Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2010

Decision document recording our decision-making process

The Permit Number is:	EPR/YP3137VY
The Applicant / Operator is:	4Evergreen Technologies Ltd
The Installation is located at:	Kemsley Park, Sittingbourne, Kent, ME10 2FE

What this document is about

This is a decision document, which accompanies a Permit.

It explains how we have considered the Applicant's Application, and why we have included the specific conditions in the Permit we are issuing to the Applicant. It is our record of our decision-making process, to show how we have taken into account all relevant factors in reaching our position. Unless the document explains otherwise, we have accepted the Applicant's proposals.

We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy, and we would welcome any feedback as to how we might improve our decision documents in future. A lot of technical terms and acronyms are inevitable in a document of this nature: we provide a glossary of acronyms near the front of the document, for ease of reference.

Preliminary information and use of terms

We gave the Application the reference number **EPR/YP3137VY/A001**. We refer to the Application as "the **Application**" in this document in order to be consistent.

The number we have given to the Permit is **EPR/YP3137VY**. We refer to the Permit as "the **Permit**" in this document.

The Application was duly made on **9 June 2015**.

The Applicant is **4Evergreen Technologies Limited**. We refer to **4Evergreen** as "the **Applicant**" in this document. Where we are talking about

what would happen after the Permit is granted (if that is our final decision), we call **4Evergreen** "the **Operator**".

4Evergreen's proposed facility is located at Kemsley Park, Sittingbourne, Kent. We refer to this as "the **Installation**" in this document.

How this document is structured

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Glossary of acronyms used in this document

(Please note that this glossary is standard for our decision documents and therefore not all these acronyms are necessarily used in this document.)

AAD	Ambient Air Directive (2008/50/EC)
APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
CROW	Countryside and rights of way Act 2000
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675) as amended
EQS	Environmental quality standard
EU-EQS	European Union Environmental Quality Standard
EWC	European waste catalogue

FSA	Food Standards Agency
GWP	Global Warming Potential
HHRAP	Human Health Risk Assessment Protocol
HMIP	Her Majesty's Inspectorate of Pollution
HPA	Health Protection Agency (now PHE – Public Health England)
HRA	Human Rights Act 1998
HW	Hazardous waste
HWI	Hazardous waste incinerator
IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LCPD	Large Combustion Plant Directive (2001/80/EC) – now superseded by IED
LCV	Lower calorific value – also termed net calorific value
LfD	Landfill Directive (1999/31/EC)
LOI	Loss on Ignition
MBT	Mechanical biological treatment
MSW	Municipal Solid Waste
MWI	Municipal waste incinerator
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
Opra	Operator Performance Risk Appraisal
PAH	Polycyclic aromatic hydrocarbons
PC	Process Contribution

PCB	Polychlorinated biphenyls
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PR	Public register
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls
PXDF	Poly-halogenated di-benzo furans
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SGN	Sector guidance note
SHPI(s)	Site(s) of High Public Interest
SNCR	Selective non-catalytic reduction
SPA(s)	Special Protection Area(s)
SS	Sewage sludge
SSSI(s)	Site(s) of Special Scientific Interest
SWMA	Specified waste management activity
TDI	Tolerable daily intake
TEF	Toxic Equivalent Factors
TGN	Technical guidance note
TOC	Total Organic Carbon
UHV	Upper heating value –also termed gross calorific value

UN_ECE	United Nations Environmental Commission for Europe
US EPA	United States Environmental Protection Agency
WFD	Waste Framework Directive (2008/98/EC)
WHO	World Health Organisation
WID	Waste Incineration Directive (2000/76/EC) – now superseded by IED

1 Our decision

We have decided to grant the Permit to the Applicant. This will allow it to operate the Installation, subject to the conditions in the Permit.

We consider that, in reaching that decision, we have taken into account all relevant considerations and legal requirements and that the Permit will ensure that a high level of protection is provided for the environment and human health.

This Application is to operate an Installation which is subject principally to the Industrial Emissions Directive (IED).

The Permit contains many conditions taken from our standard Environmental Permit template including the relevant Annexes. We developed these conditions in consultation with industry, having regard to the legal requirements of the Environmental Permitting Regulations and other relevant legislation. This document does not therefore include an explanation for these standard conditions. Where they are included in the Permit, we have considered the Application and accepted the details are sufficient and satisfactory to make the standard condition appropriate. This document does, however, provide an explanation of our use of "tailor-made" or installation-specific conditions, or where our Permit template provides two or more options.

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on **9 June 2015**. This means we considered it was in the correct form and contained sufficient information for us to begin our determination but not that it necessarily contained all the information we would need to complete that determination: see below.

The Applicant made no claim for commercial confidentiality. We have not received any information in relation to the Application that appears to be confidential in relation to any party.

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR, our statutory PPS and our own RGS Note 6 for Determinations involving Sites of High Public Interest (SHPI). We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where

we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

We advertised the Application by a notice placed on our website, which contained all the information required by the IED, including telling people where and when they could see a copy of the Application.

We made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Public Register at Orchard House, Endeavour Park, London Road, Addington, Kent, ME19 5SH. Anyone wishing to see these documents could do so and arrange for copies to be made.

We sent copies of the Application to the following bodies, which includes those with whom we have "Working Together Agreements":

- Kent County Council Planning
- Kent County Environmental Health
- Public Health England (PHE)
- Director of Public Health
- Food Standards Agency (FSA)
- Health & Safety Executive (HSE)
- Kent Fire & Rescue Service
- National Grid

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly. Note under our Working Together Agreement with Natural England, we only inform Natural England of the results of our assessment of the impact of the Installation on designated Habitats sites.

Where responses weren't received, we sent out further letters asking for any comments extending the formal consultation period from 15 July to 06 August 2015.

Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 4. We have taken all relevant representations into consideration in reaching our decision.

2.3 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, and issued information notices. A copy of each information notice was placed on our public register as was the response when received.

Notice dated 15 June 2015	HCl wet deposition modelling files
	Noise modelling files
Notice dated 9 July 2015	Odour, containment, energy efficiency, AQMA and Planning Application
Notice dated 29 July 2015	Long term integrity and performance of the liner
	Habitats
Notice dated 30 July 2015	Noise

In addition to our information notices, we received additional information during the determination by email on the noise impact assessment, received 11/06/15 and 20/07/15. We made a copy of this information available to the public in the same way as the responses to our information notices.

3 The legal framework

The Permit will be granted under Regulation 13 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the regulated facility is:

- an *installation* and a *waste incineration plant* as described by the IED;
- an *operation* covered by the WFD, and
- subject to aspects of other relevant legislation which also have to be addressed.

We address some of the major legal requirements directly where relevant in the body of this document. Other requirements are covered in a section towards the end of this document.

We consider that, in granting the Permit, it will ensure that the operation of the Installation complies with all relevant legal requirements and that a high level of protection will be delivered for the environment and human health.

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

4 The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

The Installation is subject to the EPR because it carries out an activity listed in Part 1 of Schedule 1 to the EPR:

- Section 5.1 Part A(1)(b) – incineration of non-hazardous waste in a waste incineration plant or waste co-incineration plant with a capacity of 3 tonnes or more per hour.

The IED definition of “waste incineration plants” and “waste co-incineration plants” says that it includes:

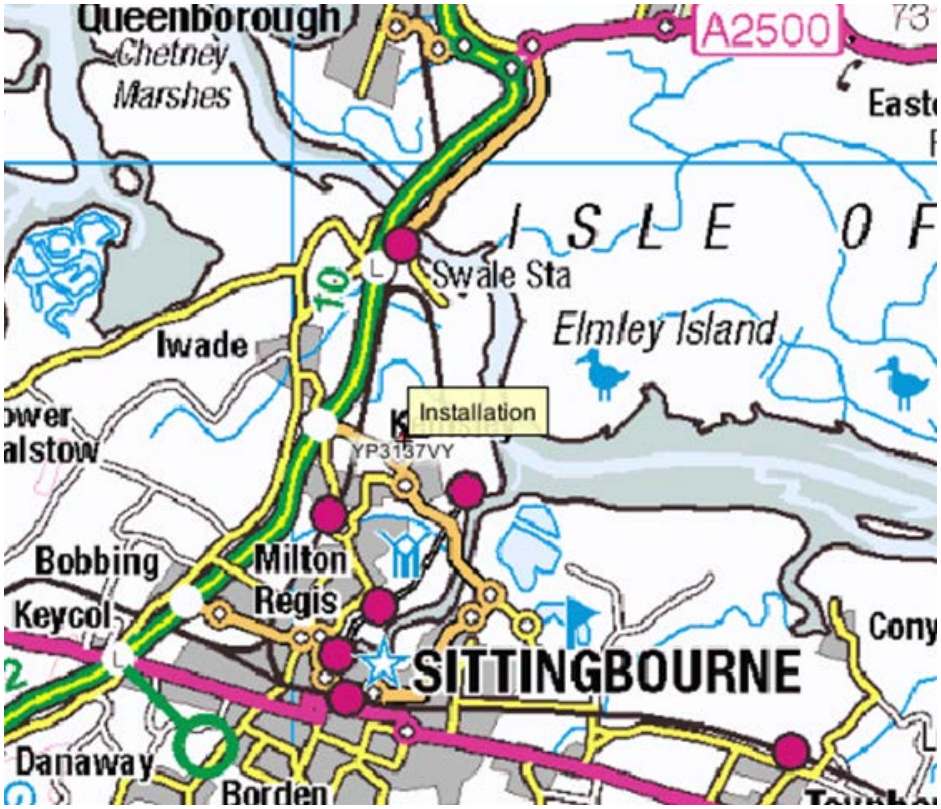
> *“all incineration lines or co-incineration lines, waste reception, storage, on-site pre-treatment facilities, waste, fuel and air supply systems, boilers, facilities for the treatment of waste gases, on-site facilities for treatment or storage of residues and waste water, stacks, devices for controlling incineration or co-incineration operations, recording and monitoring incineration or co-incineration conditions.”*

Many activities which would normally be categorised as “directly associated activities” for EPR purposes (see below), such as air pollution control plant, including storage and preparation of treatment chemicals, and the ash storage area, are therefore included in the listed activity description.

An Installation may also comprise “directly associated activities”; however there are none at this Installation where electricity is generated with gas engines. If generation of electricity was achieved using a steam turbine then this would have been a directly associated activity.

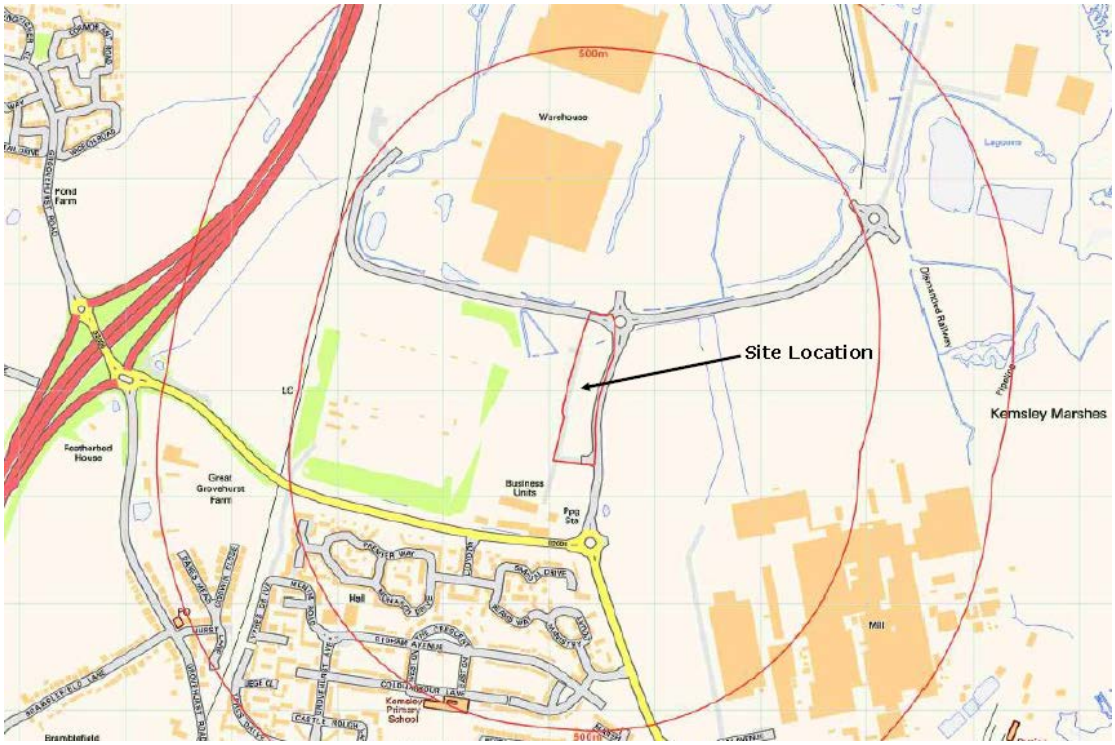
4.1.2 The Site

The Installation is located at Kemsley Park, north-west of Sittingbourne at national grid reference TQ 9127966820.



It is located on an area of land immediately to the west of Barge Way and occupies an area of approximately 1.7 hectares.

It is in an area of established industrial development with some residential development to the south and north-west. There are also habitats and conservation sites within the relevant screening distance (Refer to Section 5.4 below). The closest is the Swale which is approximately 650m north-east of the facility.



The Applicant submitted a plan which we consider is satisfactory, showing the site of the Installation and its extent. A plan is included in Schedule 7 to the Permit, and the Operator is required to carry on the permitted activities within the site boundary.

Further information on the site is addressed below at 4.3.

4.1.3 <u>What the Installation does</u>

The Applicant has described the facility as an advanced thermal conversion and energy generation facility. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, the Installation is a waste incineration plant because:

Notwithstanding the fact that energy will be recovered from the process; the process is never the less 'incineration' because it is considered that its main purpose is the thermal treatment of waste.

Our guidance 'when a plant is a Co-Incineration Plant – v 3 March 2011' provides further clarification on this classification; the waste is the principal source of fuel and will comprise of different materials without any significant pre-treatment to enhance its performance as a fuel.

Although the process used to thermally treat the waste is pyrolysis; for the process not to be considered to be a waste incineration plant, the resultant gases from the pyrolysis process must be purified to such an extent that they are no longer a waste prior to their combustion and can cause emissions no higher than those from the burning of natural gas. The Applicant has not provided information to demonstrate that the gases have passed the 'end of

waste' test as referred to in the Waste Framework Directive; therefore the whole process is considered to be a waste incineration plant and therefore subject to the requirements of Chapter IV of the IED.

Overview of the Activities

The facility will use pyrolysis to process up to 48,000 tonnes per year of refuse derived fuel (RDF) with the subsequent recovery of energy in the form of electricity and heat. The facility will have the capacity to generate up to 10.4MW of electricity, with up to 8.2MW being exported to the grid.

RDF will be delivered by road. Each batch will be checked to ensure it satisfies the necessary acceptance criteria, with any that doesn't being returned to the supplier. It will be stored in four 108 tonne capacity silos prior to processing.

The RDF will be screened to remove unwanted materials and dried in one of two rotating drum driers. Heat for the driers will be provided using hot, recirculated thermal oil from the high temperature Organic Rankine Cycle (ORC) unit.

On exiting the dryer, the exhaust gases are drawn through a cyclone to remove particulate material. The exhaust gas from the cyclone is then introduced into the main gas engine exhaust stream for further abatement in the regenerative thermal oxidiser (RTO).

Dried RDF is conveyed to the six electrically-heated pyrolysers where it is broken down into synthesis gas (syngas) and carbon char.

The char is discharged from the pyrolyser units to the char storage area which provides storage for up to 120 tonnes, which equates to approximately three days production. After cooling and bagging, the char will be taken off-site for re-use in a range of possible applications.

The syngas passes through a cyclone to remove particulate material before passing through the cleaning system. The cleaning system incorporates closed-loop oil and water quench units, whose function is primarily to cool the gas, but also to remove any entrained fine particulate material. This particulate material is treated in the associated oil and water presses. The water quench system incorporates a sodium hydroxide gas scrubbing unit to neutralise acid gases, primarily sulphur dioxide and hydrogen chloride. The syngas then undergoes further treatment to remove hydrogen sulphide in three metal oxide scavenging units.

The cleaned syngas is ducted to three inter-connected buffer storage vessels, each of 100m^3 capacity prior to feeding to twelve gas engines and the RTO.

The syngas produced in the pyrolysis stage is used as a fuel in up to twelve purpose designed gas engine/generator sets, each rated at 750kWe, providing a total generation capacity of 9MWe. Each engine will be directly

coupled to its associated generator. The exhaust gas from the engines will pass directly to the RTO for treatment.

The purpose of the RTO is to oxidise organic compounds in the engine gases to carbon dioxide and water and to recover as much heat energy as possible. The gases will be held in the combustion chamber of the RTO at a temperature of 850^{o}C for a minimum of two seconds.

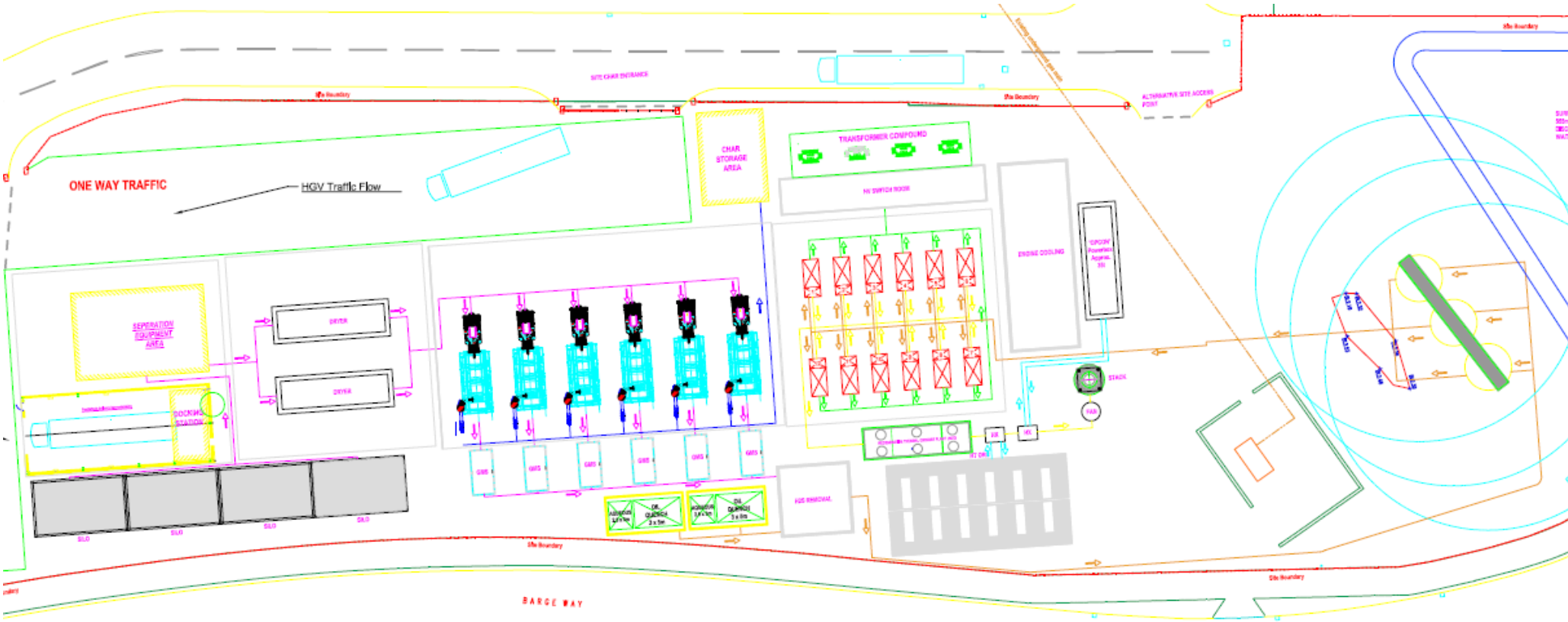
The gas stream then undergoes selective catalytic reduction (SCR) to reduce oxides of nitrogen. This process uses urea solution which is injected into the gas stream exiting the RTO and passed over a ceramic catalyst bed.

After leaving the SCR, the treated exhaust gases pass through two heat exchangers. The first is the high temperature unit using thermal oil as the heat transfer medium. The second is the low temperature unit using water as the heat transfer medium. The function of the heat exchangers is to harness the intrinsic thermal energy in the gas stream for the ORC units and to reduce the temperature of the gases to a temperature that is suitable for the down-stream induced draught (ID) fan.

The ORC units maximise the potential for electrical power generation by converting excess thermal energy from the engines and engine exhaust gases into electrical energy. The two ORC units will produce 1.4MW of electricity.

The treated gases exiting the water heat exchanger will pass through the ID fan before being discharged to atmosphere via the 30m plant discharge stack. The emissions to air will comply with the emission limits in Annex VI of the IED.

Continuous and periodic monitoring will be undertaken for the exhaust gases in the stacks as required by Chapter IV and Annex VI of the IED.


ONE WAY TRAFFIC
HGV Traffic Flow
SITE GEAR ENTRANCE
Site Boundary
ALTERNATIVE SITE ACCESS POINT
CHAR STORAGE AREA
TRANSFORMER COMPOUND
HV SWITCH ROOM
ENGINE COOLING
SEPERATION EQUIPMENT AREA
DRYER
DRYER
DOCKING STATION
SILO
SILO
SILO
SILO
GAS
GAS
GAS
GAS
GAS
GAS
OIL QUENCH 3 x 5m
OIL QUENCH 3 x 5m
ASH RAM/VAC
STACK
FAN
BARGE WAY

The key features of the Installation can be summarised in the table below:

Waste throughput, Tonnes/engine 6 x engines	48,000 tonnes/annum	1 tonnes/hour/engine 6 tonnes/hour – 6 engines
Waste processed	RDF (refuse derived fuel)	
Number of lines	6 pyrolysers operating in parallel with common feedstock preparation and abatement.	
Furnace technology	Pyrolysis	
Auxiliary Fuel	Natural Gas	
Syngas cleaning Acid gas abatement	Sodium hydroxide gas scrubbing unit	
NOx abatement	SCR	Urea
Flue gas recirculation	No	
Dioxin abatement	Syngas cleaning with oil and water quench, thermal oxidiser operating at IED Annex IV complaint temperatures, rapid cooling of exhaust gas stream to avoid de novo synthesis.	
Stack	Grid Reference 591291, 166854	
	Height, 30m	Diameter, 1.18m
Flue gas	Flow, 11.4Nm^3/s	Velocity, 15.09m/s
	Temperature 120°C	
Electricity generated	10.4MWe (9MWe arising from the gas engine-generator sets and 1.4MWe from the ORC unit-generator sets). 83,200MWh per annum is expected based on 8,000 hours of operation per annum.	
Electricity exported	8.2MWe 65,600MWh per annum is expected based on 8,000 hours of operation per annum.	
Steam exported	N/A. All process and waste heat is used to generate electricity.	
Waste heat use	Waste heat captured from gas engine cooling system and the gas engine exhausts will be used to generate electricity in two organic rankine cycle units.	

4.1.4 Key Issues in the Determination

The key issue arising during this determination is the impact from nitrogen deposition at The Swale and the Medway Estuary & Marshes habitats sites. We therefore describe how we determined these issues in most detail in this document, refer to Section 5.4 below.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The site is undeveloped open fields with the area immediately to the west of the site developed as Kemsley Fields Business Park and Kemsley paper mill to the south east.

The site layout is indicated on the General Arrangement Layout Plan which is provided in Appendix 2 of the Application Supporting information and depicted in Section 4.1.3 above. The key stages are RDF storage, drying, pyrolysis (6 x units), syngas cleaning equipment, gas engines (x12), regenerative thermal oxidiser (RTO) and discharge stack.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

Under Article 22(2) of the IED the Applicant is required to provide a baseline report containing at least the information set out in paragraphs (a) and (b) of the Article before starting operation.

The Applicant has submitted a site condition report which includes a report on the baseline conditions as required by Article 22. We have reviewed that report and consider that it adequately describes the condition of the soil and groundwater prior to the start of operations.

The baseline report is an important reference document in the assessment of contamination that might arise during the operational lifetime of the Installation and at cessation of activities at the Installation

4.2.3 Closure and decommissioning

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place for the closure and decommissioning of the Installation, as referred to in Section 12 of the Application Supporting Information. A Pre-operational condition requires the Operator to have an Environmental Management System in place before the Installation is operational, and this will include a site closure plan.

At the definitive cessation of activities, the Operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into accounts both the baseline conditions and the site's current or approved future use. To do this, the Operator will apply to us

for surrender of the Permit, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the Installation – general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Installation.

We are satisfied that the Applicant is the person who will have control over the operation of the Installation after the granting of the Permit; and that the Applicant will be able to operate the Installation so as to comply with the conditions included in the Permit.

The incineration of waste is not a specified waste management activity (SWMA). The Environment Agency has considered whether any of the other activities taking place at the Installation are SWMAs and is satisfied that none are taking place.

We are satisfied that the Applicant's submitted Opra profile is accurate.

The Opra score will be used as the basis for subsistence and other charging, in accordance with our Charging Scheme. Opra is the Environment Agency's method of ensuring Application and subsistence fees are appropriate and proportionate for the level of regulation required.

4.3.2 Management

The Applicant has stated in the Application that they will implement an Environmental Management System (EMS) that will be based on the requirements of ISO14001. A pre-operational condition is included requiring the Operator to provide a summary of the EMS prior to commissioning of the plant and to make available for inspection all EMS documentation.

We will require the EMS to be compliant with ISO14001; however we recognise that this cannot take place until the Installation is operational. An improvement condition is included requiring the Operator to report on how their system complies with certified systems.

We are satisfied that appropriate management systems and management structures will be in place for this Installation, and that sufficient resources are available to the Operator to ensure compliance with all the Permit conditions.

4.3.3 Site security

Having considered the information submitted in the Application, we are satisfied that appropriate infrastructure and procedures will be in place to ensure that the site remains secure.

4.3.4 Accident management

The Applicant has not submitted an Accident Management Plan. Having considered the other information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning as required by the pre-operational condition.

The site will store combustible wastes necessitating a Fire Prevention Plan to be in place. A pre-operational condition requires this to be in place in line with the requirements set out in our Fire prevention plans guidance (version 2, March 2015). There is provision in the Permit to incorporate the approved plan into the operating techniques (see below).

4.3.5 Off-site conditions

We do not consider that any off-site conditions are necessary.

4.3.6 Operating techniques

We have specified that the Applicant must operate the Installation in accordance with the following documents contained in the Application:

Description	Parts Included	Justification
The Application	The response to question 3 Operating techniques, given in Part B3 of the Application form. Includes Table 3a – Technical Standards Application Supporting Information Document (P2079/R005) dated March 2015	▪ the waste feed cessation system ▪ start-up and shut-down ▪ temperature monitoring in the combustion chamber ▪ energy recovery from the Installation ▪ temperature, oxygen, water vapour and pressure at air release sampling points ▪ char will be stored and transported in a manner that prevents fugitive dust releases ▪ Waste Production ▪ Abatement ▪ CEMs

Response to Schedule 5 Notice dated 09/07/15	The response to questions 1.1 to 1.4	▪ Odour control measures
Email from Applicant received 20/07/15	All parts - the gate of the acoustic barrier will only be opened for HGV movements	Noise control measures
Response to Schedule 5 Notice dated 30/07/15	Acoustic specification of buildings	Noise control measures
Emails from Applicant received: 06/08/15, 10/08/15, 18/08/15	Specification for the impermeable liner of the retention basin	Control measures to prevent/minimise emissions to land and water
Fire Prevention Plan	All parts, as approved	Refer to PO2 in Table S1.4 of the Permit.

The details set out above describe the techniques that will be used for the operation of the Installation that have been assessed by the Environment Agency as BAT; they form part of the Permit through Permit condition 2.3.1 and Table S1.2 in the Permit Schedules.

Article 45(1) of the IED requires that the Permit must 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 2005/532/EC, EC, if possible, and containing information on the quantity of each type of waste, where appropriate. The Application lists the wastes coded by the European Waste Catalogue (EWC) number, which the Applicant will accept in the waste streams entering the plant and which the plant is capable of burning in an environmentally acceptable way. We have specified the permitted waste types, descriptions and where appropriate quantities which can be accepted at the Installation in Table S2.2.

We are satisfied that the Applicant can accept the wastes contained in Table S2.2 of the Permit because:

(i) the wastes are all categorised as non-hazardous in the European Waste Catalogue and are capable of being safely burnt at the Installation.
(ii) these wastes are likely to be within the design calorific value (CV) range for the plant;
(iii) these wastes are unlikely to contain harmful components that cannot be safely processed at the Installation.

We have limited the capacity of the Installation to 48,000 tonnes per annum. This is based on the Installation operating 8,000 hours per year at a nominal capacity of 6 tonnes per hour.

The Installation will be designed, constructed and operated using BAT for the incineration of the permitted wastes. We are satisfied that the operating and

abatement techniques are BAT for incinerating these types of waste. Our assessment of BAT is set out later in this document.

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

We have considered the issue of energy efficiency in the following ways:

1. The use of energy within, and generated by, the Installation which are normal aspects of all EPR permit determinations. This issue is dealt with in this section.

2. 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*". This issue is covered in this section.

3. The combustion efficiency and energy utilisation of different design options for the Installation are relevant considerations in the determination of BAT for the Installation, including the Global Warming Potential of the different options. This aspect is covered in the BAT assessment in section 6 of this Decision Document.

4. The extent to which the Installation meets the requirement of Article 14(5) of the Energy Efficiency Directive which requires new thermal electricity generation installations with a total thermal input exceeding 20 MW to carry out a cost-benefit assessment "*assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation*".

(ii) Use of energy within the Installation

Having considered the information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that energy is used efficiently within the Installation.

The Application details a number of measures that will be implemented at the Installation in order to increase its energy efficiency, these include:

- high efficiency motors;
- high efficiency lighting;
- inverter controls on motors, fans, driers, pumps and compressors;
- insulation of plant and ductwork;
- variable speed motors fitted to plant building ventilation system.

The response to our further information notice dated 9 July 2015 confirms that the specific energy consumption, a measure of total energy consumed per

unit of waste processed, will be 367kWh/tonne. The Installation capacity is 48,000 tonnes/annum.

Data from the BREF for Municipal Waste Incinerators shows that the range of specific energy consumptions is as in the table below:

MSWI plant size range (t/yr)	**Process energy demand (kWh/t waste input)**
Up to 150,000	300 – 700
150,000 – 250,000	150 – 500
More than 250,000	60 – 200

The BREF says that it is BAT to reduce the average installation electrical demand to generally below 150kWh/tonne of waste with an LCV of 10.4MJ/kg. The LCV in this case is expected to be 18MJ/kg.

Whilst the indicative ranges quoted in the BREF Note do not relate specifically to pyrolysis plants, and although the Lower Calorific Value (LCV) of RDF may differ from that on which the process energy demands listed in the table above are based, they provide a useful context within which to judge the scale of the energy demand of the Applicant's chosen technology. The expected specific energy consumption of the Applicant's pyrolysis plant sits at the lower end of the range set out in the BREF note for incineration plant with a capacity of up to 150,000 tonnes per annum. We consider this to be a favourable indication of the technology's efficiency in the context of process energy demand.

(iii) Generation of energy within the Installation - Compliance with Article 50(5) of the IED

Article 50(5) of the IED requires that *"the heat generated during the incineration and co-incineration process is recovered as far as practicable*".

Our CHP Ready Guidance - February 2013 considers that BAT for energy efficiency for Energy from Waste (EfW) plant is the use of CHP in circumstances where there are technically and economically viable opportunities for the supply of heat from the outset.

The term CHP in this context represents a plant which also provides a supply of heat from the electrical power generation process to either a district heating network or to an industrial / commercial building or process. However, it is recognised that opportunities for the supply of heat do not always exist from the outset (i.e. when a plant is first consented, constructed and commissioned).

In cases where there are no immediate opportunities for the supply of heat from the outset, the Environment Agency considers that BAT is to build the plant to be CHP Ready (CHP-R) to a degree which is dictated by the likely future opportunities which are technically viable and which may, in time, also become economically viable.

The BREF says that where a plant generates electricity only, it is BAT to recover 0.4 – 0.65MWh/ tonne of waste (based on LCV of 10.4MJ/kg) for raw waste inputs or 0.6 – 1.0MWh/tonne of waste (based on LCV of 15.2MJ/kg) for pre-treated wastes. Our technical guidance note, SGN EPR S5.01, states that where electricity only is generated, 5-9MW of electricity should be recoverable per 100,000 tonnes/annum of waste (which equates to 0.4 – 0.72MWh/tonne of waste).

The Installation will generate electricity only and has been specified to maximise electrical output with little or no use of waste heat. The Sankey diagram in Appendix 6 of the Response to Duly Making Request dated June 2015 shows 10.4MW of electricity produced from the pryrolysis of 48,000 tonnes, which represents 21.67MW per 100,000tonnes/yr of waste pryolysed (1.73MWh/tonne of waste). The Installation is therefore significantly above the indicative BAT range based on the higher LCV.

The Applicant provided a CHP-R assessment. The plant design incorporates a waste heat recovery system so that this heat could be diverted to a heat user, if practicable, rather than the ORC units i.e. the plant is CHP-R.

The SGN and Chapter IV of the IED both require that, as well as maximising the primary use of heat to generate electricity; waste heat should be recovered as far as practicable.

Waste heat is recovered via the two ORC units with the production of 1.4MW of electricity; additionally heat recovered from the gas engine cooling system is being considered for use in space heating. Any available usable heat will be re-used within the process, should there be any surplus heat available in the future then equipment is in place for any practicable opportunities.

The location of the Installation largely determines the extent to which waste heat can be utilised, and this is a matter for the planning authority. The Applicant carried out a feasibility study and provided a CHP-R assessment as part of their Application. Establishing a district heating network to supply local users would involve significant technical, financial and planning challenges such that this is not seen as a practicable proposition at present.

Our CHP-R guidance also states that opportunities to maximise the potential for heat recovery should be considered at the early planning stage, when sites are being identified for incineration facilities.

Notwithstanding this, the Applicant has set out their thinking in respect of the direct use of waste heat. They consider there to be no viable opportunities for the provision of heat for direct use by third parties and it is clear that no district heating system currently exists locally into which a heat supply could be directed. The Applicant highlights that the plant has been designed to maximise energy recovery for electricity generation with the provision of gas engine-generator units and ORC-based generators which recover energy from the gas engine exhausts and cooling system. When set in the context of their intention to review the feasibility of utilising waste heat for space heating

and an electricity generation rate per tonne of waste that is significantly better than the indicative range for the sector, we consider the Applicant's proposals to be consistent with the requirements of Article 50(5) of the IED.

(iv) R1 Calculation and the DEFRA Good Quality CHP Scheme

The R1 calculation and gaining accreditation under the DEFRA Good Quality CHP Scheme does not form part of the matters relevant to our determination. They are however general indicators that the Installation is achieving a high level of energy recovery.

The Applicant has not presented an R1 calculation with this Application, nor have we received a separate application for a determination on whether the Installation is a recovery or disposal facility.

(v) Compliance with Article 14(5) of the Energy Efficiency Directive

The Applicant has carried out an assessment of the potential for operating the installation as a high-efficiency cogeneration installation and has concluded that this will not be possible because there are currently insufficient heat loads within 15 km of the installation and we agree with the Applicant's assessment. Therefore no cost benefit assessment is required.

(vi) Permit conditions concerning energy efficiency

A Pre-operational condition requires the Operator to carry out a comprehensive review of the available heat recovery options prior to commissioning, in order to ensure that waste heat from the plant is recovered as far as possible.

Condition 1.2.2 has also been included in the Permit, requiring the Operator to review the options available for heat recovery on an ongoing basis.

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 4. The following parameters are required to be reported: total electrical energy exported; imported and used at the Installation. Together with the total RDF pyrolysed per year, this will enable the Environment Agency to monitor energy recovery efficiency at the Installation and take action if at any stage the energy recovery efficiency is less than proposed.

There are no site-specific considerations that require the imposition of standards beyond indicative BAT, and so the Environment Agency accepts that the Applicant's proposals represent BAT for this Installation.

4.3.8 Efficient use of raw materials

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place to ensure the efficient use of raw materials and water.

The Operator is required to report with respect to raw material usage under condition 4.2. and Schedule 4, including consumption of sodium hydroxide, urea and iron oxide used per tonne of waste pyrolysed. This will enable the Environment Agency to assess whether there have been any changes in the efficiency of the air pollution control plant, and the operation of the SCR to abate NO_x. These are the most significant raw materials that will be used at the Installation, other than the waste feed itself (addressed elsewhere). The efficiency of the use of auxiliary fuel will be tracked separately as part of the energy reporting requirement under condition 4.2.1. Optimising reagent dosage for air abatement systems and minimising the use of auxiliary fuels is further considered in the section on BAT.

4.3.9 Avoidance, recovery or disposal with minimal environmental impact of wastes produced by the activities

This requirement addresses wastes produced at the Installation and does not apply to the waste being treated there. The principal waste streams the pyrolysis plant and its associated infrastructure will produce are:

- char (a solid residue remaining after the RDF has been pyrolysed);
- inert materials recovered from the RDF in its preparation for entry to the pyrolysers;
- filter cake associated with the filtration of the oil-based syngas cleaning system circuit;
- aqueous effluent associated with the water-based syngas cleaning system; and
- spent metal oxide from hydrogen sulphide abatement units.

The first objective is to avoid producing waste at all. Waste production will be avoided by optimisation of the pyrolyser operating conditions, which results in a material that is both reduced in volume and in chemical reactivity. Condition 3.1.4 and associated Table S3.4 specify limits for total organic carbon (TOC) of <3% in char. Compliance with this limit will demonstrate that conditions in the pyrolysers are optimised, waste reduction is being achieved and waste generation is being avoided where practicable.

Char will normally be classified as non-hazardous waste. However, char is classified on the European List of Wastes as a “mirror entry”, which means char is a hazardous waste if it possesses a hazardous property relating to the content of dangerous substances. Monitoring of char will be carried out in accordance with the requirements of Article 53(3) of IED. Classification of char for its subsequent use or disposal is controlled by other legislation and so is not duplicated within the permit.

Residues from the abatement units will be minimised by optimising the operating conditions. They will be sent off-site for treatment, recovery or disposal also controlled by other legislation.

In order to ensure that the char residues are adequately characterised, a pre-operational condition requires the Operator to provide a written plan for approval detailing the char sampling protocols. Table S3.4 requires the Operator to carry out an ongoing programme of monitoring. We extended this pre-operational condition to include the assessment of gas clean-up residues which should also be adequately characterised.

The Application proposes that, where possible, char will be transported to a suitable recycling facility, from where it could be re-used in a range of possible applications including:

- use as a fuel (similar to charcoal);
- use as a filler in rubber production;
- use as a filler in road construction aggregates; and
- use as a spill adsorbent.

The Applicant is currently investigating options for these uses.

Having considered the information submitted in the Application, we are satisfied that the waste hierarchy referred to in Article 4 of the WFD will be applied to the generation of waste and that any waste generated will be treated in accordance with this Article.

We are satisfied that waste from the Installation that cannot be recovered will be disposed of using a method that minimises any impact on the environment. Standard condition 1.4.1 will ensure that this position is maintained.

5. Minimising the Installation's environmental impact

Regulated activities can present different types of risk to the environment, these include odour, noise and vibration; accidents, fugitive emissions to air and water; as well as point source releases to air, discharges to ground or groundwater, global warming potential and generation of waste and other environmental impacts. Consideration may also have to be given to the effect of emissions being subsequently deposited onto land (where there are ecological receptors). All these factors are discussed in this and other sections of this document.

For an installation of this kind, the principal emissions are those to air, although we also consider those to land and water.

The next sections of this document explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment and what measures we are requiring to ensure a high level of protection.

5.1 Assessment Methodology

5.1.1 Application of Environment Agency H1 Guidance

A methodology for risk assessment of point source emissions to air, which we use to assess the risk of applications we receive for permits, is set out in our Horizontal Guidance Note H1 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 H1 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 guidance 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.

5.1.2 Use of Air Dispersion Modelling

For incineration applications, we normally require the Applicant to submit a full air dispersion model as part of their application. Air dispersion modelling enables the process contribution 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 Quality Standards (EQS) referred to as "benchmarks" in the H1 Guidance.

Where an EU EQS exists, the relevant standard is the EU EQS. Where an EU EQS does not exist, our guidance sets out a National EQS (also referred to as Environmental Assessment Level - EAL) which has been derived to provide a similar level of protection to Human Health and the Environment as the EU EQS levels. In a very small number of cases, e.g. for emissions of Lead, the National EQS is more stringent that the EU EQS. In such cases, we use the National EQS standard for our assessment.

National EQSs do not have the same legal status as EU EQSs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a national EQS. However, national EQSs 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 EQS; and
- the **short-term** process contribution is less than **10%** of the relevant EQS.

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 EQS 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 excedance of an EU EQS 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.

This is not the end of the risk assessment, because we also take into account local factors (for example, particularly sensitive receptors nearby such as a SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing of the risk assessment and taking account of any additional techniques that could be applied to limit emissions, we consider that emissions **would cause significant pollution**, we would refuse the Application.

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in Appendix 11 of the Application Supporting Information, document ref: P2079/R004, dated November 2014 and document ref: P2079/R011rev1, dated June 2015.

For the habitats assessment we have also referred to the following reports provided by the Applicant:

Ecological assessment of air quality impacts, Version 1.0/ 15-026 dated 28/04/2015.

Information to support an assessment under Regulation 61 of the Habitats and Species Regulations 2010 (as amended), Version 1.0/ 15-026-02 dated 28/04/2015.

The assessment comprises:

- An H1 screening assessment of emissions to air from the operation of the incinerator.
- Dispersion modelling of emissions to air from the operation of the incinerator.
- 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 discharge stack and its impact on local air quality. The impact on conservation sites is considered in section 5.4.

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 Installation's stack emissions using the ADMS dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather stations at Gravesend and Shoeburyness (rainfall and cloud data) between 2009 and 2013. This data was considered to be the most representative following discussion with the Met office. The impact of the terrain surrounding the site upon plume dispersion was 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 ELVs in the Permit 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)
    - Sulphur dioxide (SO_2)
    - Hydrogen chloride (HCl)
    - Hydrogen fluoride (HF)
    - Metals (Cadmium, Thallium, Mercury, Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel and Vanadium)
    - Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans)
    - Gaseous and vaporous organic substances, expressed as Total Organic Carbon (TOC)
- Second, they assumed that the Installation operates continuously at the relevant long-term or short-term emission limit values, i.e. the maximum permitted emission rate (except for emissions of cadmium, arsenic, lead, chromium, manganese and nickel, which are considered in section 5.2.3 of this decision document).
- Third, the model also considered emissions of pollutants not covered by Annex VI of IED, specifically ammonia (NH_3), nitrous oxide (N_2O), Polycyclic Aromatic Hydrocarbons (PAH) and PCB's. Emission rates used in the modelling have been drawn from data in the Waste Incineration BREF and are considered further in section 5.2.2.

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

The Applicant has used data from the local authority monitoring sites for background air quality together with DEFRA maps and other relevant monitoring networks. 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 facility.

We checked the background air quality data used by the Applicant for those pollutants which were not screened out as insignificant and made the following observations:

- NO_2 – We note that two air quality management areas (AQMAs) declared for nitrogen dioxide are located close to the site. In these areas, we can assume little or no headroom for nitrogen dioxide. The Applicant has made predictions within the AQMAs and has demonstrated that the PC would screen out as insignificant; therefore this is unlikely to affect conclusions (see below).
- Metals – The Applicant has used background metals data measured at Detling, a rural background site. We note that the facility is located in an urban area with other industry nearby; therefore backgrounds could be higher than those used.

As well as calculating the peak ground level concentration, the Applicant has modelled the concentration of key pollutants at a number of specified locations within the surrounding area.

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. We have also audited the air quality and human health impact assessment and similarly agree that the conclusions drawn in the reports were acceptable.

We engaged with Natural England following our review of the impact on the Medway Estuary & Marshes & The Swale habitats sites. We have recorded our findings in Section 5.4 below.

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

5.2.1 Assessment of Air Dispersion Modelling Outputs

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

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air and at discrete receptors. The tables below show the maximum ground level concentrations and where relevant 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 process contribution and predicted environmental concentration. 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.

Assessment of Emissions to Air - Non-Metals

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	40	1	31.3	1.62	**4.05**	32.9	82.3
	40	11	31.3	0.73	**1.83**	32.0	80.1
	200	2	17.7	32.1	**16.1**	49.82	24.91
PM_{10}	40	1	-	0.116	0.29	-	-
	50	3	-	0.38	0.76	-	-
$PM_{2.5}$	25	1	-	0.116	0.46	-	-
SO_2	266	4	7.2	45.8	**17.2**	52.96	19.91
	350	5	7.2	45.8	**13.09**	53.0	15.1
	125	6	7.2	45.8	**36.6**	52.96	42.37
HCl	750	7	-	13.8	1.84	-	-
HF	16	8	-	0.012	0.08	-	-
	160	7	-	0.917	0.57	-	-
CO	10000	9	-	7.0	0.07	-	-
	30000	10	-	11.3	0.04	-	-
TOC	2.25	1	0.07	0.116	**5.16**	0.187	8.32
	2.25	11	0.07	0.0518	**2.30**	0.123	5.47
PAH	0.00025	1	-	0.0000012	0.48	-	-
NH_3	180	1	-	0.116	0.06	-	-
	2500	10	-	2.26	0.09	-	-
PCBs	0.2	1	-	0.00000012	0.0001	-	-
	6	10	-	0.0000023	0.00	-	-
Dioxins			-	1.20E-09		-	

TOC as 1,3 butadiene
PAH as benzo[a]pyrene

1 Annual Mean
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
99.9th ile of 15-min
4 means
5 99.73rd %ile of 1-hour means
6 99.18th %ile of 24-hour means

7 1-hour average
8 Monthly average
9 Maximum daily running 8-hour mean
10 1-hour maximum
11 Maximum predicted concentration at human health receptor

Assessment of Emissions to Air - Metals

Pollutant	EQS / EAL		Back-ground	Process Contribution		Predicted Environmental Concentration	
	µg/m^3		µg/m^3	µg/m^3	% of EAL	µg/m^3	% of EAL
Cd	0.005	1	0.0003	0.00058	**11.6**	0.00088	17.6
	0.005	4	0.0003	0.00029	**5.8**	0.00059	11.8
Tl			-	0.00058		-	
Hg	0.25	1	-	0.00058	0.23	-	-
	7.5	2	-	0.011	0.15	-	-
Sb	5	1	-	0.0058	0.12	-	-
	150	2		0.113	0.08	-	-
Pb	0.25	1	-	0.0058	**2.32**	-	-
	0.25	5	-	0.00064	0.26	-	-
Co			-	0.0058		-	
Cu	10	1	-	0.0058	0.06	-	-
	200	2	-	0.113	0.06	-	-
Mn	0.15	1	-	0.0058	**3.87**	-	-
	0.15	5	-	0.00064	0.43	-	-
	1500	2	-	0.113	0.01	-	-
V	5	1	-	0.0058	0.12	-	-
	1	3	-	0.006	0.60	-	-
As	0.003	1	0.00081	0.0058	**193.33**	0.00661	**220.3**
	0.003	5	0.00081	0.00064	**21.33**	0.00145	48.3
Cr (II)(III)	5	1	-	0.0058	0.12	-	-
	150	2	-	0.113	0.08	-	-
Cr (VI)	0.0002	1	0.00025	0.0012	**600.00**	0.00145	**723.0**
	0.0002	6	0.00025	0.000132	**66.00**	0.00038	**191.0**
	0.0002	7	-	0.00000167	**0.84**	-	**-**
Ni	0.02	1	0.00140	0.0058	**29.00**	0.00720	36.0
	0.02	5	0.0014	0.0006	**3.20**	0.00204	10.2

1 Annual Mean
2 1-hr Maximum

3 24-hr Maximum
4 Based on 50% of ELV
5 Based on 11% of ELV
6 Based on 2.2% of ELV
Based on actual
7 emissions data

(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 EQS/EAL and <10% of the short term EAQ/EAL. These are:

- PM_{10}, $PM_{2.5}$, HCl, HF, CO, PAH, NH_3, PCBs, Hg, Sb, Cu, V and Cr (II)(III)

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.

(ii) Emissions unlikely to give rise to significant pollution

Also from the tables above the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% (taking expected modelling uncertainties into account) of both the long term and short term EQS/EAL

- NO_2, SO_2, TOC, Cd, Pb, Mn and Ni

For these emissions, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

(iii) Emissions requiring further assessment

Finally from the tables above the following emissions are considered to have the potential to give rise to pollution in that the Predicted Environmental Concentration exceeds 100% of the long term or short term EQS/EAL.

- As and Cr(VI)

For these emissions, the Applicant carried out additional assessment detailed in Section 5.2.3 below.

In any case, with respect to these pollutants, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances. This is reported in section 6 of this document.

We have also carefully considered whether additional measures are required above what would normally be considered BAT in order to prevent significant pollution. Consideration of additional measures to address the pollution risk from these substances is set out in section 5.2.3.

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

The impact on air quality from NO_2 emissions has been assessed against the EU EQS of 40 $\mu g/m^3$ as a long term annual average and a short term hourly average of 200 $\mu g/m^3$. The model assumes a 70% NO_x to NO_2 conversion for the long term and 35% for the short term assessment in line with Environment Agency guidance on the use of air dispersion modelling.

The above tables show that the peak long term PC is greater than 1% of the EU EQS and the peak short term PC is greater than 10% of the EU EQS and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the EU EQS being exceeded. The PC at the most impacted human health receptor is 1.83% of the EQS, significantly less than the point of maximum impact at 4.05% of the EQS.

(ii) Particulate matter PM_{10} and $PM_{2.5}$

The impact on air quality from particulate emissions has been assessed against the EQS for PM_{10} (particles of 10 microns and smaller) and $PM_{2.5}$ (particles of 2.5 microns and smaller). For PM_{10}, the EUEQS are a long term annual average of 40 $\mu g/m^3$ and a short term daily average of 50 $\mu g/m^3$. For $PM_{2.5}$ the EUEQS of 25 $\mu g/m^3$ as a long-term annual average to be achieved by 2010 as a Target Value and by 2015 as a Limit Value has been used.

The Applicant's predicted impact of the Installation against these EQSs is shown in the tables above. The assessment assumes that **all** particulate emissions are present as PM_{10} for the PM_{10} assessment and that **all** particulate emissions are present as $PM_{2.5}$ for the $PM_{2.5}$ assessment.

The above assessment is considered to represent a worst case assessment in that it assumes all particulates emitted are below either 10 microns (PM_{10}) or 2.5 microns ($PM_{2.5}$), when some are expected to be larger.

We have reviewed the Applicant's particulate matter impact assessment and are satisfied in the robustness of the Applicant's conclusions.

The above assessment shows that the predicted process contribution for emissions of PM_{10} is below 1% of the long term EQS and below 10% of the short term EQS and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of particulates to be BAT for the Installation.

The above assessment also shows that the predicted process contribution for emissions of $PM_{2.5}$ is also below 1% of the Environmental Quality Objective. Therefore the Environment Agency concludes that particulate emissions from the installation, including emissions of PM_{10} or $PM_{2.5}$, will not give rise to significant pollution.

There is currently no emission limit prescribed nor any continuous emissions monitor for particulate matter specifically in the PM_{10} or $PM_{2.5}$ fraction. Whilst the Environment Agency is confident that current monitoring techniques will capture the fine particle fraction ($PM_{2.5}$) for inclusion in the measurement of total particulate matter, an improvement condition has been included that will require a full analysis of particle size distribution in the flue gas, and hence determine the ratio of fine to coarse particles. In the light of current knowledge and available data however the Environment Agency is satisfied that the health of the public would not be put at risk by such emissions, as explained in section 5.3.3.

(iii) Acid gases, SO_2, HCl and HF

From the tables above, emissions of HCl and HF can be screened out as insignificant in that the process contribution is <10% of the short term EQS/EAL. There is no long term EQS/EAL for HCl. HF has 2 assessment criteria – a 1-hr EAL and a monthly EAL – the process contribution is <1% of the monthly EAL and so the emission screens out as insignificant if the monthly EAL is interpreted as representing a long term EAL.

There is no long term EAL for SO_2 for the protection of human health. Protection of ecological receptors from SO_2 for which there is a long term EAL is considered in section 5.4.

For emissions of SO_2 the peak short term PC is greater than 10% of the EU EQS and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the EU EQS being exceeded.

(iv) Emissions to Air of CO, VOCs, PAHs, PCBs, Dioxins and NH_3

The above tables show that for CO, PAH, PCBs and NH_3 the peak long term PC is less than 1% of the EAL/EQS and the peak short term PC is less than 10% of the EAL/EQS and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

For VOC emissions, the peak long term PC is greater than 1% of the EAL/EQS and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the EQS being exceeded.

The Applicant has used the EQS for 1,3 butadiene for their assessment of the impact of VOC. This is based on 1,3 butadiene having the lowest EQS of

organic species likely to be present in VOC (other than PAH, PCBs, dioxins and furans).

The PC at the most impacted human health receptor is 2.3% of the EQS, significantly less than the point of maximum impact at 5.16% of the EQS.

The above tables show that for PAH and PCB emissions, the peak long term PC is less than 1% of the EAL/EQS and the peak short term PC is less than 10% of the EAL/EQS for PCB's and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

The Applicant has also used the EQS for benzo[a]pyrene (BaP) for their assessment of the impact of PAH. We agree that the use of the BaP EQS is sufficiently precautionary.

There is no EAL 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 issue is considered in more detail in section 5.3

The ammonia emission is based on a release concentration of 10mg/m^3. We are satisfied that this level of emission is consistent with the operation of a well controlled SCR NO_x abatement system.

Whilst all emissions cannot be screened out as insignificant, the Applicant's modelling shows that the Installation is unlikely to result in a breach of the EAL. The Applicant is required to prevent, minimise and control VOC emissions using BAT, this is considered further in Section 6. We are satisfied that VOC emissions will not result in significant pollution.

(v) Summary

For the above emissions to air, for those emissions that do not screen out, we have carefully scrutinised the Applicant's proposals to ensure that they are applying the BAT to prevent and minimise emissions of these substances. This is reported in section 6 of this document. Therefore we consider the Applicant's proposals for preventing and minimising emissions to be BAT for the Installation. Dioxins and furans are considered further in section 5.3.2.

5.2.3 Assessment of Emission of Metals

The Applicant has assessed the impact of metal emissions to air, as previously described.

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 antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium 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.

In section 5.2.1 above, the following emissions of metals were screened out as insignificant:

- Hg, Sb, Cu, V and Cr(II)(III)

Also in section 5.2.1, the following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution:

- Cd, Pb, Mn and Ni

This left emissions of As and Cr(VI) requiring further assessment. For all other metals, the Applicant has concluded that exceedences of the EAL for all metals are not likely to occur.

Where Annex VI of the IED sets an aggregate limit, the Applicant's assessment assumes that each metal is emitted individually at the relevant aggregate emission limit value. This is a something which can never actually occur in practice as it would inevitably result in a breach of the said limit, and so represents a very much worst case scenario.

For metals Cd, Pb, Mn, Ni, As and Cr(VI) the Applicant then used a two step approach:

- Each metal is emitted as the proportion of metals in its group (i.e. one ninth of the limit for each of the group 3 metals, one half for group 2 metals). Historical data for Municipal Waste Incinerators indicates that 1/9th of the limit is an over estimate of actual emissions, and so we are satisfied that the Applicant's proposal is reasonable in this context.

Then for metals that had not screened out;

- Used representative emissions data from other municipal waste incinerators using our guidance note Please refer to "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – V.3 September 2012".

Based on the above, the following emissions of metals were screened out as insignificant:

- Pb and Mn

The following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution:

- Cd, As and Ni

This left emissions of Cr(VI) requiring further assessment. For all other metals, the Applicant has concluded that exceedences of the EAL are not likely to occur.

The 2009 report of the Expert Panel on Air Quality Standards (EPAQS) – "Guidelines for Metal and Metalloids in Ambient Air for the Protection of Human Health", sets non statutory ambient air quality guidelines for Arsenic, Nickel and Chromium (VI). These guidelines have been incorporated as EALs in the revised H1 Guidance issued by the Agency in 2010.

Chromium (VI) is not specifically referenced in Annex VI of IED, which includes only total Chromium as one of the nine Group 3 metals, the impact of which has been assessed above. The EPAQS guidelines refer only to that portion of the metal emissions contained within PM_{10} in ambient air. The guideline for Chromium (VI) is 0.2 ng/m^3.

- Measurement of Chromium (VI) at the levels anticipated at the stack emission points is expected to be difficult, with the likely levels being below the level of detection by the most advanced methods. We have considered the concentration of total chromium and chromium (VI) in the APC residues collected upstream of the emission point for existing Municipal Waste incinerators and have assumed these to be similar to the particulate matter released from the emission point. This data shows that the mean Cr(VI) emission concentration (based on the bag dust ratio) is $3.5 * 10^{-5}$ mg/m^3 (max $1.3 * 10^{-4}$).

There is little data available on the background levels of Cr(VI). Taking a precautionary approach, we have assumed that the background level already exceeds the EAL.

The Applicant has used an analogous approach to that detailed above, except that it is based on using actual emissions data for operational pyrolysis plants processing municipal solid waste (MSW), rather than actual data from municipal waste incineration plant. They considered this to be a valid approach given that RDF is derived from MSW. Table B1.29 of DEFRA report WR0608 'Emissions from Waste Management Facilities' (July 2011) indicates

that the mean total metals emissions from the operational pyrolysis plants equates to 0.0063mg/m^3. Assuming that Cr(VI) represents 2.2% of this concentration, this equates to 0.000139mg/m^3, which equates to 0.0278% of the group 3 metals ELV. This equates to a PC of 0.00000167µg/m^3. The PC is predicted as 0.84% of the EAL.

This assessment shows that emissions of Cr(VI) screen out as insignificant. We agree with the Applicant's conclusions. The Installation has been assessed as meeting BAT for control of metal emissions to air. See section 6 of this document.

5.2.4 Consideration of Local Factors

(i) Cumulative Impacts – Additional Sources Considered

There are a number of existing and proposed developments in and around the location of the facility. These developments are not yet operational so their potential impact on local air quality has not been assessed as part of the background.

The Applicant carried out a cumulative impact assessment to better define baseline conditions for the location assuming that these plant are operational. The assessment was undertaken using the relevant parameters from air dispersion modelling reports prepared for these developments. The following developments are considered:

- Ridham CHP, approximately 1.5Km north.
- Countrystyle Heat and Power, approximately 1Km north.
- Sustainable Energy plant at Kemsley Paper Mill, approximately 900m south east.
- Biomass boiler at Land at G-Park, approximately 250m north

We have included the impact assessments for those parameters which are not screened out as being insignificant in Section 5.2.1 above. The assessments are based on the point of maximum impact for human health.

The cumulative assessment for habitats is also based on the point of maximum impact and is included in Section 5.4 below.

Human Health – Cumulative Assessment

Assessment of Emissions to Air - Cumulative

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC) (all sources)		Predicted Environmental Concentration (PEC)	
	µg/m3		µg/m^3	µg/m3	% of EAL	µg/m^3	% of EAL
NO_2	40	1	31.3	6.7	16.8	38.0	95.0
	200	2	62.6	28.4	14.2	91.0	45.5
TOC	2.25	1	0.0713	0.197	8.8	0.3	11.9
As	0.003	1 & 4	0.00081	0.00102	34.0	0.0018	61.0
Cd	0.005	1 & 3	0.0003	0.000493	9.9	0.0008	15.9
Cr(VI)	0.0002	1 & 5	-	0.000001 92	0.96	-	-
Pb	0.25	1 & 4	-	0.00102	0.4	-	-
Mn	0.15	1 & 4	-	0.00102	0.7	-	-
Ni	0.02	1 & 4	0.0014	0.00102	5.1	0.0024	12.10

TOC as 1,3 butadiene

1 Annual Mean
99.79th %ile of 1-hour
2 means
3 Based on 50% of ELV
4 Based on 11% of ELV
Based on actual emissions
5 data

(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 EQS/EAL. These are:

- Cr(VI), Pb and Mn

(ii) Emissions unlikely to give rise to significant pollution

Also from the tables above the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% (taking expected modelling uncertainties into account) of the long term or short term EQS/EAL

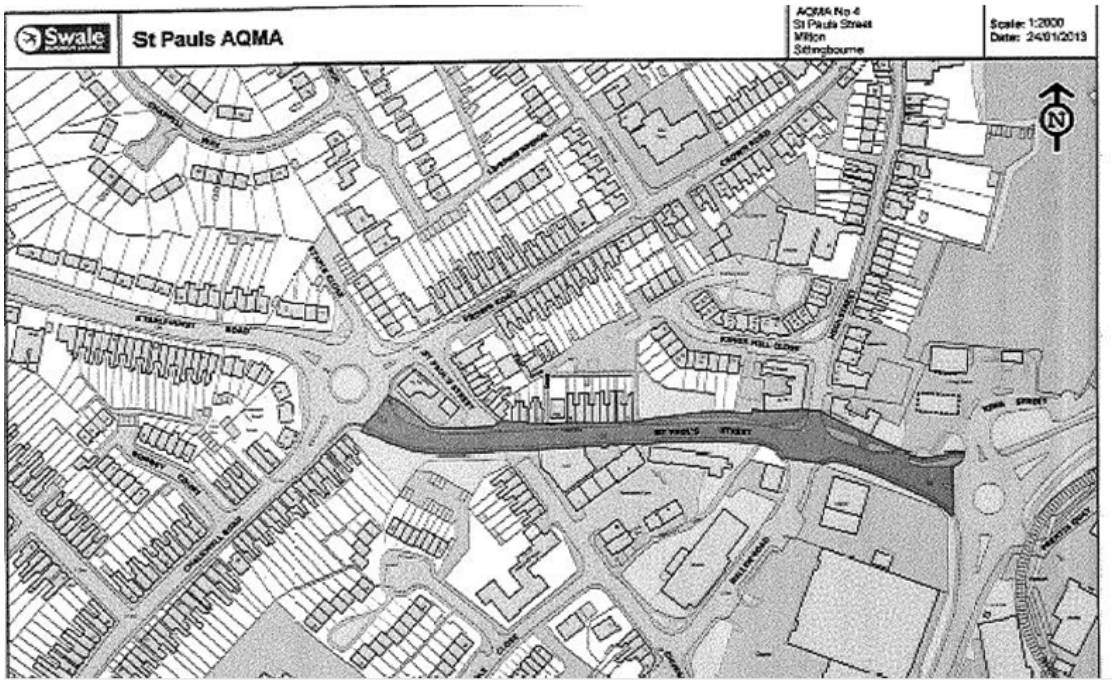
- NO_2, TOC, As, Cd and Ni

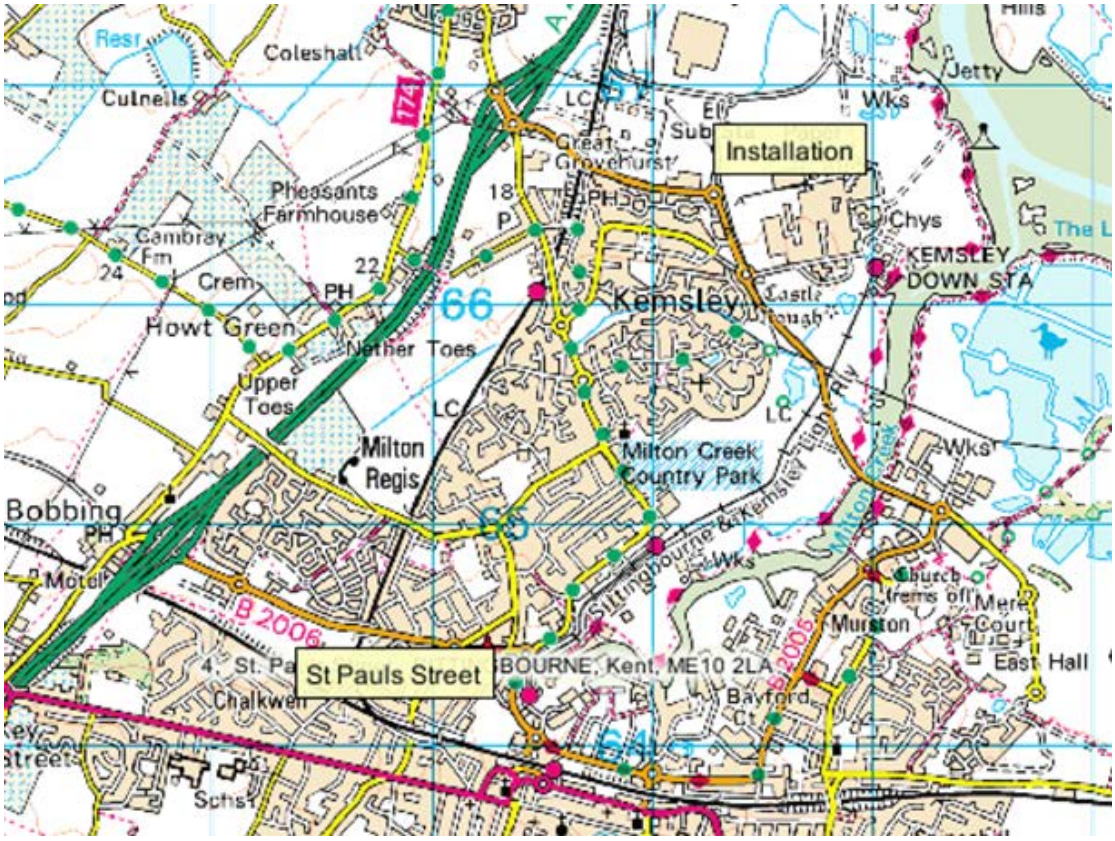
For NO_2, the maximum impact at a human health receptor on Samuel Drive is predicted to be 5.82% of the long term EQS, significantly below the point of maximum impact. Taking account of the background concentration of 17.22µg/m^3 at this location the PEC is 49% of the long term EQS.

(ii) <u>Impact on Air Quality Management Areas (AQMAs)</u>

Swale Borough Council has declared four AQMAs with respect to annual mean concentration of nitrogen dioxide (NO_2), with two of these being within close proximity to the Installation at Sittingbourne. The AQMAs are at East Street and St. Pauls Street, with St Pauls being the closest (approximately 2.6 Km south-west of the site).

The Applicant predicts the maximum impact at the St. Pauls Street AQMA:





From the Applicants model, the process contribution in the AQMA is predicted to be well below 1% of the EU EQS at 0.16% and can be considered insignificant.

The impact at the East Street AQMA is also predicted to be well below 1% of the EU EQS at 0.12%. This assessment was provided in the response to our further information notice dated 9 July 2015.

Therefore even though the background may already be above the EU EQS, the contribution from the Installation is negligible.

The Applicant is required to prevent, minimise and control emissions using the best available techniques; this is considered further in Section 6.

5.3 Human health risk assessment

5.3.1 Our role in preventing harm to human health

The Environment Agency has a statutory role to protect the environment and human health from all processes and activities it regulates. We assessed the effects on human health for this application in the following ways:

i) Applying Statutory Controls

The plant will be regulated under EPR. These regulations include the requirements of relevant EU Directives, notably, the industrial emissions directive (IED), the waste framework directive (WFD), and ambient air directive (AAD).

The main conditions in an EfW permit are based on the requirements of the IED. Specific conditions have been introduced to specifically ensure compliance with the requirements of Chapter IV. The aim of the IED is to prevent or, where that is not practicable, to reduce emissions to air, water and land and prevent the generation of waste, in order to achieve a high level of protection of the environment taken as a whole. IED achieves this aim by setting operational conditions, technical requirements and emission limit values to meet the requirements set out in Articles 11 and 18 of the IED. These requirements include the application of BAT, which may in some circumstances dictate tighter emission limits and controls than those set out in Chapter IV of IED on waste incineration and co-incineration plants. The assessment of BAT for this installation is detailed in section 6 of this document.

ii) Environmental Impact Assessment

Industrial activities can give rise to odour, noise and vibration, accidents, fugitive emissions to air and water, releases to air (including the impact on Photochemical Ozone Creation Potential (POCP)), discharges to ground or groundwater, global warming potential and generation of waste. For an installation of this kind, the principal environmental effects are through emissions to air, although we also consider all of the other impacts listed. Section 5.1 and 5.2 above explain how we have approached the critical issue of assessing the likely impact of the emissions to air from the Installation on human health and the environment and any measures we are requiring to ensure a high level of protection.

iii) Expert Scientific Opinion

We take account of the views of national and international expert bodies. The gathering of evidence is a continuing process. Although gathering evidence is not our role we keep the available evidence under review. The following is a summary of some of the publications which we have considered (in no particular order).

An independent review of evidence on the health effects of municipal waste incinerators was published by **DEFRA** in 2004. It concluded that there was no convincing link between the emissions from MSW incinerators and adverse effects on public health in terms of cancer, respiratory disease or birth defects. On air quality effects, the report concluded "Waste incinerators contribute to local air pollution. This contribution, however, is usually a small proportion of existing background levels which is not detectable through environmental monitoring (for example, by comparing upwind and downwind levels of airborne pollutants or substances deposited to land). In some cases, waste incinerator facilities may make a more detectable contribution to air pollution. Because current MSW incinerators are located predominantly in urban areas, effects on air quality are likely to be so small as to be undetectable in practice."

The European Integrated Pollution Prevention and Control Bureau stated in the Reference Document on the Best Available Techniques for Waste Incineration August 2006 "European health impact assessment studies, on the basis of current evidence and modern emission performance, suggest that the local impacts of incinerator emissions to air are either negligible or not detectable."

HPA (now PHE) in 2009 states that "The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable". In January 2012 PHE confirmed they would be undertaking a study to look for evidence of any link between municipal waste incinerators and health outcomes including low birth weight, still births and infant deaths. Their current position that modern, well run municipal waste incinerators are not a significant risk to public health remains valid. The study will extend the evidence base and provide the public with further information

Policy Advice from Government also points out that the minimal risk from modern incinerators. Paragraph 22 (Chapter 5) of WS2007 says that "research carried out to date has revealed no credible evidence of adverse health outcomes for those living near incinerators." It points out that "the relevant health effects, mainly cancers, have long incubation times. But the research that is available shows an absence of symptoms relating to exposures twenty or more years ago when emissions from incinerators were much greater than is now the case." **Paragraph 30 of PPS10** explains that "modern, appropriately located, well run and well regulated waste management facilities should pose little risk to public health."

The **Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (CoC) issued** a statement in 2000 which said that "any potential risk of cancer due to residency (for periods in excess of 10 years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern epidemiological

techniques." In 2009, CoC considered six further relevant epidemiological papers that had been published since the 2000 statement, and concluded that "there is no need to change the advice given in the previous statement in 2000 but that the situation should be kept under review".

Republic of Ireland Health Research Board report stated that "It is hard to separate the influences of other sources of pollutants, and other causes of cancer and, as a result, the evidence for a link between cancer and proximity to an incinerator is not conclusive".

The **Food Safety Authority of Ireland (FSAI) (2003)** investigated possible implications on health associated with food contamination from waste incineration and concluded: "In relation to the possible impact of introduction of waste incineration in Ireland, as part of a national waste management strategy, on this currently largely satisfactory situation, the FSAI considers that such incineration facilities, if properly managed, will not contribute to dioxin levels in the food supply to any significant extent. The risks to health and sustainable development presented by the continued dependency on landfill as a method of waste disposal far outweigh any possible effects on food safety and quality."

Health Protection Scotland (2009) considered scientific studies on health effects associated with the incineration of waste particularly those published after the Defra review discussed earlier. The main conclusions of this report were: "(a) For waste incineration as a whole topic, the body of evidence for an association with (non-occupational) adverse health effects is both inconsistent and inconclusive. However, more recent work suggests, more strongly, that there may have been an association between emissions (particularly dioxins) in the past from industrial, clinical and municipal waste incinerators and some forms of cancer, before more stringent regulatory requirements were implemented. (b) For individual waste streams, the evidence for an association with (non-occupational) adverse health effects is inconclusive. (c) The magnitude of any past health effects on residential populations living near incinerators that did occur is likely to have been small. (d) Levels of airborne emissions from individual incinerators should be lower now than in the past, due to stricter legislative controls and improved technology. Hence, any risk to the health of a local population living near an incinerator, associated with its emissions, should also now be lower."

The **US National Research Council Committee on Health Effects of Waste Incineration (NRC) (NRC 2000)** reviewed evidence as part of a wide ranging report. The Committee view of the published evidence was summarised in a key conclusion: "Few epidemiological studies have attempted to assess whether adverse health effects have actually occurred near individual incinerators, and most of them have been unable to detect any effects. The studies of which the committee is aware that did report finding health effects had shortcomings and failed to provide convincing evidence. That result is not surprising given the small populations typically available for study and the fact that such effects, if any, might occur only infrequently or take many years to appear. Also, factors such as emissions from other

pollution sources and variations in human activity patterns often decrease the likelihood of determining a relationship between small contributions of pollutants from incinerators and observed health effects. Lack of evidence of such relationships might mean that adverse health effects did not occur, but it could mean that such relationships might not be detectable using available methods and sources."

The **British Society for Ecological Medicine (BSEM) published a report in 2005** on the health effects associated with incineration and concluded that "Large studies have shown higher rates of adult and childhood cancer and also birth defects around municipal waste incinerators: the results are consistent with the associations being causal. A number of smaller epidemiological studies support this interpretation and suggest that the range of illnesses produced by incinerators may be much wider. Incinerator emissions are a major source of fine particulates, of toxic metals and of more than 200 organic chemicals, including known carcinogens, mutagens, and hormone disrupters. Emissions also contain other unidentified compounds whose potential for harm is as yet unknown, as was once the case with dioxins. Abatement equipment in modern incinerators merely transfers the toxic load, notably that of dioxins and heavy metals, from airborne emissions to the fly ash. This fly ash is light, readily windborne and mostly of low particle size. It represents a considerable and poorly understood health hazard."

The BSEM report was reviewed by the HPA and they concluded that "Having considered the BSEM report the HPA maintains its position that contemporary and effectively managed and regulated waste incineration processes contribute little to the concentrations of monitored pollutants in ambient air and that the emissions from such plants have little effect on health." The BSEM report was also commented on by the consultants who produced the Defra 2004 report referred to above. They said that "It fails to consider the significance of incineration as a source of the substances of concern. It does not consider the possible significance of the dose of pollutants that could result from incinerators. It does not fairly consider the adverse effects that could be associated with alternatives to incineration. It relies on inaccurate and outdated material. In view of these shortcomings, the report's conclusions with regard to the health effects of incineration are not reliable."

A **Greenpeace** review on incineration and human health concluded that a broad range of health effects have been associated with living near to incinerators as well as with working at these installations. Such effects include cancer (among both children and adults), adverse impacts on the respiratory system, heart disease, immune system effects, increased allergies and congenital abnormalities. Some studies, particularly those on cancer, relate to old rather than modern incinerators. However, modern incinerators operating in the last few years have also been associated with adverse health effects."

The Health Protection Scotland report referred to above says that "the authors of the Greenpeace review do not explain the basis for their conclusion that there is an association between incineration and adverse effects in terms of criteria used to assess the strength of evidence. The weighting factors used

to derive the assessment are not detailed. The objectivity of the conclusion cannot therefore be easily tested."

From this published body of scientific opinion, we take the view stated by the HPA that "While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable". We therefore ensure that permits contain conditions which require the installation to be well-run and regulate the installation to ensure compliance with such permit conditions.

iv) Health Risk Models

Comparing the results of air dispersion modelling as part of the H1 Environmental Impact assessment against European and national air quality standards effectively makes a health risk assessment for those pollutants for which a standard has been derived. These air quality standards have been developed primarily in order to protect human health via known intake mechanisms, such as inhalation and ingestion. Some pollutants, such as dioxins, furans and dioxin like PCBs, have human health impacts at lower ingestion levels than lend themselves to setting an air quality standard to control against. For these pollutants, a different human health risk model is required which better reflects the level of dioxin intake.

Models are available to predict the dioxin, furan and dioxin like PCB's intake for comparison with the Tolerable Daily Intake (TDI) recommended by the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment, known as COT. These include HHRAP and the HMIP model.

HHRAP has been developed by the US EPA to calculate the human body intake of a range of carcinogenic pollutants and to determine the mathematic quantitative risk in probabilistic terms. In the UK, in common with other European Countries, we consider a threshold dose below which the likelihood of an adverse effect is regarded as being very low or effectively zero. The HMIP model uses a similar approach to the HHRAP model, but does not attempt to predict probabilistic risk and does not include biotransfer factors specific to PCBs. As such only the HHRAP model can fully make comparisons with the TDI.

The TDI is the amount of a substance that can be ingested daily over a lifetime without appreciable health risk. It is expressed in relation to bodyweight in order to allow for different body size, such as for children of different ages. In the UK, the COT has set a TDI for dioxins, furans and dioxin like PCB's of 2 picograms I-TEQ/Kg-body weight/day (N.B. a picogram is a million millionths (10^{-12}) of a gram).

In addition to an assessment of risk from dioxins, furans and dioxin like PCB's, the HHRAP model enables a risk assessment from human intake of a range of heavy metals. The HMIP report does not consider metals. In

principle, the respective EQS for these metals are protective of human health. It is not therefore necessary to model the human body intake.

COMEAP developed a methodology based on the results of time series epidemiological studies which allows calculation of the public health impact of exposure to the classical air pollutants (NO_2, SO_2 and particulates) in terms of the numbers of "deaths brought forward" and the "number of hospital admissions for respiratory disease brought forward or additional". COMEAP has issued a statement expressing some reservations about the applicability of applying its methodology to small affected areas. Those concerns generally relate to the fact that the exposure-response coefficients used in the COMEAP report derive from studies of whole urban populations where the air pollution climate may differ from that around a new industrial installation. COMEAP identified a number of factors and assumptions that would contribute to the uncertainty of the estimates. These were summarised in the Defra review as below:

- Assumption that the spatial distribution of the air pollutants considered is the same in the area under study as in those areas, usually cities or large towns, in which the studies which generated the coefficients were undertaken.
- Assumption that the temporal pattern of pollutant concentrations in the area under study is similar to that in the areas in which the studies which generated the coefficients were undertaken (i.e. urban areas).
- It should be recognised that a difference in the pattern of socio-economic conditions between the areas to be studied and the reference areas could lead to inaccuracy in the predicted level of effects.
- In the same way, a difference in the pattern of personal exposures between the areas to be studied and the reference areas will affect the accuracy of the predictions of effects.

The use of the COMEAP methodology is not generally recommended for modelling the human health impacts of individual installations. However it may have limited applicability where emissions of NO_x, SO_2 and particulates cannot be screened out as insignificant in an H1 Environmental Impact assessment, there are high ambient background levels of these pollutants and we are advised that its use was appropriate by our public health consultees.

Our recommended approach is therefore the use of the H1 assessment methodology comparison for most pollutants (including metals) and dioxin intake model using the HHRAP model as described above for dioxins, furans and dioxin like PCBs. Where an alternative approach is adopted for dioxins, we check the predictions ourselves.

v) Consultations

As part of our normal procedures for the determination of a permit application, we consult with Local Authorities, Local Authority Directors of Public Health, FSA and PHE. We also consult the local communities who may raise health related issues. All issues raised by these consultations are considered in determining the application as described in Annex 4 of this document.

5.3.2 Assessment of Intake of Dioxins, Furans and Dioxin like PCBs

For dioxins, furans and dioxin like PCBs, the principal exposure route is through ingestion, usually through the food chain, and the main risk to health is through accumulation in the body over a period of time.

The human health risk assessment calculates the dose of dioxins and furans that would be received by local receptors if their food and water were sourced from the locality where the deposition of dioxins, furans and dioxin like PCBs is predicted to be the highest. This is then assessed against the Tolerable Daily Intake (TDI) levels established by the COT of 2 picograms I-TEQ / Kg bodyweight/ day.

The results of the Applicant's assessment of dioxin intake are detailed in the table below. (worst – case results for each category are shown). The results showed that the predicted daily intake of dioxins, furans and dioxin like PCBs at all receptors, resulting from emissions from the proposed facility, were significantly below the recommended TDI levels.

Receptor	adult	child
High Point 2	0.0279	0.0424
Westlands School, Sittingbourne	0.000003	0.00004

Calculated maximum daily intake of dioxins by local receptors resulting from the operation of the proposed facility (I-TEQ/ kg-BW/day)

The total predicted daily intake of dioxins and furans and dioxin like PCBs ranges from a maximum of 0.0424pg/kg (body weight/day) for the resident child scenario at High Point 2 to 0.000003pg/kg (body weight/day) for the resident adult at the Westlands School.

The FSA has reported that dietary studies have shown that estimated total dietary intakes of dioxins and dioxin-like PCBs from all sources by all age groups fell by around 50% between 1997 and 2001and are expected to continue to fall. A report in 2012 showed that Dioxin and PCB levels in food have fallen slightly since 2001. In 2001, the average daily intake by adults in the UK from diet was 0.9 pg WHO-TEQ/kg bodyweight. The additional daily intake predicted by the modelling as shown in the table above is substantially below this figure.

In 2010, FSA studied the levels of chlorinated, brominated and mixed (chlorinated-brominated) dioxins and dioxin-like PCBs in fish, shellfish, meat and eggs consumed in UK. It asked COT to consider the results and to

advise on whether the measured levels of these PXDDs, PXDFs and PXBs indicated a health concern ('X' means a halogen). COT issued a statement in December 2010 and concluded that " The major contribution to the total dioxin toxic activity in the foods measured came from chlorinated compounds. Brominated compounds made a much smaller contribution, and mixed halogenated compounds contributed even less (1% or less of TDI). Measured levels of PXDDs, PXDFs and dioxin-like PXBs do not indicate a health concern". COT recognised the lack of quantified TEFs for these compounds but said that "even if the TEFs for PXDDs, PXDFs and dioxin-like PXBs were up to four fold higher than assumed, their contribution to the total TEQ in the diet would still be small. Thus, further research on PXDDs, PXDFs and dioxin-like PXBs is not considered a priority."

In the light of this statement, we assess the impact of chlorinated compounds as representing the impact of all chlorinated, brominated and mixed dioxins / furans and dioxin like PCBs.

5.3.3 Particulates smaller than 2.5 microns

The Operator will be required to monitor particulate emissions using the method set out in Table S3.1 of Schedule 3 of 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 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 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. The HPA notes 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 $\mu g/m^3$ 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."

The HPA (now 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. The HPA 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.

5.3.4 Assessment of Health Effects from the Installation

We have assessed the health effects from the operation of this installation in relation to the above (sections 5.3.1 to 5.3.3). We have applied the relevant requirements of the national and European legislation in imposing the permit conditions. We are satisfied that compliance with these conditions will ensure protection of the environment and human health.

Taking into account all of the expert opinion available, we agree with the conclusion reached by the HPA (now PHE) that "While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable."

In carrying out air dispersion modelling as part of the H1 Environmental Impact assessment and comparing the predicted environmental concentrations with European and national air quality standards, the Applicant has effectively made a health risk assessment for many pollutants. These air quality standards have been developed primarily in order to protect human health.

The Applicant's assessment of the impact from PM_{10}, $PM_{2.5}$, HCl, HF, CO, PAH, NH_3, PCBs, Hg, Sb, Cu, V and Cr(II)(III) have all indicated that the Installation emissions screen out as insignificant; where the impact of emissions of NO_2, SO_2, TOC, Cd, Pb, Mn, Ni, As and Cr have not been screened out as insignificant, the assessment still shows that the predicted environmental concentrations are well within air quality standards or environmental action levels (for As emissions based on 11% ELV with actual emissions data used for Cr(VI)).

The Environment Agency has reviewed the methodology employed by the Applicant to carry out the health impact assessment. Our findings indicated that the Applicant's conclusions can be used for permit determination.

Overall, taking into account the conservative nature of the impact assessment (i.e. that it is based upon an individual exposed for a life-time to the effects of the highest predicted relevant airborne concentrations and consuming mostly locally grown food), it was concluded that the operation of the proposed facility will not pose a significant carcinogenic or non-carcinogenic risk to human health.

Public Health England (PHE) and the Local Authority Director of Public Health were consulted on the Application. We received a response from PHE who concluded that they had no significant concerns regarding the risk to the health of humans from the Installation. The Food Standards Agency was also consulted during the permit determination process; however we did not receive any consultation comments. Details of the response provided by PHE to the consultation on this Application can be found in Annex 4.

The Environment Agency is therefore satisfied that the Applicant's conclusions presented above are soundly based and we conclude that the potential emissions of pollutants including dioxins, furans and metals from the proposed facility are unlikely to have an impact upon human health.

5.4 Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.

5.4.1 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:

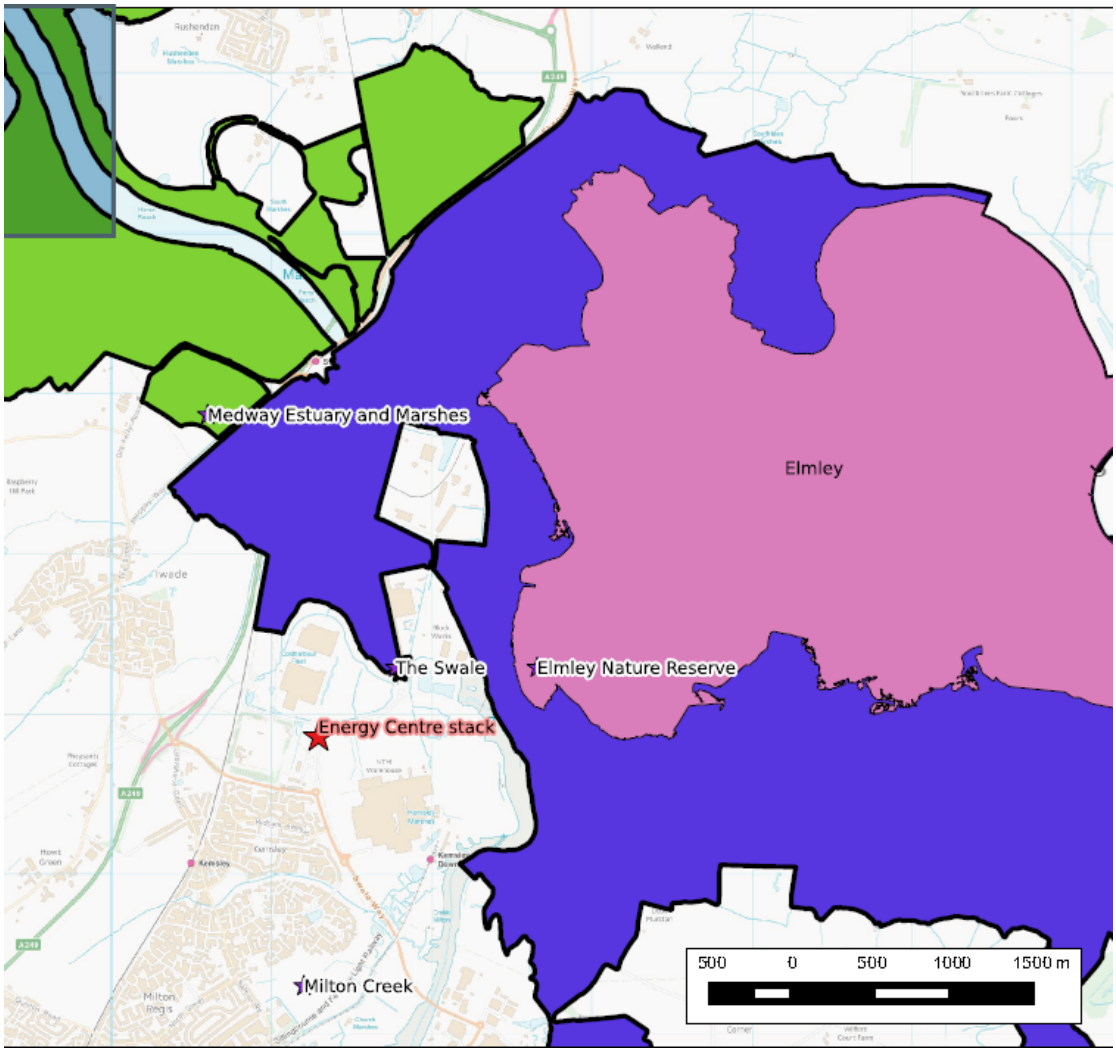
- Medway Estuary & Marshes (SPA, Ramsar)
- Thames Estuary & Marshes (SPA, Ramsar)
- The Swale (SPA, Ramsar)
- Queendown Warren (SAC)

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

- The Swale
- Medway Estuary & Marshes

The following non-statutory local wildlife and conservation sites are located within 2Km of the Installation:

- Elmley (National Nature Reserve)
- Milton Creek, Sittingbourne (Local Wildlife Site)



Legend

SPA boundary

Medway Estuary & Marshes

The Swale

National Nature Reserve (NNR)

AQA points

Energy centre

5.4.2 Habitats Assessment

The Applicant's Habitats assessment was 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, with the exception of N deposition at Medway Estuary & Marshes and The Swale which is assessed in more detail, see below.

Medway Estuary & Marshes

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)	PC as % critical level/load	Predicted Environmental Concentration (PEC)	PEC as % critical level/load
Direct Impacts[2]						
NO_x Annual	30	-	0.11	0.37	-	-
NO_x Daily Mean	75	-	1.76	2.35	-	-
SO_2	20 (1)	-	0.026	0.13	-	-
Ammonia	3 (1)	-	0.0053	0.18	-	-
HF Weekly Mean	0.5	-	0.0028	0.56	-	-
HF Daily Mean	5	-	0.009	0.18	-	-
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	10 to 30	12.18	0.19	**1.90**	12.37	**123.70[3]**
N Deposition (kg N/ha/yr)	20 [3]	-	0.19	0.95	-	-
Acidification Deposition (Keq/ha/yr)	8.798 to 8.99	-	0.0122	0.14	-	-
(1) The higher sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as lichen communities & bryophytes and ecosystems are not an important part of the ecosystem's integrity.						
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.						
(3) Scope of assessment extended to include site qualifying features and to refine it to focus on the most appropriate air quality standards (Ref 15-026, dated 28/04/2015).						

The impacts are screened out as being insignificant with the exception of N deposition using the lower critical load.

Further assessment was undertaken to include site qualifying features and to refine it to focus on the most appropriate air quality standards (Ref 15-026, dated 28/04/2015). On this basis the impact from N deposition is screened out as being insignificant.

We can conclude that the proposed permission is not likely to have a significant effect on the habitats site and Natural England agreed with our conclusions.

We have however set an improvement condition requiring an assessment based on actual emissions from the Installation with any exceedances requiring further investigative work to be undertaken.

Thames Estuary & Marshes

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)	PC as % of critical level/load	Predicted Environmental Concentration (PEC)	PEC as % critical level/load
Direct Impacts[2]						
NO_x Annual	30	-	0.02	0.07	-	-
NO_x Daily Mean	75	-	0.76	1.01	-	-
SO2	20 (1)	-	0.0052	0.03	-	-
Ammonia	3 (1)	-	0.0010	0.03	-	-
HF Weekly Mean	0.5	-	0.0005	0.10	-	-
HF Daily Mean	5	-	0.004	0.08	-	-
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	10 to 30	-	0.03	0.30	-	-
Acidification Deposition (Keq/ha/yr)	8.99	-	0.0015	0.02	-	-
(1) The higher sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as lichen communities & bryophytes and ecosystems are not an important part of the ecosystem's integrity.						
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.						

The impacts are screened out as being insignificant.

We can conclude that the proposed permission is not likely to have a significant effect on the habitats site and Natural England agreed with our conclusions.

The Swale

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)	PC as % of critical level/load	Predicted Environmental Concentration (PEC)	PEC as % critical level/load
Direct Impacts[2]						
NO_x Annual	30	16.89	1.33	**4.43**	18.22	60.73
NO_x Daily Mean	75	19.93	7.64	**10.19**	27.57	36.76
SO2	20 (1)	3.13	0.33	**1.65**	3.46	17.30
Ammonia	3 (1)	0.81	0.066	**2.20**	0.876	29.2
HF Weekly Mean	0.5	-	0.0194	3.88	-	-
HF Daily Mean	5	-	0.38	0.76	-	-
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	15 to 30	20.16	1.87	**12.46**	22.03	**146.86**[3]
N Deposition (kg N/ha/yr)	20[3]	14.42	1.87	**9.35**	16.29	**81.45**
Acidification Deposition (Keq/ha/yr)	8.818 to 9.071	1.44	0.166	**1.88**	1.606	18.21
(1) The higher sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as lichen communities & bryophytes and ecosystems are not an important part of the ecosystem's integrity.						
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.						
(3) Scope of assessment extended to include site qualifying features and to refine it to focus on the most appropriate air quality standards (Ref 15-026, dated 28/04/2015).						

Taking account of background concentrations the critical levels and critical loads are unlikely to be exceeded with the exception of N deposition.

Regarding N deposition, the Applicant's Ecological assessment report states that the greatest potential for a significant impact on the Swale is on coastal grazing marsh. The impacts are based on a number of conservative assumptions as follows:

- modelling based on full capacity operation (24-hour, 365 days) at IED limits;
- ammonia component of N deposition is the largest contributor with the modelled values based on worst case slippage;
- the lower critical load has been used; the upper critical load of 30 is not predicted to exceed the critical load;
- the lower critical load is more likely to be appropriate in neutral grassland habitats where nutrient supply is relatively low. It is expected

that the grazing marsh at the Swale will be relatively nutrient rich and consequently less sensitive;
- management of the coastal grazing marsh is good leading to an assessment of favourable condition.

Based on these conservative assumptions, we can conclude that the proposed permission is not likely to have a significant effect on the habitats site and Natural England agreed with our conclusions.

We have however set an improvement condition requiring an assessment based on actual emissions from the Installation with any exceedances requiring further investigative work to be undertaken.

Queendown Warren

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)	PC as % of critical level/load	Predicted Environmental Concentration (PEC)	PEC as % critical level/load
Direct Impacts[2]						
NO_x Annual	30	-	0.02	0.07	-	-
NO_x Daily Mean	75	-	0.41	0.55	-	-
SO2	20 (1)	-	0.0048	0.02	-	-
Ammonia	3 (1)	-	0.0010	0.03	-	-
HF Weekly Mean	0.5	-	0.0005	0.10	-	-
HF Daily Mean	5	-	0.002	0.04	-	-
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	10 to 25	-	0.03	0.30	-	-
Acidification Deposition (Keq/ha/yr)	8.856 to 22.184	-	0.0016	0.02	-	-
(1) The higher sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as lichen communities & bryophytes and ecosystems are not an important part of the ecosystem's integrity.						
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.						

The impacts are screened out as being insignificant.

We can conclude that the proposed permission is not likely to have a significant effect on the habitats site and Natural England agreed with our conclusions.

5.4.3 SSSI Assessment

The Applicant's assessment of SSSIs was 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 the proposal does not damage the special features of the SSSIs.

Refer to Section 5.4.2 above for The Swale and Medway Estuary & Marshes SSSI assessments.

5.4.4 Assessment of other conservation sites

The Applicant's assessment was 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 conservation sites.

Elmley

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)	PC as % of critical level/load
Direct Impacts[2]				
NO_x Annual	30	16.89	0.48	1.60
NO_x Daily Mean	75	19.93	4.14	5.52
SO_2	20 (1)	-	0.12	0.60
Ammonia	3 (1)	-	0.024	0.80
HF Weekly Mean	0.5	-	0.0074	1.48
HF Daily Mean	5	-	0.021	0.42
Deposition Impacts[2]				
N Deposition (kg N/ha/yr)	15 to 30	14.42	0.98	6.53
Acidification Deposition (Keq/ha/yr)	4	1.14	0.0577	1.44
(1) The higher sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as lichen communities & bryophytes and ecosystems are not an important part of the ecosystem's integrity.				
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.				

Milton Creek, Sittingbourne

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)	PC as % of critical level/load
Direct Impacts[2]				
NO_x Annual	30	-	0.21	0.70
NO_x Daily Mean	75	-	2.35	3.13
SO2	20 (1)	-	0.051	0.26
Ammonia	3 (1)	-	0.010	0.33
HF Weekly Mean	0.5	-	0.0044	0.88
HF Daily Mean	5	-	0.012	0.24
Deposition Impacts[2]				
N Deposition (kg N/ha/yr)	20 to 30	14.42	0.27	1.35
Acidification Deposition (Keq/ha/yr)	4	-	0.0227	0.57
(1) The higher sensitivity standards for ammonia and sulphur dioxide have been assigned for this assessment as lichen communities & bryophytes and ecosystems are not an important part of the ecosystem's integrity.				
(2) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.				

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.

The tables above show that the PCs are below the critical levels or loads. We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.

Habitats – Cumulative Impacts – Additional Sources Considered

There are a number of existing and proposed developments in and around the location of the facility. These developments are not yet operational so their potential impact on local air quality has not been assessed as part of the background. We have detailed these developments in Section 5.2.4 above.

We have included the impact assessments for those parameters which are not screened out as being insignificant in Sections 5.4.2 and 5.4.4 above. The assessments are based on the point of maximum impact.

Medway Estuary & Marshes

Pollutant	Critical load	Back-ground	Process Contribution (PC)-ALL Sources	PC as % of critical load	Predicted Environmental Concentration (PEC)	PEC as % critical load
Deposition Impacts						
N Deposition (kg N/ha/yr)	20[1]	14.42	0.89	**4.45**	15.31	**76.55**
(1) Scope of assessment extended to include site qualifying features and to refine it to focus on the most appropriate air quality standards (Ref 15-026, dated 28/04/2015).						

Taking account of background concentrations the critical load is unlikely to be exceeded.

The process contributions from nitrogen deposition from ALL sources is acceptable taking expected modelling uncertainties and conservative assumptions into account.

We can conclude that the proposed permission in combination with other proposals is not likely to have a significant effect on the habitats site and Natural England agreed with our conclusions.

The Swale

Pollutant	Critical level/load	Back-ground	Process Contribution (PC)-ALL Sources	PC as % of critical level/load	Predicted Environmental Concentration (PEC)	PEC as % critical level/load
Direct Impacts[1]						
NO_x Annual	30	16.89	5.97	**19.9**	22.86	76.20
NO_x Daily Mean	75	19.93	22.47	**29.96**	42.40	56.53
SO_2	20	3.13	0.65	**3.25**	3.78	18.90
NH_3	3	0.81	0.123	**4.10**	0.933	31.10
Deposition Impacts[1]						
N Deposition (kg N/ha/yr)	20[2]	14.42	7.11	**35.55**	21.53	**107.65**
Acidification Deposition (Keq/ha/yr)	8.818[2]	1.44	0.547	**6.2**	1.987	22.53
(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.						
(2) Scope of assessment extended to include site qualifying features and to refine it to focus on the most appropriate air quality standards (Ref 15-026, dated 28/04/2015).						

Taking account of background concentrations the critical levels and critical loads are unlikely to be exceeded with the exception of N deposition.

Regarding N deposition, the Applicant's Ecological assessment report states that the greatest potential for a significant impact on the Swale is on coastal grazing marsh. The impacts are based on a number of conservative assumptions set out in Section 5.4.2 above.

Based on these conservative assumptions, we can conclude that the proposed permission in combination with other proposals is not likely to have a significant effect on the habitats site and Natural England agreed with our conclusions.

Elmley

Pollutant	critical level/load	Back-ground	Process Contribution (PC)- ALL Sources	PC as % of critical level/load	Predicted Environmental Concentration (PEC)	PEC as % critical level/load
Direct Impacts[1]						
NO_x Annual	30	16.89	3.31	**11.03**	20.20	67.33
NO_x Daily Mean	75	19.93	12.16	**16.21**	32.09	42.78
Deposition Impacts[1]						
N Deposition (kg N/ha/yr)	20[2]	14.42	4.27	**21.35**	18.69	93.45
Acidification Deposition (Keq/ha/yr)	4[2]	1.14	0.358	**8.95**	1.498	37.45
(1) Direct impact units are µg/m³ and deposition impact units are kg N/ha/yr or Keq/ha/yr.						
(2) Scope of assessment extended to include site qualifying features and to refine it to focus on the most appropriate air quality standards (Ref 15-026, dated 28/04/2015).						

Taking account of background concentrations the critical levels and critical loads are unlikely to be exceeded.

The same considerations apply as The Swale; however as the critical load is not predicted to be exceeded, there is less of a risk of a significant ecological effect.

Based on these conservative assumptions, we can conclude that the proposed permission in combination with other proposals is not likely to have a significant effect on the nature reserve.

5.5 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 EQS. For the most part therefore consideration of abnormal operations is limited to consideration of its impact on short term EQSs.

The facility incorporates 'Plant By-pass Arrangements' that are activated in the event of 'abnormal' operation. Emissions associated with the by-passes are released via the 30m discharge stack which means they continue to be monitored by the CEMs.

The RTO incorporates a by-pass safety feature which would put the RTO into a controlled stop condition. This initiates all upstream plant to be brought to a stop under controlled conditions which includes stopping feed to the pyrolyser units. Syngas will continue to be combusted in the engines until the stored gas pressure does not increase. The engines will then be turned off sequentially. The SCR and post abatement heat exchangers will remain in operation.

The SCR also incorporates a by-pass which is only activated during protection of plant conditions (e.g. over temperature) until control can be re-established or a controlled shutdown is activated.

The two post abatement heat exchangers are fitted with by-pass systems which are activated as a safety measure where heat is not being taken away in order to prevent boiling and to protect the main extract fan.

The Applicant confirmed that the abnormal assessment below is consistent with emissions associated with the use of the emergency by-passes.

The Applicant based their abnormal assessment on periodic monitoring of a demonstration facility in Surrey which uses the same pyrolysis-gas engine technology and waste feedstock as this proposal. The Surrey demonstration unit does not however benefit from the emissions abatement plant that the Applicant proposes to install. The Applicant therefore considers the Surrey

plant to represent a real-life example of how their chosen technology can be expected to perform in the unlikely event of failure of their abatement plant.

The unabated monitoring results used are as follows:

- NO_x emissions of 1000mg/m^3
- Particulate emissions of 19.1mg/m^3
- SO_2 emissions of 183mg/m^3
- HCl emissions of 2.5mg/m^3
- HF emissions of 0.2mg/m^3
- CO emissions of 1,600 mg/m^3
- Cd & Tl emissions of 0.003mg/m^3
- Sb, As, Pb, Cr, Co, Cu, Mn, Ni & V emissions of 0.055mg/m^3
- Hg emissions of 0.004mg/m^3
- TOC emissions of 479mg/m^3

The result on the Applicant's short-term environmental impact is summarised in the table below.

Assessment of Emissions to Air - Abnormal Operation

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	200	2	17.72	80.3	**40.2**	98.02	49.0
PM_{10}	50	3	-	4.4	8.80	-	-
SO_2	266	4	7.16	42.1	**15.8**	49.26	18.5
	350	5	7.16	42.1	**12.03**	49.26	14.1
CO	10000	7	-	223	2.23	-	-
HCl	750	6	-	0.55	0.07	-	-
HF	160	6	-	0.0459	0.03	-	-
Hg	7.5	1	-	0.055	0.73	-	-
Sb	150	1	-	0.565	0.38	-	-
Cu	200	1	-	0.565	0.28	-	-
Mn	1500	1	-	0.565	0.04	-	-
Cr (II)(III)	150	1	-	0.565	0.38	-	-
V	1	3	-	0.03	3.00	-	-
PCBs	6	1	-	0.0000115	0.0002	-	-

1 1-hr Maximum
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 1-hour average
7 Maximum daily running 8-hour mean

This is a worst case scenario in that these abnormal conditions represent no abatement.

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 EQS/EAL.

PM_{10}, CO, HCl, HF, Hg, Sb, Cu, Mn, Cr(II)(III), V and PCBs.

Also from the table above emissions of the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to

give rise to significant pollution in that the predicted environmental concentration is less than 100% of short term EQS/EAL.

NO_2 and SO_2.

We are therefore satisfied that it is not necessary to further constrain the conditions and duration of the periods of abnormal operation beyond those permitted under Chapter IV of the IED.

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

We have however required an assessment of dioxins. The Applicant's unabated emissions of dioxins are $5.45 \times 10^{-9} mg/m^3$, which is significantly below the IED limit of $0.1ng/m^3$ ($1 \times 10^{-7} mg/m^3$) and the limit of $1ng/m^3$ ($1 \times 10^{-6} mg/m^3$) (10 x IED) used for similar assessments.

The Applicant has undertaken a HHRA based on $1ng/m^3$. The total daily intake ranges from 0.448pg TEQ/kg BW/day for the resident child scenario at High Point 2 to 0.00005pg TEQ/kg BW/day for the resident adult scenario at the Westlands School, which represents a range of between 22.4% and 0.0025% of the COT TDI, reported in Section 5.3.3. At this level, emissions of dioxins will still not pose a risk to human health.

6. Application of Best Available Techniques

6.1 Scope of Consideration

In this section, we explain how we have determined whether the Applicant's proposals are the Best Available Techniques for this Installation.

- The first issue we address is the fundamental choice of incineration technology. There are a number of alternatives, and the Applicant has explained why it has chosen one particular kind for this Installation.

- We then consider in particular control measures for the emissions which were not screened out as insignificant in the previous section on minimising the Installation's environmental impact. They are: NO_2, SO_2, TOC, Cd, Pb, Mn, Ni, As and Cr.

- We also have to consider the combustion efficiency and energy utilisation of different design options for the Installation, which are relevant considerations in the determination of BAT for the Installation, including the Global Warming Potential of the different options.

- Finally, the prevention and minimisation of Persistent Organic Pollutants (POPs) must be considered, as we explain below.

Chapter IV of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter IV. However BAT Conclusions and a revised BREF for Incineration have not yet been drafted or published, so the existing BREF and Chapter IV of the IED remain relevant.

Even if the Chapter IV limits are appropriate, operational controls complement the emission limits and should generally result in emissions below the maximum allowed; whilst the limits themselves provide headroom to allow for unavoidable process fluctuations. Actual emissions are therefore almost certain to be below emission limits in practice, because any Operator who sought to operate its installation continually at the maximum permitted level would almost inevitably breach those limits regularly, simply by virtue of normal fluctuations in plant performance, resulting in enforcement action (including potentially prosecution) being taken. Assessments based on, say, Chapter IV limits are therefore "worst-case" scenarios.

Should the Installation, once in operation, emit at rates significantly below the limits included in the Permit, we will consider tightening ELVs appropriately. We are, however, satisfied that emissions at the permitted limits would ensure a high level of protection for human health and the environment in any event.

6.1.1 Consideration of Furnace Type

The prime function of the furnace is to achieve maximum combustion of the waste. Chapter IV of the IED requires that the plant (furnace in this context) should be designed to deliver its requirements. The main requirements of Chapter IV in relation to the choice of a furnace are compliance with air emission limits for CO and TOC and achieving a low TOC/LOI level in the bottom ash (char).

The Waste Incineration BREF elaborates the furnace selection criteria as:

- the use of a furnace (including secondary combustion chamber) dimensions that are large enough to provide for an effective combination of gas residence time and temperature such that combustion reactions may approach completion and result in low and stable CO and TOC emissions to air and low TOC in residues.
- use of a combination of furnace design, operation and waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures.
- The use of furnace design that, as far as possible, physically retain the waste within the combustion chamber (e.g. grate bar spacing) to allow its complete combustion.

The BREF also provides a comparison of combustion and thermal treatment technologies and factors affecting their applicability and operational suitability used in EU and for all types of wastes. There is also some information on the comparative costs. The table below has been extracted from the BREF tables. This table is also in line with the Guidance Note "The Incineration of Waste (EPR 5.01)). However, it should not be taken as an exhaustive list nor that all technologies listed have found equal application across Europe.

Overall, any of the furnace technologies listed below would be considered as BAT provided the Applicant has justified it in terms of:

- nature/physical state of the waste and its variability
- proposed plant throughput which may affect the number of incineration lines
- preference and experience of chosen technology including plant availability
- nature and quantity/quality of residues produced.
- emissions to air – usually NOx as the furnace choice could have an effect on the amount of unabated NOx produced
- energy consumption – whole plant, waste preparation, effect on GWP
- Need, if any, for further processing of residues to comply with TOC
- Costs

Summary comparison of thermal treatment technologies (reproduced from the Waste Incineration BREF)

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Moving grate (air-cooled)	Low to medium heat values (LCV 5 – 16.5 GJ/t) Municipal and other heterogeneous solid wastes Can accept a proportion of sewage sludge and/or medical waste with municipal waste Applied at most modern MSW installations	1 to 50 t/h with most projects 5 to 30 t/h. Most industrial applications not below 2.5 or 3 t/h.	Widely proven at large scales. Robust Low maintenance cost Long operational history Can take heterogeneous wastes without special preparation	generally not suited to powders, liquids or materials that melt through the grate	TOC 0.5 % to 3 %	High capacity reduces specific cost per tonne of waste
Moving grate (liquid Cooled)	Same as air-cooled grates except: LCV 10 – 20 GJ/t	Same as air-cooled grates	As air-cooled grates but: higher heat value waste is treatable better Combustion control possible.	As air-cooled grates but: risk of grate damage/ leaks higher complexity	TOC 0.5 % to 3 %	Slightly higher capital cost than air-cooled

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Rotary Kiln	Can accept liquids and pastes solid feeds more limited than grate (owing to refractory damage) often applied to hazardous Wastes	<10 t/h	Very well proven with broad range of wastes and good burn out even of HW	Throughputs lower than grates	TOC <3 %	Higher specific cost due to reduced capacity
Fluid bed - bubbling	Only finely divided consistent wastes. Limited use for raw MSW often applied to sludges	1 to 10 t/h	Good mixing Fly ashes of good leaching quality	Careful operation required to avoid clogging bed. Higher fly ash quantities.	TOC <3 %	FGT cost may be lower. Costs of waste preparation
Fluid bed - circulating	Only finely divided consistent wastes. Limited use for raw MSW, often applied to sludges / RDF.	1 to 20 t/h most used above 10 t/h	Greater fuel flexibility than BFB Fly ashes of good leaching quality	Cyclone required to conserve bed material Higher fly ash quantities	TOC <3 %	FGT cost may be lower. Costs of preparation.
Oscillating furnace	MSW / heterogeneous wastes	1 – 10 t/h	Robust Low maintenance Long history	-higher thermal loss than with grate furnace - LCV under 15 GJ/t	TOC 0.5 – 3 %	Similar to other technologies

			Low NOX level Low LOI of bottom ash			

Technique	**Key waste characteristics and suitability**	**Throughput per line**	**Advantages**	**Disadvantages / Limitations of use**	**Bottom Ash Quality**	**Cost**
Pulsed hearth	Only higher CV waste (LCV >20 GJ/t) used for clinical wastes	<7 t/h	can deal with liquids and powders	bed agitation may be lower	Dependent on waste type	Higher specific cost due to reduced capacity
Stepped and static hearths	Only higher CV waste (LCV >20 GJ/t) Mainly used for clinical wastes	No information	Can deal with liquids and powders	Bed agitation may be lower	Dependent on waste type	Higher specific cost due to reduced capacity
Spreader - stoker combustor	- RDF and other particle feeds - poultry manure - wood wastes	No information	- simple grate construction - less sensitive to particle size than FB	only for well defined mono-streams	No information	No information
Gasification - fixed bed	- mixed plastic wastes - other similar consistent streams - gasification less widely used/proven than incineration	1 to 20 t/h	-low leaching residue -good burnout if oxygen blown - syngas available - Reduced oxidation of recyclable metals	- limited waste feed - not full combustion - high skill level - tar in raw gas - less widely proven	-Low leaching bottom ash -good burnout with oxygen	High operation/ maintenance costs

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Gasification - entrained flow	- mixed plastic wastes - other similar consistent streams - not suited to untreated MSW - gasification less widely used/proven than incineration	To 10 t/h	- low leaching slag - reduced oxidation of recyclable metals	- limited waste feed - not full combustion - high skill level - less widely proven	low leaching slag	High operation/ maintenance costs pre-treatment costs high
Gasification - fluid bed	- mixed plastic wastes - shredded MSW - shredder residues - sludges - metal rich wastes - other similar consistent streams - less widely used/proven than incineration	5 – 20 t/h	-temperatures e.g. for Al recovery - separation of non-combustibles -can be combined with ash melting - reduced oxidation of recyclable metals	-limited waste size (<30cm) - tar in raw gas - higher UHV raw gas - less widely proven	If Combined with ash melting chamber ash is vitrified	Lower than other gasifiers
Pyrolysis	- pre-treated MSW - high metal inert streams - shredder residues/plastics - pyrolysis is less widely used/proven than incineration	~ 5 t/h (short drum) 5 – 10 t/h (medium drum)	- no oxidation of metals - no combustion energy for metals/inert - in reactor acid neutralisation possible - syngas available	- limited wastes - process control and engineering critical - high skill req. - not widely proven - need market for syngas	- dependent on process temperature - residue produced requires further processing e.g. combustion	High pre-treatment, operation and capital costs

The Applicant has carried out a review of the following candidate furnace types:

- Moving Grate Furnace
- Rotary Kiln
- Fluidised Bed
- Semi-Pyrolytic (starved air)
- Pyrolysis
- Gasification

The Applicant dismisses the first four options claiming less controlled combustion/thermal destruction at higher temperatures resulting in pollutants entering the exhaust stream more easily.

The Applicant then considers pyrolysis and gasification in more detail based on these options being more controllable and producing more predictable pollutant emissions rates. Both of these options are suitable for RDF at the proposed throughput.

The environmental performance of both options is summarised:

Emissions to Air

The emissions to air would not be affected by either option as both would require abatement to achieve compliance with the IED ELVs. However, unabated emissions from gasification would have a more significant environmental impact due to higher particulate content.

Waste Streams

Gasification produces bottom ash with pyrolysis producing a carbon char which contains energy. The Applicant suggests that the char associated with the process has a number of potential uses in a range of industries, including combustion as a fuel (e.g. within the cement industry) and use as a filler or extender (such is its composition and calorific value).

The Applicant also suggests that the proposed pyrolysis technology is capable of breaking down the tars generally associated with this technology. This is achieved by higher operating temperatures (900 to 1000^{o}C) and extended residence times (1 minute), ensuring the break-down of primary and secondary tars and releasing more gas.

The Applicant has proposed to use a furnace technology comprising pyrolysis.

The Applicant proposes to use gas as support fuel for start-up, shut down and for the auxiliary burners.

Technology Design

In accordance with our Technical Guidance Note, S5.01, the Applicant has confirmed that the technology design will include the following features to minimise the potential for reformation of dioxins within the de-novo synthesis range:

- conditions for de-novo synthesis avoided by SCR heat exchangers. The high temperature exchanger reduces temperatures from 400-450^{o}C to 180^{o}C which is then further reduced to 120^{o}C in the low temperature exchanger;
- combustion conditions in the RTO will be optimised

Any of the options listed in the BREF and summarised in the table above can be BAT. The Applicant has chosen a furnace technique that is listed in the BREF and we are satisfied that the Applicant has provided sufficient justification to show that their technique is BAT. This is not to say that the other techniques could not also be BAT, but that the Applicant has shown that their chosen technique is at least comparable with the other BAT options. We believe that, based on the information gathered by the BREF process, the chosen technology will achieve the requirements of Chapter IV of the IED for the air emission of TOC/CO and the TOC on bottom ash (char).

6.2 BAT and emissions control

The prime function of flue gas treatment is to reduce the concentration of pollutants in the exhaust gas as far as practicable. The techniques which are described as BAT individually are targeted to remove specific pollutants, but the BREF notes that there is benefit from considering the FGT system as a whole unit. Individual units often interact, providing a primary abatement for some pollutants and an additional effect on others.

The BREF lists the general factors requiring consideration when selecting flue-gas treatment (FGT) systems as:

- type of waste, its composition and variation
- type of combustion process, and its size
- flue-gas flow and temperature
- flue-gas content, size and rate of fluctuations in composition
- target emission limit values
- restrictions on discharge of aqueous effluents
- plume visibility requirements
- land and space availability
- availability and cost of outlets for residues accumulated/recovered
- compatibility with any existing process components (existing plants)
- availability and cost of water and other reagents
- energy supply possibilities (e.g. supply of heat from condensing scrubbers)
- reduction of emissions by primary methods
- release of noise.

Taking these factors into account the Technical Guidance Note points to a range of technologies being BAT subject to circumstances of the Installation.

6.2.1 Particulate Matter

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.	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 proposes in this case to rely on three measures for the abatement of dust emissions.

- On exiting the dryer, exhaust gases will be drawn through a high efficiency multi-cyclone.
- the exhaust gas from the cyclone will then be introduced into the main engine exhaust stream for further abatement in the RTO.
- the syngas produced by pyrolysis passes through oil and water quench systems to remove entrained fine particulate. The water quench system incorporates a sodium hydroxide gas scrubbing unit that has the advantage of also simultaneously reducing acid gas concentrations.

We are satisfied that in this case the Applicant's chosen technologies of cyclones, RTO and wet scrubbing are BAT for the abatement of dust releases in the exhaust gas that will be emitted from the stack.

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.

6.2.2 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 (RTO) – this technique reduces NO_x from the combustion of syngas in the gas engines.
- Starved air systems – this technique also simultaneously reduces CO and is defined as BAT for pyrolysis and gasification systems.
- Optimise primary and secondary air injection (RTO) – this technique is BAT for all plant.
- Flue gas recirculation – this technique reduces the consumption of reagents for secondary NO_x control and can increase overall energy recovery, although in some applications there can be corrosion problems – the technique is considered BAT for all plant. The Applicant does not propose this technique on the basis that it is not applicable to gas engines.

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 70mg/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 180mg/m^3; it relies on an optimum temperature of around 900^oC 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.

The pyrolysis process relies for its effective operation on the near complete absence of air (and hence the absence of combustion). The generation of NO_x is effectively deferred until the point at which syngas is burned in the gas engines. In terms of the secondary abatement of NO_x, the Applicant proposes SCR and in their plant design the energy penalty associated with gas re-heat is avoided because gas clean-up occurs prior to its combustion. This means that heat is not lost in the abatement of pollutants following combustion and so re-heat immediately prior to the entry of flue gas into the SCR plant is not required; gas will leave the RTO at a temperature of 400-450ºC and pass directly into the SCR plant.

The Applicant proposes to use SCR with urea as the reagent.

Emissions of NO_x cannot be screened out as insignificant; however the Applicant has chosen SCR which reduces NOx to levels significantly below SNCR and so the Environment Agency agrees that the Applicant's proposed technique is BAT for the Installation.

The amount of urea used for NO_x abatement will need to be optimised to maximise NO_x reduction and minimise NH_3 slip. An Improvement condition requires the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The Operator is also required to monitor and report on NH_3 and N_2O emissions every 6 months.

6.2.3 Acid Gases, SO_x, 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	Higher solid residue production Reagent consumption controlled only by input rate		All plant

	Lower energy use Higher reliability			
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 has justified its choice of gas for the RTO as the support fuel.
- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by ensuring a homogeneous waste feed. Given the nature of the incoming waste we accept that there is no opportunity in this case to separate acid gas precursors from the waste stream prior to pyrolysis.

As regards secondary measures, there are three recognised techniques – wet, dry and semi-dry. Wet scrubbing produces an effluent for treatment and disposal and it results in a cool, wet flue gas which, in a conventional incineration scenario, will require re-heat in order to avoid a visible plume. The Applicant has selected wet scrubbing as their chosen secondary measure and the nature of their chosen technology will ensure that the visible plume problem is avoided (see earlier discussion regarding dust abatement). The wet scrubbing system offers the advantage in their case of dealing with both acid gases and particulates simultaneously. The Applicant's chosen reagent, sodium hydroxide, has the advantage of achieving high acid gas removal rates. We agree that the Applicant's choice of secondary acid gas abatement is BAT for this Installation.

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

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.

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

We are satisfied that the operation of the RTO will deliver this requirement and is BAT for this installation.

6.2.5 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 in 6.1.1 above;
- avoidance of de novo synthesis, which has been covered in the consideration of technology design;
- the effective removal of particulate matter, which has been considered in 6.2.1 above;

The Applicant predicts the conditions in the pyrolysis units to be such that most of the chlorine present in the RDF will be converted into hydrogen chloride which will subsequently be removed by the syngas cleaning system. The presence of chlorine is a prerequisite for the formation of dioxins and so its removal in this way will help to minimise dioxin formation in the combustion plant.

Dioxins tend to adhere to particulate matter and so it is reasonable to assume that the particulate removal described in section 6.2.1 above will also contribute to the removal of any dioxins present in the cleaned syngas. In the event that dioxins are present in the gas engine exhaust the Applicant's proposed maintenance of a temperature of 850ºC and a minimum gas residence time of 2 seconds in the RTO will ensure that they are minimised.

Our sector guidance reports that SCR may also help to promote the destruction of dioxins and the Applicant proposes to provide SCR in this case. Dioxin reformation during the cooling of flue gases (de novo formation) is a risk where the gas stream is at a temperature of between 450ºC and 200ºC for any length of time. The Applicant's proposed heat exchanger design detailed in Section 6.1.1 will minimise the formation at this stage. We are satisfied that the Applicant's proposals are BAT for the minimisation of dioxin and furan emissions from the pyrolysis plant.

6.2.6 Metals

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 Applicant expects most of the mercury, cadmium and thallium content of the syngas to be removed by the wet scrubbing plant (and subsequently captured in the oil and water filter cakes), with the remaining metals being predominantly retained in the char. We are satisfied that the effective removal of particulates through wet scrubbing is BAT for the minimisation of metals releases at this Installation.

6.3 BAT and global warming potential

This section summarises the assessment of greenhouse gas impacts which has been made in the determination of this Permit. 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.

The principal greenhouse gas emitted is CO_2, but the plant also emits small amounts of N_2O arising from the operation of secondary NO_x abatement. N_2O has a global warming potential 310 times that of CO_2. The Applicant will therefore be required to optimise the performance of the secondary NO_x abatement system to ensure its GWP impact is minimised.

The major source of greenhouse gas emissions from the installation is however CO_2 from the combustion of waste. 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. BAT for greenhouse gas emissions is to maximise energy recovery and efficiency.

The electricity that is generated by the Installation will displace emissions of CO_2 elsewhere in the UK, as virgin fossil fuels will not be burnt to create the same electricity.

The Installation is not subject to the Greenhouse Gas Emissions Trading Scheme Regulations 2012 therefore it is a requirement of IED to investigate how emissions of greenhouse gases emitted from the installation might be prevented or minimised.

Factors influencing GWP and CO_2 emissions from the Installation are:
On the debit side

- CO_2 emissions from the burning of the waste;
- CO_2 emissions from burning auxiliary or supplementary fuels;
- CO_2 emissions associated with electrical energy used;
- N_2O from the de-NOx process.

On the credit side

- CO_2 saved from the export of electricity to the public supply by displacement of burning of virgin fuels;

The GWP of the plant will be dominated by the emissions of carbon dioxide that are released as a result of waste combustion. This will constant for all options considered in the BAT assessment. Any differences in the GWP of the options in the BAT appraisal will therefore arise from small differences in energy recovery and in the amount of N_2O emitted.

Note: avoidance of methane which would be formed if the waste was landfilled has not been included in this assessment. If it were included due to its avoidance it would be included on the credit side. Ammonia has no direct GWP effect.

Taking all these factors into account, the Operator's assessment shows their preferred option is best in terms of GWP.

The Environment Agency agrees with this assessment and that the chosen option is BAT for the installation.

6.4 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 installation, namely 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 all 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 5.2.1 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.

6.5 Other Emissions to the Environment

6.5.1 Emissions to water

There will be no process related emissions to water from the facility. Storm-water run-off will pass through a Class 1 oil-separator prior to discharge to the retention basin which discharges into the receiving watercourse.. The basin has been designed to cope with a 1 in 100 year storm event and will incorporate an impermeable liner and a flow control device.

The response to our further information notice dated 9 July 2015 confirms that the capacity of the detention basin has increased from 555m^3 to 1,860m^3. The increased capacity of the basin takes account of the unlikely worst case event of a 1 in 100 year storm event occurring simultaneously with a fire incident, and the detention basin has been sized accordingly.

The detention basin will also be used to contain any potentially contaminating substances arising from spills or potentially contaminated fire-water run-off. The flow control device will be closed to ensure there is no discharge into the receiving water.

The flow control device will be situated inside a manhole downstream of the basin with an automatically controlled penstock gate valve. The penstock will close and prevent discharge when a fire alarm is activated or, alternatively, linked to another suitable sensor/indicator. The penstock will also have a manual over-ride function, capable of both electrical operation and manual operation (via valve wheel) situated in the penstock manhole.

The impermeable liner arrangement proposed for the retention basin will comprise 300mm of subsoil over a geosynthetic liner (bentonite clay impregnated matting. Atal Naue Geosynthetics Bentofix NSP 4900 (or similar) is proposed and a detailed technical specification together with an indicative drawing showing the construction detail is provided in Appendix 2 of the response to our further information notice dated 9 July 2015.

We assessed this arrangement and subsequently asked for information about the long term integrity and performance of the liner. The specification was modified to address our concerns which included increasing the soil cover on the base of the pond to 500mm. We have secured this by incorporating into Table S1.2 of the Permit.

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.

6.5.2 Emissions to sewer

There will be no surface water or process related emissions to sewer from the facility.

Based upon the information in the Application we are satisfied that appropriate measures will be in place to prevent and /or minimise emissions to sewer.

6.5.3 Fugitive emissions

The IED specifies that plants must be able to demonstrate that the plant is designed in such a way as to prevent the unauthorised and accidental release of polluting substances into soil, surface water and groundwater. In addition storage requirements for waste and for contaminated water of Article 46(5) must be arranged.

Waste will be stored internally in enclosed silos. Similarly, sodium hydroxide and urea will also be stored internally with suitable containment measures.

Storage arrangements for contaminated water in the detention basin are described above in section 6.5.1.

Based upon the information in the Application we are satisfied that appropriate measures will be in place to prevent and /or minimise fugitive emissions.

6.5.4 Odour

Waste accepted at the Installation will be delivered in covered vehicles which will enter the waste reception hall via a roller shutter door. The original proposal confirmed that the doors will be manually opened and then closed immediately the vehicle is within the confines of the facility. Offloading will not take place until the door has been closed.

Since the Application was submitted the design has changed to install automatic self-closing doors to the waste reception hall rather than a manually operated door as was originally proposed. This revised arrangement is set out in the Applicants response to our further information notice dated 9 July 2015 and we have incorporated this into the permit operating techniques, Table S1.2.

The waste handling and storage systems will be fully enclosed and there will be two main extraction systems. The extraction systems will extract ambient dust from the vehicle unloading area and the conveyor systems. They are linked via a common extraction system which is connected to a cyclone to remove any entrained particulate matter. The system incorporates pressure monitoring to maintain a constant negative pressure within the system.

The air will be extracted from the waste reception hall by the dedicated extraction system at a minimum rate of three air changes per hour, this being the minimum that the equipment manufacturer has advised is required to prevent potentially fugitive odour emissions. This equates to 666Nm^3/h. The extraction system will be fitted with variable speed drives so this can be increased if required and, also, to optimise parasitic load. The associated negative pressure produced within the waste reception hall is calculated to be approximately -2.5Pa.

The air extracted is used as combustion air in the gas engines ensuring that any entrained residual particulate matter and odour are combusted.

When the plant is not operational air will be extracted from the waste reception hall and discharged via the RTO. Should the RTO not be operational, then further RDF deliveries would only be taken up to the capacity of the RDF storage silos. Once the capacity of the silos has been reached, deliveries of RDF will be stopped until the plant is back in full operation. Given that the silos are effectively a contained system, it is considered that the potential for odour releases is minimised.

Validated waste passes through a trash box and is discharged into a 40m^3 receiving vessel, which is connected to the waste handling extraction system. From here it passes via contained conveyors to one of the four 108 tonnes capacity storage silos. The fill pattern is based on the principle of first in/first out and there will be a maximum stock buffer time of four days to ensure sufficient material is in stock during holiday periods.

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.

6.5.5 Noise and vibration

The Application contains a noise impact assessment (Ref R5431-1 Rev1, dated 4th December 2014) which identifies local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. Measurements were taken of the prevailing ambient noise levels to produce a baseline noise survey and an assessment was carried out in accordance with BS 4142:2014, to compare the predicted plant rating noise levels with the established background levels.

It predicted the level of noise impact to be low at the closest residential properties to the south of the facility.

Our initial checks identified higher impacts at the receptors; however our assessment was based on conservative assumptions about the sound emitting building specifications. The Applicant provided further information to demonstrate that buildings will be constructed to an appropriate acoustic specification. This will include cladding and roofs that have a sound reduction indice (Rw) of 24dB.

After review of the additional information supplied by the Applicant in regards to the buildings construction materials, we are satisfied that a minimum Rw of 24dB for the walls and roofs will be sufficient to reduce impacts at receptors to below +5dB above background, which would indicate a rating of below adverse impact in accordance to BS4142:2014. As such the Applicant's noise assessment can now be used for permit determination.

We have incorporated this into the operating techniques, table S1.2 of the Permit.

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.

6.6 Setting ELVs and other Permit conditions

6.6.1 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.

Below we consider whether, for those emission not screened out as insignificant, different conditions are required 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).

(i) Local factors

We have considered the cumulative impact from those developments that are not yet operational and the impact on the AQMA as detailed in Section 5.2.4 of this document.

We would not consider it practical or reasonable to expect the Applicant to go beyond what is considered BAT for the control of NO_2, TOC, As, Cd and Ni.

(ii) National and European EQSs

We do not expect emissions from the Installation to cause an exceedance of an EQS. In view of this, Article 18 of IED does not require any tighter conditions than we have already applied.

(iii) Global Warming

CO_2 is an inevitable product of the combustion of waste. The amount of CO_2 emitted will be essentially determined by the quantity and characteristics of waste being pyrolysed, which are already subject to conditions in the Permit. It is therefore inappropriate to set an emission limit value for CO_2, which could do no more than recognise what is going to be emitted. The gas is not therefore targeted as a key pollutant under Annex II of IED, which lists the main polluting substances that are to be considered when setting emission limit values (ELVs) in Permits.

We have therefore considered setting equivalent parameters or technical measures for CO_2. However, provided energy is recovered efficiently (see section 4.3.7 above), there are no additional equivalent technical measures (beyond those relating to the quantity and characteristics of the waste) that can be imposed that do not run counter to the primary purpose of the plant, which is the recovery of energy from waste. Controls in the form of restrictions on the volume and type of waste that can be accepted at the Installation and permit conditions relating to energy efficiency effectively apply equivalent technical measures to limit CO_2 emissions.

(iv) Commissioning

The Application refers to commissioning and the validation of combustion conditions for the pyrolysis plant. We have secured this by setting a pre-operational condition.

We have also set a pre-operational condition requiring a commissioning plan including timelines for completion. The commissioning plan will include the expected actual emissions (rather than the permitted 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. Commissioning shall be carried out in accordance with the commissioning plan as approved.

6.7 Monitoring

6.7.1 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 gather information about the performance of the SCR system; to establish data on the release of dioxin-like PCBs and PAHs from the incineration process and to deliver the requirements of Chapter IV of IED for monitoring of residues and 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.

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.

6.7.2 Monitoring under abnormal operations arising from the failure of the installed CEMs

The Operator has stated that they will provide back-up CEMS working in parallel to the operating CEMS. These will be switched into full operation immediately in the event that there is any failure in the regular monitoring equipment. The back-up CEMS measure the same parameters as the operating CEMS. In the unlikely event that the back-up CEMS also fail Condition 2.3.10 of the Permit requires that the abnormal operating conditions apply.

6.7.3 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.

6.8 Reporting

We have specified the reporting requirements in Schedule 5 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 and energy recovery at the installation.

7 Other legal requirements

In this section we explain how we have addressed other relevant legal requirements, to the extent that we have not addressed them elsewhere in this document.

7.1 The EPR 2010 and related Directives

The EPR delivers the requirements of a number of European and national laws.

7.1.1 Schedules 1 and 7 to the EPR 2010 – **IED Directive**

We address the requirements of the IED in the body of this document above and the specific requirements of Chapter IV in Annex 1 of this document.

There is one requirement not addressed above, which is that contained in Article 5(3) IED. Article 5(3) requires that "In the case of a new installation or a substantial change where Article 4 of Directive 85/337/EC (the EIA Directive) applies, any relevant information obtained or conclusion arrived at pursuant to articles 5, 6 and 7 of that Directive shall be examined and used for the purposes of granting the permit."

- Article 5 of EIA Directive relates to the obligation on developers to supply the information set out in Annex IV of the Directive when making an application for development consent.
- Article 6(1) requires Member States to ensure that the authorities likely to be concerned by a development by reason of their specific environmental responsibilities are consulted on the Environmental Statement and the request for development consent.
- Article 6(2)-6(6) makes provision for public consultation on applications for development consent.
- Article 7 relates to projects with transboundary effects and consequential obligations to consult with affected Member States.

The grant or refusal of development consent is a matter for the relevant local planning authority. The Environment Agency's obligation is therefore to examine and use any relevant information obtained or conclusion arrived at by the local planning authorities pursuant to those EIA Directive articles.

In determining the Application we have considered the following documents: -

- The proposal submitted with the planning application.
- The response of the Environment Agency to the local planning authority in its role as consultee to the planning process.
- The decision of Kent County Council to grant planning permission at the Committee meeting held on 9 September 2015, subject to the satisfactory conclusion of a Section106 legal agreement.

From consideration of all the documents above, the Environment Agency considers that no additional or different conditions are necessary.

The Environment Agency has also carried out its own consultation on the Environmental Permitting Application which includes the Environmental Statement submitted to the local planning authority. The results of our consultation are described elsewhere in this decision document.

7.1.2 Schedule 9 to the EPR 2010 – **Waste Framework Directive**

As the Installation involves the treatment of waste, it is carrying out a *waste operation* for the purposes of the EPR 2010, and the requirements of Schedule 9 therefore apply. This means that we must exercise our functions so as to ensure implementation of certain articles of the WFD.

We must exercise our relevant functions for the purposes of ensuring that the waste hierarchy referred to in Article 4 of the Waste Framework Directive is applied to the generation of waste and that any waste generated is treated in accordance with Article 4 of the Waste Framework Directive. (See also section 4.3.9)

The conditions of the Permit ensure that waste generation from the facility is minimised. Where the production of waste cannot be prevented it will be recovered wherever possible or otherwise disposed of in a manner that minimises its impact on the environment. This is in accordance with Article 4.

We must also exercise our relevant functions for the purposes of implementing Article 13 of the Waste Framework Directive; ensuring that the requirements in the second paragraph of Article 23(1) of the Waste Framework Directive are met; and ensuring compliance with Articles 18(2)(b), 18(2)(c), 23(3), 23(4) and 35(1) of the Waste Framework Directive.

Article 13 relates to the protection of human health and the environment. These objectives are addressed elsewhere in this document.

Article 23(1) requires the permit to specify:

(a) the types and quantities of waste that may be treated;
(b) for each type of operation permitted, the technical and any other requirements relevant to the site concerned;
(c) the safety and precautionary measures to be taken;
(d) the method to be used for each type of operation;
(e) such monitoring and control operations as may be necessary;
(f) such closure and after-care provisions as may be necessary.

These are all covered by permit conditions.

We consider that the intended method of waste treatment is acceptable from the point of view of environmental protection so Article 23(3) does not apply. Energy efficiency is dealt with elsewhere in this document but we consider the conditions of the permit ensure that the recovery of energy take place with a high level of energy efficiency in accordance with Article 23(4).

Article 35(1) relates to record keeping and its requirements are delivered through permit conditions.

7.1.3 Schedule 22 to the EPR 2010 – **Groundwater, Water Framework and Groundwater Daughter Directives**

To the extent that it might lead to a discharge of pollutants to groundwater (a "groundwater activity" under the EPR 2010), the Permit is subject to the requirements of Schedule 22, which delivers the requirements of EU Directives relating to pollution of groundwater. The Permit will require the taking of all necessary measures to prevent the input of any hazardous substances to groundwater, and to limit the input of non-hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfies the requirements of Schedule 22.

No releases to groundwater from the Installation are permitted. The Permit also requires material storage areas to be designed and maintained to a high standard to prevent accidental releases.

7.1.4 Directive 2003/35/EC – The Public Participation Directive

Regulation 59 of the EPR 2010 requires the Environment Agency to prepare and publish a statement of its policies for complying with its public participation duties. We have published our public participation statement.

This Application has been consulted upon in line with this statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our decision in this case has been reached following a programme of public consultation on the original Application. The way in which this has been done is set out in Section 2. A summary of the responses received to our consultations and our consideration of them is set out in Annex 2.

7.2 National primary legislation

7.2.1 **Environment Act 1995**

(i) Section 4 (Pursuit of Sustainable Development)

We are required to contribute towards achieving sustainable development, as considered appropriate by Ministers and set out in guidance issued to us. The Secretary of State for Environment, Food and Rural Affairs has issued *The Environment Agency's Objectives and Contribution to Sustainable Development: Statutory Guidance (December 2002)*. This document:

> "*provides guidance to the Agency on such matters as the formulation of approaches that the Agency should take to its work, decisions about priorities*

for the Agency and the allocation of resources. It is not directly applicable to individual regulatory decisions of the Agency".

In respect of regulation of industrial pollution through the EPR, the Guidance refers in particular to the objective of setting permit conditions "*in a consistent and proportionate fashion based on Best Available Techniques and taking into account all relevant matters…*". The Environment Agency considers that it has pursued the objectives set out in the Government's guidance, where relevant, and that there are no additional conditions that should be included in this Permit to take account of the Section 4 duty.

(ii) Section 7 (Pursuit of Conservation Objectives)

We considered whether we should impose any additional or different requirements in terms of our duty to have regard to the various conservation objectives set out in Section 7, but concluded that we should not.

We have considered the impact of the installation on local wildlife sites within 2Km which are not designated as either European Sites or SSSIs. We are satisfied that no additional conditions are required.

(iii) Section 81 (National Air Quality Strategy)

We have had regard to the National Air Quality Strategy and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

7.2.2 **Human Rights Act 1998**

We have considered potential interference with rights addressed by the European Convention on Human Rights in reaching our decision and consider that our decision is compatible with our duties under the Human Rights Act 1998. In particular, we have considered the right to life (Article 2), the right to a fair trial (Article 6), the right to respect for private and family life (Article 8) and the right to protection of property (Article 1, First Protocol). We do not believe that Convention rights are engaged in relation to this determination.

7.2.3 **Countryside and Rights of Way Act 2000 (CROW 2000)**

Section 85 of this Act imposes a duty on Environment Agency to have regard to the purpose of conserving and enhancing the natural beauty of the area of outstanding natural beauty (AONB). There is no AONB which could be affected by the Installation.

7.2.4 **Wildlife and Countryside Act 1981**

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the

Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

We assessed the Application and concluded that the Installation will not damage the special features of any SSSI. This was recorded on a CROW Appendix 4 form (and an Appendix 11 assessment). We used the Appendix 11 assessment to consult Natural England, who agreed with our conclusion.

The CROW assessment is summarised in greater detail in Section 5.4 of this document. A copy of the full Appendix 4 and 11 Assessments can be found on the public register.

7.2.5 **Natural Environment and Rural Communities Act 2006**

Section 40 of this Act requires us to have regard, so far as is consistent with the proper exercise of our functions, to the purpose of conserving biodiversity. We have done so and consider that no different or additional conditions in the Permit are required.

7.3 National secondary legislation

7.3.1 **The Conservation of Natural Habitats and Species Regulations 2010**

We have assessed the Application in accordance with guidance agreed jointly with Natural England and concluded that there will be no likely significant effect on any European Site.

We consulted Natural England means of an Appendix 11 assessment, and they agreed with our conclusion, that the operation of the Installation would not have a likely significant effect on the interest features of protected sites.

The habitat assessment is summarised in greater detail in Section 5.4 of this document. A copy of the full Appendix 11 Assessment can be found on the public register.

7.3.2 **Water Framework Directive Regulations 2003**

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure the requirements of the Water Framework Directive through (inter alia) EP permits, but it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

7.3.3 **The Persistent Organic Pollutants Regulations 2007**

We have explained our approach to these Regulations, which give effect to the Stockholm Convention on POPs and the EU's POPs Regulation, above.

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

S23 of the Local Democracy, Economic Development and Construction Act 2009 require us where we consider it appropriate to take such steps as we consider appropriate to secure the involvement of interested persons in the exercise of our functions by providing them with information, consulting them or involving them in any other way. S24 requires us to have regard to any Secretary of State guidance as to how we should do that.

The way in which the Environment Agency has consulted with the public and other interested parties is set out in Section 2 of this document. The way in which we have taken account of the representations we have received is set out in Annex 4. Our public consultation duties are also set out in the EP Regulations, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive. In addition to meeting our consultation responsibilities, we have also taken account of our guidance in Environment Agency Guidance Note RGS6 and the Environment Agency's Building Trust with Communities toolkit.

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 2.3.4 and Table S2.2
45(1)(b)	The Permit shall include the total waste incinerating capacity of the plant.	Condition 2.3.4 and Table S2.2
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 S3.1 and S3.1(a)
45(1)(d)	The Permit shall include the requirements for pH, temperature and flow of waste water discharges.	Not Applicable
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 S3.1, S3.1(a), S3.3 and S3.4
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.	Not Applicable
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.	Not Applicable

IED Article	Requirement	Delivered by
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
46(2)	Emission into air shall not exceed the emission limit values set out in part of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1(a)
46(3)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this
46(4)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this
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 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/m3), 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/m3), CO and TOC not to be exceeded during this period.	Condition 2.3.10
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
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out	Condition 3.5.3, and tables S3.1, S3.1(a), and S3.4

IED Article	Requirement	Delivered by
	in point 1 of Part 6 of Annex VI.	
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 3.1.1,3.1.2 and 3.5.5
50(1)	Char to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Condition 3.5.1 and Table S3.4
50(2)	Flue gas to be raised to a temperature of 850ºC for two seconds, as measured at representative point of the combustion chamber.	Condition 2.3.7, Pre-operational condition PO7, Improvement condition IC4 and Table S3.3
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 2.3.10
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.7
50(4)(b)	Automatic shut to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.7
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 2.3.7
50(5)	Any heat generated from the process shall be recovered as far as practicable.	(a) The plant will generate electricity (b)Operator to review the available heat recovery options prior to commissioning (Condition PO3) and then every 2 years

IED Article	Requirement	Delivered by
		(Conditions 1.2. 1 to 1.2.2)
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
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, 3.4 and 3.5
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Condition 2.3.4 and Table S2.2
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
52(4)	Prior to accepting hazardous waste, the Operator shall carry out the procedures set out in Article 52(4).	Not applicable
52(5)	Granting of exemptions from Article 52(2), (3) and (4).	Not applicable
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 1.4.1, 1.4.2 and 3.5.1 with Table S3.4
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

IED Article	Requirement	Delivered by
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.5.1 and Table S3.4 and pre-operational condition PO4
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.	Condition 4.2.2 and 4.2.3.

ANNEX 2: Pre-Operational Conditions

Based on the information on 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 send a summary of the site Environment Management System (EMS) to the Environment Agency and make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with the requirements set out in Section 1 of How to comply with your environmental permit. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
PO2	Prior to the commencement of commissioning, the Operator shall submit to the Environment Agency for approval a Fire Prevention Plan developed in line with the requirements set out in our Fire prevention plans guidance (version 2, March 2015).
PO3	Prior to the commencement of commissioning, the Operator shall send a report to the Environment Agency which will contain a comprehensive review of the options available for utilising the heat generated by the pyrolysis process in order to ensure that it is recovered as far as practicable. The review shall detail any identified proposals for improving the recovery and utilisation of waste heat and shall provide a timetable for their implementation.
PO4	Prior to the commencement of commissioning, the Operator shall submit to the Environment Agency for approval a protocol for the sampling and testing of pyrolysis char and gas clean-up residues for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.
PO5	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. Commissioning shall be carried out in accordance with the commissioning plan as approved.

PO6	Prior to the commencement of commissioning, the Operator shall submit a written report to the Agency detailing the waste acceptance procedure to be used at the site. The waste acceptance procedure shall include the process and systems by which wastes unsuitable for incineration at the site will be controlled. The procedure shall be implemented in accordance with the written approval from the Agency.
PO7	After completion of RTO design and at least three calendar months before any RTO operation; the Operator shall submit a written report to the 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 of the IED.
PO8	The Operator shall submit the written protocol referenced in condition 3.2.4 for the monitoring of soil and groundwater for approval by the Environment Agency. The protocol shall demonstrate how the Operator will meet the requirements of Articles 14(1)(b), 14(1)(e) and 16(2) of the IED. The procedure shall be implemented in accordance with the written approval from the Agency.
PO9	At least three months before operation, the Operator shall submit a written report to the Environment Agency specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance notes M1 and M2. The report shall include the following: • Plant and equipment details, including accreditation to MCERTS • Methods and standards for sampling and analysis • Details of monitoring locations, access and working platforms

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 are 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.

Reference	Improvement measure	Completion date
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System (EMS) and how this is compliant with certified systems.	Within 12 months of the date on which waste is first pyrolysed
IC2	The Operator shall submit a written proposal to the Environment Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission point A1, identifying the fractions within the PM_{10}, and $PM_{2.5}$ ranges. The proposal shall include a timetable for approval by the Environment Agency to carry out such tests and produce a report on the results. On receipt of written agreement by the Environment Agency to the proposal and the timetable, the Operator shall carry out the tests and submit to the Environment Agency a report on the results.	Within 6 months of the completion of commissioning
IC3	The Operator shall submit a written report to the Environment Agency on the commissioning of the installation. 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 facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions.	Within 4 months of the completion of commissioning
IC4	The Operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the regenerative thermal oxidiser (RTO) whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency.	Within 4 months of the completion of commissioning

IC5	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of the Selective Catalytic Reduction (SCR) system and combustion settings to minimise oxides of nitrogen (NOx) emissions within the emission limit values described in this permit with the minimisation of nitrous oxide emissions. The report shall include an assessment of the level of NO_x, N_2O and NH_3 emissions that can be achieved under optimum operating conditions. The report shall also provide details of the optimisation (including dosing rates) for the control of acid gases.	Within 4 months of the completion of commissioning.
IC6	The Operator shall carry out an assessment of the impact of emissions to air of the following component metals subject to emission limit values: Cd, As, Cr, Pb, Mn and Ni. A report on the assessment shall be made to the Environment Agency. Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with the Application. An assessment shall be made of the impact of each metal against the relevant EQS/EAL. In the event that the assessment shows that an EQS/EAL can be exceeded, the report shall include proposals for further investigative work.	15 months from commencement of operations
IC7	The Operator shall carry out an assessment of the impact from emissions to air of: • oxides of nitrogen; • ammonia; and • nitrogen deposition. Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with Application. The assessment shall have specific regard to the impact at the Swale and Medway Estuary & Marshes (SPA, Ramsar and SSSI) by comparison of	15 months from commencement of operations

	process contributions with the relevant critical levels and loads. In the event that the assessment shows that critical levels and loads can be exceeded as a result of emissions from the Installation, the report shall include proposals for further investigative work. A report on the assessment shall be made to the Environment Agency.	
IC8	The Operator shall submit a written summary report to the Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 and Table S3.1(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 Agency within 3 months of completion of commissioning. Full summary evidence compliance report to be submitted within 18 months of commissioning.

ANNEX 4: Consultation Reponses

A) Advertising and Consultation on the Application

The Application has been advertised and consulted upon in accordance with the Environment Agency's Public Participation Statement. The way in which this has been carried out along with the results of our consultation and how we have taken consultation responses into account is summarised in this Annex. Copies of all consultation responses have been placed on the Environment Agency public register.

The Application was advertised on the Environment Agency website from 16 June to 14 July 2015. A Copy of the Application was placed on the Environment Agency Public Register at Orchard House, Endeavour Park, London Road, Addington, Kent, ME19 5SH.

The following statutory and non-statutory bodies were consulted:

- Kent County Council Planning
- Kent County Environmental Health
- Public Health England (PHE)
- Director of Public Health
- Food Standards Agency (FSA)
- Health & Safety Executive (HSE)
- Kent Fire & Rescue Service
- National Grid

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from **Health & Safety Executive**, received by email 29 June 2015	
Brief summary of issues raised:	Summary of action taken / how this has been covered
No issues raised	No action required

Response Received from **Public Health England**, Environmental Public Health Scientist, dated 6 July 2015	
Brief summary of issues raised:	Summary of action taken / how this has been covered
They recommend that any Permit issued should contain conditions to ensure that the following potential emissions do not impact upon public health:	
Emissions to air from point and fugitive sources such as gases, metals, volatile organic compounds (VOCs), dioxins, furans and particulate matter/dusts.	Our assessment of the impact and controls in place for point source and fugitive emissions to air are detailed in Sections 5, 6.2 and 6.5.3 of this document.

	We are satisfied that the appropriate measures will be in place to prevent/minimise emissions.
Odour from activities on site including waste handling, transport, storage and treatment.	Our assessment of odour is detailed in Section 6.5.4 of this document. We are satisfied that the appropriate measures will be in place to prevent/minimise odour.
Waste disposal and handling e.g. litter and debris	Our assessment of waste produced at the Installation is detailed in Section 4.3.9 of this document. Permit conditions 3.2.1 and 3.2.2 control fugitives, which include litter and debris. We are satisfied that the appropriate measures will be in place.
The cumulative impact assessments undertaken for emissions to air from point sources are adequate to prevent any significant impacts on sensitive human receptors.	Our assessment of cumulative impact is detailed in Section 5.2.4 of this document. We are satisfied that the assessments are adequate to prevent any significant impact.
There is an adequate accident management plan in place and that the guidance prescribed in the recent Fire Prevention Plan is being followed or implemented on site to prevent any significant off site impact	Our assessment of accidents and fire prevention is detailed in Section 4.3.4 of this document. We have set conditions in the Permit to ensure that the appropriate control measures will be in place.
In relation to potential risk to public health, they recommend that we also consult the following relevant organisations in relation to their areas of expertise: • the local authority for matters relating to impact upon human health of contaminated land; noise, odour, dust and other nuisance emissions; • the Food Standards Agency, where there is the potential for	We have consulted with the relevant organisations (see above) and they have not raised any issues with respect to these matters.

deposition on land used for the growing of food crops or animal rearing; and • the Director of Public Health for matters relating to wider public health impacts. Any additional information obtained in relation to these comments should be sent to PHE for consideration as such information could affect the comments made in this response.	
Based solely on the information contained in the Application PHE have no significant concerns regarding risk to health of the local population from this proposed facility providing the Applicant takes all appropriate measures to prevent or control pollution, in accordance with the relevant sector technical guidance or industry best practice.	