x control. The applicant justifies this as follows:

  FGR is a technique to reduce the thermally generated NOx by reducing the flame temperatures within the main chamber. For treating hazardous wastes the temperatures are required to be higher, at least 1100°C and therefore FGR is not considered to be effective at reducing NOx emissions while complying with the temperature requirement.

We agree that the proposed primary measures are BAT for the installation.

There are two recognised techniques for secondary measures to reduce NO_x. These are Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). For each technique, there is a choice of urea or ammonia reagent.

SCR can reduce NO_x levels to below 70 mg/m^3 and can be applied to all plant, it is generally more expensive than SNCR and requires reheating of the waste gas stream which reduces energy efficiency, periodic replacement of the catalysts also produces a hazardous waste. SNCR can typically reduce NO_x levels to between 150 and 180 mg/m^3, it relies on an optimum temperature of around 900 ^{o}C and sufficient retention time for reduction. SNCR is more likely to have higher levels of ammonia slip. The technique can be applied to all plant unless lower NO_x releases are required for local environmental protection. Urea or ammonia can be used as the reagent with either technique, urea is somewhat easier to handle than ammonia and has a wider operating temperature window, but tends to result in higher emissions of N_2O. Either reagent is BAT, and the use of one over the other is not normally significant in environmental terms.

If limits cannot be met by the primary measures, the applicant proposes to use SNCR. Compliance with permit limits will be required and if necessary submission of an application to vary the permit will be necessary should the applicant seek to use SNCR.

Emissions of NO_x have been previously been screened out as insignificant, and so the Environment Agency agrees that the applicant's proposed technique is BAT for the installation.

Acid Gases, HCl and HF

Acid gases and halogens : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low sulphur fuel, **(< 0.1%S gasoil or natural gas)**	Reduces SOx at source		Start-up, supplementary firing.	Where auxiliary fuel required.
Management of waste streams	Disperses sources of acid gases (e.g. PVC) through feed.	Requires closer control of waste management		All plant with heterogeneous waste feed

Acid gases and halogens : Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Wet	High reaction rates Low solid residues production Reagent delivery may be optimised by concentration and flow rate	Large effluent disposal and water consumption if not fully treated for re-cycle Effluent treatment plant required May result in wet plume Energy required for effluent treatment and plume reheat		Plants with high acid gas and metal components in exhaust gas – HWIs
Dry	Low water use Reagent consumption may be reduced by recycling in plant Lower energy use Higher reliability	Higher solid residue production Reagent consumption controlled only by input rate		All plant
Semi-dry	Medium reaction rates Reagent delivery may be varied by concentration and input rate	Higher solid waste residues		All plant

Reagent Type: Sodium Hydroxide	Highest removal rates Low solid waste production	Corrosive material ETP sludge for disposal		HWIs
Reagent Type: Lime	Very good removal rates Low leaching solid residue Temperature of reaction well suited to use with bag filters	Corrosive material May give greater residue volume if no in-plant recycle	Wide range of uses	MWIs, CWIs
Reagent Type: Sodium Bicarbonate	Good removal rates Easiest to handle Dry recycle systems proven	Efficient temperature range may be at upper end for use with bag filters – Leachable solid residues Bicarbonate more expensive	Not proven at large plant	CWIs

The applicant proposes to implement the following primary measures:

- Use of low sulphur fuels for start up and auxiliary burners – gas should be used if available, where fuel oil is used, this will be low sulphur (i.e. <0.1%), this will reduce SO_x at source. The applicant will use gas as the support fuel.
- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by ensuring a homogeneous waste feed. The gas and liquid wastes are already homogeneous.

There are three recognised techniques for secondary measures to reduce acid gases. These are wet, dry and semi-dry. Wet scrubbing produces an effluent for treatment and disposal in compliance with Article 46(3) of IED. It will also require reheat of the exhaust to avoid a visible plume. Wet scrubbing is unlikely to be BAT except where there are high acid gas and metal components in the exhaust gas as may be the case for some hazardous waste incinerators. In this case, the applicant proposes to use wet scrubbing, and the Environment Agency agrees that wet scrubbing is appropriate in this case and represents BAT for the installation.

Carbon monoxide and volatile organic compounds (VOCs)

Carbon monoxide and volatile organic compounds (VOCs)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Optimise combustion control	All measures will increase oxidation of these species.		Covered in section on furnace selection	All plants

The prevention and minimisation of emissions of carbon monoxide and volatile organic compounds is through the optimisation of combustion controls, where all measures will increase the oxidation of these species.

Dioxins and furans (and Other POPs)

Dioxins and furans				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Optimise combustion control	All measures will increase oxidation of these species.		Covered in section on furnace selection	All plants
Avoid *de novo* synthesis			Covered in boiler design	All plant
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection	Can be combined with acid gas absorber or fed separately.	Combined feed rate usually controlled by acid gas content.		All plant. Separate feed normally BAT unless feed is constant and acid gas control also controls dioxin release.

The prevention and minimisation of emissions of dioxins and furans is achieved through:

- optimisation of combustion control including the maintenance of permit conditions on combustion temperature and residence time, which has been considered above;
- avoidance of de novo synthesis;
- the effective removal of particulate matter, which has been considered above;
- injection of activated carbon. This can be combined with the acid gas reagent or dosed separately. Where the feed is combined, the combined feed rate will be controlled by the acid gas concentration in the exhaust. Therefore, separate feed of activated carbon would normally be considered BAT unless the feed was relatively constant. Effective control of acid gas emissions also assists in the control of dioxin releases.

Injection of carbon has not been proposed. The applicant confirms that the levels of dioxins and furans in the feed waste are extremely low, but acknowledge that the waste gases could reform into dioxins and furans. The halogenated gases and liquids will be destroyed by the effective design of the combustion system, particularly the high temperature oxidation unit and the water quench prior to the acid removal column and final flue gas scrubber.

We are satisfied their proposal is BAT for the installation; however to confirm the levels of dioxins and furans we have required monitoring within the first month of operation in table S3.2 of the permit.

<u>Metals</u>

Metals				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Effective Particulate matter removal			Covered in section on particulate matter	All plant
Activated Carbon injection for mercury recovery	Can be combined with acid gas absorber or fed separately.	Combined feed rate usually controlled by acid gas content.		All plant. Separate feed normally BAT unless feed is constant and acid gas control also controls dioxin release.

The prevention and minimisation of metal emissions is achieved through the effective removal of particulate matter, and this has been considered above. In any event, the applicant confirms that there are no metals present in the off-gases, liquid residue or fuels.

3.1.3 Global warming potential

This section summarises greenhouse gas emissions. Emissions of carbon dioxide (CO_2) and other greenhouse gases differ from those of other pollutants in that, except at gross levels, they have no localised environmental impact. Their impact is at a global level and in terms of climate change. Nonetheless, CO_2 is clearly a pollutant for IED purposes.

A number of gases released from the installation are classed as greenhouse gases. The potential contribution of individual chemicals to climate change can be quantified by reference to their relative global warming potential (GWP).

The GWP of methane is approximately 25 times that of CO_2. Therefore, efficient collection and combustion of gases with high GWPs is required in order to protect the global atmosphere and environment.

The applicant carried out a critical analysis of the industrial processes at the installation, with particular attention devoted to those processes and equipment using substances with a particularly high GWP. For example, even though the volume of trifluoromethane (HFC-23) released is much smaller than the volume of CO released, the GWP of HFC-23 is over 11,000 times higher. The same can be said for other materials with the potential to be released.

The applicant provided the GWPs for a variety of gaseous materials potentially released at the installation, taken from Annex H of our H1 guidance and other sources. Table 4.6 from the application supporting information is shown below.

Table 4.6 Greenhouse Gases potentially released and GWPs

Material	Designation	GWP
Gases		
Carbon monoxide	CO	1
Ethylene	C_2H_4	6.8
Tetrafluoroethylene	TFE	40
Trifluoromethane	HFC-23	11700
Difluoromethane	HFC-32	650
Trifluoroethylene	HFC-1123	40
Pentafluoroethane	HFC-125	2800
Chlorodifluoromethane	HCFC-22	1500
Hexafluoropropylene	HFP	HFP
Nitrogen	N_2	0
High Boiler Liquid		
α-pinene		0 (Liquid)
Perfluoroisobutylene	PFIB	40
Hexafluoropropylene	HFP	40
Octafluorocyclobutane	PFC-318	8700
Chlorotrifluoroethylene	F1113	40
Chlorodifluoromethane	HCFC-22	1500
1-chloro-1,2,2,2-tetrafluoroethane	HCFC-124	470
Various chlorinated and fluorinated hydrocarbons		40

Note: Where no value is available for GWP a value of 40 has been used

Currently, the gaseous wastes are released to atmosphere via process vents and the high boiler liquid residues are collected in drums and sent to an appropriately licensed hazardous waste incinerator.

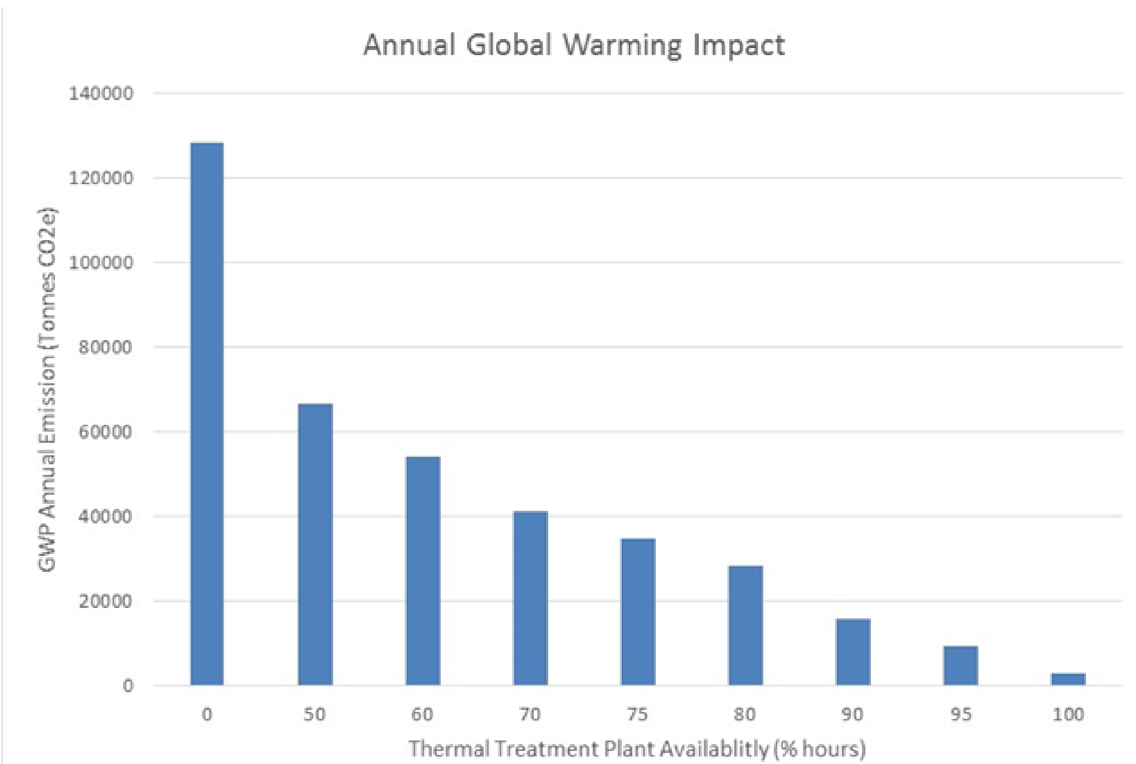
The estimate of the existing GWP is summarised in Table 4.7 of the application supporting information (see below) and is based on maximum release rates for the off-gases and liquid residues.

Table 4.7 Existing Operation GWP (Business as Usual)

	GWP - te CO2e
Gaseous releases on-site	127,550
Transport for the Liquid wastes to the off-site incinerator	1.000
CO_2 from incineration of Liquids, excluding support fuel	810
Total	129,360

The proposed thermal treatment plant will reduce the emissions of greenhouse gases by converting the off gases and liquid residues compounds to mainly carbon dioxide following flue gas treatment. There will also be CO_2 emissions from the burning of support fuels at start up, shut down and should it be necessary to maintain combustion temperatures. Figure 4.3 in the application supporting information (see below) shows the potential benefit for different operating hours.

Figure 4.3 Global Warming Potential Reduction



It is expected that the proposed thermal treatment plant will operate for a minimum of 90% of the production year (target is 95%) reducing the total emission of GWP gases to 16,000 tonnes of CO_2 equivalent (equivalent to an 87% reduction from the existing site). During periods when the plant is not available the off gases from the low boiler, waste acid and ETFE purge stacks will be released to atmosphere as is currently permitted.

3.1.4 BAT and POPs

International action on Persistent Organic pollutants (POPs) is required under the UN's Stockholm Convention, which entered into force in 2004. The EU implemented the Convention through the POPs Regulation (850/2004), which is directly applicable in UK law. The Environment Agency is required by national POPs Regulations (SI 2007 No 3106) to give effect to Article 6(3) of the EC POPs Regulation when determining applications for environmental permits.

However, it needs to be borne in mind that this application is for a particular type of activity, namely thermal treatment of waste gases and liquid residues produced by the installation, which falls under the definition of a waste incinerator. The Stockholm Convention distinguishes between intentionally-produced and unintentionally-produced POPs. Intentionally-produced POPs are those used deliberately (mainly in the past) in agriculture (primarily as pesticides) and industry. Those intentionally-produced POPs are not relevant where waste incineration is concerned, as in fact high-temperature incineration is one of the prescribed methods for destroying POPs.

The unintentionally-produced POPs addressed by the Convention are:

- dioxins and furans;
- HCB (hexachlorobenzene)
- PCBs (polychlorobiphenyls) and
- PeCB (pentachlorobenzene)

The UK's national implementation plan for the Stockholm Convention, published in 2007, makes explicit that the relevant controls for unintentionally-produced POPs, such as might be produced by waste incineration, are delivered through the requirements of IED. That would include an examination of BAT, including potential alternative techniques, with a view to preventing or minimising harmful emissions. These have been applied as explained in this document, which explicitly addresses alternative techniques and BAT for the minimisation of emissions of dioxins.

Our legal obligation, under regulation 4(b) of the POPs Regulations, is, when considering an application for an environmental permit, to comply with article 6(3) of the POPs Regulation:

"*Member States shall, when considering proposals to construct new facilities or significantly to modify existing facilities using processes that release chemicals listed in Annex III, without prejudice to Council Directive 1996/61/EC, give priority consideration to alternative processes, techniques or practices that have similar usefulness but which avoid the formation and release of substances listed in Annex III*."

The 1998 Protocol to the Convention recommended that unintentionally produced should be controlled by imposing emission limits (e.g. 0.1 ng/m^3 for MWIs) and using BAT for incineration. UN Economic Commission for Europe (Executive Body for the Convention) (ECE-EB) produced BAT guidance for the parties to the Convention in 2009. This document considers various control techniques and concludes that primary measures involving management of feed material by reducing halogenated substances are not technically effective. This is not surprising because halogenated wastes still need to be disposed of and because POPs can be generated from relatively low concentrations of halogens. In summary, the successful control techniques for waste incinerators listed in the ECE-EB BAT are:

- maintaining furnace temperature of 850^{o}C and a combustion gas residence time of at least 2 seconds
- rapid cooling of flue gases to avoid the *de novo* reformation temperature range of 250-450^{o}C
- use of bag filters and the injection of activated carbon or coke to adsorb residual POPs components.

Using the methods listed above, the UN-ECE BAT document concludes that incinerators can achieve an emission concentration of 0.1 ng TEQ/m^3.

We believe that the permit ensures that the formation and release of POPs will be prevented or minimised. As we explain above, high-temperature incineration is one of the prescribed methods for destroying POPs. Permit conditions are based on the use of BAT and Chapter IV of IED and incorporate the necessary elements of the above requirements of the UN-ECE BAT guidance and deliver the requirements of the Stockholm Convention in relation to unintentionally produced POPs.

The release of **dioxins and furans** to air is required by the IED to be assessed against the I-TEQ (International Toxic Equivalence) limit of 0.1 ng/m^3. Further development of the understanding of the harm caused by dioxins has resulted in the World Health Organisation (WHO) producing updated factors to calculate the WHO-TEQ value. Certain **PCBs** have structures which make them behave like dioxins (dioxin-like PCBs), and these also have toxic equivalence factors defined by WHO to make them capable of being considered together with dioxins. The UK's independent health advisory committee, the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has adopted WHO-TEQ values for both dioxins and dioxin-like PCBs in their review of Tolerable Daily Intake (TDI) criteria. The permit requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be monitored for reporting purposes, to enable evaluation of exposure to dioxins and dioxin-like PCBs to be made using the revised TDI recommended by COT. The release of dioxin-like PCBs and PAHs is expected to be low where measures have been taken to control dioxin releases. The permit also requires monitoring of a range of PAHs and dioxin-like PCBs at the same frequency as dioxins are monitored. We have included a requirement to monitor and report against these WHO-TEQ values for dioxins and dioxin-like PCBs and the range of PAHs as listed in the permit. We are confident that the measures taken to control the release of dioxins will also control the releases of dioxin-like PCBs and PAHs. Section 2 of this document details the assessment of emissions to air, which includes dioxins and concludes that there will be no adverse effect on human health from either normal or abnormal operation.

Hexachlorobenzene (HCB) is released into the atmosphere as an accidental product from the combustion of coal, waste incineration and certain metal processes. It has also been used as a fungicide, especially for seed treatment although this use has been banned in the UK since 1975. Natural fires and volcanoes may serve as natural sources. Releases of (HCB) are addressed by the European Environment Agency (EEA), which advises that:

> *"due to comparatively low levels in emissions from most (combustion) processes special measures for HCB control are usually not proposed. HCB emissions can be controlled generally like other chlorinated organic compounds in emissions, for instance dioxins/furans and PCBs: regulation of time of combustion, combustion temperature, temperature in cleaning devices, sorbents application for waste gases cleaning etc." [reference http://www.eea.europa.eu/publications/EMEPCORINAIR4/sources_of_HCB.pdf]*

Pentachlorobenzene (PeCB) is another of the POPs list to be considered under incineration. PeCB has been used as a fungicide or flame retardant, there is no data available however on production, recent or past, outside the UN-ECE region. PeCBs can be emitted from the same sources as for PCDD/F: waste incineration, thermal metallurgic processes and combustion plants providing energy. As discussed above, the control techniques described in the UN-ECE BAT guidance and included in the permit, are effective in controlling the emissions of all relevant POPs including PeCB.

We have assessed the control techniques proposed for dioxins by the applicant and have concluded that they are appropriate for dioxin control. We are confident that these controls are in line with the UN-ECE BAT guidance and will minimise the release of HCB, PCB and PeCB.

We are therefore satisfied that the substantive requirements of the Convention and the POPs Regulation have been addressed and complied with.

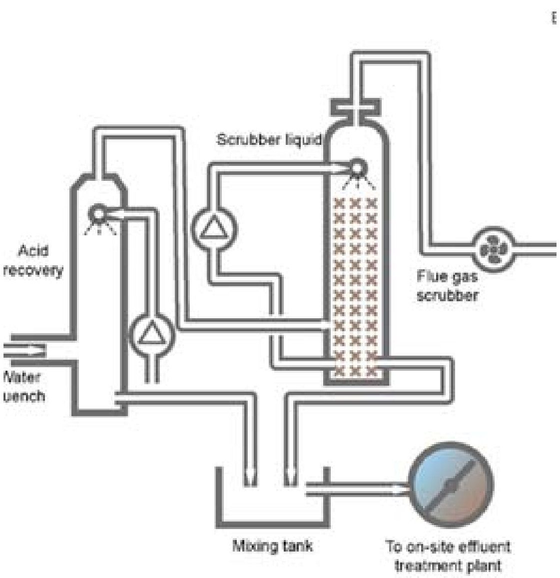
4. Energy Efficiency

For conventional incineration we are required to consider the extent to which the installation meets the requirements of Article 50(5) of the IED, which requires *"the heat generated* during the incineration and co-incineration process is *recovered as far as practicable through the generation of heat, steam or power*".

Due to the small scale of the thermal treatment process (approximately 70 kg/h of waste processed, equivalent to 600 kW thermal input) and the high fluoride content of the flue gases, heat recovery is not considered practicable. We conclude that the requirements of Article 50(5) are satisfied in this case.

5. Emissions to water (River Wyre)

The thermal treatment plant will produce a number of liquid effluents (acidic and alkaline) these will be mixed to control the pH prior to being treated within the on-site effluent treatment plant (ETP), which was described in the original permit application for the installation. The development of the thermal treatment plant will not result in any process changes to the ETP or any changes to the limits specified in the current permit.



Article 46 in Chapter IV of the IED requires limits to be set for the scrubber effluent, 'Discharges to the aquatic environment of waste water resulting from the cleaning of waste gases shall be limited as far as practicable and the concentrations of polluting substances shall not exceed the emission limit values set out in Part 5 of Annex VI', see extract below.

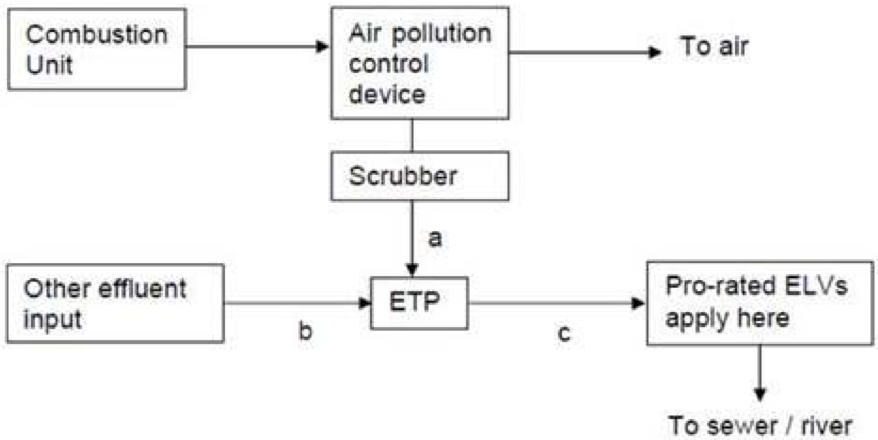
PART 5

Emission limit values for discharges of waste water from the cleaning of waste gases

Polluting substances	Emission limit values for unfiltered samples (mg/l except for dioxins and furans)	
1. Total suspended solids as defined in Annex I of Directive 91/271/EEC	(95 %) 30	(100 %) 45
2. Mercury and its compounds, expressed as mercury (Hg)	0,03	
3. Cadmium and its compounds, expressed as cadmium (Cd)	0,05	
4. Thallium and its compounds, expressed as thallium (Tl)	0,05	
5. Arsenic and its compounds, expressed as arsenic (As)	0,15	
6. Lead and its compounds, expressed as lead (Pb)	0,2	
7. Chromium and its compounds, expressed as chromium (Cr)	0,5	
8. Copper and its compounds, expressed as copper (Cu)	0,5	
9. Nickel and its compounds, expressed as nickel (Ni)	0,5	
10. Zinc and its compounds, expressed as zinc (Zn)	1,5	
11. Dioxins and furans	0,3 ng/l	

Suitable arrangements are required to assess compliance with ELVs such that the contribution from the thermal treatment plant scrubber effluent at W4 can be clearly defined, as it is necessary to account for any dilution afforded by the addition of other effluents. This is represented in the simplified diagram below:

Combined Effluent Treatment:



Notes:

1. Points a, b and c relate to sampling points required to assess compliance with ELVs.
2. The same procedure applies to on-site and off-site ETP.

In such situations the ELVs still apply after the scrubber effluent has been treated by the ETP, but it is necessary to account for any dilution afforded by the addition of the other effluents.

This must be achieved by taking the required measurements at locations a, b and c.

Appropriate mass balance calculations should then be used to determine the emission levels in the final wastewater discharge (i.e. from the ETP) that can be attributed to the wastewater arising from the cleaning of exhaust gases.

Article 46 in Chapter IV of the IED states the following:

‘Where the waste water from the cleaning of waste gases is treated collectively with other sources of waste water, either on site or off site, the operator shall make the appropriate mass balance calculations, using the results of the measurements set out in point 2 of Part 6 of Annex VI in order to determine the emission levels in the final waste water discharge that can be attributed to the waste water arising from the cleaning of waste gases.’

The applicant confirmed in their email sent 5 June 2017 that the mixed effluent from the absorber and scrubber columns will meet the ELVs in Part 5 of Annex VI without further treatment. They state the following factors:

1. There are no metals in the incoming waste streams so there can be no metals present in the scrubbing liquors.

2. The high temperatures, residence time, absence of metals and rapid quenching of the off-gases from the combustion chamber through the de-novo synthesis temperature zone will result in negligible production of dioxins and an equivalent negligible concentration in the liquid effluent.

3. The high temperatures and residence time in the combustion chamber will ensure complete combustion of the liquid high boiler input stream with negligible unburnt hydrocarbons/soot being carried over to the absorber and scrubber columns.

4. The thermal treatment plant does not accept solid waste so there will be no ash carried over to the absorber and scrubber columns from the combustion chamber.

5. The majority of scrubbing products will be sodium fluoride and sodium chloride, which are soluble. The only potential source of insoluble reaction products would originate from calcium and magnesium in the potable water in the form of calcium sulphate/fluoride and magnesium sulphate/fluoride. However, analysis of the potable water has indicated combined calcium and magnesium concentrations less than 14 mg/l and there is no sulphur in the waste inputs, support fuel or reducing agents. Therefore, any calcium and magnesium in the effluent would, by majority, be present as soluble chlorides or carbonates and the total suspended solids (TSS) would be less than 30mg/l. Combining this figure, with the current daily TSS figures, there would be no impact on permit compliance with emission point W1 (permit limit for suspended solids is 150 mg/l – weekly average).

The applicant proposes to use the existing monitoring instrumentation at emission point W1 to satisfy the continuous monitoring requirements for flow, temperature and pH. This requirement is set out in paragraph 3 in Part 6 of Annex VI of the IED.

They highlight that the effluent flow from the thermal treatment plant scrubber, defined as W4, will only be a small proportion of the overall effluent discharge from emission point W1:

- Thermal treatment plant discharge at W4 will be on average 1 to 2 m^3/hr (worst case is $3m^3$/hr).
- W1 average discharge is $31.03m^3$/hr (2016 annual average, based on site data)
- Thermal treatment plant effluent will account for approximately 6% of the overall discharge volume make up to emission point W1.

They also confirm that based on the low volume contribution, combined with the reasons above regarding the low TSS figures from the thermal treatment plant, that there will be minimal impact on the overall TSS figure to emission point W1, and current permit limits will not be exceeded.

The applicant are not requesting changes to the existing site effluent environmental permit limits, as the figures above, combined with current daily TSS figures are expected to be compliant with existing permit limits. The permit limit with regards to suspended solids is 150 mg/l (weekly average). During commissioning TSS figures will be monitored daily as per current permit requirements, to demonstrate ongoing permit compliance.

With regards to the metals, they confirm that no metals are present, due to the absence of metals in the waste inputs into the thermal treatment plant.

They propose to take spot samples during the commissioning phase to confirm this is the case, but they do not propose to undertake ongoing analysis of the metals in the effluent. Their rationale for this approach is consistent with Annex VI, Part 6, paragraph 2.5 of the IED, which allows for monitoring of HF, HCl and SO_2 emissions to air to be removed if the operator can prove that the emissions of those pollutants can under no circumstances be higher than the prescribed emission limit values.

They also propose to compare spot samples of the final effluent going to emission point W1 (after the effluent treatment plant) during the commissioning phase against baseline data – from samples taken before the thermal treatment plant is commissioned – to demonstrate compliance.

Further justification is provided for not taking samples between the thermal treatment plant sump tank and the current waste acid neutralisation plant (WAN) based on health and safety implications. This effluent would be acidic and contain HF as an equivalent 10%w/w hydrofluoric acid concentration. The effluent stream before the WAN would be more strongly acidic than the effluent from a wet scrubber associated with a 'typical' incineration activity due to the high proportions of fluorinated and chlorinated compounds in the inputs to the thermal treatment plant. Although the acidic effluent coming off the thermal treatment plant absorber column will have gone through brief mixing in the sump tank with the alkaline effluent from the scrubber column, full neutralisation will not take place as the volume of acidic effluent produced by the absorber column is approximately ten times greater than that produced by the scrubber column. The laboratory who currently undertakes analysis of effluent samples from the existing installation have confirmed they could not accept samples for analysis with a 10% HF concentration for health and safety reasons.

The thermal treatment plant effluent will go to the WAN in the first instance, before then going to the on-site ETP.

Having considered the risks of monitoring and handling samples at this point, combined with the reasoning and justification of the low TSS and metal quantities from the thermal treatment plant effluent (W4), we consider the proposed sampling and monitoring from the current sampling port on emission point W1 to be acceptable.

The monitoring requirements for the effluent from the thermal treatment plant scrubber at W4 are defined in table S3.3 of the permit. The monitoring will take place at emission point W1. The limits for W4 are in accordance with Annex IV of the IED and are set out in Table S3.4 of the permit. Compliance with these limits will be based on calculation using results of the monitoring as specified in Table S3.3.

We are satisfied with the suggested sampling arrangements and have set pre-operational and improvement conditions requiring submission of the necessary details to ensure compliance. We have also included provision for a reduced monitoring frequency which may be applicable to the metals.

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise emissions to water and that compliance with the limits specified in the IED can be demonstrated.

6. Odour

Odour generation is an inevitable consequence of the operation of typical waste disposal facilities, however none of the off-gases or liquid residues have significant, if any, odour. The existing permitted release of the off-gases has not resulted in any complaints for odour nuisance or loss of amenity. The materials are transported to the thermal treatment plant in sealed pipes preventing the uncontrolled release. The location of the plant in an industrial area, will minimise the potential for members of the general public to be affected by odours from the process, if generated. The applicant confirm they are committed to ensuring that odour is kept to a minimum through the continued use of the primary control measures and effective management of the installation.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise odour and to prevent pollution from odour.

7. Noise and vibration

The thermal treatment plant will lead to changes in existing noise sources in the area and will introduce some new sources into the local area. The applicant provided a noise assessment, document ref 34320 Final Report 17043i1, dated February 2017. The assessment presents the results of baseline noise monitoring, along with predictions of likely future noise levels due to the proposed development. The assessment criteria are based upon guidance detailed by BS4142:2014 *Method for rating industrial noise affecting mixed residential and industrial areas*.

This report concludes that the sound levels from the thermal treatment plant are deemed as low impact for all the nearest noise sensitive receptors as the rating level was below the background sound level.

The Environment Agency's modelling specialists reviewed this assessment. They found that the applicant had not included the existing plant in their noise impact assessment. They modelled the proposed thermal treatment plant only and compared their predictions to local measurements. These measurements include the noise from the existing plant and the values are indeed dominated by this plant. This method only determines whether or not the proposed plant will result in significant additional impact. They predict substantially lower noise levels than the existing plant. Our checks confirm this and therefore, despite their method not fully meeting our expectations, we are satisfied that these predictions can be used for permit determination.

Based upon the information in the application we are satisfied that the appropriate measures will be in place to prevent or where that is not practicable to minimise noise and vibration and to prevent pollution from noise and vibration outside the site.

8. Setting ELVs and other permit conditions

7.1 Translating BAT into Permit conditions

Article 14(3) of IED states that BAT conclusions shall be the reference for permit conditions. Article 15(3) further requires that under normal operating conditions; emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions.

At the time of writing of this document, no BAT conclusions have been published for waste incineration or co-incineration.

The use of IED Chapter IV emission limits for air dispersion modelling sets the worst case scenario. If this shows emissions are insignificant then we have accepted that the applicant's proposals are BAT, and that there is no justification to reduce ELVs below the Chapter IV limits in these circumstances.

We have included the annual release of Total Organic Carbon from the thermal treatment plant (A14) in Table S3.5. This will allow for a comparison of emissions to air, with and without the thermal treatment plant.

For emissions to water there are no changes to the emission limits with the impact already assessed as part of the original permit application. The limits set for the effluent from the scrubber at W4 will be determined by mass balance calculation as detailed in Schedule 3 of the permit.

For those emissions not screened out as insignificant, we consider that we do not require different conditions as a result of consideration of local or other factors, so that no significant pollution is caused (Article 11(c)) or to comply with environmental quality standards (Article 18).

9 Monitoring

9.1 Monitoring during normal operations

We have decided that monitoring should be carried out for the parameters listed in Schedule 3 using the methods and to the frequencies specified in those tables. These monitoring requirements have been imposed in order to demonstrate compliance with emission limit values and to enable correction of measured concentration of substances to the appropriate reference conditions; to establish data on the release of dioxin-like PCBs and PAHs from the thermal treatment process and to deliver the requirements of Chapter IV of IED for monitoring of temperature in the combustion chamber.

For emissions to air, the methods for continuous and periodic monitoring are in accordance with the Environment Agency's Guidance M2 for monitoring of stack emissions to air.

For emissions to water, the in-house methods have already been validated by improvement condition IP12 in the original permit. There is provision in the permit for periodic evaluation of the in-house methods against methods in the Environment Agency's Guidance M18 for monitoring of discharges to water and sewer.

Based on the information in the application and the requirements set in the conditions of the permit we are satisfied that the operator's techniques, personnel and equipment will have either MCERTS certification or MCERTS accreditation as appropriate.

9.2 Monitoring of heavy metals, cadmium, thallium and mercury for emissions to air

Point 2.6 of Part 6 of Annex VI of the IED allows for a reduction in heavy metals monitoring frequency as follows:

2.6. The competent authority may decide to require one measurement every 2 years for heavy metals and one measurement per year for dioxins and furans in the following cases:

(a) the emissions resulting from co-incineration or incineration of waste are under all circumstances below 50 % of the emission limit values;

(b) the waste to be co-incinerated or incinerated consists only of certain sorted combustible fractions of non-hazardous waste not suitable for recycling and presenting certain characteristics, and which is further specified on the basis of the assessment referred to in point (c);

(c) the operator can prove on the basis of information on the quality of the waste concerned and the monitoring of the emissions that the emissions are under all circumstances significantly below the emission limit values for heavy metals and dioxins and furans.

Based on the information in the application i.e. that metals are not present in the input fuels or waste streams, we have included provision for this reduced monitoring in the permit. On this basis we have also included this provision for cadmium, thallium and mercury.

9.3 Continuous emissions monitoring for dioxins and heavy metals

Chapter IV of IED specifies manual extractive sampling for heavy metals and dioxin monitoring. However, Article 48(5) of the IED enables The Commission to act through delegated, authority to set the date from which continuous measurements of the air emission limit values for heavy metals, dioxins and furans shall be carried out, as soon as appropriate measurement techniques are available within the Community. No such decision has yet been made by the Commission.

The Environment Agency has reviewed the applicability of continuous sampling and monitoring techniques to the installation.

Recent advances in mercury monitoring techniques have allowed standards to be developed for continuous mercury monitoring, including both vapour-phase and particulate mercury. There is a standard which can apply to CEMs which measure mercury (EN 15267-3) and standards to certify CEMs for mercury, which are EN 15267-1 and EN 15267-3. Furthermore, there is an MCERTS-certified CEM which has been used in trials in the UK and which has been verified on-site using many parallel reference tests as specified using the steps outlined in EN 14181.

In the case of dioxins, equipment is available for taking a sample for an extended period (several weeks), but the sample must then be analysed in the conventional way. A CEN committee has agreed Technical Specifications (EN TS 1948-5) for continuous sampling of dioxins. This specification will lead to a CEN standard following a validation exercise which is currently underway. According to IED Article 48(5), "As soon as appropriate measurement techniques are available within the Union, the Commission shall, by means of delegated acts in accordance with Article 76 and subject to the conditions laid down in Articles 77 and 78, set the date from which continuous measurements of emissions into the air of heavy metals and dioxins and furans are to be carried out. This is yet to happen. However, our extant 'dioxin enforcement policy' recommends continuous sampling of dioxins where multiple emission exceedances occur and no clear root cause can be identified. Therefore should continuous sampling be required at a later date during the operation of the installation, then sampling and analysis shall comply with the requirements of EN TS 1948

For either continuous monitoring of mercury or continuous sampling of dioxins to be used for regulatory purposes, an emission limit value would need to be devised which is applicable to continuous monitoring. Such limits for mercury and dioxins have not been set by the European Commission. Use of a manual sample train is the only technique which fulfils the requirements of the IED. At the present time, it is considered that in view of the predicted low levels of mercury and dioxin emission it is not justifiable to require the operator to install additionally continuous monitoring or sampling devices for these substances.

In accordance with its legal requirement to do so, the Environment Agency reviews the development of new methods and standards and their performance in industrial applications. In particular the Environment Agency considers continuous sampling systems for dioxins to have promise as a potential means of improving process control and obtaining more accurate mass emission estimates.

10. Reporting

We have specified the reporting requirements in Schedule 4 of the permit either to meet the reporting requirements set out in the IED, or to ensure data is reported to enable timely review by the Environment Agency to ensure compliance with permit conditions and to monitor the efficiency of material use at the installation.

ANNEX 1: APPLICATION OF CHAPTER IV OF THE INDUSTRIAL EMISSIONS DIRECTIVE

IED Article	Requirement	Delivered by
45(1)(a)	The permit shall include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate.	Condition 2.3.6 and Table S2.2 in Schedule 2 of the permit.
45(1)(b)	The permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.6 and Table S2.2 in Schedule 2 of the permit.
45(1)(c)	The permit shall include the limit values for emissions into air and water.	Conditions 3.1.1 and 3.1.2 and Tables S3.2, S3.2(a), S3.3 and S3.4 in Schedule 3 of the permit.
45(1)(d)	The permit shall include the requirements for pH, temperature and flow of waste water discharges.	Conditions 3.1.1 and 3.1.2 and Table S3.3 in Schedule 3 of the permit.
45(1)(e)	The permit shall include the sampling and measurement procedures and frequencies to be used to comply with the conditions set for emissions monitoring.	Conditions 3.5.1 to 3.5.5 and Tables S3.2, S3.2(a), S3.3 and S3.4 in Schedule 3 of the permit.
45(1)(f)	The permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.	Conditions 2.3.10 and 2.3.11.
45(2)(a)	The permit shall include a list of the quantities of the different categories of hazardous waste which may be treated.	Condition 2.3.6 and Table S2.2 in Schedule 2 of the permit.

IED Article	Requirement	Delivered by
45(2)(b)	The permit shall include the minimum and maximum mass flows of those hazardous waste, their lowest and maximum calorific values and the maximum contents of polychlorinated biphenyls, pentachlorophenol, chlorine, fluorine, sulphur, heavy metals and other polluting substances.	Condition 2.3.6 and Table S2.2 of Schedule 2 of the permit.
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Condition 2.3.1 and Table S1.2 of Schedule 1 of the permit.
46(2)	Emission into air shall not exceed the emission limit values set out in part of Annex VI.	Condition 3.1.1 and 3.1.2 and Tables S3.2 and S3.2(a) of the permit.
46(3)	Relates to conditions for water discharges from the cleaning of exhaust gases.	Condition 3.1.1 and Tables S3.3 and S3.4 of the permit.
46(4)	Relates to conditions for water discharges from the cleaning of exhaust gases.	Condition 3.1.1 and Tables S3.3 and S3.4 of the permit.
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	The original application explains the measures to be in place for achieving the directive requirements
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m^3), CO and TOC not to be exceeded during this period.	Conditions 2.3.10 and 2.3.11
47	In the event of breakdown, reduce or close down operations as soon as practicable. Limits on dust (150 mg/m^3), CO and TOC not to be exceeded during this period.	Condition 2.3.10

IED Article	Requirement	Delivered by
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.5.1 to 3.5.5. Reference conditions are defined in Schedule 6 of the permit.
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Condition 3.5.3, and Tables S3.2, S3.2(a), and S3.6.
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Conditions 3.5.3 and 3.5.4.
48(4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	Conditions 4.1.1 and 4.1.2, and Tables S4.1 and S4.4.
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	Conditions 3.1.1 and 3.1.2 and 3.5.5.
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Not applicable, no solid residues produced.
50(2)	Flue gas to be raised to a temperature of 1100ºC for two seconds, as measured at representative point of the combustion chamber.	Condition 2.3.7, Pre-operational condition PO2 and Improvement condition IC2 and Table S3.6.
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Condition 2.3.8
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.11
50(4)(b)	Automatic shut to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.8

IED Article	Requirement	Delivered by
50(4)(c)	Automatic shut to prevent waste feed if the CEMs show that ELVs are exceeded due to disturbances or failure of waste cleaning devices.	Condition 2.3.11
50(5)	Any heat generated from the process shall be recovered as far as practicable.	Not practicable for this installation.
50(6)	Relates to the feeding of infectious clinical waste into the furnace.	No infectious clinical waste will be burnt
50(7)	Management of the Installation to be in the hands of a natural person who is competent to manage it.	Conditions 1.1.1 to 1.1.3 and 2.3.1 of the permit.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of this chapter are me.	No such conditions have been allowed
51(2)	Changes in operating conditions do not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Articles 50(1), (2) and (3).	No such conditions have been allowed
51(3)	Changes in operating conditions shall include emission limit values for CO and TOC set out in Part 3 of Annex VI.	No such conditions have been allowed
52(1)	Take all necessary precautions concerning delivery and reception of wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.2, 3.3 and 3.4.
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Not applicable for this installation.
52(3)	Prior to accepting hazardous waste, the operator shall collect available information about the waste for the purpose of compliance with the permit requirements specified in Article 45(2).	Not applicable for this installation.
52(4)	Prior to accepting hazardous waste, the operator shall carry out the procedures set out in Article 52(4).	Not applicable for this installation.

IED Article	Requirement	Delivered by
52(5)	Granting of exemptions from Article 52(2), (3) and (4).	Not applicable for this installation.
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Not applicable, no solid residues produced.
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1 2.3.1, 2.3.2 and 3.2.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Not applicable, no solid residues produced.
55(1)	Application, decision and permit to be publicly available.	All documents are accessible from the Environment Agency Public Register.
55(2)	An annual report on plant operation and monitoring for all plants burning more than 2 tonne/hour waste.	Conditions 4.2.2 and 4.2.3.

ANNEX 2: Pre-Operational Conditions

Based on the information in the Application, we consider that we do need to impose pre-operational conditions. These conditions are set out below and referred to, where applicable, in the text of the decision document. We are using these conditions to require the operator to confirm that the details and measures proposed in the Application have been adopted or implemented prior to the operation of the Installation.

Reference	Pre-operational measures
PO1	Prior to the commencement of commissioning, the operator shall provide a written commissioning plan, including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. It shall also include a programme of monitoring to be undertaken at emission point W1, as defined in Table S3.3 of this permit. The purpose of the monitoring programme is to demonstrate that concentrations of pollutants in the effluent from the cleaning of gases at the thermal treatment plant (defined as emission point W4) are in accordance with emission limit values set out in Part 5 of Annex VI of the IED. Commissioning shall be carried out in accordance with the commissioning plan as approved.
PO2	After completion of furnace design and at least three calendar months before commencement of commissioning; the operator shall submit a written report to the Environment Agency of the details of the computational fluid dynamic (CFD) modelling. The report shall demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED.

ANNEX 3: Improvement Conditions

Based in the information in the Application we consider that we need to set improvement conditions. These conditions are set out below - justifications for these is provided at the relevant section of the decision document. We are using these conditions to require the operator to provide the Environment Agency with details that need to be established or confirmed during and/or after commissioning.

Ref:	Improvement measure	Completion date
IC1	The operator shall submit a written report to the Environment Agency on the commissioning of the thermal treatment plant. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the application. The report shall also include a review of the performance of the thermal treatment plant against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions. Confirmation shall also be provided that the Environmental Management System (EMS) and the installation Emergency Plan, have been updated accordingly.	Within 4 months of the completion of commissioning
IC2	The operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the combustion chamber of the thermal treatment plant whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency and include a comparison with the computational fluid dynamic (CFD) modelling submitted with PO2.	Within 4 months of the completion of commissioning
IC3	The operator shall submit a written summary report to the Environment Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.2 and Table S3.2(a) complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3.	Initial calibration report to be submitted to the Environment Agency within 3 months of completion of commissioning Full summary evidence compliance report to be submitted within 18 months of completion of commissioning

IC4	The Operator shall submit a written summary report to the Environment Agency setting out how the concentration of pollutants in the effluent from the cleaning of gases at the thermal treatment plant (defined as W4 in Table S3.4 of this permit) comply with emission limit values in Part 5 of Annex VI of the IED. The report shall include: • The emissions monitoring data approved by PO1 in Table S1.4 of this permit. • A comparison of suspended solids concentrations for baseline (prior to thermal treatment plant) and operational scenarios including effluent from the thermal treatment plant. This shall include where possible, an estimate of the contribution of suspended solids from the thermal treatment plant. Where an estimate of suspended solids is not possible, a justification shall be provided. • A review of the results from metals monitoring and a comparison against baseline data obtained prior to operation of the thermal treatment plant.	Within 4 months of the completion of commissioning

Decision checklist

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Consultation/Engagement	
Consultation	The consultation requirements were identified in accordance with the Environmental Permitting Regulations and our public participation statement. The application was publicised on the GOV.UK website. We consulted the following organisations: Local Authority Environmental Protection Department Food Standards Agency (FSA) Health & Safety Executive (HSE) Public Health England (PHE) & Director of Public Health The comments and our responses are summarised in the consultation section.
Requests for Further Information	
Requests	Although we were able to consider the application duly made, we did in fact need more information in order to determine it, and requested further information as follows: Request sent by email 22 May 2015 – Noise Impact Assessment Request sent by email 23 May 2017 - Monitoring of effluent from cleaning of waste gases. Request sent by email 6 June 2017 – Abnormal operation emission concentrations. A copy of this information was made available to the public together with the responses.

Aspect considered	Decision
The facility	
The regulated facility	We considered the extent and nature of the facilities at the site in accordance with RGN2 ‘Understanding the meaning of regulated facility’, Appendix 2 of RGN 2 ‘Defining the scope of the installation’. The extent of the facilities are defined in the site plan and in the permit. The activities are defined in table S1.1 of the permit. Refer to Key issues section above.
The site	
Extent of the site of the facility	The operator has provided a plan which we consider is satisfactory, showing the extent of the site of the facility including the discharge points. The plan is included in the permit.
Biodiversity, heritage, landscape and nature conservation	The application is within the relevant distance criteria of a site of heritage, landscape or nature conservation, and/or protected species or habitat. We have assessed the application and its potential to affect all known sites of nature conservation, landscape and heritage and/or protected species or habitats identified in the nature conservation screening report as part of the permitting process. We consider that the application will not affect any sites of nature conservation, landscape and heritage, and/or protected species or habitats identified. Refer to Key issues section above. We have not consulted Natural England; however we have completed an Appendix 11 Habitats assessment form which we have sent for information only. The decision was taken in accordance with our guidance.
Environmental risk assessment	
Environmental risk	We have reviewed the operator's assessment of the environmental risk from the facility. The operator’s risk assessment is satisfactory. Refer to Key issues section above.

Aspect considered	Decision
Operating techniques	
General operating techniques	We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility. The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.
Operating techniques for emissions that do not screen out as insignificant	For emissions of pollutants that cannot be screened out as insignificant, we have assessed whether the proposed techniques are BAT. Refer to Key issues section above. The proposed techniques/emission levels for emissions that do not screen out as insignificant are in line with the techniques and benchmark levels contained in the technical guidance and we consider them to represent appropriate techniques for the facility. The permit conditions ensure compliance with relevant BREFs.
Operating techniques for emissions that screen out as insignificant	For emissions of pollutants that have been screened out as insignificant we agree that the applicant's proposed techniques are BAT for the installation. Refer to Key issues section above. We consider that the emission limits included in the installation permit reflect BAT for the sector.
Permit conditions	
Updating permit conditions during consolidation	We have updated permit conditions to those in the current generic permit template as part of permit consolidation. The conditions will provide the same level of protection as those in the previous permit.
Use of conditions other than those from the template	Based on the information in the application, we consider that we do not need to impose conditions other than those in our permit template.
Waste types	We have specified the permitted waste types, descriptions and quantities, which can be treated by the thermal treatment plant. We are satisfied that the thermal treatment plant is capable of treating the off-gases and liquid residues produced at the installation. Refer to Key issues section above.

Aspect considered	Decision
Pre-operational conditions	Based on the information in the application, we consider that we need to impose pre-operational conditions. These have been set to ensure compliance with Chapter IV and Annex VI of the IED.
Improvement programme	Based on the information on the application, we consider that we need to impose an improvement programme. We have imposed an improvement programme to ensure that compliance with Chapter IV and Annex VI of the IED is being achieved.
Operator competence	
Management system	There is no known reason to consider that the operator will not have the management system to enable it to comply with the permit conditions.
Relevant convictions	The Case Management System has been checked to ensure that all relevant convictions have been declared. No relevant convictions were found. The operator satisfies the criteria in our guidance on operator competence.
Financial competence	There is no known reason to consider that the operator will not be financially able to comply with the permit conditions.

Aspect considered	Decision
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to vary this permit. Paragraph 1.3 of the guidance says: "The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation." We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections. We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

Consultation

The following summarises the responses to consultation with other organisations, our notice on GOV.UK for the public, and the way in which we have considered these in the determination process.

Responses from organisations listed in the consultation section

Response received from	
Public Health England (PHE), Environmental Public Health Scientist, Specialist Environmental Public Health Scientist, letter dated 19 June 2017.	
Brief summary of issues raised	**Summary of actions taken or show how this has been covered**
That any permit issued should contain conditions to ensure that point source and fugitive emissions do not impact on human health.	Conditions in Section 3 of the permit will ensure prevention/minimisation of these emissions.
That operational emissions are verified as soon as possible after operation.	This will be achieved by monitoring as specified in Table S3.2 of the permit. Compliance with limits in this table will provide the necessary verification.
That we confirm whether any substantiated complaints have been received in relation to fugitive emissions of odour, noise or particulate matter.	We have not had any substantiated complaints due to the current operation of the plant. Whilst we are not expecting any increases in these emissions as a result of this variation, any complaints will be recorded and investigated in accordance with our policy.
That we ensure that the site emergency plan has been updated.	We have set an improvement condition in Table S1.3 of the permit requiring confirmation that the EMS and site emergency plan have been updated.
That the application states that there is a site condition report, though it is not included in the application.	A site condition report is not required as part of the application as there are no changes to the installation boundary as a result of the proposed changes. Permit condition 4.1.1 requires that records are maintained for matters which affect the condition of the land and groundwater.