Determination of an Application for an Environmental Permit under the Environmental Permitting (England & Wales) Regulations 2016

Consultation on our decision document recording our decision-making process

The Permit Number is:	EPR/FP3335YU
The Applicant is:	Gent Fairhead & Co. Limited
The Installation is located at:	Rivenhall Airfield Woodhouse Lane Kelvedon Essex CO5 9DF

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/FP3335YU/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/FP3335YU. We refer to the Permit as "the **Permit**" in this document.

The Application was duly made on 6 March 2017.

The Applicant is Gent Fairhead & Co. Limited. We refer to Gent Fairhead & Co. Limited as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted, we call Gent Fairhead & Co. Limited "the **Operator**".

Gent Fairhead & Co. Limited's proposed facility is located at Rivenhall Airfield, Woodhouse Lane, Kelvedon, Essex, CO5 9DF. 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

AAD	Ambient Air Directive (2008/50/EC)
AD	Anaerobic digestion
APC	Air Pollution Control
AQS	Air Quality Strategy
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CBA	Cost benefit analysis
CCW	Countryside Council for Wales
CEA	Cost effectiveness analysis
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
Defra	Department of Environment, Food & Rural Affairs
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
EQS	Environmental Quality Standard
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 675) as amended
ES	Environmental standard
EWC	European Waste Catalogue
FGT	Flue gas treatment
FPP	Fire prevention plan

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
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
IWMF	Integrated Waste Management Facility
LCV	Lower calorific value – also termed net calorific value
LADPH	Local Authority Director(s) of Public Health
LOI	Loss on Ignition
MBT	Mechanical Biological Treatment
MRF	Materials Recycling Facility
MSW	Municipal Solid Waste
MWI	Municipal waste incinerator
NFPA	National Fire Protection Association
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
OMP	Odour management plan
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
RHI	Renewable Heat Incentive
ROC	Renewable Obligation Certificate
SAC	Special Area of Conservation
SCADA	Supervisory Control and Data Acquisition
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)
SPZ	Source Protection Zone
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
USEPA	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 Gent Fairhead & Co. Limited 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 (EPR) 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 received by the Environment Agency on 2 March 2017 and duly made on 6 March 2017. 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 internal guidance RGS Note 6 for Determinations involving Sites of High Public Interest. 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 (GOV.UK) and consultation web site (Citizen Space), which contained all the information required by the IED, including telling people where and when they could see a copy of the Application. We also placed an advertisement in the Braintree & Witham Times Newspaper on 16 March 2017.

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 the Environment Agency, Rivers House, Threshelfords Business Park, Inworth Road, Feering, Kelvedon, Colchester, CO5 9SE. Anyone wishing to see these documents could do so and arrange for copies to be made. We also placed a copy of the Application at the Kelvedon Library and Coggeshall Libraries.

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

- Essex County Council (Planning Authority)
- Braintree District Council (Environmental Protection)
- Public Health England

- Director of Public Health (Essex County Council)
- Health & Safety Executive
- Essex County Fire & Rescue Service
- Food Standards Agency

These are bodies whose expertise, democratic accountability and/or local knowledge make it appropriate for us to seek their views directly. 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. We did not consult with Natural England in this determination.

In addition to advertising the Application, we undertook a programme of extended public consultation. Public drop-in events were held at the following locations and dates:

- Silver End Village Hall, Broadway, Silver End, CM8 3RQ on Monday 20 March, 2017; and
- Christ Church, Stoneham Street, Coggeshall, CO6 1UH on Friday 31 March, 2017

In order to publicise these events, press releases advertising the Application and the details of the public drop-in events were issued to local councillors, MPs, parish councils and other local interest groups.

Written comments were also accepted by the Environment Agency beyond the formal consultation period. 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 determination.

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 an information notice on 26 April 2017. A copy of the information notice and responses when received were placed on our public register.

In addition to our information notices, we received additional information during the determination from the Applicant:

Additional information	**Date received**
Revised cost-benefit analysis graphs and noise modelling data.	16/03/17
Additional information – site condition report.	30/03/17
Nitrogen dioxide process contributions at sensitive receptors.	31/03/17
Additional information – site condition report.	04/04/17

Additional information	Date received
Revised stack height assessment.	06/04/17
Additional information on air quality modelling, monitoring of stack emissions, IBA sampling protocol and revised fire prevention plan.	13/04/17
Response to Schedule 5 notice dated 26/04/17.	12/05/17
Revised Application documents (BAT assessment, noise measurements, HHRA, air quality assessment, abnormal emissions assessment, clarification of FPP aspects, specific energy consumption, air quality assessment methodology and stack height justification).	26/05/17
Revised air quality /noise model input files, clarification on cadmium and thallium concentrations and stack height information.	31/05/17
Revised site plan and justification of wastes proposed for incineration.	13/06/17
Revised Figure 4 diagram – dispersion modelling report.	04/07/17
Clarification of issues raised from consultation of draft decision #1.	09/08/17
Clarification of issues raised from consultation of draft decision #2.	11/08/17
Clarification of issues raised from consultation of draft decision #3.	15/08/17

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

Finally we consulted on our draft decision from 20 June 2017 to 18 July 2017. A summary of the consultation responses and how we have taken into account all relevant representations is shown in Annex 4.

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 activities listed in Part 2 of Schedule 1 to the EPR as follows:

- Section 5.1 A(1)(b) – The incineration of non-hazardous waste in a waste incineration plant with a capacity exceeding 3 tonnes per hour;
- Section 5.4 A(1)(b)(i) – Recovery or a mix of recovery and disposal of non-hazardous waste with a treatment capacity exceeding 75 tonnes per day involving biological treatment; and
- Section 6.1 A(1)(a) – Producing, in industrial plant, pulp from timber or other fibrous materials

The Applicant originally submitted a separate Application for the anaerobic digestion facility as a Standard Rules Installation. However, we determined that the anaerobic digestion facility shared site infrastructure (such as the main stack and drainage) with other activities. We consider that the anaerobic digestion facility is part of the Installation. We will regulate the anaerobic digestion facility as a section 5.4 A(1)(b)(i) activity under one Permit (see activity AR3 in the Permit).

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 e.g. lime slaking), and the ash storage bunker, are therefore included in the listed activity description.

An Installation may also comprise "directly associated activities", which at this site includes:

- Generation of electricity and steam (using a steam turbine and gas engines);
- Back-up electricity generator for emergencies;
- Mechanical & Biological Treatment (MBT) Facility;

- Materials Recycling Facility (MRF);
- Waste Water Treatment Plant (WWTP);
- Emergency flare operation
- Storage of waste prior to recovery or disposal
- Physical treatment for the purpose of recycling
- Storage of biogas
- Storage of digestate

Together, these listed and directly associated activities comprise the Installation.

4.1.2 The Site

The site for the proposed Installation is approximately centred on National Grid Reference TL 82293 20519. The Installation is to be located on the south-eastern edge of a World War II airfield known as Rivenhall Airfield between the villages of Bradwell (northwest 2.6 km), Silver End (southwest 1.1 km), Rivenhall (south 2.3 km), Coggeshall (northeast 2.8 km) and Kelvedon (southeast 3.4 km). Access to the site will be provided via a private access road from the existing A120. The former airfield and its immediate surroundings are on a plateau above the River Blackwater. The airfield was open and exposed and had been used predominantly for agricultural purposes, although extensive sand and gravel extraction and restoration has been undertaken at the site. There are 12 residential receptors within 1 km of the proposed facility.

There are no European habitat sites (Special Areas of Conservation, Special Protection Areas and Ramsar) within 10 km of the proposed Installation. There are no Sites of Special Scientific Interest (SSSIs) located within 2 km of the proposed Installation. There are seven non-statutory sites (local wildlife sites and ancient woodlands) located within 2 km of the proposed Installation.

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

Further information on the site is addressed in section 4.2 below.

4.1.3 What the Installation does

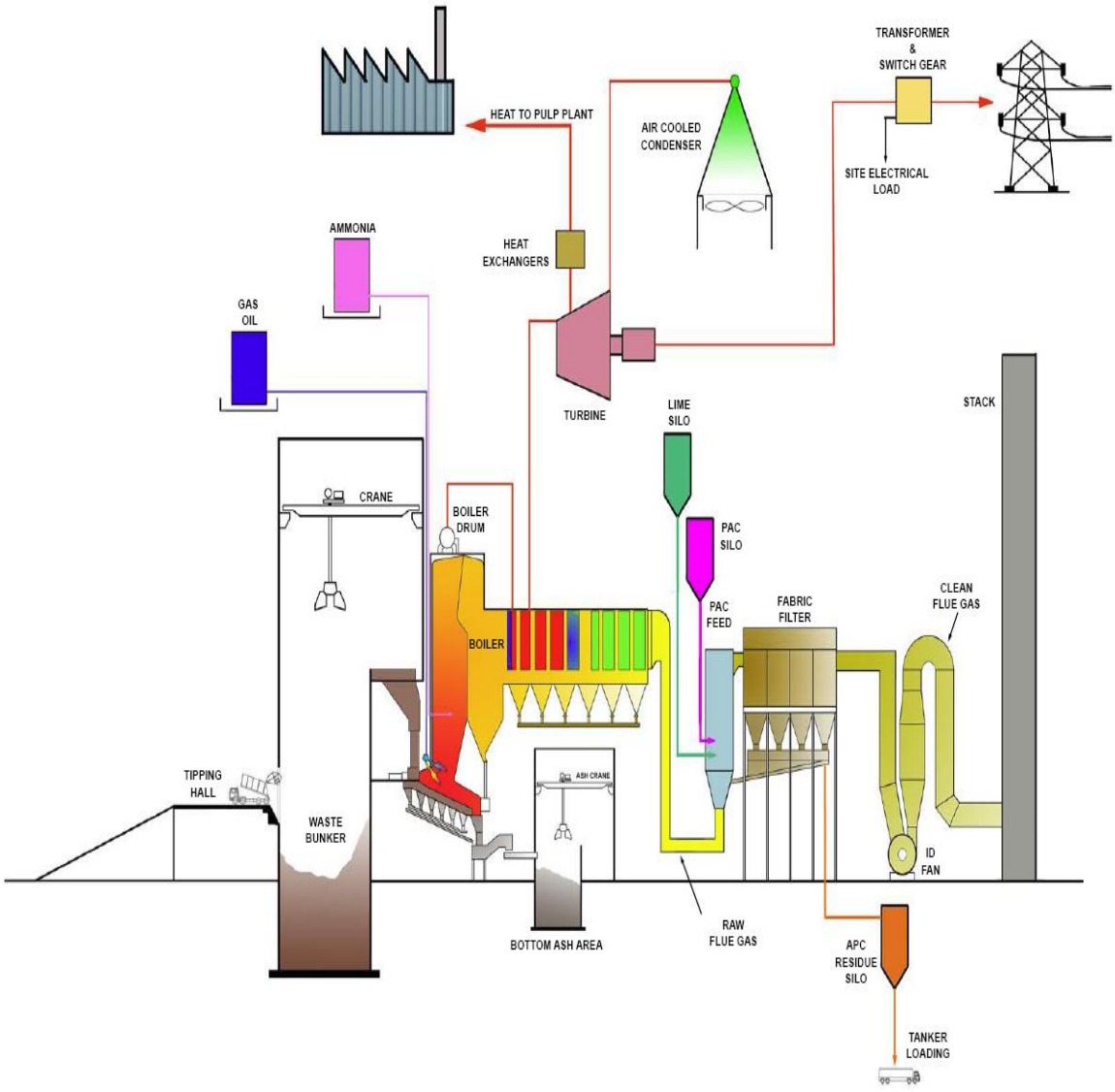
The Applicant has described the Installation as an Integrated Waste Management Facility, incorporating a CHP plant. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, the Installation comprises a waste incineration plant, a paper pulp plant, an anaerobic digestion facility and directly associated activities. As the main purpose of the CHP plant is the thermal treatment of waste notwithstanding the fact that energy will be recovered from the process, we consider the CHP plant as a waste incineration plant.

The key features of the Installation are summarised below:

Waste incineration plant

The waste incineration plant is proposed to burn waste comprising predominantly solid recovered fuel (SRF) and refuse derived fuel (RDF) from off-site satellite waste treatment facilities, RDF produced by the on-site MRF and MBT and some biological residues from the WWTP. The waste incineration plant will produce electrical power for use in the incineration process and other on-site processes with excess exported to the local distribution network. Heat will be provided as steam and hot water to on-site processes and for space heating.

The key features of the waste incineration plant are summarised below:



Waste throughput, Tonnes/line	595,000 te/annum	36.5 te/hour
Waste processed	Solid recovered fuel; refuse derived fuel	
Number of lines	2	
Furnace technology	Moving Grate	
Auxiliary Fuel	Gas Oil	
Acid gas abatement	Dry	Lime
NOx abatement	SNCR	Ammonia
Reagent consumption	Auxiliary Fuel: 600 te/annum Ammonia: 750 te/annum Lime: 6,800 te/annum Activated carbon: 150 te/annum Water demand: 691,800 te/annum	
Flue gas recirculation	Yes	
Dioxin abatement	Activated carbon	
Incinerator Stack	TL 82442 20418	
	Height, 58 metres above surrounding ground levels [note 1]	Diameter, 2.3 m
Flue gas	Flow (actual), 69.7 Nm^3/s Flow (normalised), 51.6 Nm^3/s	Velocity, 16.8 m/s
	Temperature 138.65 °C	
Electricity generated	49 MWe	399,350 MWh
Electricity exported	27.4 MWe	223,310 MWh
Steam conditions	Temperature, 440 °C	Pressure, 75 bar
Steam exported	35 MW	285,250 MWh
Waste heat use	Steam used at adjacent paper pulp plant – pulp drying machine: 184.1°C, 10 bar; disperger: 151.8°C, 4 bar	
Note 1 – Stack height is taken to mean the height relative to surrounding ground levels. The proposed Installation will be located at the base of a quarry. The stack height is 78 metres when measured from the base of the quarry but 58 metres above the level of the top of the quarry (surrounding ground levels). This gives an "equivalent stack height" of 58 metres.		

The waste incineration plant will consist of two combustion lines. The thermal capacity of each boiler will be 92 MWth giving a total thermal capacity of 184 MWth. The waste incineration plant will be designed to accept fuel with a net calorific value (NCV) design range of circa 7-13 MJ/kg. Fluctuations in the delivered NCV will lead to variations in the mass throughput of waste. The maximum waste input capacity of the waste incineration plant is 595,000 tonnes per annum. The waste incineration plant will generate up to 49 MWe. Normal export is expected to be around 28 MWe.

Anaerobic digestion facility

The AD facility is proposed to be located within the Installation and will comprise a wet pre-treatment and digestion system. This is considered to be a proven technology for the proposed waste feedstock, which will comprise separately collected municipal or commercial food wastes and/or other green

wastes, referred to as mixed organic waste. The AD facility will generate up to 1 MWe from the combustion of biogas, bringing the total electricity generation of the Installation to 50 MWe.

Mechanical biological treatment facility

The purpose of the MBT Facility is to receive collected municipal or commercial wastes that require some pre-treatment in order to remove moisture and recyclates (in combination with the adjacent MRF) and to manufacture a RDF suitable for energy recovery in the waste incineration plant. The MBT may also be employed when appropriate to biologically dry and moisture-condition incoming RDF prior to energy recovery in the waste incineration plant.

The MBT process is designed to receive materials that will be treated in a series of enclosed vessels. The vessels include individual floor and roof systems that provide for air to be forced through the waste to facilitate the process of biological drying. The process is designed for the treatment of up to approximately 170,000 tonnes per annum of waste utilising eight lines with two vessels in each line. The waste will be loaded into each vessel by a front-end loading shovel.

The waste will remain in the vessels for a minimum of 7 to 14 days enabling the biological process to occur, during which time the waste will lose up to 12% moisture content. This enables easier extraction of recyclables, particularly plastics and metals, within the mechanical processes in the MRF.

Materials recycling facility

The MRF is designed to identify and recover recyclates from the following streams:

- incoming untreated Municipal Solid Wastes (MSW) and Commercial & Industrial (C&I) wastes;
- the shredded and biologically dried MBT output; and
- untreated SRF and RDF from off-site sources.

The identification and separation processes are achieved initially through a mechanical process and subsequently through a manual process for final quality control. The design capacity of the MRF is 300,000 tonnes per year.

The MRF processing facility is divided into two lines:

- Line 1 is for processing the material that comes from the MBT bio-drying vessels.
- Line 2 is for processing material that generally comes directly into the Installation having undergone no treatment or minimal pre-treatment.

Once all recyclable materials have been removed, the remaining waste materials will be transferred to the waste incineration plant for burning.

Paper pulp plant

The paper pulp plant will be capable of recycling up to 170,000 tonnes per annum of recovered printing and writing paper and card. The plant has been designed and configured to produce recycled pulp suitable for use in the manufacture of writing or printing paper, white surface packaging and some tissue. To achieve this, the quality and purity of the paper and card feedstock imported to the site will comply with a recognised specification. This will provide the plant with raw materials suitable for the washing, cleaning, bleaching, mixing and drying operations required to produce the recycled pulp.

Grades (defined by EN643) within High Grade Recovered Paper (RCP), specifically sorted office papers and "white letter" which are largely post-consumer and uncoated papers and Multigrade (printer waste) will be sourced as a feedstock for the paper pulp plant.

Waste water treatment plant

Process water from the paper pulp plant will be despatched to the waste water treatment plant (WWTP) for treatment consisting of the following stages:

- Coarse and fine screening;
- Roughing and polishing dissolved air floatation (DAF);
- Lime soda softening;
- Sand filtration;
- Membrane treatment – reverse osmosis;
- DAF and precipitator sludge collection; and
- Dewatering.

The treated water from the WWTP will be transferred and stored in the on-site storage lagoon (Upper Lagoon) for re-use as process water within the Installation.

4.1.4 Key Issues in the Determination

The key issues arising during this determination were as follows:

- Water use;
- Emissions to air and impacts on human health and the environment; and
- Justification for selected stack height

We describe how we determined these issues in the relevant sections of this decision document (sections 4.3.9, 5.1 to 5.5, 6.1.2 and 6.2).

4.2 The site and its protection

4.2.1 Site setting, layout and history

The Installation site is underlain by the quaternary boulder clay deposit consisting of layers of firm to stiff orange or brown grey chalky mainly silty or gravelly clay with occasional sandy clay. The thickness of the boulder clay deposit varies between 1.6 metres and 17 metres. Sand and gravel deposits are located beneath the boulder clay unit. This layer consists of loose to medium dense yellow or orange brown or grey brown sands and gravels or sandy gravels with some chalk or flint in upper layers and some small cobbles or occasional clay nodules in lower layers. The sands and gravels layers are interspersed with thin sandy clay layers. The thickness of the sands and gravels deposit varies between 0 and 11.2 metres.

The London Clay located below the sands and gravels deposits consists of stiff to very stiff brown or grey clay. The upper surface of the London Clay is often weathered; the upper layers of the clay are often described as silty clay and often contain some gravel. The London Clay is classified as a non-aquifer, with the Upper Chalk below, classified as a Major Aquifer that is developed for industrial, public and general agricultural use. The hydrogeological map of the area indicates that in 1976, the piezometric surface of the Chalk Aquifer was at approximately 50 metres below the current ground level. The site is separated from the Major Chalk Aquifer by approximately 40 metres from the low permeability London Clay.

The Kesgrave Formation sand and gravel deposits beneath the site contain minor amounts of water, with the pattern of groundwater flow being influenced to some degree by the River Blackwater, and also by the topography of the surface of the underlying London Clay. Hollows in the underlying London Clay surface typically contain groundwater. The cohesive and relatively impermeable nature of the Lowestoft Formation overburden typically restricts the recharge to the Kesgrave Formation.

The site is not located within any source protection zones (SPZ). The closest SPZ is located approximately 9 km to the north of the site. There are 6 licenced groundwater abstractions within a 5 km radius of the site. There are no records of private water abstractions within 5 km of the site.

The proposed Installation lies within the permitted areas of the Bradwell Quarry where sand and gravel extraction is currently in operation.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

The Applicant's physical and management measures to prevent pollution to the environment is described in the Supporting Information document submitted with the Application and is summarised below:

Physical prevention measures	
Substance or scenario	**Prevention measures**
Water run-off	The plant will be constructed on hardstanding and constructed of materials resistant or impervious to the substances being handled. All surfaces are designed to direct rain and storm water run-off to the surface water drainage system. Surface water run-off (storm water) will be collected in the site drainage system and pumped from the surface water drainage collection sump into the Upper Lagoon, from where it is used for site processes. The lagoon has been designed with a freeboard capacity sized to accommodate surface water flows after rain for events up to and including a 1 in 100 year flood event.
Firewater	The site drainage system has been designed to contain all discharged firewater onsite, in the Upper Lagoon and within the site drainage systems. The Installation has been designed for zero liquid discharges, and there will be no discharge of contaminated waters from fire-fighting from the Upper Lagoon.
Spills and leaks; loss of containment; transfer of substances; overfilling of vessels	All storage areas will be provided with secondary containment and constructed from materials resistant or impervious to the substances contained. Bund capacity will be constructed to contain 110% capacity of the largest tank and 25% of the combined capacity of all the tanks in the bund, whichever is the larger. Tanks and pipe-work containing potentially polluting liquids will be constructed so that any leaks /spills will be contained within a bund.
Management controls	
Competent trained staff will be used for handling, storage and transfer of materials. Materials will be handled in contained areas to contain any spillages. Routine inspection of tanks, bunds and container vessels to check for damage and/or deterioration. Spill kits will be available to contain and collect small spillage. Condition 1.1.1 of the permit requires that the scope of the management system shall include measures to minimise the risk of accidents and incidents using competent persons and resources. An accident management plan will be in place prior to the commencement of commissioning.	

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 without a complete baseline data. We have reviewed that report and consider that it does not adequately describe the condition of the soil and groundwater prior to the start of operations. There are two approved conditions within the existing planning consent for the Installation (condition 24 and condition 25), which relate to a scheme for groundwater monitoring and contaminated soil (including remediation and mitigation measures should contamination be identified). The Applicant proposes to submit the baseline report on soil and groundwater at that time. We have therefore set pre-operational condition 6 requiring the Operator to provide this information prior to the commencement 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. However, it is only required before operations begin as it provides the baseline information for the state of the site at that time.

We have assessed the management and physical measures described in the Application and consider that the likelihood of incidents involving loss of containment is low and that the overall risk to the local environment is not significant. Pre-operational condition 7 requires the Operator to submit proposals (in the form of a protocol) for meeting the requirements of soil and groundwater monitoring in accordance with IED required under Article 16.

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 2.11.2 Supporting Information document submitted with the Application. Pre-operational condition 1 requires the Operator to have an Environmental Management System (EMS) in place before the commencement of activities AR1 to AR6 in the Permit 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 account 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

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.

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 EMS that will be certified under ISO14001. Pre-operational condition 1 is included requiring the Operator to provide a summary of the EMS prior to

commissioning of each regulated activity (AR1 to AR6) and to make available for inspection all EMS documentation. The Environment Agency recognises that certification of the EMS cannot take place until the Installation is operational. Improvement condition 1 is included requiring the Operator to report progress towards gaining accreditation of its EMS.

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. However, the Applicant reports that the Accident Management Plan will be in place prior to the commencement of commissioning of the Installation. The plan will be part of the Emergency Preparedness and Response Plan and will include:

- Identifying what dangerous substances are present at the Installation and the risks associated with them;
- Identifying and implementing the control measures to either remove the risks or control them to within acceptable limits;
- Putting controls in place to reduce the effects of any incidents involving dangerous substances;
- Creating and putting in place plans and procedures to deal with accidents, incidents and emergencies involving any dangerous substances;
- Ensuring that employees are properly trained and informed on the control of the risks from the dangerous substances identified; and
- Identifying and classifying areas of the Installation where explosive atmospheres may occur and ensuring that no ignition sources are present in those areas

Having considered the 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 pre-operational condition 1.

4.3.5 Fire prevention plan

The Environment Agency's Fire Prevention Plan (FPP) guidance (dated November 2016) has been designed to ensure that Applicants meet 3 objectives:

- minimise the likelihood of a fire happening on site
- aim for a fire to be extinguished within 4 hours
- minimise the spread of fire within the site and to neighbouring sites

Please note that Applicants can propose other fire prevention measures other than those specified in the Environment Agency's FPP guidance provided that the objectives above are met. The guidance does not replace statutory requirements or other applicable legislation.

The Applicant submitted a Fire Prevention Plan. The Applicant's FPP details how they will meet the following 3 objectives at the Installation:

Measures to minimise the likelihood of a fire happening

Waste incineration plant

The waste incineration plant bunker is sized as follows: Length – 52 m, Height – 22.8 m, Depth – 24.5 m. The maximum waste storage capacity of the bunker is approximately 29,000 m^3 which will be the theoretical maximum volume of waste stored. The waste bunker will be a subsurface structure of concrete construction and located within the waste incineration plant. With respect to the potential volume of fire water required, this will be considerably less than the total potential (or 'airspace') volume of the bunker i.e. reduced by the volume taken up by waste at the time of a potential fire.

The bunker is designed as a 2-hour fire compartment with water cannons installed. The roof steelwork above the bunker will be protected with water sprinklers in the event of a fire within the bunker. These measures are in accordance with the requirement of the National Fire Protection Association (NFPA) and the insurers of energy from waste plants in the UK.

Bunker management procedures will be adopted to ensure that there is a constant turnover of waste within the bunker to prevent the occurrence of hot spots or anaerobic conditions. The crane has been sized to ensure that there is up to 45 minutes per hour for mixing and rotating of the waste within the bunker. There will be thermal imaging cameras fixed around the perimeter of the bunker to provide the crane driver with a continuous thermal 'map' of the bunker. The crane driver will therefore be able to identify and react to hot areas in the bunker and undertake mixing or feeding of waste as appropriate, or in extreme cases, use the fire water cannons to extinguish any smouldering/burning waste.

Materials recovery facility

The incoming waste storage facility within the MRF is the day holding bunker /floor tipping bay ('bunker/bay') situated within the MBT building area. The bunker/bay will be of concrete construction and located within the MBT process areas. The floor of the bunker/bay is contiguous with the floor of the MBT building. Waste is held in the bunker/bay by means of rear and side-wall concrete push-walls designed to withstand the wheeled loader operations, and for increased safety and operational reasons the theoretical volume (or airspace) of the bunker/bay will be greater than the operational maximum.

The bunker/bay will be sized to accommodate a maximum volume of waste of 432 m^3. The dimensions of the bunker/bay will be larger than the dimensions of the pile to allow for tipping and pile management using a wheel loader, i.e. push-walls are expected to be 4 or 5 metres high, width up to 18 m and depth 14 m. Control markings, such as thick horizontal and vertical painted lines on the walls will delineate a "maximum" potential pile size. There will be clear separation of 6 metres between the bunker/bay side-walls for incoming MBT wastes and the side-wall for the adjacent feeding bay into the MRF.

Recyclates which are recovered within the MRF will be baled and stored in the dedicated MRF recyclates storage area prior to transfer off-site to a suitably licenced recycling facility. The MRF recyclates storage area is an area of hardstanding at the same level as the MRF operating floor. Stored recyclates will be in the form of bales.

Recyclates will drop from either of the two lines, and from the manual picking conveyor, into segregated steel troughs (one per recyclate type) running transversely beneath the recycling lines. These troughs will be fitted with a walking floor at the base and a gate at one end leading onto a conveyor belt that feeds a baler. Each recyclate commodity can then be baled separately as required by opening the selected gate onto the baling conveyor. Each bale will be approximately 1.3 m^3 maximum.

The baled recyclates will be stored in piles awaiting transfer to a licenced re-processing facility. The bales will be stored in 25-tonne piles (i.e. approximately 25 bales per pile). The baled recyclates will be stored in this area for no more than two weeks prior to collection and transfer off-site to a reprocessing facility. The baled recyclates storage area will be at the front of the MRF building and will be 70 m wide by 3 m deep (front to back). Within the dedicated storage area, the individual piles will be no less than 6 metres apart. The MRF recyclates storage area will be covered by water sprinklers designed for 14.3 mm/minute.

RDF Output

The RDF output will be stored in the RDF storage bay within the MRF at the end of the MRF lines. The day holding bunker / floor tipping bay ('bunker/bay') will be of concrete construction and located within the MRF process areas. The floor of the bunker/bay is contiguous with the floor of the MRF building. Waste is held in the bunker/bay by means of rear and side-wall concrete push-walls designed to withstand wheeled loader operations, and for increased safety and operational reasons the theoretical volume (or airspace) of the bay will be greater than the operational maximum.

The RDF will drop into the bunker/bay from conveyors and the volume of the pile will be managed by the plant operator using a wheel loader. The bunker/bay will be sized to accommodate a maximum volume of RDF of 432 m^3. The dimensions of the bunker/bay will be larger than the dimensions of the pile to allow for tipping and pile management using a wheel loader (i.e. push-walls may be 4 or 5 m high, width up to 14 m and depth 21 m). Control markings, such as thick horizontal and vertical painted lines on the walls will delineate a "maximum" potential pile size.

Whilst the maximum stored waste in the RDF bunker/bay floor area will be limited by operations to less than 450 m^3, it is possible that two trailers will be used to collect RDF as it is deposited by the conveyors. One would be filled while the other would be taken by a slave tractor to the RDF bunker in the waste incineration plant. The RDF storage area will be covered by water sprinklers designed for 14.3 mm/minute.

Mechanical biological treatment facility

The incoming waste storage facility within the MBT is the day holding bunker / floor tipping bay ('bunker/bay') situated within the MBT building area. The bunker/bay will be of concrete construction and located within the MBT process areas. The floor of the tipping bay is contiguous with the floor of the MBT building. Waste will be held in the bunker/bay by means of rear and side-wall concrete push-walls designed to withstand the wheeled loader operations, and for increased safety and operational reasons the theoretical volume (or airspace) of the bay will be greater than the operational maximum.

The bunker/bay will be sized to accommodate a maximum volume of waste of 432 m^3. The dimensions of the bunker/bay will be larger than the dimensions of the pile to allow for tipping and pile management using a wheel loader (i.e. push-walls may be 4 or 5m high, width up to 18 m and depth 14 m). Control markings, such as thick horizontal and vertical painted lines on the walls will delineate a "maximum" potential pile size.

There will be a 6-metre clear separation between the tipping bay side-walls for incoming MBT wastes and the adjacent bay side-wall for the bay for direct feed into the MRF. The day holding bunker will be emptied at the end of each day. The whole of the MBT area will be covered by water sprinklers designed for 14.3 mm/minute.

There will be 16 vessels installed within the MBT facility. Each vessel is designed to hold up to 200 tonnes of waste. Therefore, there would be up to 3,200 tonnes of waste being processed within the MBT facility at any one time. The vessels will have concrete walls on three sides and a retractable roof which can be pulled back to allow loading/unloading of the vessels. Within the MBT tunnels, the temperature inside the waste for optimum biological drying conditions is likely to be in the region of 50 to 60°C.

Upon completion of processing the waste within the biodrying tunnels, it will be unloaded from the tunnels and transported by wheeled loader directly into the MRF reception hopper for further processing as part of the MRF operation. There will be no other storage of bio-dried waste within the MBT building apart from within the MBT vessels.

Paper pulp plant

The waste reception area within the pulp plant for incoming waste paper and card bales known as “Recovered Paper” (or “RCP”) has been designed with a maximum waste storage capacity of 8,450 tonnes, equivalent to approximately 24 days’ supply. The total floor area of the RCP hall is 3,920 m^2. RCP bales will be stored in stacks/piles not exceeding a volume of 750 m^3. Separation between the piles will be minimum of 6 m. Delivered RCP will have typical bale dimensions of 1.4 m long x 1.1m wide x 1.1m high. Stacking is considered to be safe up to a height of five bales giving a maximum height of the pile of 5.5 metres.

The RCP will be delivered by road and stored in the area shown in the drawings. The RCP piles will be turned periodically to minimise the risk of self-combustion and will be processed on a ‘first-in first-out’ basis. A complete stock turn is expected to occur 15 to 20 times per annum, therefore the RCP will not be stored on-site for any longer than 2 to 3 weeks. In accordance with the insurers guidance (ACE Engineering Technical Risks Information Bulletin Guidance Document – Waste Processing Plants – Fire Systems), the RCP storage area is protected with fire detection and water sprinklers designed for 14.3 mm/minute.

Maximum total waste retention times

Waste delivered to the Installation will be treated within a number of the different waste treatment processes.

Allowing for the design capacity of the waste incineration plant, it is estimated that the maximum period of time in which waste will remain in the bunker will be approximately 4 to 5 days. Typically, the bunker will be filled sufficiently by the end of business on a Friday, to operate over the weekend without further waste deliveries. By commencement of delivery on the following Monday (or Tuesday on a bank holiday), the bunker will be nearly empty. Therefore, the maximum expected storage period for waste in the waste incineration plant bunker will be approximately one week.

With regard to other municipal and commercial wastes processed through the MBT and MRF, the longest period would be via the MBT:
Incoming waste to MBT (1 day) -> 7 days in MBT clamps -> 1 day transfer to MRF plus 1 day processing RDF (1 day) to waste incineration plant (7 days): Total 17 days

Taking into consideration the other timescales detailed above, the maximum total retention times for waste (paper) to be stored and treated within the Installation is 29 days:
RCP to Pulp plant (24 days) -> Paper de-inking process (1 day) -> Pulp sludge prior to land-spreading (1 day). The Pulp retention on site is not counted as this is a product at this stage and no longer a waste.

In conclusion, the maximum storage time for waste prior to treatment at the proposed Installation would be 24 days for the RCP storage area, and up to 17 days for municipal and commercial RDF (i.e. via the MBT and MRF to the waste incineration plant). Total retention times through the storage and treatment systems on site would not exceed 29 days for all wastes.

Arson or vandalism

Security measures will prevent access by members of the public and thereby prevent the risk of arson attacks or vandalism. The proposed Installation will be bounded by security fencing and monitored using CCTV. A barrier will be present at the entrance and exit to site to control vehicular access. There will be a gatehouse at the proposed Installation which will be manned 24-hours per day (including security guards during night-time hours). Only authorised visitors will able to enter the site.

The Installation will be operational and manned 24 hours, 7 days a week, with the CCTV system monitored in the control room by the operators. The shift team leaders will be responsible for security on the site, including delivery vehicles as they travel around the site.

The Applicant reports that an emergency preparedness procedure will be developed for the Installation, prior to the commencement of operations as part of the site EMS, which will detail the response to a number of different emergency situations on site, including unauthorised personnel on site.

Measures to extinguish a fire within 4 hours

Fire detection systems

Procedures will be developed to detect a fire in its early stages to enable the impact of the fire to be reduced. There will be a fire detection and alarm system which will cover the whole Installation.

The fire detection systems will include the following, where appropriate:

- Smoke and heat detectors including temperature probes;
- CCTV visual flame detection systems; and

- Spark, infrared and ultraviolet detection.

The fire alarm systems will include the following:

- Local detectors/transducers and call points;
- Sounders/high intensity flashing beacons;
- Cabling and containment systems;
- Local control and indication panels; and
- Remote control and indication panel (incorporating integral printers) will be in the control room.

The details of the fire detection and alarm systems for each process area will be confirmed prior to the commencement of commissioning of the Installation.

- Automatic fire detection and alarm systems will be designed and maintained by a suitably qualified, experienced and registered fire protection engineer.
- Detailed design calculations, risk assessments and system drawings to demonstrate compliance with the requirements of the building control officer, fire officer and the insurer's requirements will be produced during detailed design.
- It will be the responsibility of the shift team leaders to monitor the fire alarms for the Installation.

Fire suppression systems

There will be a fire suppression system installed in the locations considered to be at risk of fire across the Installation as specified by the Fire Strategy and NFPA 850. The fire suppression systems will include the following:

- Automatic sprinkler/water deluge systems – Waste reception and storage areas, waste incineration plant waste feed system, step-up transformer area, 33 kV series circuit reactor, fire pump container and the emergency diesel generator.
- Automatic foam systems – turbine generator and lube oil systems, waste incineration plant auxiliary burners.
- Inert gas suppression – electrical rooms, CEMS container.
- CO_2 gas suppression system – For the bag filters in the flue gas treatment system.

The automatic fire suppression systems will be designed and maintained by a suitably qualified, experienced and registered fire protection engineer. All automated fire suppression equipment will be covered by an appropriate UKAS-accredited third party certification scheme.

Provision of firewater

The Applicant reports that the firewater provision for the Installation has been designed in accordance with the requirements of ACE and NFPA850, which require that fire-fighting systems should be based on providing a 2-hour supply for the following items:

1. Either of items below, whichever is larger:

- The largest fixed fire suppression system demand; and
- Any fixed fire suppression system demand that could reasonably be expected to operate simultaneously during a single event; and

2. The hose stream demand of not less than 1,890 litres per minute.

All waste treatment process areas will have 2-hour fire walls to contain any fire within the individual waste treatment process areas.

Applying the requirements of ACE guidance, titled '*ACE Technical Risks - Engineering Information Bulletin Guidance Document*', the treatment process which will have the greatest firewater demand will be the paper pulp plant.

Taking the design of the pulp plant into consideration, the fire protection measures could be required to operate simultaneously for the following areas:

- MDIP storage and vehicle circulation area;
- Pulp processing plant;
- RCP storage & vehicle circulation;
- Workshop;
- Stores;
- Sludge process area;
- Sludge bunker area; and
- Offices.

The recommendations of NFPA850 include that a minimum of 2 hours of supply should be available and that any water supply should be replenishable within an 8-hour period. Taking into consideration the requirements for firewater supply for the paper pulp plant, the supply of firewater is significantly greater than the two hours required to satisfy the requirements of ACE.

Furthermore, it is acknowledged that the FPP guidance requires a provision of three hours supply of water for fire-fighting. Taking this into consideration, the firewater provision for the paper pulp plant would be approximately 24,450 m^3 of water.

Applying the requirements of the FPP guidance, that a "worst case scenario would be the largest waste pile catching fire", this would apply to the waste incineration plant bunker. The guidance states that "*a water supply of at least 2,000 litres a minute for a minimum of 3 hours for a 300 cubic metre pile of combustible material*". The capacity of the bunker is approximately 29,000 m^3. Therefore, applying the requirement of the FPP guidance, the requirements for the provision of firewater is 34,800 m^3 of water for fire-fighting.

Firewater will be provided from the Upper Lagoon. The capacity of the Upper Lagoon will be maintained at a minimum of approximately 25,000 m^3 (by automatically pumping top-up water as and when required from New Field Lagoon into Upper Lagoon). This system will be maintained by topping up New Field Lagoon by pumping water from the River Blackwater, in accordance with the EA abstraction licence (AN/037/0031/001/R01). Whilst the Upper Lagoon has a minimum storage capacity of 25,000 m^3, New Field Lagoon has an additional storage capacity of 250,000 m^3 (minimum). Therefore, there is a total available capacity of 275,000 m^3 (minimum) of water available at all times for firefighting. This is far in excess of the requirements of the FPP guidance.

Bunker cannons

Thermal cameras will be installed over the waste incineration plant bunker to detect any hot spots in the waste. If the temperature of any hot spot exceeds 90ºC, water cannons installed around the bunker will automatically operate to prevent the potential for fire outbreak within the bunker. The water cannons within the bunker will operate automatically, although it can also be operated remotely from the control room. The cannons will be located in positions to optimise the horizontal and vertical coverage of the water sprays for total firefighting suppression across the entire area of the bunker.

Throughout the detailed design of the bunker, the number and position of the fire monitors and cannons will be established, alongside the automatic and remote control systems. Continuous fire monitor (or hot spot) screens will be installed within the main control room.

Fire hose reel system and wet riser system

A pumped fire hose reel system will be installed at the Installation. The fire hose reel system will be designed to ensure that all internal areas and rooms are within the range of a fire hose. Following detailed design of the Installation, a plan identifying the location of the fire hose reels will be developed.

Fire hydrant and mains

Standard fire hydrants of the underground type will be provided within a concrete pit, housing a sluice gate valve and handle key for opening and shutting off water supply to the fire hydrant. Appropriate signage shall be supplied for the fire hydrant system. The fire hydrants will be designed in accordance with the requirements of the Building Regulations and spaced at no greater than 90 metres apart, approximately 12 metres from the building.

The location of fire hydrants will be subject to detailed design. Following detailed design of the Installation, a plan identifying the location of the fire hose reels and hydrants will be confirmed. A drawing showing the indicative locations of the fire hydrants is presented in Appendix A of the FPP. Fire hydrants and mains will be designed in accordance with the requirements of the Building Regulations.

Fire extinguishers

Fire extinguishers will be strategically located throughout the Installation. The location of the fire extinguishers will be subject to implementation of the recommendations of the Fire Officer for the Installation. Following detailed design of the Installation, a plan identifying the location of the fire extinguishers will be developed.

Containment of firewater

The site drainage system has been designed to contain all discharged firewater onsite, in the Upper Lagoon and within the site drainage systems. The Installation has been designed for zero liquid discharges, and there will be no discharge of contaminated waters from fire-fighting from the Upper Lagoon.

The water used for fire-fighting will be sampled and analysed to identify whether it is suitable to be used as process water or if treatment/disposal of the water is required. If the firewater is considered to be contaminated, the water will be pumped out, and transferred off-site to a suitably licenced waste management facility. The Upper Lagoon will have a storage capacity of approximately 25,000 m^3 with a water level 32 m AOD. It should be noted that above the water level of 32 m AOD Upper Lagoon has an additional 20,481 m^3 of storm water storage capacity.

The Upper Lagoon will be constructed below surrounding ground levels and within areas of previous quarry working. The side slopes of the Upper Lagoon will be constructed largely within in-situ London Clay (permeability $<10^{-10}$ m/s) and backfilled Boulder Clay. The slopes will be shaped to a maximum gradient of 1V:3H. Furthermore, it should be noted that the Installation will be constructed within the footprint of a former quarry, below surrounding ground level.

Measures to minimise the spread of fire within the site and to neighbouring sites

In accordance with the waste acceptance procedures for the Installation, unloading of all waste deliveries will be supervised by operational staff. CCTV will be installed in all areas where there will be vehicles discharging waste into waste reception facilities and areas where wastes and recovered materials are discharged from the processes. The design of the CCTV systems is subject to detailed design of the waste treatment processes.

Within the waste incineration plant, the bunker will be continuously monitored by the fully automatic thermal imaging system linked to the water cannons. During daytime operation, the bunker will be visually monitored by the full-time crane operator. At night-time the control personnel will visually monitor the bunker as part of their responsibilities for operating the waste incineration plant.

There will be thermal imaging cameras fixed around the perimeter of the bunker to provide the crane driver with a continuous thermal 'map' of the bunker. The crane driver is, therefore, able to identify and react to hot areas in the bunker and undertake mixing or feeding of waste as appropriate, or in extreme cases, use the fire water cannons to extinguish any smouldering /burning waste.

Fire walls will be installed between the different waste treatment processing areas. Areas with a higher risk of fire will be protected in accordance with the requirements of NFPA 850. These areas are separated through fire-resistant construction (indoor) or by separation distance (outdoor). NFPA 850 recommends that fire-resistant barriers rated to 2 hours are installed to provide separation of these areas from each other and the rest of the building. Any doors, shutters or penetrations through these walls also have a fire-resistance rating of 2 hours of protection in accordance with NFPA 850. Where fire-resistant barriers are installed, the supporting structure will also be protected to at least the same rating as the barrier itself.

Fire walls will be installed with a 'freeboard' space at the top and sides to contain any fires within the individual waste treatment facilities. Where fire walls are present, the separation distances stated in the Environment Agency's FPP guidance will be implemented in the design of the Installation.

Where fire walls are not being used, there will be a separation distance of at least 6 meters between waste piles and the site perimeter, any buildings, or other combustible or flammable materials. The design of the Installation means that between processing areas, full height fire walls will be installed.

Quarantine areas for unacceptable waste

The location of quarantine areas within the waste treatment areas are subject to detailed design, however it can be confirmed that the quarantine areas will have a suitable clearance around the perimeter. Following completion of detailed design of the waste treatment processes, plans showing the location of all quarantine areas will be developed. The plans will show the size of the quarantine area, clearance areas around the perimeter and infrastructure associated with the quarantine areas.

As a minimum, it is expected that in addition to the quarantine area provided for the waste incineration plant, there will be at least one other quarantine area established in the MBT building that would be suitable to temporarily store any unacceptable waste that is detected prior to being tipped into the MBT vessels, MRF hopper or the AD process. These will be identified by the wheeled loader driver or the AD operative and removed using the site backhoe and placed into the quarantine bunker.

The MBT building quarantine area will be provided near to (but with minimum 6 metres spacing) the day holding bunkers at the level of the tipping hall. It will have a concrete floor and push-walls to allow the waste to be collected and loaded into appropriate road vehicles and removed from the site. Fire detection and protection measures (e.g. smoke /flame detectors, hose reel, sprinklers, or water cannon) will be installed in this area, the final design being subject to the recommendations of the final fire strategy completed during the detailed design phase of the project and agreed with insurers.

Our assessment

We have assessed the Applicant's Fire Prevention Plan (FPP) and we are not satisfied that it meets the objectives set out in the Environment Agency's Fire Prevention Plan guidance (November 2016) as not all the information can be provided at this time. We identified some omissions in the FPP in relation to location of quarantine and designated smoking areas, emergency preparedness procedures, staff fire exercises etc. which have not been provided in detail.

The Applicant reports that this is a preliminary Fire Prevention Plan (FPP) for the Installation and will be subject to review following completion of detailed process design, which has not yet been undertaken. The Installation is expected to take approximately 3 years to build, commission and switch to full operational status. The construction and commissioning of the Installation will be undertaken as a "phased project".

The Applicant confirms that a suite of emergency procedures for the Installation will be written and included in the training package for all staff and contractors. Training of site operatives will commence approximately 6 months prior to commencement of commissioning of each process plant and all operational personnel will be tested on the fire prevention and emergency procedures.

Prior to the commencement of commissioning of each activity (AR1 to AR6), the Installation's FPP will be updated and submitted to the Environment Agency for approval. The FPP and the measures to mitigate the risk and impact of fires within the Installation will be developed in accordance with the requirements of:

- Environment Agency Fire prevention plans: environmental permits (9 November 2016);
- Building Regulations – Approved Document B (Fire Safety);
- ACE Technical Risks, Engineering Information Bulletin, Guidance Document Energy from Waste (EfW) – Fire Systems Issue 1.0 (26 March 2014);
- ACE Technical Risks, Engineering Information Bulletin, Guidance Document Waste Processing Plants – Fire Systems Issue 1.0 (26 March 2014);
- NFPA 850: Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations, 2005 Edition published by the National Fire Protection Association; and
- Insurer's requirements where structures or equipment fall outside published guidance or recommended practice.

We have not approved the FPP and we accept it is not appropriate to finalise it at this present time; however we have set pre-operational condition 10 to allow the Operator time in which to provide a revised FPP prior to the commencement of commissioning of activities AR1 to AR6 in Table S1.1 of the Permit. To be clear, the Environment Agency's FPP guidance does not replace other statutory requirements or applicable legislation with respect to fire prevention measures. The Applicant is expected to comply with all relevant legislation with respect to prevention and management of fires. The environment and human health are not at risk from pollution from fires at the Installation as no waste can be accepted, processed or any commissioning commence until the Environment Agency approves the updated FPP in writing prior to the commissioning of each activity. Given the duration of time it would take for the Installation to commence full commercial operation, we consider that this is a reasonable and proportionate approach to permitting plants of this size undertaking a phased construction /commissioning.

4.3.6 Off-site conditions

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

4.3.7 Operating techniques

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

Operating techniques		
Description	**Parts**	**Date Received**
Application	Supporting Information of the application document provided in response to section 3a – technical standards, Part B3 of the application form (excluding references to the AD facility as a standard rules facility); Annex 4 – Environmental Risk Assessment; Annex 8 – Pest Management Plan.	06/03/17
Additional information	Monitoring of stack emissions; IBA sampling protocol	13/04/17
Response to Schedule 5 Notice dated 26/04/17	Operating techniques described in the responses to the Notice: Responses 1 and 2 (environmental risk assessment), Response 3 (pest management), Responses 4 and 5 (back-up generator), Response 7 (site surface water streams), Response 8 (discharges to River Blackwater), Responses 9 and 10 (water use), Responses 26 to 28 (energy efficiency).	12/05/17
Additional information	Revised BAT assessment and stack height justification	26/05/17 & 31/05/17

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 condition 2.3.1 and Table S1.2 in the Permit Schedules.

We have also specified the following limits and controls on the use of raw materials and fuels:

Raw Material or Fuel	Specifications	Justification
Gas Oil	<0.1% sulphur content	As required by Sulphur Content of Liquid Fuels Regulations.

Article 45(1) of the IED and Article 23 of the WFD require that a 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 contains a list of those wastes in section 2.2 of the Supporting Information Document. The wastes are coded by the European Waste Catalogue (EWC) number, which the Applicant will accept in the waste

streams entering the Installation and which the Installation is capable of processing 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 Tables S2.2, S2.3, S2.4, S2.5 and S2.6.

We are satisfied that the Applicant can accept the wastes contained in Tables S2.2, S2.3, S2.4, S2.5 and S2.6 of the Permit because:

(i) these wastes are categorised as municipal waste in the European Waste Catalogue or are non-hazardous wastes similar in character to municipal waste (except 07 01 08* which is a hazardous waste designated for the AD facility and specified in our standard permits) and are capable of being safely processed 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 based on the design and operating hours as follows:

Process	Annual throughput (tonnes per annum)
Waste incineration plant	595,000
Materials recycling facility	300,000
Mechanical biological treatment facility	170,000
Anaerobic digestion facility	30,000
Paper pulp plant	170,000
Waste water treatment plant	550,000

The Installation will be designed, constructed and operated using BAT for the processing of the permitted wastes. We are satisfied that the operating and abatement techniques are BAT for incineration, paper pulp activity, biological treatment, materials recycling and waste water treatment. Our assessment of BAT is set out later in chapter 6 of this decision document.

4.3.8 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 chapter 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 to "*assess the cost and benefits of providing for the operation of the installation as a high-efficiency cogeneration installation*".

   Cogeneration means the simultaneous generation in one process of thermal energy and electrical or mechanical energy and is also known as combined heat and power (CHP).

   High-efficiency co-generation is cogeneration which achieves at least 10% savings in primary energy usage compared to the separate generation of heat and power – see Annex II of the Energy Efficiency Directive for details on how to calculate this.

(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:

1. Maintenance and housekeeping procedures to ensure efficient operation.
2. Insulation to avoid heat losses from relevant plant items such as the main furnace and steam systems.
3. Energy will be monitored and recorded. Usage will be reviewed to identify areas for improvement and ensure that any abnormal increase in energy use is investigated and appropriate action taken to resolve the issue.
4. An energy efficiency plan will be incorporated within the Operating and Maintenance (O&M) procedures.
5. Plant maintenance regime to ensure energy efficiency is maintained.

The Applicant claims that due to the sensitivity of the site within the wider landscape and the desire to reduce the visual impact of the Installation, a condition of “no visible plume from the stack” was set in the planning consent. The Applicant considered two options to achieve this condition – the removal of water vapour from the plume or dilution of the plume from the waste incineration plant with the exhaust air from another process. The Applicant considered that the option of removing water vapour from the plume was not practical.

The second option considered was to dilute the plume from the waste incineration plant with the exhaust air from the pulp plant, as this has a lower moisture content. Dispersion modelling was carried out to predict the number of visible plumes which would occur in a year. The Applicant reports that operating with a temperature of 138.7°C ensured that there were no visible plumes predicted between June and September, but a very small number of visible plumes were predicted for the rest of the year.

The Applicant acknowledges that the energy efficiency of the waste incineration plant may be reduced due to the need to avoid a visible plume as set by the Planning Authority. However, the Applicant has proposed to implement further measures to ensure that the waste incineration plant has a high energy efficiency, which are:

- The boilers will be equipped with economisers and super-heaters to optimise thermal cycle efficiency without prejudicing boiler tube life, having regard for the nature of the waste that is being burnt;

- Unnecessary releases of steam and hot water will be prevented, to avoid the loss of boiler water treatment chemicals and the heat contained within the steam and water;

- Medium Pressure and Low Pressure steam from pass-outs on the turbine will be used to pre-heat combustion air;

- Steady operation will be maintained where necessary by using auxiliary fuel firing; and

- Boiler heat exchange surfaces will be cleaned on a regular basis to ensure efficient heat recovery.

The Application states that the specific energy consumption of the waste incineration plant – a measure of total energy consumed per unit of waste processed, will be 123.4 kWh/tonne based on an annual throughput of 595,000 tonnes per annum.

Data from the BREF for Municipal Waste Incinerators shows that the range of specific energy consumption 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 150 kWh/tonne of waste with an LCV of 10.4 MJ/kg. The LCV in this case is expected to be 7 – 13 MJ/kg (9.07 MJ/kg used in design calculations). Taking account of the difference in LCV, the specific energy consumption in the Application is in line with that set out above.

(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) plants 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 0.6 – 1.0 MWh/tonne of waste (based on LCV of 15.2 MJ/kg) for pre-treated wastes. Our technical guidance note, EPR 5.01, states that where electricity only is generated, 5–9 MW of electricity should be recoverable per 100,000 tonnes/annum of waste (which equates to 0.4 – 0.72 MWh/tonne of waste).

The proposed Installation will generate electricity for export to the National Grid, but will also provide heat in the form of steam to the adjacent paper pulp plant and waste water treatment plant. The ratio of energy exported as electricity to that as steam will vary depending on the operation of the paper pulp plant. When the paper pulp plant is running at full capacity, the electrical output of the waste incineration plant will be 49 MWe. This is equivalent to 8.23 MW per 100,000 tonnes of waste (which equates to 0.67 MWh/tonne of

waste burned). The proposed Installation is therefore high up in the indicative BAT range when both electricity and heat output are taken into account.

Our technical guidance note 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. 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. In our role as a statutory consultee on the planning application, we ensured that the issue of energy utilisation was brought to the planning authority's attention. We have made comments about this to Essex County Council (the planning authority) in our role as a statutory consultee for the planning application. We consider that, within the constraints of the location of the Installation explained above, the Installation will recover heat as far as practicable, and therefore that the requirements of Article 50(5) are met.

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

The R1 calculation and/or 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.

The Operator has obtained accreditation under the Defra Good Quality CHP Scheme. This process does not form part of the matters relevant to our determination, but forms part of financial aspects of the project drawing down funding through Renewable Obligation Credits (ROCs). Gaining accreditation under the scheme is however an indication of achieving a high level of energy recovery. Our consideration of energy recovery is described in the preceding paragraphs and we are satisfied that the level of recovery being achieved meets all the statutory requirements. The availability or non-availability of financial incentives for renewable energy such as the ROCs and Renewable Heat Incentive (RHI) schemes is not a consideration in determining this Application.

(iv) Choice of Steam Turbine

The steam will be fed to a steam turbine which will be used to generate electricity. The steam turbine proposed enables the selection of steam pressures to optimise electrical output and overall plant efficiency. Steam will be extracted from the steam turbine at various pressures. This will be used to supply heat for internal processes (e.g. de-aeration and condensate preheating), plume abatement at the stack and external processes at the pulp plant (drying, process heating and space heating) and the WWTP (evaporation, effluent cooling and space heating).

Total heat export from the waste incineration plant (including plume abatement but excluding internal heat uses at the waste incineration plant) will normally be in the range 20 to 40 MWth depending on external ambient conditions. External ambient conditions (predominantly temperature) will affect the heat demand for space heating in the paper pulp plant and WWTP, and plume abatement at the waste incineration plant. Most of the steam supplied to the paper pulp plant will be returned as condensate to the waste incineration plant for re-use in the water-steam cycle. This will minimise the consumption of potable water used for the production of demineralised water for the boiler.

(vi) Choice of Cooling System

The waste incineration plant will operate air cooled condensers to condense the steam output from the turbine to allow return of the condensate to the boiler. The air cooled condensers will be designed and guaranteed with enough additional capacity to maintain turbine efficiency during the summer. The Applicant has chosen air cooled condensers as they do not require large volumes of water and do not generate a visible plume. The Applicant considers that air cooled condensers are BAT for the proposed Installation. The Environment Agency agrees with this assessment.

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

Compliance with Article 14(5) of the Energy Efficiency Directive is not a relevant consideration for this Application because the waste incineration plant is designed to produce electricity and provide steam to the paper pulp plant and WWTP. We have considered whether the proposed Installation is generating waste heat at a useful temperature. Article 14 does not define "useful temperature" but district heating schemes in the UK generally require waste heat at a temperature of 65 ºC or more. There are no waste heat sources in the paper pulp plant, MRF, MBT or WWTP which generate waste heat at this temperature. Furthermore, the proposed Installation is already designed to operate using co-generation (CHP). Therefore no cost benefit assessment is required.

(viii) Permit conditions concerning energy efficiency

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 5 in the Permit. The following parameters are required to be reported: total electrical energy generated; electrical energy exported; total energy usage and energy exported as heat (if any). Together with the total MSW burned per year, this will enable the Environment Agency to monitor energy recovery efficiency at the proposed 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 the proposed Installation.

4.3.9 Efficient use of raw materials

Water use at the proposed Installation

The Applicant's water use (including a flow diagram) is described in section 2.3.3 of the Supporting Information document of the Application as follows:

Site water	Quantity per annum (m^3)
Abstraction from River Blackwater	250,000 [note 1]
Rain water harvesting (Upper Lagoon)	124,412
Mains supply	173,000
Treated water	550,000
Total	**1,097,412**
Note 1 – This is the maximum quantity of water that is permitted to be abstracted from the River Blackwater every year. However, water will be taken "as needed" by the Applicant for site use and so quantity abstracted may be significantly lower than the figures shown.	

Site water demand	Quantity per annum (m^3)
Mechanical& Biological Treatment (MBT) Plant	--
Waste Water Treatment Plant	--
Material Recycling Facility (MRF)	350
Waste Incineration Plant	75,000
Paper Pulp Plant	609,000
Total	**684,350**

- The proposed Installation will be designed to be a "zero liquid discharge" (or "closed loop") system which ensures that there are no discharges of any water stream to surface water, groundwater and land.

- Water will be abstracted from the River Blackwater, in accordance with an existing abstraction licence (AN/0031/001/R01) and will be fed into New Field Lagoon. The abstraction licence allows for the abstraction of 250,000 m^3/year from the River Blackwater under specific conditions.

- Water for use within the Installation will be pumped from Upper Lagoon (which is recharged as required with water from New Field Lagoon) and fed into the paper pulp plant at a rate of 507.5 m^3 per day to support and supplement the Installation's zero liquid discharge waste water treatment system.

- Where practicable, surface water will be separated from process effluents. The design of the drainage systems will be to prevent surface water run-off from being 'mixed' with untreated process effluents. In separating surface waters from process effluents, it will minimise the quantity of effluent to be treated within the WWTP;

- All process effluents generated on-site will be treated (within the WWTP and package treatments) and/or reused and recirculated into the Installation processes or Upper Lagoon; and

- Treated process effluents from the WWTP will be collected and fed into the Upper Lagoon prior to re-use as process water within the proposed Installation.

Water availability at the proposed Installation

We examined the availability of water for use at the proposed Installation as part of this determination.

The Applicant states that it is likely that construction on site is likely to commence in January 2018. The programme for the different stages of construction and commissioning of the proposed Installation assumes that all waste treatment processes will be fully commissioned within approximately 36 months from the commencement of construction (assumed July 2018). On this basis, commissioning of the waste treatment processes will be undertaken in the final months up to July 2021. To be on the conservative side, for the purposes of planning for the project, the availability and usage of water has been assumed to commence in January 2021.

The Applicant confirms that two fresh water lagoons, Upper and New Field lagoons, will be used to manage and control the water required by the proposed Installation:

- the Upper lagoon will provide the day-to-day water required by the proposed Installation; and
- the larger New Field lagoon will provide additional storage of water resulting from permitted abstraction of water from the River Blackwater and surface water run-off from surrounding land.

The New Field Lagoon will have a capacity in excess of 250,000 m^3; allowing for fluctuation in water level it would offer the following storage capacity:

- Water Level 40.5 m AOD – 726,000 m^3
- Water Level 39.0 m AOD – 547,800 m^3
- Water Level 37.0 m AOD – 369,800 m^3

The Upper Lagoon will have a storage capacity of approximately 25,000 m^3 with a water level at 32 m AOD. Both lagoons will be constructed below

surrounding ground levels and within the base of the former quarry (lined and constructed within the underlying London Clay or Boulder Clay backfill).

The Applicant provided additional information on the flow of the River Blackwater using the Appleford Bridge data from 2006 to 2016. The flow of 1,309 l/sec is the limiting flow in the River Blackwater below which the Applicant is unable to abstract water under its current abstraction licence. The Applicant refers to the limiting flow as the "hands off flow".

The information confirms that the flow at Appleford Bridge exceeded 1,309 l/sec on 443 days in the last 5 years and 886 days in the last 10 years. Both the 5 year and 10 year data give an average number of 89 days per year when flows exceeded 1,309 l/sec. However, some of the days occur in the summer months, between 1 April and 31 October, when abstraction is not permitted. Excluding the "no abstraction period", the resulting number of days in the winter months when abstraction can take place above 1,309 l/sec is 70 days per year.

As the licence allows up to 8,640 m^3/day to be abstracted on these days, the number of days pumping is required at the maximum rate to achieve the permitted 250,000 m^3 per year would be 29 days, or approximately 50% of the actual number of days available. Note that the hands off flow of 1,309 l/sec is equivalent to 113,098 m^3 per day. In the event that the Applicant abstracted its daily maximum, it would only be 7.6% of the hands off flow.

New Field Lagoon storage capacity

The Applicant submitted further information to demonstrate how the New Field Lagoon will be filled prior to the commencement of commercial operations on site. The water balance takes into account all potential inflows and outflows from the lagoon including:

- Inflows – direct rainfall to lagoon, surface water run-off from surrounding catchment to the lagoon, groundwater inflows, River Blackwater abstraction; and;
- Outflows – open water evaporation, groundwater outflows, pumping to the Installation.

The water balance model assumed that the water level and water storage in New Field lagoon at the start of the analysis was 40 m AOD and 666,794 m^3 respectively. The water balance was run at a daily time-step for a 2-year period and is not dependent upon rainfall, but indicates the following key features:

- Commencement of volume of water in the Lagoon of 666,794 m^3, but this volume never dropping below 603,000 m^3 at the beginning of the winter months;
- A steady "abstraction rate to process from the storage lagoon" at 507.50 m^3/day (i.e. this is the amount of make-up water that is needed to be pumped from the Upper Lagoon on site onto the proposed Installation);

- Abstraction of water from River Blackwater at 950 m^3/day over the winter months only (1 November to 31 March)

Based on the calculation, replenishment of the New Field Lagoon from the River Blackwater (to maintain it at or near its full capacity) would require the 950 m^3/day over 151 days of each year from 1 April to 31 October; this simplified assumption at the time of producing the model was equivalent to meeting the need to replace a total of 143,450 m^3 per year or only 57% of the abstraction permitted maximum annual volume.

Considering the more recent data of river flows at the Appleford Bridge, if only 70 days per year could be utilised because of the hands off flow in the River Blackwater, then the daily abstraction volume would need to be 2,050 m^3/day, which is significantly less than the daily maximum abstraction of 8,640 m^3 per day stated in the abstraction licence. If the model were re-run at only 70 days over each winter abstracting 2,050 m^3 per day, the net result would be the same.

The Applicant considers that it is reasonable to assume, as presented in the model, that there will be more than sufficient water stored on site at the time of commissioning. There will be 3 years between the end of the initial earthworks and the start of commissioning. During this 3-year period, the maximum that could be pumped into the lagoon system on the site, based on the new (revised) figures relating to the Appleford Bridge data above, would be 70 days per year at 8,640 m^3/day or 604,800 m^3 per year or 1.81 million m^3 over 3 years. This demonstrates that the New Field Lagoon could be filled from empty to full capacity during only one normal summer period. In practice, it would be a lesser volume over 2 or 3 years.

Surface water from rainfall

The Applicant provided additional information on rainfall data and undertook calculations and detailed modelling. In accordance with Table 2.1 of the Floods and Reservoir Safety (Institution of Civil Engineers, July 2015) the volume of rainfall runoff that would be shed to the lagoons was calculated. The potential peak rate of runoff to each lagoon was also estimated. The analysis considered the 1,000-yr and 10,000-yr rainfall events and a 3-day duration storm (e.g. a bank holiday weekend).

Potential rainfall depths for the design storm events were obtained from the Flood Estimation Handbook. The volume and rate of runoff was calculated using the Modified Rational Method. The volume of storm water runoff was estimated assuming that 100% of rainfall to the lagoons forms run-off and a proportion of the runoff to the surrounding catchment ultimately discharges to the lagoon.

The areas used within the calculations are summarised below:

- Area of New Field Lagoon: 128,054 m^2 (at 40.5 m AOD measured from CAD design drawings). Assumed 100% of rainfall reaches lagoon as worst case.

- Area of New Field Lagoon Catchment: 731,196 m^2 (total catchment area which will ultimately drain to the lagoon measured from CAD design drawings, excluding lagoon itself and haul road drainage). Run-off rate of 55% assumed as calculated from National Coal Board Nomogram methodology.

The average annual rainfall in the local area is reported to be about 550 mm/annum. Potential evapotranspiration is reported as about 540 mm/annum. The potential peak rate of runoff to New Field lagoon has been calculated for the 1,000 and 10,000 year storms, assuming a 1-hr storm duration. Summary results are given below:

- Total catchment area [New Field Lagoon and Area of Catchment]: 859,250 m^2
- 1,1000-yr 1h peak rate of runoff: 16.40 m^3/sec
- 1,10,000-yr 1h peak rate of runoff: 34.36 m^3/sec
- Run-off coefficient: 0.6 (weighted average lagoon surface and natural catchment).

It was estimated by the model that an annual volume of water of 124,412 m^3 will be collected from direct rainfall and surface water run-off. This will be direct rainfall (62,755 m^3) and surface water run-off (61,657 m^3) into the New Field Lagoon.

A detailed water balance was prepared for the New Field Lagoon (as the principal water storage and supply lagoon to the IWMF) to assess potential variation in water levels in the lagoon and the relative contribution/losses from rainfall, evaporation, groundwater inflow and outflow etc. The water balance model is presented as part of the Application and has been populated using site specific and regional data where relevant.

The following data has been extracted from the model:

Water Balance for New Field Lagoon – Annual Summary	
Direct Rainfall	+62,755 m^3
Surface Water Run-off	+61,657 m^3
Evaporation	-78,513 m^3
Groundwater Inflow / Outflow	-1,124.2 m^3

As will be seen from the column headings, the water balance takes into account all potential inflows and outflows from the lagoon including:

- Inflows – direct rainfall to lagoon, surface water run-off from surrounding catchment to the lagoon, groundwater inflows, River Blackwater abstraction; and;
- Outflows – open water evaporation, groundwater outflows, pumping to the proposed Installation

The water balance model assumed that the water level and water storage in the New Field Lagoon at the start of the analysis was 40.0 m AOD and

666,794 m^3 respectively. The water balance was run at a daily time-step for a two-year period.

Initial modelling showed that, under normal operations in one year, and assuming with no river abstraction, there would be a net reduction in water storage in New Field Lagoon of approximately 140,000 m^3. Hence, as shown in the model, a steady state water abstraction rate from the River Blackwater to replenish the New Field Lagoon of 950 m^3/day was assumed.

This volume is equivalent to about 50% of the practically available permitted abstraction as proven above. Also, as explained above, if the model is re-run using the Appleford Bridge data for available abstraction days at only 70 per year, it would need to show abstraction of 2,050 m^3/day to yield the same results.

A steady state water abstraction rate from the New Field Lagoon to the proposed Installation of 507 m^3/day was also assumed. The water balance showed, as a result of the lagoon setting, loss of water from the lagoon to groundwater was negligible (as was groundwater inflow to the lagoon) – less than 4 m^3/day. The water balance also showed that the volume of surface water, from direct rainfall and from surface water runoff to the lagoon from surrounding ground, to New Field Lagoon was more than the simulated evaporation loss of water from the surface of the lagoon.

The water balance model demonstrates that the proposed New Field lagoon has capacity to sustain operation of the proposed Installation for more than 3 years without any water abstraction from the River Blackwater. Notwithstanding the above, in the unlikely event that water stored within the lagoons falls low, there are operational controls that can be implemented such as reducing the throughput within the paper pulp plant to reduce water demands that can be implemented to maintain site operations at the proposed Installation.

<u>Waste water treatment plant – water availability</u>

The WWTP plant will only receive, treat and return process water from the paper pulp plant. The Applicant provided additional information to demonstrate the treatment capacity of the WWTP as follows:

- The paper pulp plant consumes a maximum of 1,750 m^3 of water per day to produce 85,500 tonnes of high grade recycled pulp per year. This water demand was provided by the specialist technology supplier and is in line with paper industry best practice of approximately 7 m^3 of water per tonne of pulp produced, based on a proposed operational availability of 8,352 hours per annum.
- Water losses through the pulp process are estimated to be 244 m^3 resulting from water contained within the rejects and sludge, and evaporation through the paper pulp plant.
- The total quantity of water (effluent) from the paper pulp plant that is fed into the WWTP will be 1,506 m^3 per day.

- The WWTP has been designed to treat the water from the paper pulp plant to an exceptionally high standard using seven treatment stages.
- The WWTP is designed to treat and maximise the return of water for use within the pulp process and losses resulting from evaporation are small (10 m^3 per day). Allowing for water losses through the reverse osmosis process, 1,496 m^3 of cleaned and treated water will be recirculated and reused within the paper pulp plant or the New Field Lagoon to provide a zero liquid discharge (or closed loop) waste water treatment system. These figures were provided by the specialist technology supplier for the WWTP.

Under normal operating arrangements, based on 8,352 hours of operation, 520,608 m^3 of treated water will be returned for reuse within the paper pulp plant. Allowing for potential variations in the quantity of recycled pulp that is produced within the proposed Installation, and the possibility of extended operating hours, the maximum return of water from the WWTP will be 550,000 m^3.

The total water supply available to the proposed Installation is approximately 1,097,412 m^3 per annum, with an overall water demand of 684,350 m^3 per annum. Taking this into consideration, and the ability to hold excess water in the New Field Lagoon topped up by rainfall and from the river water abstraction, the available water supply significantly exceeds the water demand for the waste treatment processes at the proposed Installation.

The Operator is required to report with respect to raw material usage under condition 4.2 and Schedule 5 in the Permit, including consumption of lime, activated carbon and ammonia used per tonne of waste burned. This will enable the Environment Agency to assess whether there are any changes in the efficiency of the air pollution control plant, and the operation of the SNCR to abate NOx. These are the most significant raw materials that will be used at the proposed 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.

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.

4.3.10 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 Installation will produce are:

- Incinerator bottom ash (IBA) from the waste incineration plant;

- Air Pollution Control (APC) residues and fine ash particles from the waste incineration plant;
- Recyclable materials and rejects from waste pre-treatment (MRF and MBT Facility);
- Liquid effluent or leachate from the MBT facility;
- Whole digestate from the AD facility;
- Organic and inorganic material from the paper pulp plant; and
- Sludge from the WWTP

The first objective is to avoid producing waste at all. Waste production will be avoided by achieving a high degree of burnout of the ash in the furnace, which results in a material that is both reduced in volume and in chemical reactivity. Condition 3.1.2 and associated Table S3.3 in the Permit specify limits for total organic carbon (TOC) of <3% in bottom ash. Compliance with this limit will demonstrate that good combustion control and waste burnout is being achieved in the furnaces and waste generation is being avoided where practicable.

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

The Applicant proposes that, where possible, IBA will be transported to a suitable recycling facility, from where it could be re-used in the construction industry as an aggregate. However, if there are no available waste management options which will allow the IBA to be recovered, it may be transferred to a non-hazardous landfill. The option of disposal at a non-hazardous landfill is intended only as an operational “last resort” to be used in the unlikely event that all other operational recovery sites are unable to receive the IBA. It would be part of an operational contingency plan to be utilised on a short-term emergency basis, not as a regular means of disposal.

The Applicant states that long-term recovery contracts will be made with specialist UK IBA processors for the continuous receipt, processing and recovery of IBA from the proposed Installation. Due to the quantity involved (new to the UK market), one of these specialists is establishing one or two new locations for IBA processing and aggregate recovery in the south-east of England. It is anticipated that these facilities will be operational before the commissioning of the proposed Installation. The facilities will be established to receive IBA from the proposed Installation and from other waste incineration facilities. In addition, back-up arrangements will be made with other IBA processors throughout the UK that can be used occasionally if and when the contracted facility may have short-term difficulties to receive the IBA. Hence, there will be back-up alternative licenced recovery sites available across the UK.

Air pollution control (APC) residues from flue gas treatment are hazardous waste and therefore must be sent for disposal to a landfill site permitted to accept hazardous waste, or to an appropriately permitted facility for hazardous waste treatment. The amount of APC residues is minimised through optimising the performance of the air emissions abatement plant.

In order to ensure that the IBA and APC residues are adequately characterised, pre-operational condition 2 requires the Operator to provide a written plan for approval detailing the ash sampling protocols. Table S3.3 in the Permit requires the Operator to carry out an ongoing programme of monitoring.

Ferrous and non-ferrous metals, plastics, paper and cardboard from the MBT and MRF will be baled and exported from the facility as segregated streams for off-site recycling. Inert reject waste which cannot be recycled will be transferred off-site for disposal. Sludge from the paper pulp plant will be transferred off-site to be used as a soil conditioner. Sludge from the WWTP will be dewatered and transferred to the waste incineration plant for burning.

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 in the Permit 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 guidance 'risk assessments for your environmental permit'

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 web guidance "Air emissions risk assessment for your environmental permit" and has the following steps:

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

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

and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

5.1.2 Use of Air Dispersion Modelling

For incineration applications, we normally require the Applicant to submit a full air dispersion modelling 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 Installation. Once the short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES).

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

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

PCs are considered **Insignificant** if:

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

The **long term** 1% process contribution insignificance threshold is based on the judgement 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 human health and the environment.

The **short term** 10% process contribution insignificance threshold is based on the judgement 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 human 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 emissions to be BAT. That is because if the impact of the emissions are already insignificant, it follows that any further reduction in the emissions will also be insignificant.

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

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

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 SSSIs, SACs or SPAs). These additional factors may also lead us to include more stringent conditions than BAT.

If, as a result of reviewing 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 or that the techniques proposed were not BAT**, 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 Dispersion Modelling Assessment v.8 of the Application. The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the Installation.
- 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 Installation's 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 5.2 dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The Applicant used 5 years of meteorological data collected from the weather station at Stansted Airport

between 2009 and 2013. The Applicant carried out a sensitivity analysis using more recent weather data from Stansted Airport (2012 to 2016) and Andrewsfield (2012 to 2016). 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 (NOx), expressed as NO_2

For this Application, the Applicant has proposed a stricter daily average NOx ELV of 150 mg/Nm^3 and a half-hourly average of 400 mg/Nm^3 for the waste incineration plant. For waste incineration plants under IED, the daily average NOx ELV is 200 mg/Nm^3 and a half-hourly average of 400 mg/Nm^3.

For the gas engines proposed to burn biogas, ELVs were those derived from our landfill technical guidance note, LFTGN08 which is considered appropriate for these engines.

    - 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 ELVs, i.e. the maximum permitted emission rate (except for emissions of arsenic, chromium 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), polycyclic aromatic hydrocarbons (PAH) and Polychlorinated biphenyls (PCBs). Emission rates used in the modelling have been drawn from data in the Waste Incineration BREF and are considered further in section 5.2.3.

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

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 the dispersion models, the selection of input data, use of background data and the assumptions 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.

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

5.2.1 Assessment of Air Dispersion Modelling Outputs

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air. We have conservatively assumed that the maximum concentrations occur at the location of receptors. Whilst we have used the Applicant's modelling predictions in the tables below, we have made our own simple verification and calculation of the percentage process contribution and predicted environmental concentration. Any such minor discrepancies do not materially impact on our conclusions.

Table 5.1 – Predicted long term impact to air from the Installation

Pollutant	ES µg/m³	Background [1] µg/m³	PC µg/m³	PC % of ES	PEC [3] µg/m³	PEC [3] % of ES
NO_2	40	18.6	0.88	2.20	19.5	48.7
PM_{10}	40	--	0.08	0.20	--	--
$PM_{2.5}$	25	--	0.08	0.32	--	--
HF	16	--	0.01	0.06	--	--
VOCs (1, 3-butadiene)	2.25	0.20	0.15	6.67	0.35	15.49
PAH	0.00025	--	8.5×10^{-07}	0.34	--	--
NH_3	180	--	0.08	0.04	--	--
PCBs	0.2	--	4×10^{-05}	0.02	--	--
Dioxins			8.1×10^{-10}			
Cd	0.005	0.00015	4.4×10^{-04}	8.2	5.9×10^{-04}	11.2
Hg	0.25	--	4.1×10^{-04}	0.16	--	--
Sb	5	--	4×10^{-03}	0.08	--	--
Pb	0.25	--	4.1×10^{-04}	0.16	--	--
Co		--	5×10^{-05}		--	
Cu	10	--	4×10^{-03}	0.04	--	--
Mn	0.15	--	4.9×10^{-04}	0.33	--	--
V	5	--	4×10^{-03}	0.08	--	--
As	0.003	0.00047	2×10^{-04}	6.67	6.7×10^{-04}	22.3
Cr (II)(III)	5	--	4.5×10^{-03}	0.08	--	--
Cr (VI) [2]	0.0002	--	1.6×10^{-06}	0.55	--	--
Ni	0.02	0.00137	1.8×10^{-03}	8.95	3.33×10^{-03}	15.8

Note 1 – Background concentration is that used by the Applicant. There are no existing background concentrations for dioxins and cobalt.

Note 2 – Process contribution based on the Environment Agency's "Guidance on assessing Group 3 metal stack emissions from incinerators, version 4".

Note 3 – Where the process contribution is demonstrated to be less than 1% of the long term ES (a level below which we consider to indicate insignificant impact), we consider that examination of the PEC and background is not necessary.

Table 5.2 – Predicted short term impact to air from the Installation

Pollutant	ES µg/m^3	Background [1] µg/m^3	PC µg/m^3	PC % of ES	PEC [2] µg/m^3	PEC [2] % of ES
NO_2	200	--	16.21	8.1	--	--
PM_{10}	50	--	0.29	0.58	--	--
SO_2 (15-min mean)	266	--	26.37	9.9	--	--
SO_2 (1-hour mean)	350	--	22.69	6.48	--	--
SO_2 (24-hour mean)	125	--	3.41	2.7	--	--
HCl	750	--	9.02	1.25	--	--
HF	160	--	0.60	0.38	--	--
CO	10000	--	15.7	0.16	--	--
NH_3	2500	--	1.5	0.06	--	--
PCBs	6	--	7.5×10^{-04}	0.01	--	--
Hg	7.5	--	7.52×10^{-03}	0.10	--	--
Sb	150	--	0.075	0.05	--	--
Co		0.00016	8.8×10^{-04}		1.04×10^{-03}	
Cu	200	--	0.08	0.04	--	--
Mn	1500	--	0.15	0.01	--	--
V	1	--	0.075	7.52	--	--
Cr (II)(III)	150	--	0.075	0.05	--	--

Note 1 – Background concentration is that used by the Applicant. There are no existing background concentrations for dioxins and cobalt.

Note 2 – Where the process contribution is demonstrated to be less than 10% of the short term ES (a level below which we consider to indicate insignificant impact), we consider that examination of the PEC and background is not necessary. For the assessment of short term impacts, the PEC is determined by adding twice the long term background concentration to the short term process contribution.

From the tables above, the following emissions can be screened out as insignificant in that the PC is <1% of the long term ES and <10% of the short term ES.

These are:

- Sulphur dioxide, PM_{10}, $PM_{2.5}$, hydrogen fluoride, PaH[BaP], ammonia, PCBs, hydrogen chloride, mercury, antimony, copper, chromium (II)(III) and carbon monoxide

Therefore, generally, we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

Also from the tables above, the following emissions were not screened out as insignificant:

- Nitrogen oxides (expressed as NO_2), VOCs (as 1,3-butadiene), cadmium, arsenic and nickel

We have assessed the above pollutants as being unlikely to give rise to significant pollution in that the predicted environmental concentration (PEC) is well below 100% (taking expected modelling uncertainties into account) of both the long term and short term ES. For these emissions, we have carefully scrutinised the Applicant's proposals to ensure that they are applying BAT to prevent and minimise emissions of these substances. This is reported in chapter 6 of this decision document.

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 ES of 40 µg/m^3 as a long term annual average and a short term hourly average of 200 µg/m^3. The model assumes a 70% NOx 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 ES and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the ES being exceeded. The peak short term PC is less than 10% and is screened out as insignificant.

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

The impact on air quality from particulate emissions has been assessed against the ES for PM_{10} (particles of 10 microns and smaller) and $PM_{2.5}$ (particles of 2.5 microns and smaller). For PM_{10}, the ES are a long term annual average of 40 µg/m^3 and a short term daily average of 50 µg/m^3. For $PM_{2.5}$ the ES is 25 µg/m^3 as a long-term annual average and 20 µg/m^3 to be achieved by 2020.

The Applicant's predicted impact of the Installation against these ESs 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 that the Installation emits particulates continuously at the IED Annex VI limit for total dust, whereas actual emissions from similar installations are normally lower.
- 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 ES and well below 10% of the short term ES and so can be screened out as insignificant. The above assessment also shows that the predicted process contribution for emissions of $PM_{2.5}$ is below 1% of the ES. We consider that particulate emissions from this Installation, including emissions of PM_{10} or $PM_{2.5}$, will not give rise to significant pollution. The Environment Agency concludes that the Applicant's proposals for preventing and minimising particulate emissions at the proposed Installation to be BAT.

There is currently no emission limit prescribed nor any continuous emissions monitor for particulate matter specifically in the separate 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, Improvement condition 2 has been set in the Permit which requires a full analysis of particle size distribution in the flue gas, and hence the determination of the ratio of fine to coarse particles. In light of current knowledge and available data, 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 less than 10% of the short term ES. There is no long term ES for HCl. HF has 2 assessment criteria – a 1-hr ES and a monthly EAL – the process contribution is less than 1% of the monthly EAL and so the emission screens out as insignificant if the monthly ES is interpreted as representing a long term ES.

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 ES is considered in section 5.4. Emissions of SO_2 can also be screened out as insignificant in that the short term process contribution is also less than 10% of each of the three short term ES values. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for this Installation.

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

The above tables show that for CO emissions, the peak short term PC is less than 10% of the ES and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising CO emissions to be BAT for this Installation.

The Applicant has used the ES for 1,3 butadiene for their assessment of the impact of VOCs. The basis for using 1,3 butadiene is that the substance has

the lowest ES of organic species likely to be present in VOCs (other than PAH, PCBs, dioxins and furans). The above tables show that for VOCs emissions, the peak long term PC exceeds 1% of the ES and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the ES being exceeded.

The Applicant has also used the ES for benzo[a]pyrene (BaP) for their assessment of the impact of PAH. We agree that the use of the BaP ES is sufficiently precautionary. The above tables show that for PAH and PCBs emissions, the peak long term PC is less than 1% of the ES and the peak short term PC is less than 10% of the ES for PCBs 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 this Installation.

There is no ES for dioxins and furans as the principal exposure route for these substances is by ingestion and the risk to human health is through the accumulation of these substances in the body over an extended period of time. This issue is considered in more detail in section 5.3.

From the tables above, all the other emissions can be screened out as insignificant in that the process contribution is less than 1% of the long term ES and less than 10% of the short term ES, except for VOCs (as 1,3-butadiene) where the long term PC is 6.67% of the ES. Even so, from the table above, the emission is not expected to result in the ES being exceeded.

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

(v) Summary

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 relevant ES. We are satisfied that emissions will not result in significant pollution. Dioxins and furans are considered further in section 5.3.2. The Applicant is required to prevent, minimise and control emissions using BAT and this is considered further in chapter 6 of this decision document.

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 when each was considered to be emitted at 100% of the group ELV (worst case screening – i.e. 0.5 mg/m^3):

- Mercury, antimony, copper, chromium (II)(III) and vanadium

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:

- Cadmium, lead, manganese and nickel

This left emissions of arsenic and chromium (VI) requiring further assessment. For all other metals, the Applicant has concluded that exceedence 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 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 arsenic and chromium (VI), the Applicant used representative emissions data from other municipal waste incinerators using our guidance note (*Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4*).

Based on the above, chromium (VI) was screened out as insignificant. While emissions of arsenic did not screen out as insignificant, they were assessed as being unlikely to give rise to significant pollution.

Thallium and cobalt do not have an EAL. As shown above, the process contribution of these metals is similar to that of the other metals and we consider the emissions of these metals to be not significant.

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 ESs in our guidance 'Air emissions risk assessment for your environmental permit'.

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 chromium (VI) emission concentration (based on the bag dust ratio) is 3.5 x 10^{-5} mg/m^3 (max 1.3 x 10^{-4} mg/m^3).

There is little data available on the background levels of chromium (VI). Taking a precautionary approach, we have assumed that the background level already exceeds the ES. The Applicant has used the above data to model the predicted chromium (VI) impact. The PC is predicted as 0.53% of the EAL. This assessment shows that emissions of chromium (VI) screen out as insignificant. We agree with the Applicant's conclusions. Improvement condition 6 has been set in the permit to assess actual emissions of arsenic and chromium (VI) against those assumed. The Installation has been assessed as meeting BAT for control of metal emissions to air (see section 6 of this decision document).

5.2.4 Consideration of Local Factors

(i) Impact on Air Quality Management Areas (AQMAs)

No Air Quality Management Areas (AQMAs) have been declared within an area likely to be affected by emissions from the proposed Installation.

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 the Installation Permit are based on the requirements of the IED. Further specific conditions have been introduced to ensure compliance with the requirements of the IED. The aim of IED is to prevent or to limit as far as practicable negative effects on the environment, in particular pollution by emissions into air, soil, surface water and groundwater, and the resulting risks to human health, from the incineration and co-incineration of waste. The IED achieves this aim by "setting stringent operational conditions, technical requirements and emission limit values" and through the use of BAT, which may in some circumstances dictate tighter emission limits and controls.

(i) 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. Sections 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.

(ii) Expert scientific opinion

We take into account the views of national and international expert bodies. 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."

A Position Statement issued by the **HPA** 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".

Policy Advice from Government also points out the minimal risk from modern incinerators. Paragraph 22 (Chapter 5) of Waste Strategy 2007 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's 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 (now Public Health England) 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 we regulate the Installation to ensure compliance with such permit conditions.

(iii) Health Risk Models

Comparing the results of air dispersion modelling as part of the 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 and furans, 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.

Dioxin Intake Models: Two models are available to predict the dioxin 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 are the HHRAP model.

HHRAP has been developed by the United States Environmental Protection Agency (USEPA) 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 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 sizes, such as for children of different ages. In the UK, the COT has set a TDI for dioxins, furans and dioxin-like PCBs 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 PCBs, the HHRAP model enables a risk assessment from human intake of a range of heavy metals. In principle, the respective ES 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 applying its methodology to small affected areas. Those concerns generally relate to the fact that the exposure-response coefficients used in the COMEAP report are derived 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 NOx, SO_2 and particulates cannot be screened out as insignificant in an Environmental Impact Assessment where 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 methodology set out in our guidance for 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 decision 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 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 shows that the predicted daily intake of dioxins, furans and dioxin-like PCBs at all receptors, resulting from emissions from the proposed Installation, are significantly below the recommended TDI levels.

Table 5.3 – Predicted maximum daily intake of dioxins, furans and dioxin-like PCBs from the Installation

Receptor	Maximum predicted daily intake (pg I-TEQ/kg-BW/day)[1]
Receptor 18 (Adult resident)	0.012
Receptor 18 (Child resident)	0.016
Note 1 – Data shown is the calculated maximum daily intake of dioxins by local receptors resulting from the operation of the proposed facility (I-TEQ/ kg-BW/day).	

The FSA reported that dietary studies have shown that estimated total dietary intake of dioxins and dioxin-like PCBs from all sources by all age groups fell by around 50% between 1997 and 2001, and are expected to continue to fall. A report in 2012 showed that dioxin and PCBs 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 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 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 (now PHE) addresses the issue of the health effects of particulates in their September 2009 statement 'The Impact on Health of Emissions to Air from Municipal Incinerators'. It refers to the coefficients linking PM_{10} and $PM_{2.5}$ with effects on health derived by COMEAP and goes on to say that if these coefficients are applied to small increases in concentrations produced locally by incinerators, the estimated effects on health are likely to be small. PHE note that the coefficients that allow the use of number concentrations in impact calculations have not yet been defined because the national experts have not judged that the evidence is sufficient to do so. This is an area being kept under review by COMEAP.

In December 2010, COMEAP published a report on The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. It says that "a policy which aims to reduce the annual average concentration of $PM_{2.5}$ by 1 $\mu g/m^3$ 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."

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

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

5.3.4 Assessment of Health Effects from the Installation

We have assessed the health effects from the operation of the proposed 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 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 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 of emissions of sulphur dioxide, hydrogen fluoride, PM_{10}, $PM_{2.5}$, PCBs, hydrogen chloride, ammonia, mercury, carbon monoxide, antimony, copper and chromium have screened out as insignificant. Where the impact of emissions of nitrogen oxides, VOCs, cadmium, lead, manganese, vanadium, arsenic, chromium (VI) and nickel 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.

The Environment Agency has reviewed the methodology employed by the Applicant with respect to the health impact assessment. We carried out check modelling for human intake of dioxins and furans using empirical calculations. Making reasonably conservative assumptions and following default screening parameters where appropriate, our checks are relatively consistent with the Applicant's predictions due mainly to consistency in the conservative assumptions made. Our checks indicate that the impacts are not likely to exceed those predicted by the Applicant. Indicatively, had they applied the lifetime exposure coefficients defined in HHRAP, their predictions would have been reduced to below 1% of the TDI.

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 is concluded that the operation of the proposed Installation will not pose a significant carcinogenic or non-carcinogenic risk to human health.

We consulted Public Health England, the Director of Public Health (Essex County Council) and the Food Standards Agency during the determination of the Application. PHE concluded that they had no significant concerns regarding the risk to human health from the proposed Installation. No response was received from the Food Standards Agency and the Director of Public Health (Essex County Council) during the permit determination process. Details of the responses provided by Public Health England to the consultation on this Application can be found in Annex 4 of this decision document.

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, dioxin-like PCBs

and metals from the proposed Installation 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

There are no Habitats (i.e. Special Areas of Conservation, Special Protection Areas and Ramsar) sites within 10 km of the proposed Installation. There are no Sites of Special Scientific Interest within 2 km of the proposed Installation.

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

- Upney Wood
- Storey's Wood
- Link's Wood
- Blackwater Plantation
- Park House Meadow
- Blackwater Plantation

5.4.2 Assessment of other conservation sites

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 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 could 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 Applicant has assessed the dispersion of the relevant pollutants against critical level criteria for the protection of vegetation and ecosystems which is summarised in the following table. The values shown represent the highest concentrations predicted for any of the receptors for each pollutant.

Table 5.4 – Maximum critical level concentrations on local wildlife sites within 2 km of the Installation

Pollutant	Critical level (µg/m^3)	PC (µg/m^3)[1]	PC as % of Critical level
SO_2	20 (LT)	0.09	0.5
NOx (as NO_2)	30 (LT)	0.27	0.9
	75 (ST)	5.58	7.4
HF	0.5 (LT)	0.009	1.8
	5 (ST)	0.036	0.7
NH_3	3 (LT)	0.018	0.6
Note [1] – PC is given as the highest concentrations predicted for all non-statutory sites – Storey's Wood.			

The Applicant has assessed the critical loads for nitrogen and acid deposition against critical load criteria for sites as obtained from the UK Air Pollution Information System (APIS) which is summarised in the following table. The values shown represent the highest concentrations predicted for any of the receptors for each parameter.

Table 5.5 – Maximum critical load concentrations on local wildlife sites within 2 km of the Installation

Pollutant	Critical load (most severe criterion used to exemplify receptors)	PC [1]	PC as % of Critical load
Nitrogen deposition	10 kg N/ha/yr	0.19 kg N/ha/yr	1.9
Acid deposition	1.71 keq/ha/yr	0.05 keq/ha/yr	0.6
Note [1] – PC is given as the worst case of results for all non-statutory sites – Storey's Wood.			

The tables above show that the PCs are well below the critical levels or loads. We are satisfied that the proposed Installation will not cause significant pollution at the sites. The Applicant's assessment of non-statutory sites 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 will not have a significant impact on the non-statutory sites. The Applicant is required to prevent, minimise and

control emissions using BAT, this is considered further in chapter 6 of this decision document.

5.5 Impact of abnormal operations

Article 50(4)(c) of IED requires that waste incineration and co-incineration plants 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 an incineration plant, IED sets backstop limits for particulates, CO and TOC which must continue to be met at all times. The CO and TOC emission limit values 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/Nm^3 (as a half hourly average) which is five times the emission limit value 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 hours aggregated operation in any calendar year. This is less than 1% of total operating hours and so abnormal operating conditions are not expected to have any significant long term environmental impact unless the background conditions were already close to, or exceeding, an ES. For the most part therefore, consideration of abnormal operations is limited to consideration of its impact on short term ESs.

In making an assessment of abnormal operations, the following worst case scenario has been assumed:

- Dioxin emissions of 10 ng/Nm^3 (100 x normal)
- Metal emissions are 100 times those of normal operation
- NOx emissions of 550 mg/Nm^3 (1.375 x normal)
- Particulate emissions of 150 mg/Nm^3 (5 x normal)
- SO_2 emissions of 480 mg/Nm^3 (2.4 x normal)

- HCl emissions of 900 mg/Nm^3 (15 x normal)
- HF emissions of 90 mg/Nm^3 (22.5 x normal)
- PCBs emissions of 5 mg/Nm^3 (1,000 x normal)

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

The result on the Applicant's abnormal emissions impact assessment is summarised in the table below:

Table 5.6 – Predicted abnormal emissions impact to air from the Installation

Pollutant	ES	Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC) [1]	
	µg/m^3	µg/m^3	µg/m^3	% of ES	µg/m^3	% of ES
NO_2	200	37.2	22.0	11.0	59.2	29.6
PM_{10}	50	--	3.8	7.60	--	--
SO_2 (15 min mean	266	12.4	58.0	21.8	70.4	26.5
SO_2 (1 hour mean)	350	12.4	49.9	14.3	62.3	17.8
SO_2 24 hour mean	125	12.4	31.7	25.33	43.57	34.86
HCl	750	1.44	135.4	18.05	136.8	18.25
HF	160	--	9.0	5.63	--	--
Hg	7.5	--	0.113	1.50	--	--
Sb	150	--	0.026	0.02	--	--
Cu	200	--	0.065	0.03	--	--
Mn	1,500	--	0.135	0.01	--	--
PCBs	6	--	0.0752	1.25	--	--
Cr (II)(III)	150	--	0.21	0.14	--	--
V	1	--	0.014	1.41	--	--
Dioxins			6.8×10^{-07}			

Note 1 – Where the PC is demonstrated to be less than 10% of the short term EAL, a level below which we consider to indicate insignificant impact, examination of the PEC and background is not considered necessary. For the assessment of short term impacts the PEC is determined by adding twice the long term background concentration to the short term process contribution.

From the table above, the emissions of the following substances are considered insignificant, in that the PC is less than 10% of the short term ES for PM_{10}, HF, Hg, Sb, Cu, Mn, PCBs, Cr and V.

Also from the table above, emissions of the following substances (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the PEC is well below 100% of the short term ES for NO_2, SO_2 and HCl.

We have not assessed the impact of abnormal operations against long term ES for the reasons set out above. Except that if dioxin emissions were at 10 ng/m^3 for the maximum period of abnormal operation, there would be an increase in the TDI reported above. We consider that this represents the worst case situation and is in practice a highly unlikely scenario. In these circumstances, the TDI would be 0.022 pg(I-TEQ/ kg-bw/day), which is 1.1% of the COT-TDI limit of 2 pg (I-TEQ)/ kg-bw/day for a resident (calculated as a human lifespan of 70 years with appropriate proportions as a child and adult). At this level, emissions of dioxins will still not pose a risk to human health.

5.6 Other emissions

Other emissions that may have a significant impact on the environment and people, such as those to water, sewer, land or groundwater, fugitive emissions, noise or odour are considered in chapter 6 of this decision document.

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 BAT for the proposed 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 the proposed Installation. We also examined BAT considerations for the other activities – paper pulp activity, mechanical biological treatment, anaerobic digestion, materials recycling and waste water treatment.

- We then consider in particular control measures for the emissions which were not screened out as insignificant in the previous chapter on minimising the Installation's environmental impact. These are nitrogen oxides, VOCs, cadmium, lead, manganese, vanadium, arsenic, chromium (VI) and nickel.

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

- Finally, we consider prevention and minimisation of Persistent Organic Pollutants (POPs).

Chapter IV of the IED specifies a set of maximum emission limit values for waste incineration and co-incineration plants. 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 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, Paper and Pulp and Waste Treatment have not yet been 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.

The Waste Incineration BREF elaborates the furnace selection criteria as:

- The use of 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.
- The 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 retains 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 the EU and for all types of wastes. There is also some information on the comparative costs. The table below has been extracted from the Waste Incineration BREF tables. This table is also in line with our 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

Table 6.1 – 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 treatable; better combustion control possible.	As air-cooled grates but risk of grate damaging leaks and higher complexity	TOC 0.5 % to 3 %	Slightly higher capital cost than air-cooled
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; Low NOX level; Low LOI of bottom ash	Higher thermal loss than with grate furnace; LCV under 15 GJ/t	TOC 0.5 – 3 %	Similar to other technologies

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) mainly 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
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 required; not widely proven; need market for syngas	Dependent on process temperature; Residue produced requires further processing, sometimes 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
- Oscillating Kiln
- Fixed and Pulsed Hearth
- Fluidised Bed
- Pyrolysis / Gasification

The various options for thermal treatment of the proposed combination of waste materials have relative benefits and disadvantages. All the options are capable, subject to appropriate abatement measures being taken, of performing within IED emissions limits (although limited emissions performance data are reported in respect of gasification and pyrolysis). Whilst moving grate systems generate higher raw gas pollutant concentrations, the application of abatement, which is still required for all options, enables compliance with IED limits and in many instances, performance to achieve emissions well below these levels.

The Applicant discounted fixed hearth as the technology is suitable for low volumes of consistent waste. Therefore this system is not considered practical and has not been considered any further.

Pulsed hearth technology has been used for waste fuels, such as RDF, in the past, as well as other solid wastes. However, there have been difficulties in achieving reliable and effective burnout of waste and it is considered that the burnout criteria required by the IED would be difficult to achieve using this system. Therefore the Applicant considers that this system is not considered practical for the proposed Installation.

Rotary kilns are used widely within the cement industry which uses a consistent fuel feedstock and they have been used widely within the healthcare sector in treating clinical waste, but they have not been used in the UK for large volumes of waste-derived fuels. The energy conversion efficiency of a rotary kiln is lower than that of other waste incineration technologies due to the large areas of refractory lined combustion chamber.

An oscillating kiln is used for the incineration of municipal waste at one site in England and some sites in France. The energy conversion efficiency is the same as the rotary kiln.

The capacity of the rotary or oscillating kiln unit is limited to 8 tonnes per hour. If this is applied to the proposed Installation, a large number of furnaces would be required to achieve the design throughput. This is not considered practical and would lead to significant efficiency losses, therefore this option has not been considered any further.

The Applicant considered Pyrolysis and Gasification. Whilst these are established technologies, the process can be very complex, expensive and operator intensive. There would be significant challenge in achieving the very

high temperature throughout a solid waste mass at large scale and this is a practical constraint for scaling the Application. To date, most applications of pyrolysis and gasification technology for wastes or waste-derived fuels have only been carried out on a research or demonstration basis at small scale and the technology has not been proven on a commercial basis. It is therefore not considered proven for scale up to the size of the proposed Installation and has been discounted from consideration.

The Applicant concluded that only moving grate and fluidised bed incineration systems were technically proven options at large scale. This is broadly in line with the Waste Incineration BREF. The Applicant considered the following options in more detail:

1. Moving Grate Furnace – Option 1
2. Fluidised Bed – Option 2

- Fluidised beds are designed for the combustion of relatively homogeneous fuel. Therefore, fluidised beds are appropriate for untreated waste which have been pre-processed to produce an RDF, such as that proposed for the Installation.

- Emissions from each option are similar. Although fluidised bed can achieve lower NOx emissions, in practice secondary abatement would still be required. Abated emissions would be similar to moving grate with NOx emissions dependant on the abatement technique although using a fluidised bed would benefit from a lower reagent use.

- Raw material usage for moving grate is lower than fluidised bed due to sand being required for fluidised bed.

- Differences in GWP between each option are not significant. The energy requirements for each option are very similar. The amount of carbon dioxide emitted will be dependent on the carbon content of the waste and will therefore be essentially the same for each option. The amount of energy that can be recovered from the waste is a consideration for GWP in that if more energy is recovered, less fossil fuel will be required to be combusted elsewhere. The energy conversion efficiencies for options 1 and 2 are similar.

- The overall amount of residues generated is similar for each option, although fluidised bed will generate more hazardous waste air pollution control residues.

- There are no significant differences in odour, noise and accident risks between the options.

The Applicant reports that the lower annualised costs associated with a moving grate system outweigh the additional material costs and higher ammonia consumption for fluidised bed. Furthermore, the moving grate system will be able to process large volumes of waste-derived fuel compared to a fluidised bed system. In this context and alongside in particular the fact that its reliability at a commercial scale is proven and that it provides a cost effective option, moving grate has been selected as the thermal treatment technology and is considered BAT for the proposed Installation.

We have considered the assessments made by the Applicant and agree that the furnace technology chosen represents BAT. We believe that, based on the information gathered by the BREF process (see table above), the chosen technology will achieve the requirements of the IED for all emissions to air including TOC/CO and the TOC in bottom ash.

The Applicant proposes to use gas oil as support fuel for start-up, shut-down and for the auxiliary burners. The choice of support fuel is based on lack of grid connection of natural gas to the site. The fuel will have a low sulphur content and its consumption is not anticipated to be high. We consider that the method of operation, the proposed techniques used for waste feed charging and the design will help to minimise the use of auxiliary burners. This coupled with the limited planned shut-down of plant (annual maintenance) should ensure that the use of gas oil would be kept to a minimum. We agree that in this case, gas oil is the best option for fuel support.

Boiler Design

In accordance with our Technical Guidance Note, EPR 5.01, the Applicant has confirmed that the boiler design will include the following features to minimise the potential for reformation of dioxins within the de-novo synthesis range:

- Ensuring that the steam/metal heat transfer surface temperature is a minimum where the exhaust gases are within the de-novo synthesis range;
- Design the boilers using CFD to ensure no pockets of stagnant or low velocity gas;
- Boiler passes will be progressively decreased in volume so that the gas velocity increases through the boiler; and
- Design boiler surfaces to prevent boundary layers of slow moving gas.

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 emissions of TOC/CO and the TOC in bottom ash.

6.1.2 Consideration of stack height

The Applicant has approached the selection of the appropriate stack height for the Installation as follows:

- A consideration of the stack height of other incineration and/or co-incineration plants;
- A consideration of the influence of building height and surrounding environment on stack height;
- A consideration of pollutant impact against varying stack heights; and
- A consideration of costs incorporating a cost-benefit analysis (CBA)

The proposed stack height relative to the building height and surrounding ground levels is represented in Figure 6.1 below.

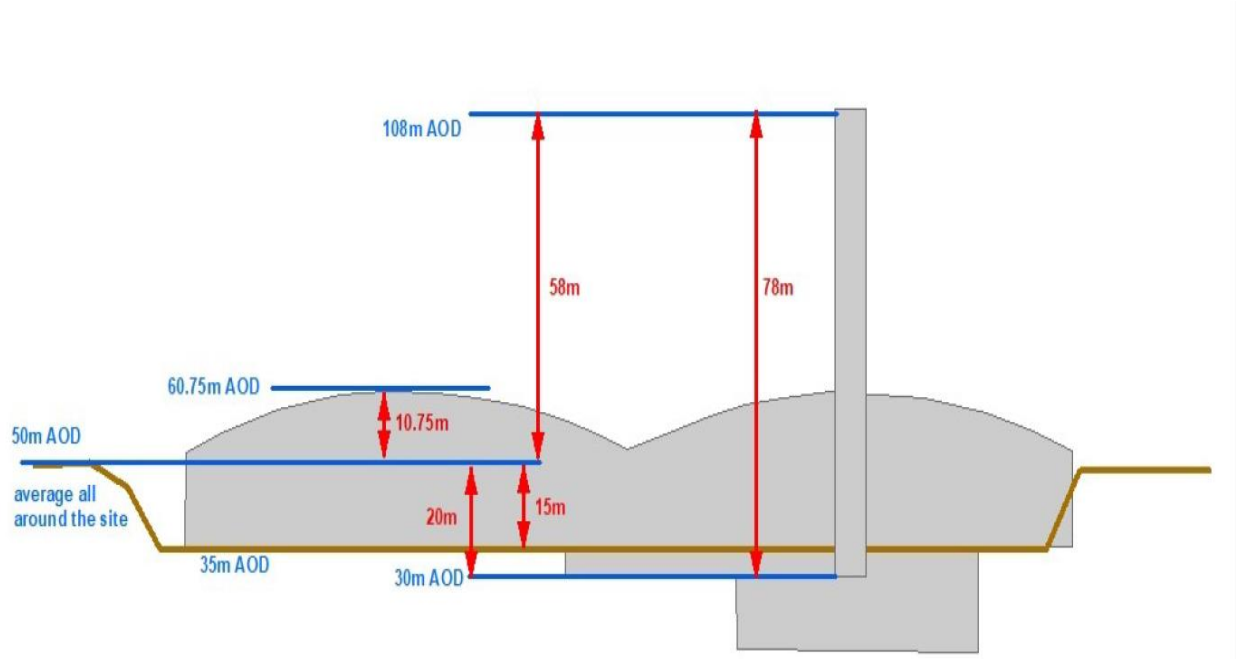


Figure 6.1 – Diagram showing the stack height relative to the building height of the proposed Installation and surrounding ground levels (*known as Figure 4 in the Applicant's air dispersion modelling report dated 26 May 2017*)

Consideration of the stack height of other incineration and/or co-incineration plants

The Applicant provided further information on the stack height of other incineration and/or co-incineration plants. Figure 6.2 below compares the stack height above surrounding ground levels with plant throughput. The purple diamonds show other plants (Hartlebury, Newhaven and Allington) where the base of the stack is below surrounding ground levels (as is the case for the proposed Installation – Rivenhall).

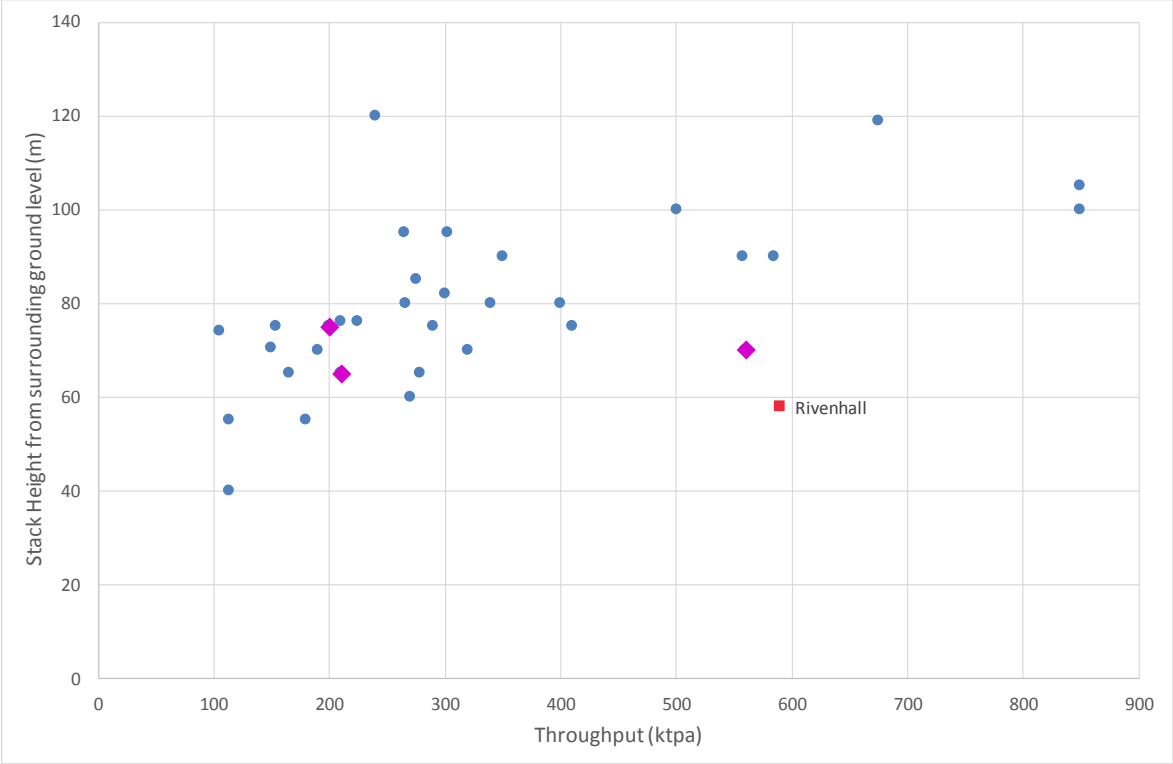


Figure 6.2 – Applicant's comparison of equivalent stack height (i.e. the height above surrounding ground levels) with the plant throughput of 34 energy from waste plants with annual throughputs above 100,000 tonnes. Purple points show plants where the base of the stack is below surrounding ground levels.

The Applicant states that the spread is slightly dispersed and the correlation between stack height and plant capacity is low. The Applicant explains the reasons for the low correlation may be as a result of the change in the methodology of determining stack heights and the complexity of varying plant capacity.

Change in stack height determination methodology

The Applicant reports that the methodology of determining stack heights has changed over the years. The 1956 Memorandum on Chimney Heights provided a "design by rule" for combustion processes that gave rise to SO_2 and NOx. The Memorandum was adapted and expanded to cover a wide range of pollutants and discharge conditions and issued by Her Majesty's Inspectorate of Pollution (HMIP) as Technical Guidance Note D1, and incorporated into Part 1 of the Environmental Protection Act 1990. The D1 Guidance Note provided a method of calculating minimum stack height by use of a formula.

The Applicant explains that by the late 1990s and early 2000s, various air modelling software were established and progressively validated. The D1 Guidance Note was subsequently withdrawn by the Environment Agency, by which time computer-based air quality modelling was the preferred method for air quality assessment and stack height determination.

The Applicant states that the basis on which a number of the energy from waste plant stack heights were determined is now out of date and different to that used for the proposed Installation. The Applicant reports that whilst it is not possible to generalise across all plants designed during the late 1990s /early 2000, they suggest that some of the plants designed during that period may have stacks that are actually higher than would otherwise have been the case based upon current modelling.

Influence of plant capacity

The Applicant explains that the capacity of the plant may have an effect on stack height, but this is very complex. There are three different effects, some of which compete with each other.

- A larger plant will release a greater mass of pollutants, assuming that it runs at the same emission limit, and so it has the potential to lead to higher ground level concentrations.
- However, a larger plant releases a greater volume of total flue gases. These have an increased buoyancy effect, which improves the dispersion of pollutants.
- A larger plant will need a larger building. However, this is not necessarily a taller building. The height of the building for an incineration plant is primarily determined by the height of the boiler, and the height of the boiler is related to the capacity of each stream. For example, a plant which has a single stream with a capacity of 150,000 tonnes per year would have the same building height as a 300,000 tonnes per year plant which has two streams. The building would be larger, but not taller. The proposed waste incineration plant has two streams.

The Applicant states that the relationship between capacity and building height is further complicated by the addition of architectural features, which can serve to improve the appearance of a building but almost always leads to an increase in its height or the lowering of the plant below surrounding ground levels, as is the case at the proposed Installation.

The Applicant concludes that the above graphs do not show a strong relationship between annual throughput and stack height for the reasons discussed above.

Consideration of the influence of building height and surrounding environment on stack height

Figure 6.3 below shows stack heights and building heights above surrounding ground levels. This shows the proposed Installation with a stack height of 58 metres above surrounding ground levels and a building height of 10 metres, to compare the height of emission points relative to the surroundings. The heights for the other stacks are also shown above surrounding ground levels with a line of best fit drawn through the data points. A line of best fit is a straight line drawn through the centre of a group of data points on a scatter plot or graph. This line shows whether two variables (such as stack height and throughput) are correlated.

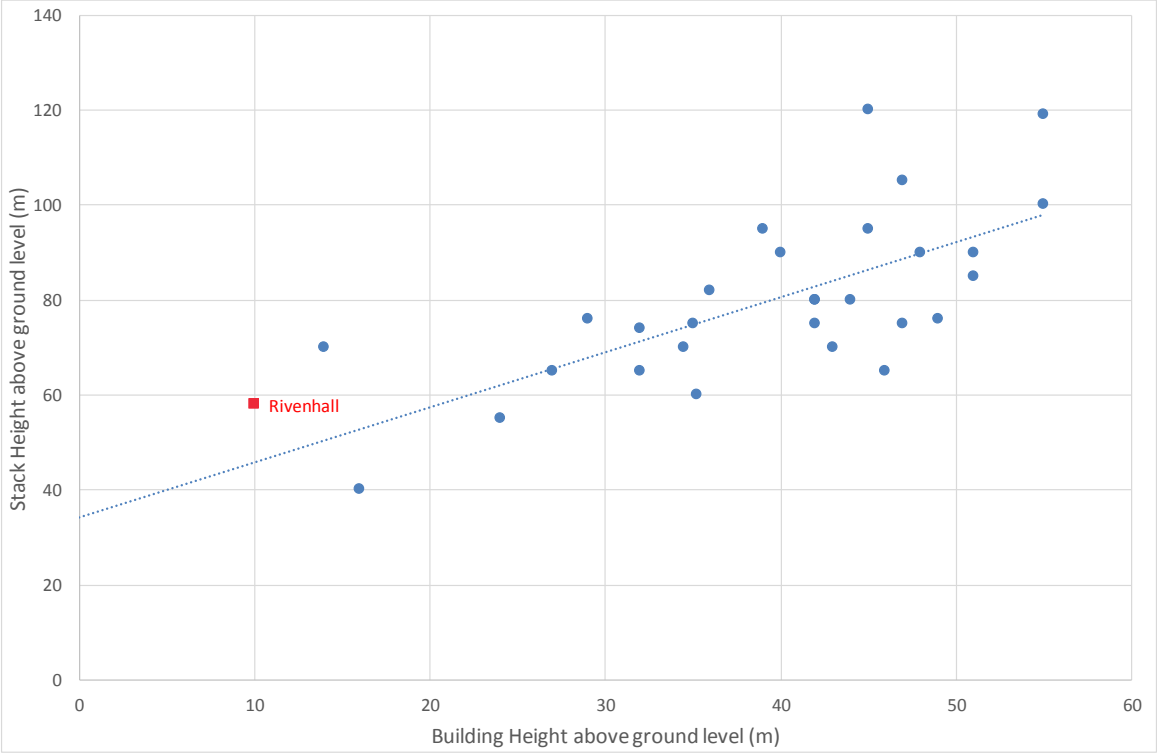


Figure 6.3 – Applicant's comparison of equivalent stack height with building height above surrounding ground levels of 28 energy from waste plants with annual throughputs above 100,000 tonnes. The graph shows the Rivenhall IWMF with a building height of 10 metres above surrounding ground levels.

Figure 6.4 below shows the proposed Installation with a total stack height of 78 metres from the base (i.e. physical length of stack) and a building height of approximately 30 metres from the base to offer a direct comparison of its total stack height with other plants. In this figure, the Applicant adjusted the relevant heights for the three other UK plants with stacks below surrounding ground levels – Hartlebury, Newhaven and Allington – for consistency. These are shown as purple diamonds.

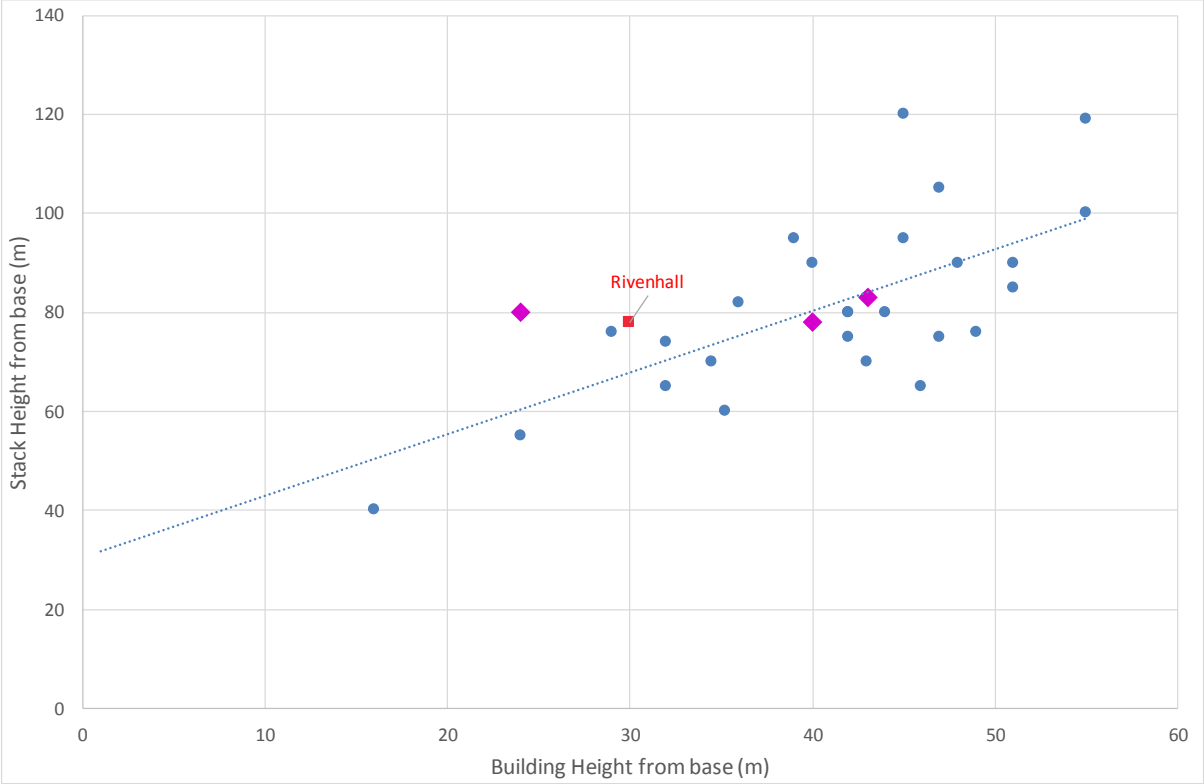


Figure 6.4 – Applicant's comparison of total stack height and total building height of 28 energy from waste plants with annual throughputs above 100,000 tonnes. The graph shows the Rivenhall IWMF with a total building height of 30 metres (i.e. 30 metres from the base).

The Applicant reports that there is a clearer relationship between stack height and building height shown in Figures 6.3 and 6.4 than there is between stack height and throughput (Figure 6.2). The Applicant concludes that the proposed stack height of the Installation is above the line of best fit in both cases, therefore building height is the more important factor when considering an appropriate stack height compared to annual throughput.

Figure 6.5 below illustrates the effect of the surrounding environment on stack height. Runcorn has a tall stack because there are existing buildings in the close vicinity which are taller than the boiler house. Cornwall, Beddington and Ferrybridge Multifuel 2 have taller stacks than would be expected from the building height in order to protect statutory sensitive receptors nearby – a protected habitat for Cornwall and an AQMA for the other sites. Ferrybridge Multifuel 1 has a shorter stack than Ferrybridge 2 because it is around 300 metres further away from the receptor in the AQMA which influenced the stack height for Ferrybridge 2.

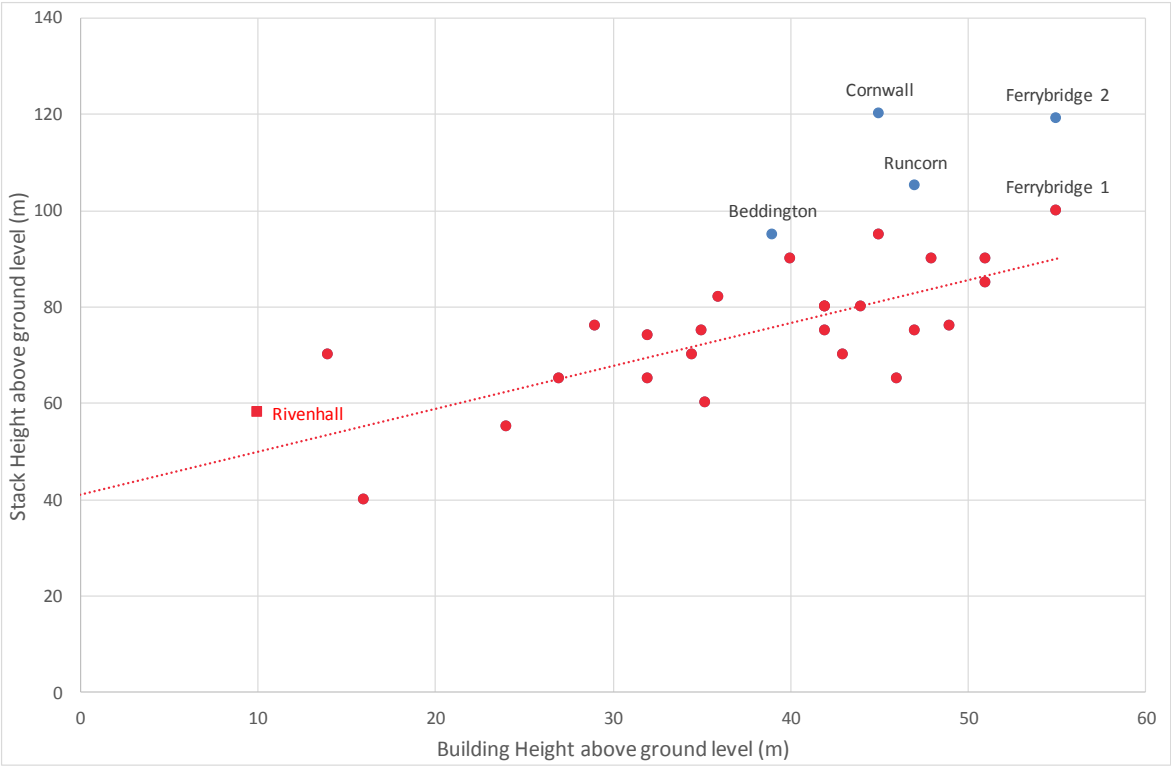


Figure 6.5 – Applicant's comparison of equivalent stack height and surrounding environment of 28 energy from waste plants with annual throughputs above 100,000 tonnes. The graph shows the Rivenhall IWMF with a building height of 10 metres above surrounding ground levels.

The Applicant states that "if the four plants with high stacks from the dataset are excluded and a new line of best fit is calculated (as shown above), the other plants have less spread around the line and that the proposed Installation is even closer to the line". In their view, the Applicant states that this emphasises the importance of the surrounding environment and also confirms that building height is one of the most important influences on stack height. The Applicant reports that the continued spread around the line of best fit confirms that building height is not the only factor, with the age of the plant and the plant capacity also being relevant.

Overall, the Applicant considers that the graphs (Figures 6.2 to 6.5) demonstrate that the proposed stack height, when properly compared with the building height and the immediate surroundings of the proposed Installation, is consistent with other similar facilities in the UK.

Consideration of pollutant impact against varying stack heights

Table 6.2 below shows the predicted ground level nitrogen dioxide process contribution as a percentage of the ES at the maximum grid (point of highest impact) and at residential receptors for the different stack heights considered. The Applicant assumes that the emissions from the waste incineration plant are released at the proposed more stringent daily average NOx ELV of 150 mg/Nm^3 for the whole year. The table also shows the number of residential receptors where, for at least one year of weather data, the impact does not screen out as insignificant (fourth column).

Table 6.2 – Predicted maximum ground level nitrogen dioxide PC as %ES for the different stack heights assessed

Stack height above surrounding ground levels (m)	Maximum grid annual average contribution of nitrogen dioxide (% of ES)	Maximum annual average contribution of nitrogen dioxide at a residential receptor (% of ES)	Number of residential receptors not screened out as insignificant (i.e. PC > 1% of ES)
25	7.78%	3.77%	>300
30	6.05%	3.47%	>250
35	4.85%	3.18%	111
40	3.97%	2.90%	26
45	3.31%	2.64%	5
50	2.80%	2.39%	3
55	2.40%	2.19%	3
58	2.20%	2.0%	3
60	2.07%	1.95%	3
65	1.81%	1.75%	2
75	1.40%	1.40%	1
85	1.12%	1.11%	1
95	0.91%	0.86%	0

Taking the above figures into consideration, the Applicant states that:

- the impact of annual mean nitrogen dioxide does not screen out as insignificant (i.e. <1% of ES) at all sensitive receptors until the stack height reaches around 95 metres;

- increasing the stack height from 35 metres (proposed in the previous application) to 58 metres (proposed in this application) above surrounding ground levels would enable the impact on an additional 108 residential receptors to be screened as 'insignificant' for annual mean emissions of nitrogen dioxide, whilst reducing the predicted impact on the most impacted residential receptor by 1.18% of the ES.

The Applicant states that the process contributions are conservative assumptions when considering impact at receptors, as the impact will be lower than at the point of maximum impact. The plant will typically operate below the emission limit and the plant will not operate for the whole year as it will be offline for maintenance. The Applicant concludes that the proposed daily average NOx ELV of 150 mg/Nm^3 is one of the lowest for a waste incineration plant in the UK. Notwithstanding this, the impact is not significant at any receptors at any of the stack heights considered.

Consideration of costs incorporating a cost-benefit analysis

The Applicant provided additional information on the costs of increasing the stack (including the foundation) in a cost benefit analysis. The table below compares the results for the annualised costs and impact of the different stack heights. The stack heights are shown as being above surrounding ground levels (i.e. equivalent stack height). The table also shows the marginal annualised cost for each increase in stack height and the marginal cost per 1% reduction in process contribution of nitrogen dioxide (annual mean) for each increase in stack height. This shows that the marginal cost to achieve the same benefit increases as the stack height increases.

The Applicant reports that there is a step change in the total annualised cost at 75 metres due to the need to increase the strength of the stack foundations and provide the stability required. Using the information presented in the table below, the marginal abatement costs associated with increasing the stack height are compared with the environmental impact in Figures 6.6 and 6.7 below.

Table 6.3 – Applicant's comparison of marginal annualised cost and the marginal cost per 1% reduction in process contribution in annual mean nitrogen dioxide for each increase in stack height.

Parameter	Units	Stack height above surrounding ground levels (m)											
		25	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**75**	**85**	**95**
Impact of long term emissions of NO_2 at point of maximum Impact	% PC of ES	7.78%	6.05%	4.85%	3.97%	3.31%	2.80%	2.40%	2.07%	1.81%	1.40%	1.12%	0.91%
No. of residential properties which NO_2 impact cannot be screened as '*insignificant'*		>300	>250	111	26	5	3	3	3	2	1	1	0
Total Annualised Cost[1]	£ p.a.	£60,198	£85,376	£110,555	£135,734	£160,912	£185,185	£209,457	£234,863	£260,268	£311,531	£361,435	£411,793
Marginal Annualised Cost[2]	£ p.a.	-	£25,179	£25,179	£25,179	£25,179	£24,272	£24,272	£25,405	£25,405	£51,264	£49,904	£50,357
Marginal cost per reduction in impact (% PC of ES)[3]	£ p.a.	-	£14,512	£20,963	£28,884	£38,107	£47,280	£60,459	£78,345	£95,596	£126,763	£174,461	£239,268

Note 1 – Total annualised cost means the cost of buying, operating and maintaining an asset over its lifetime.

Note 2 – Marginal annualised cost means the change in the cost of buying, operating and maintaining one asset over its lifetime, compared to another.

Note 3 – Marginal cost per reduction in impact means the change in the cost of an option that produces a certain process contribution as a percentage of the environmental standard (e.g. 5%) compared to another option that produces a different percentage.

Figures 6.6 and 6.7 below show two ways of identifying the point at which the additional costs associated with increasing the stack height are less proportionate to the environmental benefits gained. Both graphs show the relationship between the marginal annualised cost and the process contribution for all of the assessed stack heights.

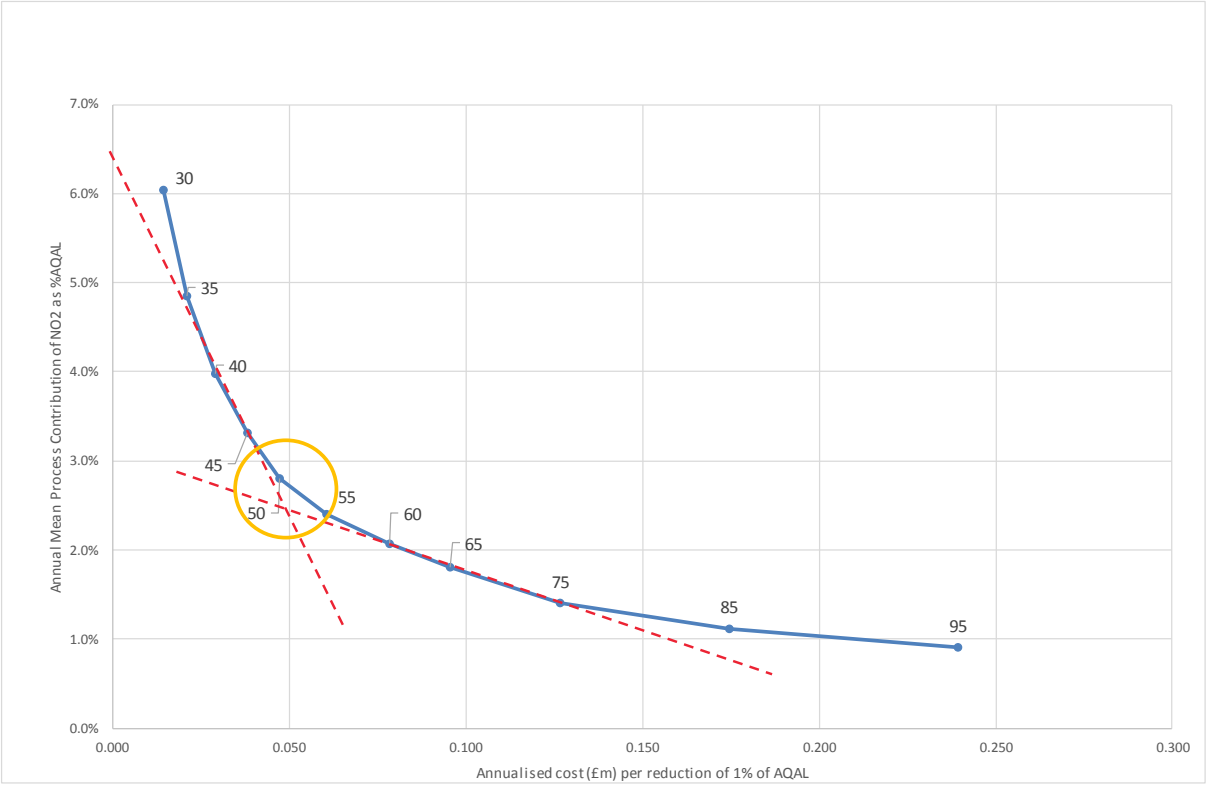


Figure 6.6 – Applicant's assessment of maximum ground level PC_{LT} (% of ES) of nitrogen dioxide and annualised cost per reduction in impact to demonstrate the point at which there is a change between marginal cost of increases in stack height against environmental benefits

Figure 6.6 above shows a line between each of the points and illustrates that there are two parts of the line where the slope is consistent. This shows that there is a change in slope between the first part of the line and the latter part, with the two slopes intercepting at around 50 metres above surrounding ground levels and this change from one slope to the other occurs within the range of stack heights between 45 and 60 metres. Hence, this identifies the point at which there is a clear change between the marginal costs associated with increasing the stack height against the environmental benefits from reducing the NOx process contribution.

Figure 6.7 below shows a more analytical approach. A line drawn from the top left hand corner of the graph to the bottom right hand corner that encompasses all of the data points would have an angle of 45° if the graph were drawn as a square, so it is referred to below as "the 45° line".

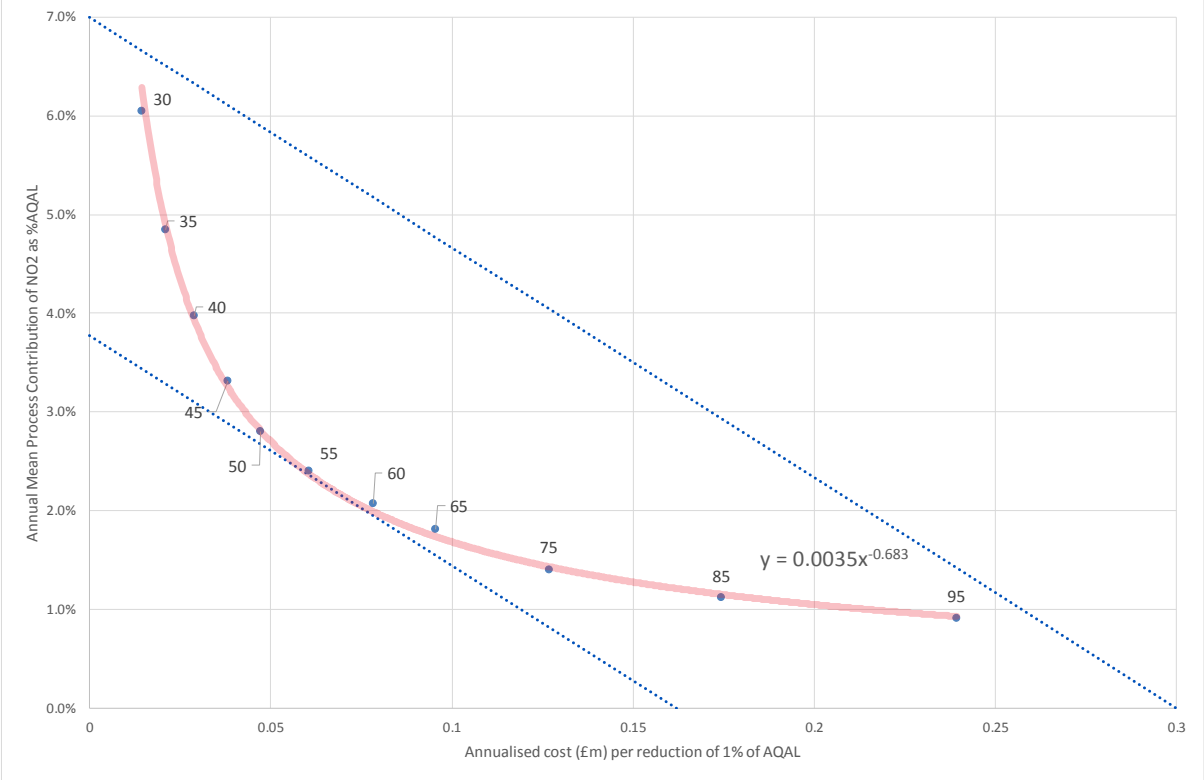


Figure 6.7 – Applicant's assessment of maximum ground level PC_{LT} (% of ES) of nitrogen dioxide and annualised cost per reduction in impact to demonstrate the "45° line

The Applicant explains that the aim is to find the point at which the marginal cost starts to increase faster than the process contribution as a percentage of the ES is decreasing. This is the point at which a line with the same slope as the 45° line makes a tangent with the marginal cost curve. This is a power curve, which means that it has an equation of the form $y=Ax^B$. The slope of this curve is the first derivative, which is $ABx^{(B-1)}$. Hence, the point at which the slope of this curve is the same as the slope of the 45° line can be calculated and it is 57.4 metres. The above figures suggest that the cost effectiveness of increases in stack height begin to reduce noticeably around 50 to 60 metres above surrounding ground levels.

The information in table 6.2 above also shows that the number of receptors which do not screen out as insignificant in all weather years drops to 3 at a stack height of 50 metres above surrounding ground levels and that the stack height would need to increase to 65 metres before an additional receptor is also screened out. This also supports Figure 6.7 which shows the cost effectiveness of increases in stack height begin to reduce between 50 to 60 metres above surrounding ground levels.

The Applicant has selected a stack height of 58 metres above surrounding ground levels as this is within the indicated range from the above methods and is the height calculated from the analytical method, rounded up to the nearest metre. The Applicant explains that increasing the height of the stack from 35 metres (proposed in the previous application) to 58 metres above surrounding ground levels (proposed in this application) will:

- enable all short term impacts of nitrogen dioxide to be screened out as insignificant;
- reduce the maximum long term process contribution of nitrogen dioxide from 4.85% to about 2.2% of the ES;
- reduce the number of residential properties at which the impact of long term emissions of nitrogen dioxide do not screen out as 'insignificant' under all weather conditions from 111 to 3, assuming that the proposed Installation operates at the emission limit for the entire year; and
- increase the annualised costs associated with the stack by approximately £114,000.

The Applicant reports that increasing the stack height further would have limited benefits for increased marginal costs. The environmental benefits of increasing the stack height above 58 metres are considerably less than the benefits associated with increasing the stack from 35 metres to 58 metres, even acknowledging that the actual long term impact at all stack heights above 35 metres is not significant.

Taking all of the above into consideration, the Applicant concludes that a stack height of 58 metres above surrounding ground levels (78 metres from the base) with a daily average NOx ELV of 150 mg/Nm^3 represents BAT for the Installation.

Our assessment

The Applicant's stack height assessment is set out in Appendix 12 of the Application. During the determination, we requested additional information on the stack height assessment from the Applicant. Consequently, the stack height assessment has been revised a number of times in order to ensure it contains the technical information necessary for us to make our decision.

We have reviewed the Applicant's approach to determining the stack height of the proposed Installation based on BAT. We agree that the methodology is appropriate and in accordance with our internal guidance.

We have examined the data submitted by the Applicant which was used to plot the graphs in this section. We do not agree with the Applicant's statement that there is a clearer relationship between stack height and building height shown in Figures 6.3 and 6.4 than there is between stack height and throughput (Figure 6.2). The line of best fit is a different shape, but the spread of data around the line is roughly the same in all three figures. We have examined the influence of building height on the stack height of a plant in addition to the use of the guidance document D1 in previous permit applications. We agree with the Applicant's statement that the proposed stack height for this Installation is comparable to that of other plants based on the data that has been provided.

The ’45 degree line’ approach – cost benefit analysis

The method of determining the stack height at which the costs to the Applicant and the benefits to people and the environment is explained further and comprises two methods.

One approach to the 45° line methodology is to draw a line at 45° to the x and y axes on a graph where they are drawn to the same scale. This joins all the points where the change in the quantity being measured on the x axis is the same as the change in the quantity being measured on the y axis. If the line is at any other angle, then one of the two quantities changes more than the other, so a steeper slope means the process contribution as a percentage of the air quality assessment level is dropping faster than the marginal cost is increasing and a shallower line means the reverse. The point of disproportionate cost is when the marginal cost is increasing faster than the process contribution as a percentage of the air quality assessment level is decreasing. Because it is very difficult to ensure that the two axes of a graph are drawn to the same scale in Excel, it is better to work out the formula for the required line rather than try to create one at the correct angle.

The other approach to the 45° line methodology is to adjust the labels of the units on either the x or y axis where there are different units on both axes. The effect would be to squash or stretch the marginal cost curve on the graph. If the straight line remains at 45 degrees, then it will intersect the curve at a different point. To counter this problem, an alternative approach is to draw a straight line that connects the two endpoints of the graph. This gives a slope that shows the average change in y as x increases. The advantage of using this straight line is that it does not rely on the units of the graph, only on the values of the two end-points. Those endpoints are still arbitrary, however the difference that they make can be examined as part of a sensitivity analysis. The result is that this method does not give a single answer, but instead produces a range of possible stack heights at which the costs to the Applicant could be considered to be disproportionate in comparison to the benefits to people and the environment.

Similar to the previous methodology, the aim is to calculate the point at which the slope of the marginal cost curve is equal to that of the line showing the average change in process contribution as a percentage of the air quality assessment level as stack costs increase. The slope of a curve at any particular point can be worked out by calculating the curve’s first derivative. Where the slopes are equal is where the environmental impact decreases as stack costs increase by the same amount as the average overall rate.

The Applicant has followed the latter approach and the result gives a recommended stack height of 57.38 metres. Our calculation gives a recommended stack height of 57.66 metres, which is consistent with the requested stack height of 58 metres. The uncertainty in this range has been examined in our analysis and it is between 53 metres to 61 metres. The Applicant’s proposed stack height of 58 metres above surrounding ground levels is at the upper end of this range.

Our conclusion

Chapter 2 of the IED applies an integrated environmental approach to the regulation of certain industrial activities. This means that emissions to air, water (including discharges to sewer) and land, plus a range of other environmental effects, must be considered together. The competent authority (in this case, the Environment Agency) must set permit conditions so as to achieve a high level of protection for the environment as a whole, based on the use of BAT, which balances the costs to the Operator against the benefits to the environment. Stack height is an important technique in minimising the impact of the emissions that do occur.

Article 46(1) of the IED requires waste gases from waste incineration and waste co-incineration plants to be discharged in a controlled way by means of a stack height which is calculated in such a way as to safeguard human health and the environment. We are satisfied that the Applicant has provided sufficient information and has demonstrated how the proposed stack height of 58 metres above surrounding ground levels was calculated in this respect.

Annex III of the IED identifies “comparable processes, facilities or methods of operation which have been tried with success on an industrial scale” as a criteria in determining BAT. In our determination of BAT for the proposed Installation, we have considered the stack heights of other waste incineration and co-incineration plants of similar capacity to that proposed in this Application. The stack height of plants of similar size are in the region of between 70 and 120 metres above surrounding ground levels which we regard as the “indicative BAT” for plants in the UK. We would normally expect plant to be within this range.

For this Application, the Applicant has proposed a stack height of 58 metres above surrounding ground levels which is less than the range as specified above. We have considered whether planning constraints would be a consideration in the determination of what is “available” in terms of BAT for the stack height of the proposed Installation. “Available techniques” are defined in the IED as “those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into account costs and advantages, whether or not the techniques are used or produced in the member state in question as long as they are reasonably accessible to the operator”. Techniques include both the technology used and the way in which the plant is designed and built.

The impact of the plant on local landscapes and views was of significant concern to members of the Public at the Public Inquiry into this plant in 2010. To protect the countryside, preserve visual amenity and to comply with the Waste Planning Authority’s policies, a condition of “no visible plume” from the Installation’s stack was specified in the current planning consent.

The guidance on the interaction between planning and pollution control is given in the National Planning Policy Framework. It says that the planning and

pollution control systems are separate but complementary. We did not accept the "planning height constraint" in the previous application as it was not clear that a taller stack would not be acceptable to the Planning Authority. Even if it were not, that does not necessarily mean it would not be an available technique in the generic terms of the definition. It may just mean that this is the wrong location in land use terms. The Applicant's decision to remain with the proposed stack height in the previous Application was driven primarily by the delays that would be caused due to the determination of a revised stack height Application and additional costs under the planning regime. Whilst planning constraint is not considered determinative of what is available at this location, we have taken it into account as part of our overall assessment in this Application.

Where an Applicant intends to demonstrate that BAT is being implemented to prevent and minimise pollution at a particular site, they must carry out an installation-specific assessment using a cost-benefit analysis to select the most appropriate option. Given that the stack height is less than the range specified above, the Applicant provided a cost-benefit analysis of the proposed Installation's stack height in line with the Environment Agency methodology (H1 Guidance Annex K – now withdrawn as internal guidance) in this Application. As part of the cost benefit analysis, the Applicant proposed a more stringent NOx emission limit (daily average) of 150 mg/Nm^3 (normal daily average NOx ELV for waste incineration plants is 200 mg/Nm^3).

In the Applicant's cost-benefit analysis, the marginal abatement cost curves clearly demonstrate that at a height of approximately 57.4 metres, the magnitude of the rate of increase in the marginal annualised cost per reduction of 1% of the ES becomes higher than the magnitude of the rate of decrease in the annual mean process contribution of NO_2 as a percentage of the ES. The Applicant's proposed stack height of 58 metres therefore slightly exceeds the height at which the costs of reducing the environmental impact of emissions begin to outweigh the benefits of those reductions.

We did not accept the proposed stack height of 35 metres in the previous Application as it was significantly below the height we would have expected for a plant of this size and we required further measures to reduce environmental impact and protect health. In addition, the Applicant failed to demonstrate through a robust BAT options appraisal (including a cost-benefit analysis) for selecting the proposed stack height compared to taller stack heights, given the then proposed level of NO_2 PC (6.8% of the ES).

In our determination of BAT for the stack height in this Application, we examined the environmental impact of NO_2 emissions from other plants with stack heights between 70 and 119 metres in comparison with the predicted emissions from the proposed Installation. Table 6.4 below shows the stack heights of other waste incineration and co-incineration plants we have determined of similar or greater size to the proposed Installation (i.e. plants with an annual feedstock capacity of 500,000 tonnes and above).

Table 6.4 – A comparison of stack height, NO_2 impact, secondary abatement and emission limits of waste incineration and co-incineration plants with annual throughput of 500,000 tonnes per annum and above

Plant	Size of plant – annual throughput (tonnes)	Stack height above ground level (m)	Impact on the environment & human health			NOx secondary abatement	NOx ELV (daily average) mg/Nm^3
			NO_2 PC µg/m^3	NO_2 PC as % of ES	NO_2 PEC as % of ES		
Rivenhall (this Application)	595,000	58 (78) [1]	0.88	**2.2**	**48.7**	SNCR	**150**
Teesside	781,000	70	2.0	5.0	72.5	SNCR	200
Allington	560,000	70 (80) [1]	1.81	5.4	75.9	SNCR	200
Wilton	500,000	80	1.55	3.9	78.9	SNCR	200
Slough	558,000	90	1.6	4.1	81.5	SNCR	200
Riverside	785,000	90	1.8	4.5	91.0	SNCR	200
Lostock	600,000	90	3.7	9.3	65.0	SNCR	200
Edmonton	750,000	100	Data not available	Data not available	Data not available	SNCR	200
Avonmouth	850,000	100	2.2	5.5	70.8	SNCR	300
Cheshire	850,000	100	0.88	2.2	Data not available	SNCR	200
Ferry Bridge 1	675,000	100	2.6	6.5	67.8	SNCR	200
Runcorn	850,000	105	1.4	3.5	68.5	SNCR	200
North Blyth	900,000	105	0.76	1.9	75.9	SNCR	300
Ferry Bridge 2	675,000	119	0.72	1.8	68.9	SNCR	180

Note 1 – The figures in parenthesis show the total stack heights from the base (in metres) where the base of the stack is below surrounding ground levels (or lowered stack height).

The table above shows that the impact of NO_2 (process contribution) at all plants is higher than that of the proposed Installation except at North Blyth and Ferry Bridge 2. For these two plants, the predicted environmental concentration (PEC) and the ELVs are higher than those of the proposed Installation. As already mentioned, in addition to increasing the stack height to 58 metres above surrounding ground levels, the Applicant has proposed abatement and the reduction of emissions at source as a further measure in their demonstration of BAT at the Installation. A more stringent emission limit (daily average NOx ELV 150 mg/Nm^3) has been proposed by the Applicant and the Applicant confirms that this emission limit can be achieved using SNCR. Hence although the stack height of the proposed Installation is lower than that of other plants of similar or greater size we have permitted, the impact of NO_2 is one of the lowest.

The key judgement in this determination is whether the impact of NO_2 is unacceptable and the proposed stack height is BAT taking the technical characteristics of the site and local environmental conditions into account. In view of:

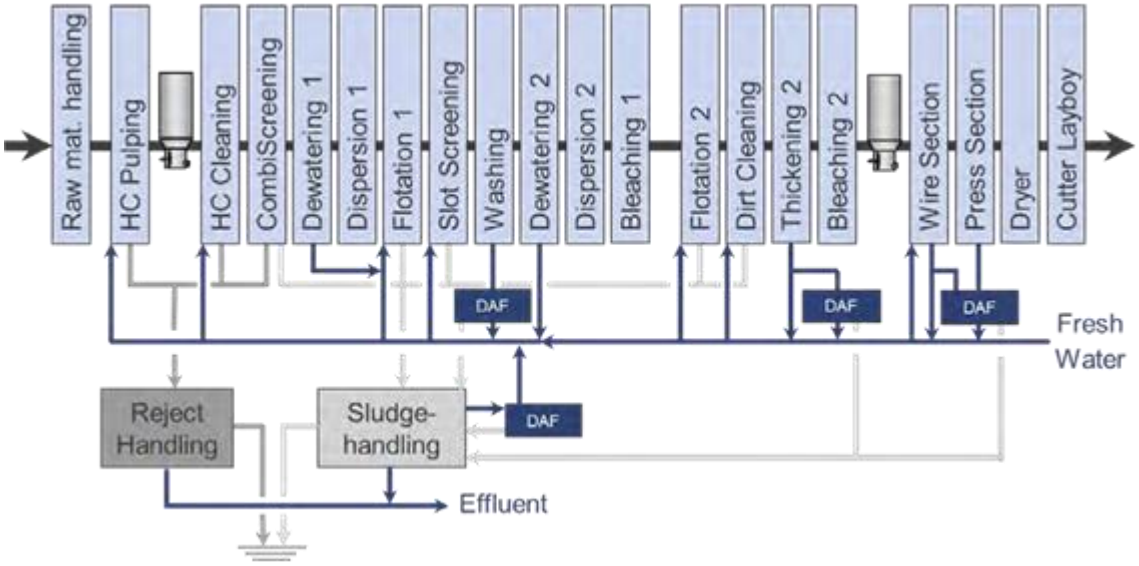
- the peak process contribution given as 2.2% of the ES;
- the predicted environmental concentration (PEC) which shows no exceedance of the ES (PEC is 48.7% of the ES)
- the reduction in the number of residential properties at which the impact of long term emissions of nitrogen dioxide do not screen out as 'insignificant' under all weather conditions from 111 to 3,
- the uncertainties of modelling and the conservative nature of the assumptions used in the modelling:
    - modelling predictions are based on a worst case scenario of the plant emitting at the proposed daily average NOx emission limit of 150 mg/Nm^3 continuously throughout the year.
    - actual emissions will generally be lower as the emission limit should provide headroom to allow for unavoidable process fluctuations and there will be periodic shut downs for maintenance etc.
- an improvement condition which requires a report on how NO_2 emissions are minimised through optimisation of the SNCR system,

We can therefore conclude that the NO_2 impact is well below 100% of the ES. We do not consider it practical or reasonable to expect the Applicant to go beyond what is considered BAT for the control of NO_2 emissions.

Annex III of IED also identifies the nature, effects and volume of the emissions concerned as criteria for determining BAT. As already mentioned, Article 46(1) requires stack height to be calculated to safeguard human health and the environment. Given the more stringent emission limit applied (daily average NOx ELV from 200 mg/Nm^3 to 150 mg/Nm^3), the reduction of the environmental impact of emissions from the stack (PC ~2% of the ES) and taking into account the building height, plant capacity and the environmental characteristics and setting, the Environment Agency is satisfied that a stack height of 58 metres above surrounding ground levels (78 metres from base) is BAT for the proposed Installation.

6.1.3 Consideration of BAT for the paper pulp plant

A simplified process flow diagram for the paper pulp plant is presented below.



High grade mixed office waste paper and other high grade waste paper will be delivered to the proposed Installation and unloaded in the reception hall. Paper will be delivered in baled form, but the reception hall can also receive paper in loose form i.e. delivered within ejector trailers. Forklifts with de-baling equipment and front-end loaders will transfer the paper feedstock to a feeding hopper that will evenly distribute the paper onto a feed conveyor. At this point, the paper feedstock to the pulp plant will be mixed with paper recovered from the mixed dry recyclables and/or similar pre-sorted or separated mixed commercial wastes MRF.

Waste paper will be fed by conveyor into the pulper. Water will be heated to a temperature of approximately 80°C using a direct steam inductor and added to the pulper under flow control. The amount of water added is determined by the desired pulping consistency (i.e. ratio of water to solid matter). Typically, the likely paper feed would be approximately 90% solids whereas the ideal pulping consistency is 15% to ensure maximum fibre-to-fibre contact is achieved in order to loosen the ink from the paper fibres.

The un-pulpable contaminants, (i.e. plastic covers, large staples and pieces of metal that have not been previously removed) will be screened out and discharged on to a conveyor and fed to a standing open Ro-Ro container. The Ro-Ro container will be transported by the on-site truck to feed the rejected materials either into the MRF for further screening, separation and recovery or into the waste incineration plant bunker to be mixed with the incoming RDF feedstock and used within the waste incineration plant.

Additives will be applied to raise the pH to approximately pH 10 to create the right conditions for the fibres to swell and soften. At the end of the pulping cycle, the fibrous mixture or 'stock' from the pulper will pass through a perforated screen. The fibrous mixture will be diluted to 5% consistency before being pumped to the high consistency cleaner.

Following pulping, the fibres will undergo a series of cleaning, flotation, bleaching and thickening activities. The final stage of the process will be the dewatering, drying and baling of the recycled fibrous pulp. At the end of the drying stage, the pulp will be at 87% to 90% solids content. The dried and recycled pulp sheet is passed from the exit dryer and baled either for temporary storage within the pulp store or direct to the vehicle loading bay for export from the proposed Installation.

The resultant sludge (principally china clay and small pulp fibre) from the paper making activity will be fed through a screw press and steam-heated tube dryer to reduce its moisture content from 50% to 35%. Water arising from the sludge drying process will be fed to the WWTP for treatment, recirculation and reuse. The sludge comprises inert materials with no odour potential. The sludge drying operation takes place within the Installation's building. By reducing the moisture content of the sludge, vehicle movements associated with its collection and export from site will be minimized. Following drying, the sludge will be exported from site to be used as a soil improvement material.

We have considered BAT for the paper pulp activity as follows:

- The Applicant proposes to use bleaching agents other than chlorine compounds, thereby reducing the environmental impact associated with its use.
- Sludge from the process will be dewatered and dried prior to despatch off-site for use as a soil improvement material.
- There will be no discharges of any liquids to controlled waters and sewer. Effluent from the paper pulp plant will be transferred to an on-site WWTP for treatment.
- Water use is maximised in a way that treated effluent will be discharged to the Upper Lagoon and reused at the Installation.
- Energy for the paper pulp plant will be sourced from the adjacent waste incineration plant.
- There will be systems in place to ensure that effluent cannot bypass the WWTP. There will be adequate effluent buffer storage to prevent spills reaching the WWTP or controlled waters.

We consider that the Applicant's proposals comply with the Sector Guidance Note EPR 6.01, How to Comply – Additional Guidance for Paper and Pulp.

6.1.4 Consideration of BAT for biological treatment (MBT and AD)

We have considered BAT for the MBT and AD activities as follows:

- Pre-acceptance of wastes
- Acceptance of wastes
- Reception and storage of wastes
- Biological treatment & process monitoring
- Post-treatment of wastes

Pre-acceptance of wastes

The Applicant states that following deposition by the delivery vehicle, a wheeled loading shovel will handle the incoming waste. In the event that the incoming waste has not undergone any initial shredding at the customer's collection or transfer facility, there will be a mobile shredder available in the tipping hall to ensure that all material placed into the MBT vessels are shredded to an appropriate size to be determined during operations; in the order of 150 mm to 300 mm. The mobile shredder will not necessarily shred all wastes, only selected wastes. In addition, it will "cut" wastes to a size of 300 mm.

For the AD activity, mixed organic waste is delivered to the site and deposited into the AD reception area, where it is taken on a collecting screw conveyor and transferred to the pulpers.

The Applicant states that procedures for pre-acceptance of wastes will include audits of waste producers and/or fuel suppliers involving a review of their operations to confirm that the wastes which they are delivering are in accordance with the waste descriptions, specifications and EWC codes as specified in the Permit. For each waste treatment process, a detailed waste specification will be finalised with the waste suppliers, prior to the Operator's approval to receive these wastes for processing at the proposed Installation.

The Applicant reports that documented procedures for pre-acceptance of wastes will be developed prior to the commencement of operation of each of the waste treatment processes, in accordance with the documented management systems for the proposed Installation.

Acceptance of wastes

The Applicant reports that there will be on-site procedures for reviewing wastes at the weighbridges and for checking incoming wastes against the agreed specifications on a regular basis. Crane drivers and other operatives will be trained in order to undertake these tasks.

The Applicant states that the following measures will be adopted for the receipt of wastes:

- A high standard of housekeeping will be maintained in all areas. Suitable equipment will be provided to clean up spilled materials.

- Loading and unloading of vehicles will only be undertaken in designated internal areas provided with impermeable hard standing. These areas will have appropriate falls to the process water drainage system.
- Delivery and reception of waste will be controlled by a management system that will identify all risks associated with the reception of waste and shall comply with all legislative requirements, including statutory documentation.

The Applicant states that all incoming wastes will be delivered in covered vehicles or containers and unloaded in the enclosed waste reception areas. The design of equipment, buildings and handling procedures will ensure there is no dispersal of litter. Inspection procedures will be employed to ensure that any wastes which would prevent the anaerobic digestion process from operating are segregated and placed in a designated quarantine area pending removal from site. Further inspection will take place by the plant operatives during vehicle tipping and waste unloading.

The weighbridge will include a radioactive waste detection system which will notify site operatives via an alarm if radioactive waste is present within the waste deliveries. The reporting procedures if this alarm is activated will be included within the documented management systems. This additional measure has been taken to identify any potentially radioactive material in the wastes prior to incineration.

The Applicant reports that documented procedures for acceptance of wastes will be developed prior to the commencement of operation of each of the waste treatment processes, in accordance with the documented management systems for the proposed Installation. This will include procedures for the rejection of wastes which do not conform with permitted waste.

Reception and storage of wastes

The reception area will be within an enclosed building maintained under negative air pressure with discharges via an emissions abatement system in order to minimise odour and dust release and to reduce noise during unloading, storage or handling operations. The operating areas for unloading, preparing and processing wastes will be on an impermeable paved surface.

For the MBT activity, the Applicant reports that the wheeled loading shovel will pick up the waste from the tipping floor or holding bay, pass it through the mobile shredder as required, and place it into one of the MBT vessels as soon as possible after it has arrived at the proposed Installation. The waste reception area will be cleared of waste and cleaned at the end of each working day.

The maximum period of time in which incoming waste will be held in the reception area awaiting processing will be approximately half the working day, equivalent to 6 hours. However, most waste delivered to the MBT facility will be processed within one or two hours of the delivery occurring, depending on the availability of the mobile shredder and the MBT vessels when the waste is tipped.

The enclosed MBT vessels will be located within the main buildings ("the Western Hangar"). The floor of the MBT area within the MBT facility will be graded internally for appropriate waste water control within each vessel and, separately, within the trafficked areas of the remainder of the MBT. The initial tipping area and short-term waste bunkers will be individually drained. The design allows for all surfaces to be regularly washed down and kept clean using fresh water from the Upper Lagoon.

The building floor beneath each MBT vessel is sloped lengthwise from the waste access /entrance door towards the central aisle between the two banks of MBT vessels. At the end of each floor, a 150 mm wide by 150 mm deep leachate collection drain will run transversely across the MBT vessel floor and will collect any leachate and feed it into the collection drains.

For the AD activity, digestate which has not been sent for dewatering will be pumped to the two digestate storage tanks. The tanks will be equipped with quick coupling systems for the removal of the liquid digestate for its transfer off-site.

For all activities, storage tanks will be located on an impermeable surface with sealed construction joints and will be provided with appropriate secondary containment that can accommodate a volume at least 110% of the largest tank or 25% of the total tankage volume (whichever is the greater). All bunds shall be regularly inspected to ensure that they are regularly emptied and all connections and fill points will be within the bunded area with no pipework penetrating the bund wall.

Biological treatment & process monitoring

MBT – treatment and process monitoring

The design of the MBT vessels is modular and there will be up to 16 vessels installed and in operation. The vessels are made from 3 walls of concrete with a fixed or retractable PVC roof. Approximate dimensions of each vessel are 6.5 metres internal width, 18 metres length and 4 metres internal height. There is a removable metal door at the front. During loading, the metal door will be removed and the retractable part of the roof rolled back. The waste will be placed to a height of approximately 3 metres and initially compacted with the loading shovel.

Each vessel will be designed to hold up to approximately 200 tonnes of waste. When the vessel is full, the door will be replaced (using the loading shovel) and, if appropriate, the roof will be rolled back over the top of the vessel. The vessels will be effectively sealed at this stage. This minimises the potential for vermin, helps to maintain the heat within the vessels and contains odours or dust during the biological drying process.

A strict regime of temperature and moisture content monitoring will be undertaken for a period of 7 to 14 days whilst the waste is being treated within the vessels. When the waste has achieved the appropriate moisture content, the vessels will be emptied by a wheeled loading machine and transferred directly through to the MRF feed hopper for further processing.

Depending upon the nature of the waste and on the output from similar previous practices in the MRF, the Operator may decide that there are insufficient recyclates that can be recovered by sending the MBT output through the MRF. If this is the case, the material that exits the MBT, now classified as 'RDF', will be loaded direct onto in-house dump-trucks which will transport the RDF direct to the waste incineration plant bunker.

Within the MBT, the temperature inside the waste for optimum biological drying conditions is likely to be in the region of 50 to 60°C. There will be no external heat supplied or drawn into the vessels. The effective self-composting process ensures that the material in the vessels warms up naturally without requiring any external heating sources to provide heat into the vessels.

In order to assist in biodrying control and to confirm when the wastes have reached appropriate moisture content, a number of 2-metre long temperature probes will be inserted through the roofs of the vessels. Each vessel will have a large fan at the back to constantly blow through air and to keep the wastes aerated. Adjustments will be made in air circulation to maintain temperatures at appropriate levels.

Air within the MBT vessels will be circulated for an anticipated 75% of the cycle time. A valve on the inlet air side of the fan units will control replenishment volumes of air as needed to control temperatures and moisture. The capacity of the stainless steel fan units is circa 1.5 m^3/sec which in turn is controlled by a speed reducer. The air flow will be distributed at ground level through patented air rails which have proven themselves to stay clear and remain unblocked for a service interval of at least 6 months. The oxygen enriched air percolates through the waste and is then sucked back into the fan via pipework mounted on the inside of each vessel roof. There are no emissions from the MBT vessels whilst in this phase of operation.

As the air used within the vessels is fed into and re-circulated on a closed (contained) loop system, the short retention time (a minimum of 7 days and up to a maximum of 2 weeks) mitigates the potential creation of an anaerobic environment. Temperature controls will enable the Operator to ensure that such anaerobic conditions are not reached.

The Applicant anticipates that moisture modification through the biodrying process will be in the order of 10% to 12% reduction over the first week with a maximum potential moisture reduction of 15% over 2 weeks. Moisture modification results in approximately 75% leachate generation and 25% loss to air.

AD – treatment and process monitoring

Waste that has undergone pre-treatment will be pumped from the suspension buffer to the digesters, where the biogas production will take place. The digesters will be fed with the means of a digester feeding pump. The feeding process of the digesters will be automatic and semi-continuous. It will be fed throughout a twenty-four hour day, seven days a week, for short periods and in frequent intervals by the use of pumps, optimal for the transport of low flowing suspensions containing solids. High liquid level in the digester outlet sump inhibits the digester feed pump.

Part of the biogas produced in the digesters will be transferred to gas compressors where it will be compressed and pushed back into the digesters via a central gas lance system at the bottom of each digester. The biogas creates bubbles while leaving the gas lances and it increases the water level at the top of the digester. Thus, a significant volume of liquid is displaced which creates a high velocity current in the central part of the digester up to the surface. It continues horizontally towards the perimeter of the digester, moves down close to the wall region to the bottom and then back to the digester's centre. This effect has the capability of mixing all the digester's volume. The high surface velocities avoid the formation of a 'crust' on the surface of the digester.

The temperature of the digesters will be monitored. The biological process operates at mesospheric temperature conditions, i.e. between 36°C and 38°C, which gives higher operating and disposal safety within the process. A constant temperature will be maintained in the digesters by the external recirculation heat exchanger system provided for each digester. The retention time for the waste will be approximately 18 days, during which the organic dry matter in the digesters will be converted to biogas. The digested pulp (referred to as digestate) will be automatically pumped from the digesters to the dewatering station under level control.

Digestate storage tanks will be equipped with appropriate pressure control systems including pressure sensors and pressure relief valves to protect against both pressure and vacuum. Data from the pressure control system and sensors will be fed to the AD control room. Pressure within the digesters will be monitored and managed to prevent build-up or vacuum conditions developing. In the unlikely event of pressure build-up, the pressure release valves will allow the tanks to vent through control pipes to a pressure control gasometer.

Whilst the AD facility is subject to detailed design, it is expected that any significant pressure variations will result in an alarm notifying the Operator.

The Applicant reports that the AD facility will be installed with a Supervisory Control and Data Acquisition (SCADA) system to monitor digester and digestate storage tank levels, temperature and pressure. The volumetric flow through the anaerobic digestion process will be monitored via a flow-meter located on the slurry feed line to the digesters.

The digester monitoring philosophy will be subject to the detailed design stage of the AD facility. The following parameters are listed below and will be confirmed following detailed design:

- Chemical assays (alkalinity, ammonia, dry solids and volatile solids, volatile fatty acids, C:N ratio, organic loading rate, pH) will be performed in accordance with standard techniques. Under normal operation the monitoring frequency will be weekly or greater as required, for example during start-up and stabilisation of the digesters.

- On-line measurements of temperature, biogas pressure, H_2S and biogas flow rate are likely to be included for process control. Data will be measured by instruments fitted to various parts of the plant. Data will be logged automatically and reviewed daily via a computerised user interface. High level indications will link to alarms. The instruments will be maintained in accordance with good operating practice and the manufacturer's instructions.

- Safety critical outputs will be linked to alarms and verified by offline measurements at suitable intervals, where practical.

Post-treatment of wastes

Leachate produced from the biodrying process will be used as a pre-seeded source of process water to support the adjacent AD facility.

Following digestion of waste in the digesters, whole digestate will be separated by the use of a centrifuge into a liquid and solid fraction. The digestate will be continuously pumped at a controlled rate from the digesters to the dewatering centrifuges. Prior to entering the centrifuges, whole digestate will be conditioned by the addition of polyelectrolyte solution if required.

The solid fraction of the digestate will be placed on a covered conveyor belt and will be transported to a small storage area for temporary storage prior to transfer off-site for use a soil conditioner. The liquid fraction of the digestate will be discharged into a small tank and pumped to the process water tank for re-circulation in the AD process.

We consider that the Applicant's proposals are in accordance with the Environment Agency's Draft Technical Guidance Note for MBT and AD (which represents our understanding of BAT for biological treatment):

- How to comply with your environmental permit. Additional technical guidance for: Mechanical Biological Treatment Sector, Reference LIT 8707, Report version 1.0 August 2013
- How to comply with your environmental permit. Additional guidance for: Anaerobic Digestion, Reference LIT 8737, Report version 1.0 and November 2013

Although we agree that the Applicant's proposals are BAT for biological treatment of wastes using MBT and AD, we have set pre-operational condition 4 in the Permit which requires the Operator to submit details of the site pre-acceptance and acceptance procedures prior to the commencement of commissioning of each of the activities (AR1 to AR6).

6.1.5 Consideration of BAT for the MRF

The MRF processing facility will be divided into two lines:

Line 1 will be for processing the material that has been pre-treated in the MBT biodrying vessels.

Following treatment, the dried wastes within the MBT vessels will be collected by a wheeled front-end loader and tipped into a metering feed hopper at the head of Line 1. The hopper acts as both a reception point for the waste and a way of systematically feeding the waste at a steady state into the treatment process.

Once the materials have passed through the hopper, they will be transferred by conveyor into the trommel (a rotary screening drum that separates materials of different sizes based on its settings of hole sizes). As material passes through the drum, any material that is smaller than the holes in the drum at that point will drop out, thus providing effective separation. The first holes will be set to 50 mm, and any material less than 50 mm will fall through and be conveyed directly to the temporary storage or holding bay at the end of the line as RDF.

The retained material will continue to pass through the trommel over separation holes set at 150 mm, and any material less than 150 mm will fall through into a hopper feeding a transverse conveyor beneath the trommel. This fraction size of between >50 mm <150 mm will include the bulk of the metals and plastic bottles. The transverse conveyor will take this material to the ballistic separator shared with Line 2.

The remaining materials will pass out of the end of the trommel underneath an over-band magnet to remove any remaining ferrous material and the residual material will be dropped into the RDF bunker.

Line 2 will be designed for processing material that generally comes direct into the MRF having undergone no treatment or minimal pre-treatment. In addition, it will process the 50 mm to 150 mm fraction separated out from Line 1.

Following deposition by the delivery vehicle, a wheeled loading shovel will handle the incoming waste, either initially storing it temporarily in the daily holding bunker or feeding it directly into the feed hopper at the head of Line 2. Waste placed into the feed hopper drops onto a shredder that will shred the waste into 300 mm particles. This ensures that the waste passes through the process in a uniformed size and that the RDF produced at the end of the line is in accordance with the fuel requirements for incineration within the waste incineration plant.

All of the shredded material will then pass along a conveyor into the trommel where the initial separation holes will be set at 50 mm. All of the material less than 50 mm material will drop through the holes and be conveyed to the RDF bay ready for despatch.

The remaining material will pass along the trommel to where the next separation holes are set at 150 mm. All of the >50 mm <150 mm will fall through the trommel at this stage and onto a ballistic separator. At this point, the >50 mm <150 mm material from Line 1 will also be fed in parallel to this ballistic separator.

The function of the ballistic separator is to separate out the principal recyclates in 2D and 3D formats. This is achieved by passing the waste materials over a series of parallel inclined rotating plates formed of angled metal paddles. This action enables the 2D flat and flexible materials such as paper and plastic film to rise up the incline but any 3D rigid or rolling materials such as plastic bottles and metal cans will roll back down the incline. Fine items will fall through a sieve mesh.

From the ballistic separator, the 2D or flat >50 mm <150 mm material is conveyed to the RDF despatch bay. The 3D or non-flat >50 mm <150 mm material will pass along a conveyor via an over-band magnet and eddy separator to an optical sorter where all of the plastic bottles can be identified. The optical sorter works by reading the different polymer types, colours and shapes. Once these have been identified, an electronic signal is sent to an air jet that expels the bottle as it passes over the jet of air. These materials will be ejected into holding cages ready for baling.

The >150 mm material that had not dropped out of the trommel for conveyance to the ballistic separator continues on to the end of the trommel where it is fed onto a conveyor under an over-band magnet for ferrous extraction and then into a picking cabin. In the picking cabin, site staff will manually take out the larger recyclables such as paper and rigid plastics. These will be dropped into appropriate holding cages or bunkers beneath the picking station ready for baling.

Following the end of the picking line, the remaining material will continue on the conveyor and over a non-ferrous separator to extract non-ferrous metals and under a final over-band magnet to extract any remaining ferrous metals. The ferrous and non-ferrous fractions will be dropped into a holding cage or bunker ready for baling for transfer off-site to a licenced waste management facility.

All remaining materials will be fed by conveyor to drop into the RDF despatch bay. The materials that have been separated out for recycling such as paper, card, plastic bottles and metals will be mechanically transferred from each holding cage on a separate basis and conveyed to the baler attached to Line 2. The area between the baler and the RDF bunker will be used for the storage of bales (by clamp truck) of the various recyclates awaiting transfer off-site.

We consider that the Applicant's proposals for the MRF activity are BAT as they are in accordance with the following Sector Guidance Notes:

- How to comply with your environmental permit. Additional technical guidance for: Mechanical Biological Treatment Sector, Reference LIT 8707, Report version 1.0 August 2013; and

- IPPC S5.06 – Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste, Version 5, May 2013

6.1.6 Consideration of BAT for the WWTP

Waste water from the Installation will be transferred to the WWTP where it will undergo screening, dissolved air flotation (DAF), lime softening, reverse osmosis and dewatering processes.

The coarse and fine screens will remove larger particles including 'stickies' that are troublesome in downstream process plant and can interfere with flotation and settlement. Collected screenings will be removed from the screen face by a wiper screw auger and will be deposited in an adjacent wheelie bin. In the event of failure of one unit, the entire flow can be accommodated and the level of treatment maintained by the remaining packaged screening unit.

The incoming effluent will have total suspended solids of up to 710 mg/l and a temperature of up to 50°C. The high temperature reduces the solubility of oxygen in water and therefore limits the amount of air that can be saturated in the air dissolving tube. This combined with a high incoming suspended solids leads to a less than ideal solids/air bubble ratio and less than ideal separation performance.

Therefore there is a second stage of polishing DAFs. The bulk of the suspended solids removal will take place in the roughing DAFs with the polishing DAFs operating at a much improved solids/air bubble ratio and providing an overall much improved separation performance.

The double DAF arrangement will allow for operation of each stage at differing pH which will be optimised to improve silica and organics separation. Therefore the design of the DAFs is optimised to achieve the maximum physiochemical separation possible which is intrinsically the lowest cost form of treatment.

After the roughing and polishing DAF plant where ferric chloride coagulant will be dosed, the effluent will be further dosed with hydrated lime which will be supplemented with additional ferric chloride to aid reduction in the de-inking solids and to improve the mobility of settled carbonate sludge.

Clarified water from the lime soda softening precipitators will be subject to sand filtration to remove any solids carry-over. A bank of four pressure down-flow filters will capture any suspended solids in the sand media bed. On increase in head-loss, each filter will in turn be subject to an air, air and water and water only backwash. Solids removed will be returned to the calamity /balance tank where they will be pumped to the DAFs for solids separation.

The combination of double DAF, lime soda softening and filtration will remove as much of the residual ink and greatly reduce the scaling and fouling potential of the pre-treated effluent. Only organic matter in particulate form that is able to float or settle will be removed and therefore soluble organic matter and its associated COD will be unaffected.

Four stages of reverse osmosis (RO) will be used to achieve the water quality requirements as specified in the Application. The product /permeate from each stage becomes the feed to the following stage and the quality of the permeate progressively improves such that by the final fourth stage, the desired treatment objectives are comfortably achieved. The concentrate or reject from each stage is passed back to the feed of the preceding stage such that eventually all the concentrate /reject is amalgamated as a single discharge from the first stage.

Treated water will be recirculated and reused within the paper pulp plant to provide a zero liquid discharge (or closed loop) waste water treatment system. Solid rejects/sludge arising from the WWTP process will be mixed with RDF within the waste incineration plant bunker prior to incineration.

Process waters from the paper pulp plant to the WWTP will be monitored for pH, temperature and conductivity with set points to raise alarms and/or divert flow to the buffer tank. The WWTP will be provided with sample points between all series process units to allow routine chemical analysis to confirm performance (i.e. chemical oxygen demand removal, ammonia, nitrate, biological oxygen demand, residual hardness, residual silica, total dissolved solids, etc. at the appropriate stage) and to calibrate the process instrumentation.

When the waste incineration plant and/or the paper pulp plant are not available due to planned or unplanned shutdown, the waste incineration plant's control room will inform the WWTP. The operatives will then switch the WWTP to auxiliary mode prior to fully shutting down.

We have examined the information in the Application and compared the proposals with the sector guidance note for waste treatment – IPPC S5.06 – Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste, Version 5, May 2013. Dissolved air flotation is recognised as an appropriate treatment technique for process waters and we accept that it is BAT at the proposed Installation.

6.2 BAT and emissions control

6.2.1 Consideration of emissions control from the AD facility and waste incineration plant

AD facility

AD facilities utilise the biogas produced on-site, either as a fuel for use in boilers to provide hot water and heating (small scale AD plants) or by combustion via CHP gas engines to provide electricity and heat. Maintaining the availability of the on-site energy recovery plant is a priority and this requires alignment of the reactor design to the energy recovery plant to avoid any biogas surplus and maintaining the energy recovery plant to minimise unnecessary downtime.

Emergency flares are used to burn excess biogas, when the combustion plant (boiler or gas engine) is unavailable due to maintenance or breakdown and the on-site biogas storage has exceeded its capacity. Monitoring of the exhaust emissions of the combustion plant is required in order to ensure that the combustion characteristics have been optimised and drift in engine performance is minimised.

The emissions and monitoring standards that apply to biogas-fuelled engines are the same as those applied to engines fuelled by landfill gas, with emission limits set for oxides of nitrogen (NOx), carbon monoxide (CO), sulphur dioxide (SO_2) and total volatile organic compounds (VOCs).

Waste incineration plant

The prime function of flue gas treatment (FGT) 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 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; and
- release of noise.

Taking these factors into account, our Technical Guidance Note EPR 5.01 points to a range of technologies being BAT subject to circumstances of the Installation.

6.2.2 Particulate matter

AD facility

Emissions of particulate matter are not expected from the combustion of biogas derived from biodegradable waste. Consequently, the proposed gas engines will not require particulate matter control.

Waste incineration plant

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

The Applicant proposes to use fabric filters for the abatement of particulate matter at the waste incineration plant. Fabric filters provide reliable abatement of particulate matter to below 5 mg/m^3 and are BAT for most installations. The Applicant proposes to use multiple compartment filters with burst bag detection to minimise the risk of increased particulate emissions in the event of bag rupture.

Emissions of particulate matter have been previously screened out as insignificant. In this case, it is not considered that any of the alternate techniques offer any advantage in comparison with the Applicant's preferred option of fabric filters and so the Environment Agency agrees that the Applicant's proposed technique is BAT for the proposed Installation.

6.2.3 Oxides of Nitrogen

AD facility

The Applicant proposes to use reciprocating engines (spark ignition engines) to burn biogas produced from the digesters. The principal technique used to reduce NOx emissions is lean burn technology, where the fuel content of the charge is less than stoichiometric. This reduces local temperatures by dilution and ensures there is ample oxygen for good hydrocarbon conversion.

The Applicant confirms that the proposed gas engines and emergency flare are capable of meeting the emission limits specified in the Environment Agency's landfill guidance LFTGN 08: Guidance for monitoring landfill gas engine emissions and LFTGN 05: Guidance for monitoring enclosed landfill gas flares. Consequently, no secondary measures for NOx control are proposed for the gas engines and emergency flare.

Waste incineration plant

Oxides of Nitrogen : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for Waste Incineration**
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	Reduces the consumption of	Some applications		All plant unless

(FGR)	reagents used for secondary NOx control May increase overall energy recovery	experience corrosion problems		impractical in design (needs to be demonstrated)

The Applicant proposes to implement the following primary measures:

- Low NOx burners – this technique reduces NOx at source and is defined as BAT where auxiliary burners are required.
- Optimise primary and secondary air injection – this technique is BAT for all plant.
- Flue gas recirculation – this technique reduces the consumption of reagents for secondary NOx control and can increase overall energy recovery, although in some applications there can be corrosion problems – the technique is considered BAT for all plant.

Oxides of Nitrogen : Secondary Measures (BAT is to apply primary measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for Waste Incineration**
Selective catalytic reduction (SCR)	NOx emissions <70 mg/Nm^3 Reduces CO, VOC, dioxins	Expensive Re-heat required – reduces plant efficiency		All plant
Selective non-catalytic reduction (SNCR)	NOx emissions typically 150 – 180 mg/Nm^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

There are two recognised techniques for secondary measures to reduce NOx. 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 NOx levels to below 70 mg/Nm^3 and can be applied to all plant. SCR 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 NOx levels to between 150 and 180 mg/Nm^3. It relies on an optimum temperature of around 900°C and sufficient retention time for reduction. SNCR is more likely to have higher levels of ammonia slip. The technique can be applied to all plant unless lower NOx 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. The use of one over the other is not normally significant in environmental terms.

The Applicant proposes to use SNCR with ammonia as the reagent. Emissions of NOx cannot be screened out as insignificant. Therefore the Applicant has carried out a cost benefit analysis of the alternative techniques. The cost per tonne of NOx abated over the projected life of the plant has been calculated and compared with the environmental impact as shown in the table below.

Secondary measure	Cost of NOx removal £/tonne	PC (long term)	PC% of long term ES
SCR	£5,100	0.41	1.03%
SNCR	£2,800	0.88	2.2%

The Applicant compared the use of SCR at the proposed stack height of 58 metres above surrounding ground levels with the use SNCR at an increased stack height. The table below shows the annualised costs, the change in annualised costs compared to the base option of SNCR and the predicted ground level nitrogen dioxide process contribution as a percentage of the ES at the maximum grid (point of highest impact).

NOx abatement technology		SNCR				SCR	
Stack Height	**metres**	**55**	**58**	**85**	**95**	**55**	**58**
PC as % of ES	µg/m³	2.40%	2.20%	1.12%	0.91%	1.12%	1.03%
Annualised stack cost	£ p.a.	209,457	224,700	361,435	411,793	209,457	224,700
Annualised NOx abatement cost	£ p.a.	1,397,000	1,397,000	1,397,000	1,397,000	3,761,000	3,761,000
Total annualised cost	£ p.a.	1,606,457	1,621,700	1,758,435	1,808,793	3,970,457	3,985,700
Annualised cost compared to base case	£ p.a.	--	15,243	151,978	202,336	2,364,000	2,379,243

The Applicant reports that adopting SCR with a stack height of 58 metres will give a ground level NO_2 process contribution of 1.03% of the ES. To achieve this ground level concentration using SNCR will require a stack height of at least 85 metres above surrounding ground levels. The annualised cost of increasing the stack height from 58 metres to 85 metres using SNCR is £137,000 and that for adopting SCR at 58 metres is £2.4 million. Given that the benefit derived from increasing the stack height from 58 metres to 85 metres (using SNCR) or the adoption of SCR (with a stack height of 58 metres) is a reduction of the grid maximum NO_2 impact by 1.2% of the ES and a reduction in the number of human receptors where NO_2 impact does not screen out as 'insignificant' by 2 (from 3 receptors to 1), the Applicant considers that the cost of the above proposals outweighs the benefits and is therefore disproportionate and not justified. Thus SCR is not BAT in this case and SNCR is BAT for the proposed Installation. The Environment Agency agrees with this assessment.

The Applicant has justified the use of ammonia as the reagent for the following reasons:

- Ammonia tends to give rise to lower nitrous oxide formation than urea. Nitrous oxide is a potent greenhouse gas. Ammonia emissions (or 'slip') can occur with all reagents, but good control will limit this.

- Urea is easier to handle than ammonia; the handling and storage of ammonia can introduce additional risk. However, once the ammonia has been delivered in the storage tank, there is no further handling required for ammonia solution. Dry urea is required to be made-up into a solution to be used as a reagent in a SNCR system.

The Environment Agency agrees with this assessment. The amount of ammonia used for NOx abatement will need to be optimised to maximise NOx reduction and minimise NH_3 slip. Improvement condition 5 requires the Operator to report to the Environment Agency on optimising the performance of the NOx abatement system. The Operator is also required to monitor and report on NH_3 and N_2O emissions every 6 months.

6.2.4 Acid Gases – SO_2, HCl and HF

AD facility

Natural gas that meets the standard for acceptance into the National Transmission System is considered to be a sulphur free fuel. Natural gas that does not meet this standard and industrial gases (e.g. some refinery gas and gases from gasification plants) may contain sulphur compounds and may require desulphurisation.

The sulphur content of biofuels can range widely, dependent upon the fuel used. For example straw and barley crops can contain between 0.2 and 0.7% sulphur whilst concentrations in willow are expected to be at round 0.06%.

For smaller scale combustion plant, use of low sulphur fuels (i.e. less than 1.2% sulphur) may be sufficient in the consideration of BAT for control of oxides of sulphur emissions.

The Applicant proposes to use low sulphur fuels as a primary measure. Only biogas produced from source segregated biodegradable waste will be combusted using the gas engines. Hydrogen sulphide will be removed from the biogas prior to combustion in order to avoid engine corrosion and to reduce sulphur concentrations in the emissions when the biogas is combusted. An external biological desulphurisation will be used to achieve the required values for the valorisation of the biogas.

The Applicant confirms that the proposed gas engines are capable of meeting the emission limits specified in the Environment Agency's biowaste treatment permit template. Consequently, no secondary measures for SO_2 control are proposed for the gas engines.

Waste incineration plant

Acid gases and halogens : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for Waste Incineration**
Low sulphur fuel, (< 0.1%S gas oil or natural gas)	Reduces SOx at source		Start-up, supplementary firing	Where auxiliary fuel required
Management	Disperses	Requires closer		All plant with

of waste streams	sources of acid gases (e.g. PVC) through feed.	control of waste management		heterogeneous waste feed

The Applicant proposes to implement the following primary measures:

- Use of low sulphur fuels for start-up and auxiliary burners – gas oil with low sulphur content (i.e. <0.1%) will be used to reduce sulphur emissions at source. The Applicant has justified its choice of gas oil as the support fuel on the basis that there is no existing natural gas connection to the Installation. In the event of a gas connection, an uninterrupted supply would be required leading to high tariffs. The additional costs to install the required gas infrastructure and secure an uninterrupted supply for auxiliary firing of natural gas are not justified for any small savings that may be achieved. The Environment Agency agrees with this assessment.
- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by ensuring a homogeneous 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 Waste Incineration**
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	Higher solid residue production Reagent consumption		All plant

	recycling in plant Lower energy use Higher reliability	controlled only by input rate		
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

There are three recognised techniques for secondary measures for acid gas abatement. These are wet, dry and semi-dry. Wet scrubbing produces an effluent for treatment and disposal in compliance with Article 46(3) of IED. It will also require reheat of the exhaust to avoid a visible plume. Wet scrubbing is unlikely to be BAT except where there are high acid gas and metal components in the exhaust gas as may be the case for some hazardous waste incinerators. In this case, the Applicant does not propose using wet

scrubbing and the Environment Agency agrees that wet scrubbing is not appropriate for the proposed Installation.

The Applicant has therefore considered dry and semi-dry methods of secondary measures for acid gas abatement. Either can be BAT for this type of facility.

Both dry and semi-dry methods rely on the dosing of powdered materials into the exhaust gas stream. Semi-dry systems (i.e. hydrated reagent) offer reduced material consumption through faster reaction rates, but reagent recycling in dry systems can offset this.

In both dry and semi-dry systems, the injected powdered reagent reacts with the acid gases and is removed from the gas stream by the bag filter system. The powdered materials are either lime or sodium bicarbonate. Both are effective at reducing acid gases and dosing rates can be controlled from continuously monitoring acid gas emissions. The decision on which reagent to use is normally economic. Lime produces a lower leaching solid residue in the APC residues than sodium bicarbonate and the reaction temperature is well suited to bag filters. It tends to be lower cost but it is a corrosive material and can generate a greater volume of solid waste residues than sodium bicarbonate. Either reagent is BAT. The use of one over the other is not significant in environmental terms.

In this case, the Applicant proposes to use a dry system using hydrated lime on the basis that it is a proven, effective and efficient reagent for neutralising acid gases and well suited to operation with bag filters. Moreover, the reaction temperature for lime systems match well with the optimum adsorption temperature for carbon which is dosed at the same time. The Environment Agency is satisfied that this system is BAT for the proposed Installation.

Dosage rates of hydrated lime will be controlled and monitored to ensure usage is optimised and to avoid over-dosage resulting in increased quantities of unreacted material within the APC residues. Dosage will be controlled against raw gas concentrations of SO_2 and HCl. Flow of reagent will be monitored and alarmed to indicate a failure. Reagent will be recalculated to minimise usage. The amount of reagent used for abatement will need to be optimised to maximise acid gas reduction and minimise hydrated lime waste. Improvement condition 5 requires the Operator to report to the Environment Agency on optimising the performance of the hydrated lime injection abatement system.

6.2.5 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.

AD facility

The Applicant proposes to use good combustion conditions to minimise releases to air from the gas engines. The Applicant confirms that the proposed gas engines and emergency flare are capable of meeting the emission limits specified in the Environment Agency's landfill guidance LFTGN 08: Guidance for monitoring landfill gas engine emissions and LFTGN 05: Guidance for monitoring enclosed landfill gas flares. Consequently, no secondary measures for CO and VOCs control are proposed for the gas engines and emergency flare.

Waste incineration plant

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

6.2.6 Dioxins and furans (and other Persistent Organic Pollutants)

AD facility

Emissions of dioxins and other Persistent Organic Pollutants (POPs) from the combustion of biogas derived from source segregated biodegradable waste is low. Consequently no secondary control measures are proposed for the gas engines and emergency flare.

Waste incineration plant

Dioxins and furans				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for Waste Incineration**
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			Covered in section on particulate	All plant

removal			matter	
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 section 6.1.1 above;
- Avoidance of de novo synthesis, which has been covered in the consideration of boiler design;
- The effective removal of particulate matter, which has been considered in section 6.2.2 above;
- Injection of activated carbon. This can be combined with the acid gas reagent or dosed separately. Where the feed is combined, the combined feed rate will be controlled by the acid gas concentration in the exhaust. Therefore, separate feed of activated carbon would normally be considered BAT unless the feed was relatively constant. Effective control of acid gas emissions also assists in the control of dioxin releases.

For this Application, the Applicant proposes separate feed and we are satisfied their proposals are BAT.

6.2.7 Metals

AD facility

The largest proportion of metals and their compounds released to air during combustion of fuels are in the particulate phase, except for mercury and boron (these metals are released in the vapour phase). Controlling particulate levels and selecting residual fuel oils with a low ash content will control levels of most metals. Emissions of metals and their compounds are not expected from the combustion of biogas. Consequently the proposed gas engines and emergency flare will not require secondary measures for metals control.

Waste incineration plant

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

The prevention and minimisation of metal emissions is achieved through the effective removal of particulate matter, and this has been considered in 6.2.2 above.

Unlike other metals however, mercury if present will be in the vapour phase. BAT for mercury removal is also by dosing of activated carbon into the exhaust gas stream. This can be combined with the acid gas reagent or dosed separately. Where the feed is combined, the combined feed rate will be controlled by the acid gas concentration in the exhaust. Therefore, separate feed of activated carbon would normally be considered BAT unless the feed was relatively constant.

For this Application, the Applicant proposes separate feed and we are satisfied their proposals are BAT.

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 Installation also emits small amounts of N_2O arising from the operation of secondary NOx 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 NOx 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 be 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.

The Applicant considered energy efficiency and compared SCR to SNCR in its BAT assessment. This is set out in sections 4.3.8, 6.1.1 and 6.2.3 of this decision document.
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 this 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 an Integrated Waste Management Facility incorporating a waste incineration plant and other activities. 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 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 it 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 decision 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 POPs 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 850ºC 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 to 450ºC; and
- 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 explained 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 incorporates 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 decision 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 emissions to controlled waters from the proposed Installation.

The Application describes the arrangements within the proposed Installation for the treatment of process effluent, with the treated effluent from WWTP being discharged into the Upper Lagoon to enable it to be reused for on-site activities. There will be no discharge of treated effluents from the proposed Installation into the River Blackwater.

In response to some earlier planning queries, the Applicant confirmed the zero discharge to controlled waters (as above) but explained that the option to apply for a discharge licence always exists.

In the event the Applicant wishes to discharge liquids into controlled waters, they would need to submit an application to vary the environmental permit.

Any such application will be subject to the same scrutiny as this one and will be determined on its merits if and when it is made to us.

6.5.2 Emissions to sewer

There will be no emissions to sewer from the proposed Installation.

6.5.3 Fugitive emissions

The IED specifies that plants must be able to demonstrate that they are 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 must be arranged (Article 46(5) of the IED).

The Applicant proposes to employ the following methods and techniques to prevent and minimise the release of fugitive emissions at the proposed Installation:

- Wastes will be stored within the Installation's reception area on impermeable surfaces. All surfaces will be of hard standing and designed to accommodate the operations carried out. No wastes will be processed or stored outside the buildings.

- Spill kits will be kept at several locations on site in the event of a spillage.

- Tanks containing potentially polluting liquids will be constructed so that any leaks /spillages are contained. Bunds will have a capacity greater than 110% of the largest tank or 25% of the total tankage (whichever is the greater).

- Rainwater will be stored in the on-site lagoon (Upper Lagoon). The Applicant reports that the Upper Lagoon will be lined with low permeability in-situ London Clay. Therefore, even if an uncontrolled release was to enter the Upper Lagoon, this would be contained and would not contaminate the groundwater beneath the site. Process water will be collected for treatment at the WWTP and re-used.

- Air Pollution Control (APC) residues will be handled within an enclosed system. It will be stored in silos and discharged via sealed connections to fully contained disposal vehicles. There will be a filter on the silo vent fitted with a differential pressure alarm. Bottom ash will be stored in a building. It will be dampened with ash run-off to minimise dust prior to despatch off site for treatment.

- Activated carbon and hydrated lime will be used within the flue gas treatment plant. These reagents are potentially dusty. Sealed connections will be used for deliveries. Air displaced during deliveries

will vent via a filter unit installed on the storage vessel. The filter unit will be visually inspected during unloading operations to ensure that it is operating effectively. In the event of a dust emission, the filter will be replaced.

- During delivery of ammonia solution, displaced air will be vented back to the delivery vehicle. In the event of a spillage, any spilt material will be cleaned up immediately and disposed of appropriately.

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

6.5.4 Odour

The Applicant proposes to employ the following methods and techniques to prevent and minimise odour emissions at the proposed Installation:

- Fast action roller shutter doors will be provided for vehicle access and egress to the Installation's reception building.
- Waste will be delivered in covered vehicles.
- Waste will be stored inside the reception building to prevent odour release.
- The tipping hall and waste bunker will be maintained under negative pressure created by drawing of combustion air from the top of the waste reception and storage building to create an airflow direction into the building minimising the potential for dust and odour emissions and keeping external doors closed where possible.
- All plant areas will be cleaned out regularly to prevent the build-up of putrescible waste.
- Waste will not be delivered to the site during periods of extended shut-down to prevent build-up of waste. Procedures will be in place to divert waste away from the site during shut downs.
- Air from the other parts of the building (AD, MBT, paper pulp plant and WWTP) will be extracted to an abatement system (biofilter, ozone and carbon filtration system). These abatement systems are listed in the Environment Agency's odour guidance, H4 – Odour management.
- Bunker management procedures (mixing and periodic emptying and cleaning) will be employed to avoid the development of anaerobic conditions;
- Wastes will be rotated on a "first-in first-out" principle to avoid the generation of putrescible odours.
- Olfactory monitoring of odour will be undertaken at the site boundary.
- The Applicant has developed a site liaison group to give the local community an opportunity to discuss any matters arising from the operation of the proposed Installation. The group will consist of the Environment Agency and representatives from Essex County Council, Braintree District Council, Parish Councils (Rivenhall, Silver End,

Bradwell, Coggeshall, Kelvedon and Feering) and the local Community Group.

We have assessed the Applicant's Odour Management Plan (OMP) and we are not satisfied that it meets the appropriate measures set out in the Environment Agency technical guidance documents: Draft Technical Guidance for Anaerobic Digestion (Reference LIT 8737, November 2013) and Mechanical Biological Treatment Sector (Reference LIT 8707, August 2013) and the objectives of H4 – Odour Management.

We identified some omissions in the OMP in relation to waste inventory and pre-acceptance procedures, odour parameters, trigger levels for action and abatement plant maintenance which have not been provided in detail. The Applicant confirms that some design details are not available at this time. The Applicant reports that this is a preliminary OMP and will be subject to review following completion of detailed process design, which has not yet been undertaken. The proposed Installation is expected to take approximately 3 years to build, commission and switch to full operational status. The construction and commissioning will be undertaken as a "phased project". Prior to the commencement of commissioning of each activity, the OMP will be updated and submitted to the Environment Agency for approval.

We have not approved the OMP in its current format as it has not been finalised. However we are satisfied that odour emissions can and will be adequately controlled at the proposed Installation. Given that the waste incineration plant will be the first activity to be constructed and commissioned, two options are available to us:

- to approve the OMP with respect to the waste incineration plant only at this stage as we are satisfied with the Applicant's proposals for odour management; or
- to set a pre-operational condition for an updated OMP to be submitted to us for approval before the commencement of commissioning.

We consider it prudent to set pre-operational condition 9 to allow the Operator time in which to provide an updated OMP prior to the commencement of commissioning of the activities specified in Table S1.1 of the Permit. The environment and human health are not at risk from pollution from emissions of odour as no waste can be accepted, processed or any commissioning commence until the Environment Agency approves the updated OMP in writing. Approving the OMP prior to the commissioning stage provides an additional advantage of taking into account any recent technological advances in odour management and control. Given the duration of time it would take for the proposed Installation to commence full commercial operation, we consider that this is a reasonable and proportionate approach to permitting plants of this size undertaking a phased construction /commissioning.

6.5.5 Noise and vibration

The Application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed Installation 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.

The assessment concluded that during daytime and night time periods, the operation of the proposed Installation at the predicted noise levels would be unlikely to cause complaints at any of the assessment locations as the change in noise impact at the sensitive receptors was assessed as being below marginal significance in line with BS4142.

The assessment carried out by the Applicant was based on equipment that has not yet been installed in buildings that have not yet been built. From information supplied within the Application, we consider that the proposed Installation will not cause an additional noise impact at the nearest sensitive receptors. Pre-operational condition 11 has been set in the Permit requiring the submission of a programme of monitoring at the Installation and in the surrounding environment to establish noise levels during plant commissioning and operation as specified in the Application. This will ensure that any impact can be identified and rectified at the earliest opportunity.

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 BAT as laid down in the decisions on BAT Conclusions. At the time of writing of this document, no final BAT Conclusions have been published for waste treatment and waste incineration or co-incineration.

The use of IED Chapter IV and our landfill technical guidance note for gas engines and emergency flares emission limits in the Applicant's 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 those specified in IED Chapter IV and our technical guidance in these circumstances.

We consider whether, for those emissions 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 information submitted by the Applicant with respect to the nearby Listed Buildings, residential properties and local wildlife sites. The impact of the proposed Installation on these features is not significant. The Applicant has proposed a tighter NOx ELV of 150 mg/Nm^3. We consider that no further measures are required.

(ii) National and European ESs

There are no additional National and European EQS (including Article 18) that need to be considered other than the limits in Chapter IV of the IED to protect the local environment.

(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 incinerated, 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 in Permits.

We have therefore considered setting equivalent parameters or technical measures for CO_2. However, provided energy is recovered efficiently (see section 4.3.8 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 proposed Installation, 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 proposed Installation and permit conditions relating to energy efficiency effectively apply equivalent technical measures to limit CO_2 emissions.

(iv) Commissioning

The proposed Installation will undergo a period of commissioning before the plant becomes fully operational. The IED and the conditions set out in the permit cover activities at the Installation once it is fully operational – receiving wastes for pre-treatment, biological treatment, paper pulp activity, burning waste and providing electricity to the grid. Prior to commissioning of each regulated activity in Table S1.1 of the Permit, the Applicant shall submit a commissioning plan (required under pre-operational condition 3) to the Environment Agency for approval outlining the expected emissions during different stages of commissioning, the expected duration and timeline for

completion of activities and any necessary action to protect the environment in the event that actual emissions exceed expected emissions.

It is recognised that certain information provided in the Application is based upon design data or data from similarly designed operational plant. The commissioning stage provides an early opportunity to verify much of this information and the following points will be verified by the Applicant:

- A commissioning plan to be agreed with the Environment Agency (required under pre-operational condition 3).
- Development of procedures to demonstrate process control of expected emissions under different operating conditions; plant operation conforms to conditions set out in the Permit (required under improvement condition 3);
- Abatement plant optimisation (required under improvement condition 5);
- Calibration of CEMs equipment (required under improvement condition 7);
- Verification of combustion chamber residence times, temperature and oxygen content (required under improvement condition 4 and pre-operational condition 5).

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;
- gather information about the performance of the SNCR system;
- establish data on the release of dioxin-like PCBs and PAHs from the incineration process; and
- 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. We have set pre-operational 8 which requires the Operator to provide specific arrangements for continuous and periodic monitoring of emissions to air prior to the commencement of commissioning of any part of the proposed Installation.

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. The CEMs 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 proposed Installation.

Recent advances in 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 proposed 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 emissions, it is not justifiable to require the Operator to install additional continuous monitoring or sampling devices for these substances.

In accordance with its legal requirement, 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 4 of the Permit either to meet the reporting requirements set out in the IED or to ensure data is reported to enable timely review by the Environment Agency to ensure compliance with permit conditions and to monitor the efficiency of material use and energy recovery at the proposed 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 2016 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 2016 – **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 (now Directive 2011/92/EU) (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 the 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) to 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 this Application, we have considered the following documents:

- The Environmental Statement submitted with the planning application (which also formed part of the Environmental Permit Application).
- The decision of Essex County Council to grant a variation to the original 2010 planning permission on 26 February 2016.
- The report and decision notice of the local planning authority accompanying the grant of planning permission.
- The response of the Environment Agency to the local planning authority in its role as consultee to the planning process.

From consideration of all the documents above, the Environment Agency considers that no additional or different conditions from those contained in our standard permit template 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 (Annex 4).

7.1.2 Schedule 9 to the EPR 2016 – **Waste Framework Directive**

As the Installation involves the treatment of waste, it is carrying out a *waste operation* for the purposes of the EPR 2016, 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 Installation 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; and
(f) such closure and after-care provisions as may be necessary.

These are all covered by permit conditions.

The Permit does not allow the mixing of hazardous waste so Article 18(2) is not relevant.

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 decision document but we consider that 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 2016 – **Water Framework and Groundwater Directives**

To the extent that it might lead to a discharge of pollutants to groundwater (a "groundwater activity" under the EPR 2016), 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 proposed 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 60 of the EPR 2016 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 is being 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 extended public consultation on the original application. The way in which this has been done is set out in section 2.2 of this decision document. A summary of the responses received to our consultations and our consideration of them is set out in Annex 4 of this decision document.

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 5 (Preventing or Minimising Effects of Pollution of the Environment)

We are satisfied that our pollution control powers have been exercised for the purpose of preventing or minimising, remedying or mitigating the effects of pollution.

(iii) Section 6(1) (Conservation Duties with Regard to Water)

We have a duty to the extent we consider it desirable generally to promote the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and the land associated with such waters, and the conservation of flora and fauna which are dependent on an aquatic environment. We consider that no additional or different conditions are appropriate for this Permit.

(iv) Section 6(6) (Fisheries)

We have a duty to maintain, improve and develop fisheries of salmon, trout, eels, lampreys, smelt and freshwater fish. We consider that no additional or different conditions are appropriate for this Permit.

(v) Section 7 (Pursuit of Conservation Objectives)

This places a duty on us, when considering any proposal relating to our functions, to have regard amongst other things to any effect which the proposals would have on sites of archaeological, architectural, or historic interest; the economic and social well-being of local communities in rural areas; and to take into account any effect which the proposals would have on the beauty or amenity of any rural area.

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.

(vi) Section 39 (Costs and Benefits)

We have a duty to take into account the likely costs and benefits of our decisions on the applications ('costs' being defined as including costs to the environment as well as any person). This duty, however, does not affect our obligation to discharge any duties imposed upon us in other legislative provisions. In so far as relevant, we consider that the costs that the permit may impose on the Applicant are reasonable and proportionate in terms of the benefits it provides.

(vii) Section 108 Deregulation Act 2015 – Growth duty

We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this Permit.

Paragraph 1.3 of the guidance says:
"The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to alongside the delivery of the protections set out in the relevant legislation."

We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5, that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

We consider the requirements and standards we have set in this Permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate Operators because the standards applied to the Operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.

(viii) 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 proposed 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. There is no SSSI which could be affected by the proposed Installation.

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 **Conservation of 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. There is no European Site which could be affected by the proposed Installation.

7.3.2 **Water Environment (Water Framework Directive) Regulations 2017**

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 compliance with the requirements of the Water Framework Directive and the EQS Directive through (inter alia) environmental permits and its obligation in regulation 17 to have regard to the river basin management plan

(RBMP) approved under regulation 14 and any supplementary plans prepared under regulation 16. However, it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

We are satisfied that granting this Application with the conditions proposed would not cause the current status of the water body to deteriorate.

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 chapter 2 of this decision 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 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 2.3.3(a), Tables S1.1 and S2.2 in Schedule 2 of the Permit.
45(1)(b)	The permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.3(a), Tables S1.1 and S2.2 in Schedule 2 of the Permit.
45(1)(c)	The permit shall include the limit values for emissions into air and water.	Conditions 3.1.1, 3.1.2, Tables S3.1 and S3.1(a) in Schedule 3 of the Permit.
45(1)(d)	The permit shall include the requirements for pH, temperature and flow of waste water discharges.	Not Applicable. There are no point source emission to surface water.
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; Tables S3.1, S3.1(a) and S3.2 in Schedule 3 of the Permit.
45(1)(f)	The permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.	Conditions 2.3.11 and 2.3.12.
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(a) and Table S1.2 of Schedule 1 of the Permit.
46(2)	Emission into air shall not exceed the emission limit values set out in	Conditions 3.1.1 and 3.1.2; Tables

IED Article	Requirement	Delivered by
	Part 3 of Annex VI.	S3.1 and S3.1a.
46(2)	Emission into air shall not exceed the emission limit values set out in Part 3 or determined in accordance with Part 3 of Annex VI.	Conditions 3.1.1, 3.1.2; Tables S3.1 and S3.1a.
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 requirements of the Directive.
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m^3), CO and TOC not to be exceeded during this period.	Conditions 2.3.11 and 2.3.12.
47	In the event of breakdown, reduce or close down operations as soon as practicable. Limits on dust (150 mg/m^3), CO and TOC not to be exceeded during this period.	Condition 2.3.7
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.5.1 to 3.5.5. Reference conditions are defined in Schedule 6 of the Permit.
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Condition 3.5.3; Tables S3.1, S3.1(a), and S3.2
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	Conditions 4.1.1 and 4.1.2; Tables S4.1 and S4.4.

IED Article	Requirement	Delivered by
	which are included in the permit.	
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)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or Loss on Ignition (LOI) < 5%.	Conditions 3.5.1 and Table S3.3.
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 5, Improvement condition 4 and Table S3.2.
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Condition 2.3.8
50(4)(a)	Automatic shut to prevent waste feed if at start-up until the specified temperature has been reached.	Condition 2.3.7
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.	The plant will generate electricity and heat in the form of steam and supply it to the paper pulp plant and waste water treatment plant.
50(6)	Relates to the feeding of infectious clinical waste into the furnace.	No infectious clinical waste will be burnt
50(7)	Management of the Installation to be in the hands of a natural person who is competent to manage it.	Conditions 1.1.1 to 1.1.3 and 2.3.1 of the Permit.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of	No such conditions have been allowed.

IED Article	Requirement	Delivered by
	this chapter are met.	
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, 2.3.2, 2.3.4, Tables S2.2, S2.3, S2.4 and S2.5 in Schedule 2 of the Permit.
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Conditions 2.3.1, 2.3.2, 2.3.4, Tables S2.2, S2.3, S2.4 and S2.5 in Schedule 2 of the Permit.
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 1.4.1, 1.4.2, 3.5.1 and Table S3.3.
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1 2.3.1, 2.3.2 and 3.2.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.5.1, Table S3.3 and Pre-operational condition 2.
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 in the Application, we consider that we do need to impose pre-operational conditions. These conditions are set out below and referred to, where applicable, in the text of this 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.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
1	Prior to the commencement of commissioning of each activity in Table S1.1 of the permit, the operator shall submit the site Environment Management System (EMS) to the Environment Agency and obtain the Environment Agency's written approval to it. The operator shall 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 the Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk). The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
2	Prior to the commencement of commissioning of activity AR1, the operator shall submit to the Environment Agency for approval, a protocol for the sampling and testing of incinerator bottom ash for the purposes of assessing its hazard status and obtain the Environment Agency's written approval to it. Sampling and testing shall be carried out in accordance with the protocol as approved.
3	At least 6 months (or any other date as agreed with the Environment Agency) prior to the commencement of commissioning of any part of the installation, the operator shall provide a written commissioning plan, including the phased commissioning proposal and timelines for completion, for approval by the Environment Agency and obtain the Environment Agency's written approval to it. 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.
4	Prior to the commencement of commissioning of each of the following activities in Table S1.1 of the permit – AR1, AR2, AR3, AR4, AR5 and AR6, the operator shall submit a written report to the Agency detailing the waste pre-acceptance and waste acceptance procedures to be implemented for that activity and obtain the Environment Agency's written approval to it. The waste pre-acceptance and acceptance procedures shall include the process and systems by which wastes unsuitable for treatment at the site will be controlled. The procedures shall be implemented in accordance with the written approval from the Environment Agency.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
5	After completion of furnace design and at least three calendar months before commencement of commissioning of activity AR1, the operator shall submit a written report to the Environment Agency of the details of the computational fluid dynamic (CFD) modelling and obtain the Environment Agency's written approval to it. The report shall demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED.
6	At least 4 months (or any other date as agreed with the Environment Agency) prior to the commencement of commissioning of any part of the installation, the operator shall submit a report on the baseline conditions of soil and groundwater at the installation and obtain the Environment Agency's written approval to it. The report shall contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities provided for in Article 22(3) of the IED. The report shall contain information, supplementary to that already provided in Application Site Condition Report, needed to meet the information requirements of Article 22(2) of the IED.
7	At least 4 months (or any other date as agreed in writing with the Environment Agency) prior to the commencement of commissioning of any part of the installation, the operator shall submit the written protocol referenced in condition 3.2.4 for the monitoring of soil and groundwater and obtain the Environment Agency's written approval to it. 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 Environment Agency.
8	At least 6 months before the commencement of commissioning of any part of the installation, 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 and obtain the Environment Agency's written approval to it. 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
9	At least 6 months (or any other date as agreed in writing with the Environment Agency) prior to the commencement of commissioning of each activity in Table S1.1 of the permit, the operator shall submit a revised odour management plan to the Environment Agency and obtain the Environment Agency's written approval to it. The plan shall incorporate all the required detailed information as specified in the Environment Agency's review of the site's odour management plan (dated 30/05/2017) relevant to the activities covered.

Table S1.4 Pre-operational measures	
Reference	**Pre-operational measures**
	The plan shall take into account the appropriate measures for odour control specified in the Environment Agency Draft Technical Guidance for Anaerobic Digestion (Reference LIT 8737, November 2013) and Mechanical Biological Treatment Sector (Reference LIT 8707, August 2013). The plan shall also include all the required information as specified in the Environment Agency Horizontal Guidance H4 – Odour Management.
10	At least 6 months (or any other date as agreed in writing with the Environment Agency) prior to the commencement of commissioning of each activity in Table S1.1 of the permit, the operator shall submit a revised fire prevention plan to the Environment Agency and obtain the Environment Agency's written approval to it. The plan shall take into account the Environment Agency's technical guidance, Fire prevention plans (dated November 2016). The appropriate measures for fire prevention shall, as a minimum, include: • the management of storage of feedstock, product and/or waste piles • the measures to prevent, detect and contain fires; and • the management of fire waters The plan shall incorporate all the required detailed information as specified in the Environment Agency's review of the site's fire prevention plan (dated 31/05/2017) relevant to the activities covered. The operator shall implement the procedures and measures as approved by the Environment Agency.
11	Prior to the commencement of commissioning of any part of the installation, the operator shall provide the Environment Agency with a written report describing the detailed programme of noise and vibration monitoring that will be carried out at the site at the commissioning stage and also when the plant is fully operational as proposed in the Application and obtain the Environment Agency's written approval to it. The report shall include confirmation of locations, time, frequency and methods of monitoring. The monitoring programme shall be carried out in accordance with the Environment Agency's written approval.

ANNEX 3: Improvement Conditions

Based on the information in the Application, we consider that we need to set improvement conditions. These conditions are set out below – justifications for these is provided at the relevant section of this 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.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
1	The operator shall submit a written report to the Environment Agency on the implementation of the site Environmental Management System (EMS) following the completion of each activity in Table S1.1 of the permit and the progress made in the certification of the system by an external body or if appropriate submit a schedule by which the EMS will be certified.	Within 6 months of commissioning each activity
2	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 and A2, identifying the fractions within the PM_{10} and $PM_{2.5}$ ranges. On receipt of written approval from 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 commissioning activity AR1
3	The operator shall submit a written report to the Environment Agency on the commissioning of each activity in Table S1.1 of the permit. The report shall summarise the environmental performance of the activities as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the activities against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Within 4 months of commissioning each activity
4	The operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency and include a comparison with the CFD modelling submitted with pre-operational condition 5.	Within 4 months of commissioning activity AR1
5	The operator shall submit a written report to the Environment Agency describing the performance and	Within 4 months of

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	optimisation of: • The Selective Non-Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx).The report shall include an assessment of the level of NOx, N_2O and NH_3 emissions that can be achieved under optimum operating conditions; • The lime injection system for minimisation of acid gas emissions; and • The carbon injection system for minimisation of dioxins and heavy metal emissions.	commissioning activity AR1
6	The operator shall carry out an assessment of the impact of emissions to air of the following component metals subject to emission limit values – As and Cr (VI). 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 the completion of commissioning activity AR1
7	The operator shall submit a written summary report to the Environment Agency to confirm 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 Environment Agency within 3 months of commissioning activity AR1 Full summary evidence compliance report to be submitted within 18 months of commissioning activity AR1

ANNEX 4: Consultation Responses

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 representations into account in reaching our decision is summarised in this Annex. Copies of all consultation representations have been placed on the Environment Agency public register.

The Application was advertised on the Environment Agency web site (GOV.UK) and consultation web site (Citizen Space) from 9 March 2017 to 13 April 2017 and in the Braintree & Witham Times on 16 March 2017. The Application was made available to view at the Environment Agency public register located at Rivers House, Threshelfords Business Park, Inworth Road, Feering, Colchester, CO 9SE. Anyone wishing to see these documents could do so and arrange for copies to be made. We also placed a copy of the Application at the Kelvedon Library and Coggeshall Library.

The following organisations were consulted during the determination:

- Essex County Council (Planning Authority);
- Braintree District Council (Environmental Protection);
- Director of Public Health, Essex County Council;
- Public Health England;
- Health & Safety Executive;
- Essex County Fire & Rescue Service; and
- Food Standards Agency

1) Consultation Responses from Statutory and Non-Statutory Bodies

Representations from Public Health England dated 05/04/17	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
PHE recommend that any environmental permit issued for this site should contain conditions to ensure that the following potential emissions do not impact upon public health – emissions to air from the main stack and odour arising from the storage and treatment of waste material.	We have included permit conditions to address these concerns. Tables S3.1 and S3.1(a) in the permit specifies the emission limits set for the main stack which is in accordance with Annex VI of the IED. We have set pre-operational condition 9 in the permit which requires the Operator to submit a revised odour management plan prior to commissioning of each activity in the Permit for approval. No waste will be accepted at the Installation unless the odour management plan is approved.
In relation to potential risk to public health, PHE recommend that the Environment Agency also consult the	The following organisations were consulted during the determination: • Essex County Council (Planning

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 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.	Authority); • Braintree District Council (Environmental Protection); • Director of Public Health, Essex County Council; and • Food Standards Agency. The response from Essex County Council is shown in this Annex. No response was received and no concerns were raised by Braintree District Council, the Director of Public Health (Essex County Council) and the Food Standards Agency.
Based solely on the information contained in the application provided, PHE has no significant concerns regarding risk to health of the local population from this proposed activity, providing that the applicant takes all appropriate measures to prevent or control pollution, in accordance with the relevant sector technical guidance or industry best practice.	No further action. The proposed Installation will be operated in accordance with BAT to prevent or control pollution as specified in our technical guidance notes: How to Comply EPR 5.01 – The Incineration of Waste, EPR 6.01 – Paper and Pulp, Draft Technical Guidance for Anaerobic Digestion (Reference LIT 8737, November 2013), Mechanical Biological Treatment Sector (Reference LIT 8707, August 2013) and H4 – Odour Management.

Representations from Essex County Council dated 13/04/17	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
Concern regarding the retention time of materials within the MBT vessels with respect to clarity and the short time of 7 to 14 days proposed.	Incoming waste will be processed in the MBT vessels for a minimum of 7 days and a maximum of 14 days. The re-circulation of air within the vessels and a retention time of between 7 to 14 days ensures that anaerobic conditions leading to odour emissions are prevented. The proposed retention period is considered normal practice for wastes subjected to biodrying.
It is stated that the waste will be maintained at 50 to 60 degrees. Are natural processes adequate to ensure temperatures remain above 50 degrees? If not, without a heating system, how would temperatures be raised above 50 degrees to ensure the process remains efficient?	Biodrying is similar to the composting process. The heat generated by the interaction between micro-organisms and the substrate ensures that energy in the form of heat is released. The circulation of air through the waste material ensures that the application of external heat is not necessary.

Para 1.3.3.8 refers to combustion of biogas from the AD plant during maintenance periods. It is not clear where the emissions from this combustion would be exhausted to.	If the biogas engines at the AD facility are not in operation due to maintenance or failure, biogas will be transferred to the emergency flare for combustion and emissions will be released to atmosphere via a stand-alone stack referred to as emission point A6. It is expected that the use of the emergency flare will be less than 10% of the time in one year. This is a normal practice for AD facilities.
Comment regarding location of carbon filters in the IWMF building and ventilation layout. Recommendation for air-lock system given.	Emissions of odour are discussed in section 6.5.4. We have not approved the Applicant's odour management plan in its current form. The exact location of the building ventilation, air extraction and odour abatement will be specified in a revised odour management plan which the Operator will submit for approval prior to the commissioning of each activity specified in Table S1.1 in the Permit (pre-operational condition 9).
Concern regarding no emission limits for the paper pulp plant ventilation, IWMF building ventilation /louvres and emergency flare.	There are no combustion gases emitted from the paper pulp plant ventilation points and IWMF building ventilation /louvres, therefore emission limits are not required. The Applicant reports that the louvres are principally intended to allow air to be sucked into the building to maintain negative air pressure and for ventilation purposes. There will be defined areas of operation within the building that will be compartmentalised to control the working environment, emissions and odours. The internal ventilation system will be fed through ducts and emitted through the louvres located at the periphery of the building. Emission point A7 is provided as an indicative location subject to detailed design. Emission limits for the emergency flare is specified in the Permit (see Schedule 3).
Concern regarding odour emissions from the transfer of paper sludge.	Vehicles transporting paper sludge will be covered.

No representations were received from the following organisations
• Director of Public Health (Essex County Council) • Braintree District Council (Environmental Protection) • Health & Safety Executive • Essex County Fire & Rescue Service • Food Standards Agency

2) Consultation Responses from Members of the Public and Community Organisations

The consultation representations received were wide ranging and a number of the issues raised were outside the Environment Agency's remit in reaching its permitting decisions. Specifically, questions were raised which fall within the jurisdiction of the planning system, both on the development of planning policy and the grant of planning permission. Guidance on the interaction between planning and pollution control is given in the National Planning Policy Framework. It says that the planning and pollution control systems are separate but complementary. We are only able to take into account those issues which fall within the scope of the Environmental Permitting Regulations.

a) Representations from Local MP, Councillors and Parish / Town Councils

Representations were received from Local Councillors (Essex County Council), Parish Councils (Rivenhall, Cressing and Bradwell) and Witham Town Council who raised the following issues:

Representations from Local Councillors (Essex County Council), Parish Councils (Rivenhall, Cressing, Bradwell) and Town Council (Witham).	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
The proposed stack height of 55 metres is not BAT. The previous application was refused by the Environment Agency because the stack height was not within the BAT range (70 to 120 metres) for plants of a similar size. The stack height of similar plants are above 82 metres.	The Environment Agency refused the Applicant's previous application (EPR/KP3035RY) because the Applicant had not demonstrated that their proposals would reduce emissions and their impact on the environment through the use of BAT and in particular that the proposed stack height of 35 metres above surrounding ground levels is BAT. The stack height assessment in this Application is discussed in section 6.1.2 of this decision document. A stack height of 58 metres above surrounding ground levels is now proposed by the Applicant. Although we have permitted plants of the same size as the proposed Installation with higher stacks (between 70 and 120 metres), there is no **mandatory** stack height specified in the Industrial Emissions Directive or previous Directives. Applicants are required to demonstrate that the stack height has been calculated in

	such a way as to safeguard human health and the environment (Article 46(1) of the IED). The Applicant has demonstrated how the stack height was calculated in this Application. Applicants are also required to justify how their proposals (including stack height) are BAT. This includes measures such as the reduction of emissions at source. The Applicant proposes a more stringent NOx daily average emission limit of 150 mg/Nm^3 (instead of 200 mg/Nm^3) to safeguard human health and the environment. Each incineration application must be determined on a case-by-case basis. When comparing energy from waste plants, it is important to take into account, differences in the annual throughput, plant design, fuel, energy generation, planning constraints, site activities, surrounding environment, location and impact of pollutants. Note that some energy from waste plants with higher stacks have higher NO_2 impact than those stated in this Application (see Table 6.4 in section 6.1.2 of this decision document). We are satisfied that the proposed stack height of 58 meters above surrounding ground levels (78 metres from the base) is BAT for this Installation.
If a stack in the order of 80 to 90 metres is determined to be BAT for this plant, it would have a significant negative visual impact on the landscape and may need aviation warning lights.	A stack height of 80 to 90 metres is not proposed for this Installation (refer to section 6.1.2 of this decision document). The proposed stack height is 58 metres above surrounding ground levels which we have accepted as BAT. Visual impact will be considered by the planning authority (Essex County Council). The Applicant has confirmed that no aviation warning lights are required for the stack.
Concern regarding ordnance datum figure used in the stack height – 105 m AOD compared to 75 m high stack.	The stack height of 58 metres is now proposed by the Applicant. The equivalent ordnance datum height is 108 m AOD (refer to section 6.1.2 of this decision document).
A new EIA study must be undertaken that includes all the variables not just the stack height changes.	This is a matter for the planning authority – Essex County Council. The planning authority will determine whether or not the proposed change in the stack height requires an Environmental Impact Assessment through screening. We have assessed the environmental impact of the proposed Installation in this Application (please see chapter 5 of this decision document).

The stack height should be determined on best performance and not cost given the impacted areas (existing and potential).	The stack height assessment provided by the Applicant has been determined based on BAT (refer to section 6.1.2 of this decision document). The Industrial Emissions Directive details that BAT includes the costs to the Operator and the benefits to the environment. We consider the "cost" to Applicants when determining what is BAT for a particular Installation as required by the Industrial Emissions Directive.
The Applicant intends to discharge liquids into the River Blackwater (reference to a letter dated 9 September 2016 to Essex County Council). An application for a discharge consent should be made together with the environmental permit.	We received further information from the Applicant in response to our information notice dated 26 April 2017. No discharges to the River Blackwater is proposed in this Application. The permit does not allow any discharges from the proposed Installation into the River Blackwater (see Schedule 3 to the Permit). If the Applicant were to propose a discharge to the River Blackwater in future, they would need to vary the permit to do so. Any such application will be subject to the same scrutiny as this one and will be determined on its own merit if and when it is submitted to us.
Why has the Applicant submitted two permit applications?	The Applicant originally submitted two applications, one for the waste incineration plant (including the paper pulp plant and other directly associated activities) and the other for the anaerobic digestion facility. However, we determined that the anaerobic digestion facility shares other site infrastructure such as the main stack and internal drainage. We therefore consider that the anaerobic digestion facility is part of the whole Installation. We have assessed the anaerobic digestion facility in accordance with BAT (refer to section 6.1.4 of this decision document). Consequently, all the activities will be regulated under one Permit – EPR/FP3335YU.
Concern regarding status of drawings labelled as "preliminary" or "indicative" and inconsistencies relating to the management of the Installation.	The Applicant submitted additional information in response to our information notice dated 26 April 2017 to address these points. The current planning permission has a requirement for the Operator to submit the details of the IWMF process layout and configuration for approval by Essex County Council prior to the installation of process equipment or plant. Consequently, until any of the process layouts and configurations have been approved by Essex County Council, they can only be described as "preliminary". The Applicant confirms that the final designs of the proposed Installation will be in accordance with the emissions profiles stated within the environmental assessments submitted in support of the permit application and planning applications. There would be no subsequent impact on the environment or human health as a result of internal process layout changes. We are satisfied that the information provided in this determination is sufficient to enable us grant an environmental permit to

	the Applicant.
Concern regarding errors in the air quality assessment with respect to sensitive human receptors, exceedences for a number of metals in children and terrain.	The impact of emissions on human health is discussed in section 5.2 of this decision document. We audited the Applicant's air quality and human health impact assessment. We have also undertaken sensitivity analysis including the effect of terrain on dispersion of pollutants. We consider that all relevant sensitive human and ecological receptors have been taken into account. We agree that the proposed Installation is unlikely to contribute to exceedences of the air quality standards for human health and ecology or result in any exceedance of metals.
There is no clear and complete water process flow diagram with quantities that would explain how water is to be used on the current "closed loop" proposal.	The Applicant's use of water is discussed in section 4.3.9 of this decision document. The Application contains a water flow diagram. The Applicant submitted additional information in response to our information notice dated 26 April 2017, regarding the management of excess water at the proposed Installation which we consider acceptable.
What is meant by the term "not a current operating company" in the application with respect to the Applicant?	The term "not a current operating company" was used to explain why the Applicant, Gent Fairhead & Co. Limited (GFC), does not have a current accredited Environmental Management System. Gent Fairhead & Co. Limited is an active company registered at Companies House, but its current operations are investment, administrative and managerial in nature. It does not currently operate any regulated facilities.
Concern regarding abnormal emissions and control of emissions during this period.	The impact of abnormal emissions is discussed in section 5.5 of this decision document. This section also includes the reasons we allow periods of abnormal operation.

b) Representations from Community and Other Organisations

Representations were received from Kelvedon and Feering Heritage Society and Parishes Against Incineration (PAIN). A number of these issues are the same as those raised by the Local Councillors. Additional issues raised were:

Representations from Kelvedon & Feering Heritage Society	
Brief summary of issues raised:	**Summary of action taken / how this has been covered**
Recommendation that the plant design is of the highest level to operate efficiently and to utilise heat or use it locally.	We have considered the proposed design of activities that will be undertaken at the proposed Installation and we are satisfied with the Applicant's proposal. The proposed Installation will generate electricity and also provide heat in the form of steam to the paper pulp plant, waste water treatment plant and

	other site processes. We consider that the proposed Installation complies with our CHP-R requirements. Energy efficiency is discussed in section 4.3.8 of this decision document.
The plant should have strict monitoring procedures to control the entire process and report any breaches. Ad hoc visits should be part of this procedure.	The Operator is required to undertake continuous monitoring of the main pollutants for which limits are set and periodic monitoring for the other substances in accordance with the Industrial Emissions Directive. We will carry out audits of the Operator's procedures and methods for emissions monitoring. We will carry out regular announced and unannounced inspections, investigating non-compliance with any condition of the permit and taking enforcement action as appropriate.
The Applicant should clarify water abstraction and discharge proposals from /to the River Blackwater and the impact on the current Coggeshall, Feering and Kelvedon Flood Alleviation proposals.	See response in relation to discharging into the River Blackwater above and section 6.5.1 of this decision document. The abstraction of water for use at the Installation is covered under a separate abstraction licence issued on 9 March 2016 (AN/037/0031/001/R01). This Application does not relate to any discharge into River Blackwater or impact on any flood alleviation proposal.

Representations from Parishes Against Incineration (PAIN)	
A report prepared by ADM Ltd for Parishes Against Incineration (PAIN) commented on the Applicant's air quality impact assessment and the stack height assessment (Appendix 12)	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
Why is there a change in the estimates of background concentrations between the previous application and the current application?	The Applicant confirms that an updated review of the background concentrations was undertaken in this Application. This resulted in a change in the background concentrations for a number of pollutants using the latest available data sets. The changes in background concentrations associated with the use of the most recent baseline data sets are minor and do not change the conclusions of the assessment as in many cases the conclusions are based on the process contribution of pollutants only. We have checked the Applicant's estimation of background concentrations and reviewed

	available information including Defra's published background maps. We have considered the site setting and proximity to local sources and how this would impact background concentrations. We are satisfied that the Applicant's selected background is reasonably representative and any differences would not change the overall conclusions.
Why is there a change in the emissions data between the previous application and the current application?	The difference in emissions data is due to the change in the flue gas treatment reagent used to abate acid gases from the waste incineration plant (from sodium bicarbonate to dry hydrated lime). Hydrated lime as proposed in this Application has an optimum reaction temperature of around 135°C at the outlet of the boiler compared to approximately 180°C for sodium bicarbonate, hence the difference. The exhaust gases in the paper pulp plant flue are combined with the waste incineration plant flue gases prior to release at the stack. To prevent sub-dew point corrosion in the steel flues, the combined exit temperature must be at least 130°C. To achieve this, the temperature of the paper pulp plant exhaust air is heated to approximately 120°C. These changes have been driven by the technology provider. The Environment Agency considers that the difference in the emissions data does not change the conclusions with respect to the air quality impact assessment.
Question regarding details and justification on how the five plumes have been combined.	The Applicant reports that flues from the waste incineration plant, paper pulp plant, gas engines and biofilters are in close proximity to each other and contained in a common windshield. The plumes will, therefore, interact and act as a single plume with combined source characteristics rather than five individual sources. In ADMS, the combined flues option can be used in this instance. This option is switched on using the additional input file (aai) which was supplied with the model input files to the Environment Agency for verification and auditing. We carried out sensitivity analysis to approaches on combining plumes. We are satisfied that this does not change the overall conclusions with respect to the air quality impact assessment.
A detailed plume visibility analysis should be submitted.	Plume visibility is included in the air quality assessment submitted with the Application. We consider that any visible plumes would not amount to significant pollution as defined in the Environmental Permitting Regulations.

	Management of the plume from the waste incineration plant to ensure “no visible plume” is a condition placed in the planning consent granted to the Applicant by the Secretary of State for Communities and Local Government. The Applicant confirms that the current plume management plan has been updated for the planning application to vary the stack height which has been submitted to Essex County Council for determination.
The Applicant should use more recent meteorological data from Andrewsfield in the air quality impact assessment.	The Applicant submitted further information regarding the use of more recent meteorological data including the files from Andrewsfield. They confirm that overall, the conclusions of the air quality impact assessment would be unaffected even if more recent meteorological data from Stansted and Andrewsfield were used. We are satisfied that the use of 5 consecutive years of meteorological data takes into account inter-annual meteorological variation. We have consulted and reviewed a range of meteorological data and we are confident that climatic changes over a period of the past few decades are not significant enough to change meteorological data beyond any variability observed within any 5 consecutive years within that period. As such, we consider that any consecutive 5 years will be representative. More recent data is not considered to be more representative or more worst-case.
The air quality impact assessment should include human receptors in the new housing development in Silver End, Coggeshall and all affected areas.	The location of the proposed Silver End development is upwind of the prevailing wind direction. As such, this location would not be worse than the worst-case locations assessed in the Applicant’s air quality assessment. The Applicant’s modelling and our sensitivity checks assessed against the maximum on the grid. We are satisfied that the magnitude of any impacts at the worst-case receptor location are broadly similar to impacts at the maximum point of impact on the grid. As such, no additional receptors identified and assessed (including in Coggeshall) would change the overall conclusions of the assessment. We confirm that all relevant human receptor locations have been considered in our auditing of the Applicant’s air quality impact assessment.
Comment regarding errors in the maximum annual mean process contributions (PC)	All errors in the annual process contribution figures in both tables have been corrected in the revised Appendix 12 document.

presented in Table 2.1 and Table 2.2 of Appendix 12.	
What is the loss of potential recoverable energy that is expected and how does this balance against the environmental gain and justification provided as to how the installation can be described as a CHP?	Energy from Waste (EfW) plants produce energy in the form of heat and power. Many EfW plants are unable to utilise the heat which is lost through the condensers and the exhaust gases. By recovering and utilising the heat in various processes on site, including the paper pulp plant and the plume abatement station, the efficiency of the proposed Installation is recognised by the CHPQA as CHP. The Applicant confirms that the CHP status of the waste incineration plant was formally validated by the Department of Business, Energy & Industrial Strategy (BEIS). The associated application (and calculation) was scrutinised under the CHPQA programme prior to the issue of the CHPQA certificates. These calculations are based on preliminary design information received from HZI and Andritz for the waste incineration plant (using a lime-based flue gas treatment system) and the paper pulp plant respectively. The design cases assessed by HZI were for a range of temperatures in the stack of the mixed incineration flue gases and exhaust air from the paper pulp plant. These temperatures are varied according to the external ambient temperature as set out in the plume management plan. The Application contains a Sankey diagram which shows the energy generated and lost. The Applicant provided further clarification of the energy input, output and losses by way of an energy flow diagram. Excess heat will be dissipated by means of air condensers which is considered to be BAT where dissipation of waste heat is required for a combustion unit of this size. Therefore where possible, the Permit ensures that the amount of unused heat that needs to be dissipated into the environment is minimised and that BAT is used to do so where necessary. Energy efficiency is discussed in section 4.3.8 of this decision document.
The Applicant should report the actual total stack height costs including the cost of the stack foundations in the stack height assessment.	The total height cost including the cost of the stack foundations have been included in the revised Appendix 12.

Question regarding the stack height costs and accompanying spreadsheet and reason for distinct reduction in cost per unit height at 55 metres and whether this has distorted the BAT analysis towards 55 metres.	The Applicant updated the stack height assessment report and reviewed the stack height costs following an information notice dated 26 April 2017. The accompanying spreadsheet and figures have been revised and are consistent. We consider that the spreadsheet and figures do not distort the BAT analysis.
Why is there a *'stepped change'* at 55 metres and not at other heights?	Please refer to section 6.1.2 of this decision document which addresses this issue.
How was Figure 3 in Appendix 12 generated?	The capital costs used in the assessment have been provided by the contractor responsible for the design and construction of the stack.
Why is there a selection of a slope of -0.20 for the straight blue line shown in Figure 3?	Please refer to section 6.1.2 of this decision document which addresses this issue.
Why is the approach in Appendix 12 an appropriate method for determining a stack height and what justification is there for the selection of 55 metres from the graphs and data presented?	The approach to the stack height assessment applies the Environment Agency's H1 Annex K 'Cost Benefit Analysis' methodology (withdrawn but used as internal Environment Agency guidance). The Applicant proposes that a stack height of 58 metres above surrounding ground levels with a daily emission limit for NOx of 150 mg/Nm^3 represents BAT for the proposed Installation. The Environment Agency agrees with this assessment.
The Applicant should include other heights higher than 55 metres.	Heights above 55 metres have been included in the revised Appendix 12.
What is the reason for the differences in stack capital costs between Table 2.1 and Table 2.3 and justification for the cost estimates?	The Applicant confirms that the inconsistencies were due to revised quotations received just before the original Appendix 12 was released and inconsistencies in the exchange rate. All costs have now been revised with a consistent exchange rate in the revised Appendix 12.
Why does a reduction of 1.5% of the ES in annual average concentration of NO_2 (from 2.4% to 0.9%) not justify the additional annualised cost of about £315,000 given that £120,000 annualised cost to achieve the same benefit is insignificant (as stated by the Applicant) and the £2.8 million to achieve the same reduction	Please refer to section 6.2.3 of this decision document. In our determination, we have considered the costs of achieving BAT at the proposed Installation as required by the Industrial Emissions Directive. The use of a cost benefit analysis and within it the approach used by the Applicant was designed to define a cut-off point by finding a balance between the cost of increasing the stack and the resulting benefits to people and the environment. The

using SCR in Appendix 12.	additional costs of reducing the annual NO_2 PC from 2.4% to 0.9% of the ES are considered disproportionate to the environmental benefits to be achieved. We agree with the Applicant's assessment that a stack height of 58 metres above surrounding ground levels is BAT for the proposed Installation.
The Applicant should re-submit Figure 4 to show the proposed stack height of 55 metres above surrounding ground level.	Figure 4 (now numbered as Figure 6 in the revised Appendix 12 document) shows the proposed stack height of 58 metres above surrounding ground levels.

c) Representations from Individual Members of the Public

A total of 157 representations were received from individual members of the public. The public drop-in events were attended by about 88 persons, who were a mixture of local residents and business community likely to be affected by the proposed Installation. A number of these responses came from people attending the drop-in events. Many of the issues raised were the same as those considered above. Only issues additional to those already considered are listed below:

Representations from individual members of the Public	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
The Applicant proposes a stack of 55 metres instead of 70 metres. Is this because of planning /building permission or due to a new study on so-called safe height?	The Applicant has proposed a stack height of 58 metres above surrounding ground levels following an assessment using BAT. This is explained in section 6.1.2 of this decision document.
The proposals are not permitted and are outside and contravene the planning restrictions. The environmental permit should not be granted until actual site details are approved and planning consent for the revised stack is granted.	The planning permission process considers the need, scope and scale of proposed developments in the context of local and regional plans and infrastructure requirements. The environmental permitting process considers the design and operational techniques associated with the plant in the context of its on-going operation against its stated purpose. The planning permission process is completely independent to our process for determining an environmental permit. We have a duty to determine the application made to us and that is what we have done. The proposed Installation will need to have both planning permission and an environmental permit to operate. Each one can be granted without the other. If we grant the environmental permit, it does not guarantee that local planning authority will issue the planning permission to vary the stack height and vice

	versa. This is because both processes are assessed by different criteria.
Concern regarding potential pollution to the air and surrounding waterways.	Emissions to air from the facility and their potential impacts are discussed in sections 5.2, 5.3 and 5.5 of this decision document. We also audited the Applicant's air quality and human health impact assessment and agree that the conclusions drawn in the reports are acceptable, that there would be no significant impact to the environment or human health. The proposed Installation will be designed and operated so as to prevent the pollution of surrounding waterways. Discharge of liquids to controlled waters (e.g. River Blackwater) is not permitted.
Additional pollution from the vehicles transporting waste to the plant	The impact of traffic on the local community are relevant considerations for the grant of planning permission and do not form part of the environmental permit decision-making process except in terms of how they affect the prevailing background pollutant levels. Where there are established high background concentrations contributing to poor air quality, the increased level of traffic might be significant in these limited circumstances. The Environmental Permitting Regulations are concerned with control of emissions from the proposed Installation and in determining this Application under these regulations, we have considered the impact of emissions on local air quality. The Applicant has demonstrated that emissions from the operation of the proposed Installation are well below the ES. We are satisfied that there is no risk to the ES being breached within the locality of the site. We will regulate the operational activities at the proposed Installation as defined in the Permit and this will commence when any waste is first brought to the site.
Permission should not be granted as the risks from the facility are unknown. Is it true that little is known about the risks of many of the pollutants, particularly when combined?	The United Kingdom Interdepartmental Liaison Group on Risk Assessment (UK-ILGRA) state that the precautionary principle should be invoked when there is good reason to believe that harmful effects may occur and the level of scientific uncertainty about the consequences or likelihood of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision making. The Health Protection Agency (Response to British Society for Ecological Medicine Report, "The Health Effects of Waste Incinerators) say that "as there is a body of scientific evidence strongly indicating that contemporary waste management practices, including

	incineration, have at most a minor effect on human health and the environment, there are no grounds for adopting the 'precautionary principle' to restrict the introduction of new incinerators". We consulted Public Health England during this determination with respect to the impact of combined emissions from the proposed Installation on human health. Their comments on the Application are summarised in this Annex.
Concern regarding short term and long term health risks to people (such as cancers) and the environment including impact on air quality.	The risks of air emissions on human health is discussed in sections 5.2, 5.3 and 5.5 of this decision document. The Application contains detailed assessments of the impact of the emissions on the health of the local population. The assessments use worst-case assumptions about emissions and exposure routes, and employ the latest methods based on current scientific thinking. The assessments conclude that acute impacts on health by inhalation of gases and fine particles would be insignificant, and that exposure to metals and dioxins would not pose a significant risk to health. These conclusions are consistent with the findings of authoritative published studies of the health of communities living near to modern municipal waste incinerators. In support of the conclusions, Public Health England (PHE, *formally known as the Health Protection Agency*) has published a position statement on incineration of municipal solid waste which states that "Modern, well managed waste incinerators will only make a very small contribution to background levels of air pollution provided they comply with modern regulatory requirements, such as the Industrial Emissions Directive, they should contribute little to the concentrations of monitored pollutants in ambient air". 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 has been undertaken to extend the evidence base and provide the public with further information; as such it does not justify a delay in our decision making on permit applications. The Environment Agency takes advice from PHE on the health implications of incinerators generally and specifically on each application for a permit. We

	consulted PHE during the determination of this Application. Their comments are summarised in this Annex.
Concern regarding the impact of pollutants on locally grown crops, soil and animals, hence contamination of the food chain.	The Human Health Risk Assessment (HHRA) considers the location where the maximum deposition of pollutants that can result in bioaccumulation (dioxins and metals) takes place. It then makes the assumption that a farmer and his family manage the land at this location and produce sufficient food from that land to satisfy their dietary needs throughout the year. This worst case prediction of intake of these pollutants via this route by members of the theoretical 'farmer family' is then compared against a 'daily recommended maximum dose' standard. We audited the Applicant's HHRA and we confirm that there is no likelihood of dioxin and heavy metals intake exceeding the daily recommended maximum dose standard even in this worst case scenario. Given that crops grown by residents in their own gardens or local allotments will only form a relatively small part of their total annual dietary intake, we are satisfied that the Tolerable Daily Intake (TDI) will not be exceeded and that any impact on human health as a result of this intake mechanism would be insignificant. We consulted the Food Standards Agency, Public Health England and the Director of Public Health during the determination of this Application. They have not raised any concerns with respect to contamination of the food chain from locally grown crops, soil or animals.
Concern regarding the destruction of woodland and the habitats of known protected species.	The Applicant carried out a habitats survey report at the proposed site. We have reviewed the details of the survey report during this determination. We agree with the Applicant's conclusion that there is no risk of the destruction of any woodland or protected species.
Concern regarding the increased stack height posing a danger to birds.	We do not consider that the height of the stack will change the risk of danger to flying birds as there are other infrastructure of a similar height (such as a radar mast and high voltage power lines) within the area.
Concern regarding the impact of incinerator by-products on the nearby woodlands and local nature.	We carried out an audit of the Applicant's air quality impact assessment (including impact on ecological receptors). Our assessment shows that site emissions will not have a significant effect on any ecological site, protected species or interest features of the habitat sites.

Concern regarding the impact of pollutants on the Listed Buildings at Woodhouse Farm.	Possible physical impact of emissions on buildings through acid rain (wet deposition) resulting from acid gases could be relevant to our determination. Acid rain can be caused by emission of acidic gases from large combustion plants, such as large coal-fired power stations that do not have methods for removal of sulphur dioxide from the exhaust gases. For this Installation, acid gases will be abated by injection of hydrated lime into the exhaust gases. Wet deposition is a long range effect and we consider that the amount of acid gases emitted from the proposed Installation would not be high enough to contribute to acid rain and impact on the Listed Buildings.
Concern regarding increased noise and light pollution. Concern regarding the Installation's opening hours and the associated noise emissions.	The impact of noise and vibration is addressed in section 6.5.5 of this decision document. The Applicant submitted a noise impact assessment with the Application. We reviewed the noise impact assessment and we are satisfied that emissions of noise and vibration will not give rise to complaints. Permit conditions 3.4.1 and 3.4.2 will ensure that emissions of noise and vibration do not cause pollution off-site at any time of day or night. We have set pre-operational condition 11 in the Permit requiring the submission of a programme of monitoring at the proposed Installation and in the surrounding environment to establish noise levels during plant commissioning and operation. This will ensure that any impact can be identified and rectified at the earliest opportunity. Light pollution from the plant infrastructure is a matter that will be considered by the local planning authority. We would expect the impact of light to be limited in accordance with the National Planning Policy Framework. The requirement to use energy efficiently will mean lighting at the proposed Installation will be kept to a minimum. The opening hours of the proposed Installation are considerations for the local planning authority and are specified in the current planning consent. If the Applicant wishes to change these hours, they would need to vary their current planning consent.
Concern regarding the impact of emissions on users of footpaths.	We examined the impact of short term emissions of pollutants on human health as part of our determination. We agree that the conclusions drawn in the reports are acceptable, that there would be no significant impact to the environment or human health including on users of footpaths.
Concern regarding impact of bioaerosols	The biological treatment of waste will be undertaken inside enclosed buildings and tanks. The biofilter flue

	will be in a stack which is 58 metres high. We consider that the risk of bioaerosols impact is minimal.
Community regarded as a "dumping ground" for waste from other regions including all of London's waste.	It is argued that overcapacity of residual waste incinerators within an area will result in the import of waste from outside the area or sub-region, which is not in line with the proximity principle of disposing of waste as close to source as possible. The appropriateness of the capacity and number of waste incinerators in a given area is considered within the planning system. The planning consent was granted by the Secretary of State for Communities and Local Government. The Environment Agency's role is to ensure that it can be operated without giving rise to significant pollution or harm to human health.
Concern regarding the siting of the Installation in an inland area of the country (rural countryside) where emissions will fall on populated areas (residential houses, schools, businesses).	Decisions over land use are matters for the planning system. The location of the installation is a relevant consideration for Environmental Permitting, but only in so far as its potential to have an adverse environmental impact on communities or sensitive environmental receptors. The environmental impact is assessed as part of the determination process and has been reported upon in the main body of this decision document. The location of an installation can have an impact on the ability to recover waste heat for use in nearby residential, commercial or industrial premises and we commented on this in our consultation response to the local planning authority.
Question regarding whether or not the UK could have under-used incinerators, according to a report by Eunomia.	It is not the role of the Environment Agency to assess the current and future need of incineration facilities in England. This is a matter for the Government's waste strategy and waste planning authorities. The Environment Agency's role is to ensure that if a waste incineration plant is built and becomes operational, it will not have an adverse impact on the environment or human health.
The volume of water taken from the River Blackwater is 500,000 m^3 per day which is returned to a lagoon. Over a year this is 182.5 million m^3. What effect would this have on the river environment and how will the contaminated waste water be safely stored?	The statement is incorrect. The abstraction licence specifies the quantity of water that the Applicant can take from the River Blackwater under specific conditions – up to 360 m^3/hr; 8,640 m^3/day; and 250,000 m^3/year. Effluent from the paper pulp plant will be treated in the waste water treatment plant. Treated water will be stored in the Upper Lagoon and reused at the proposed Installation for on-site processes. There will be no discharge of liquids to the River Blackwater (see Schedule 3 to the Permit).

Concern regarding over-abstraction of the River Blackwater and changes to the water table and the impact on protected species.	The Applicant has an existing abstraction licence to take water from the River Blackwater. Abstraction of water from the River Blackwater is covered under a separate licence.
Will the Applicant undertake tree planting and environmental restoration of the disturbed ground to make it better than it currently is as an ecosystem.	The Applicant is required to undertake ecological restoration /improvements around the site under the current planning consent. These matters are outside the scope of this determination.
Question as to whether the facility would meet the government's set air quality targets and limits to be implemented for the health of the nation.	The Government's air quality targets considers the release of pollutants from all sources including traffic, industrial activities, agriculture etc. The meeting of the set air quality targets and limits is the responsibility of the Government, working together with local planning authorities. Emissions from the site are well below the air quality standards and will not cause any exceedance.
Concern regarding the risk of fires as the incinerator and anaerobic digestion plant are located in the same area. Concern regarding uncontrollable fire which could start from the plant either from an explosion with widespread high temperature deposits or other causes.	The Installation will be subject to a detailed site wide DSEAR (The Dangerous Substances and Explosive Atmosphere Regulations 2002) study to ensure that the engineering and process design complies with the appropriate regulations that cover dangerous substances and explosive atmospheres. This will be incorporated into the various independently chaired Hazard and Operability Studies (HAZOP) that will ensure that risks are eliminated or mitigated to acceptable levels by good layout design. The recommendations of the risk assessment and HAZOP study will result in the appropriate designation of explosion zones and the detailed specification for any equipment that has to operate within such areas to be appropriately Atmosphères Explosibles (ATEX) rated. This will also feed into Operations and Maintenance (O&M) plans and site operational procedures (SOPs), including special works permits and method statements, developed and incorporated into O&M manuals for the different waste treatment processes. The Operator will be responsible for incorporating the results of the studies into the site accident management plan. Operation and maintenance staff will be trained in these procedures and will be made aware of any residual risks that could not be fully eliminated by design. The Applicant submitted a fire prevention plan as part of the Application. We have not approved the plan in this determination as some details have not been finalised. We have set pre-operational condition 10 which requires

	the Operator to submit a revised fire prevention plan to the Environment Agency for approval prior to the commencement of commissioning of each activity in Table S1.1 of the Permit. No waste can be accepted on site until the fire prevention plan is approved in writing by the Environment Agency.
The monitoring data from radioactivity checks on waste input should be live and online for the public to view.	The Permit does not allow radioactive material to be accepted as a specific waste. It is possible that smoke alarms could be placed in household bins. However, they are likely to be small in number and have a low level of radioactivity so there is little likelihood of any significant risk. In addition, the Applicant will install radioactive detection at the weighbridge to increase the potential of detecting any radioactive materials prior to burning at the waste incineration plant. Evidence of these checks will be made available to the Environment Agency during compliance.
Concern regarding the high concentrations of toxic substances such as dioxins and heavy metals in the bottom ash.	Most IBA is likely to be classified as non-hazardous waste. However, IBA is classified on the European List of Wastes as a “mirror entry”, which means IBA is a hazardous waste if it possesses a hazardous property relating to the content of dangerous substances. The Operator is required to monitor the residue quality of the IBA under the monitoring requirements to ensure that the IBA produced is dealt with in an appropriate manner (see condition 3.5.1 and Table S3.3 in the Permit). Incinerator bottom ash and air pollution control residues will not be processed at the facility. Residual ash will be despatched to off-site re-processing facilities for recovery or to landfill for disposal (see section 4.3.10 of this decision document).
How many times a week will the pollutants be monitored?	Monitoring frequency of all parameters (including dioxins) will be in accordance with the requirements of Annex VI of the Industrial Emissions Directive. Emissions from the stack will be monitored using continuous emissions monitoring systems (CEMS) for particulates, carbon monoxide, ammonia, sulphur dioxide, hydrogen chloride, nitrogen oxides and Total Organic Carbon (TOC). In addition to the continuous monitoring, periodic sampling and measurements will be undertaken for hydrogen fluoride, heavy metals, dioxins and furans and dioxins-like PCBs. Periodic measurements will be carried out four times in the first year of operation and twice per year thereafter. The waste incineration plant will include a dedicated duty continuous emission monitoring system (CEMS) for each line and a stand-by CEMS which will ensure that there is continuous monitoring data available even if

	there is a problem with a duty CEMS system.
Are there measures for fines or will the facility be closed for exceeding the emission limits imposed?	The Permit requires the Operator to inform us if they exceed any of the emission limits or if they fail to comply with any operating conditions. We can also undertake our own monitoring at any time. We will investigate any non-compliance with any condition of the Permit and take enforcement action if needed, including issuing notices, prosecuting serious breaches or potentially revoking the Permit.
Concern regarding how the content of any waste would be controlled and the subsequent control of the numerous chemical emissions.	We have specified in the Permit the types of wastes that may be accepted at the proposed Installation for processing (see condition 2.3.3 and Tables S2.2 to S2.6 in the Permit). The Applicant will have pre-acceptance and waste acceptance procedures in place prior to the commencement of commissioning of activities AR1 to AR6 as required by pre-operational condition 4. The pollution prevention measures will be suitable for the types of waste that will be processed at the proposed Installation.
Concern regarding the increased risk of flooding.	The Environment Agency provides advice and guidance to the local planning authority on flood risk in our consultation response to the local planning authority. Our advice on these matters is normally accepted by both Applicant and planning authority. When making permitting decisions, flood risk is still a relevant consideration, but generally only in so far as it is taken into account in the accident management plan and that appropriate measures are in place to prevent pollution in the event of a credible flooding incident. The proposed Installation is not within a flood risk area therefore the risk of flooding is low. The accident management plan which will be part of the site EMS will include measures to prevent pollution in the event of a flood.
The increased stack height should be applied for under a new permit application as this will affect the environment, wildlife. Higher plume will disperse into greater areas affecting more villages, schools and wildlife.	The Application for a revised stack height was submitted to the Environment Agency for determination on 2 March 2017. This was an application for a new environmental permit. We have assessed the impact of the increased stack height as described in the main body of this document (see section 6.1.2 of this decision document). This is the decision being consulted on. We are minded to grant an environmental permit to the Applicant, Gent Fairhead & Co. Limited to operate the proposed Installation. Please refer to chapter 5 of this decision document for impact of air emissions on human health and the environment.

Abnormal emissions box has been ticked by the Applicant in the Application form.	This is correct. Abnormal emissions are allowed under the Industrial Emissions Directive. The impact of abnormal emissions is discussed in section 5.5 of this decision document.
Concern regarding the safety of employees and drivers of delivery vehicles.	The safety of employees and drivers of delivery vehicles is covered by the Health & Safety Regulations. We consulted the Health & Safety Executive during this determination. They have not raised any concerns with respect to this Application.
Concern regarding loss of property value and farmlands as a result of proposed facility.	The Environment Agency is responsible for assessing and regulating emissions from the proposed Installation. Based on our assessment of these, there is no reason why there should be any impact on property value and farmlands.
Concern regarding undecided scale of the types of operations on the site as the incineration operation has already increased.	Please refer to sections 4.1.1 and 4.3.7 of this decision document. The Applicant has submitted an application for an environmental permit to operate an integrated waste management facility which includes a waste incineration plant and other activities with respective annual throughput. These restrictions are specified in the Permit.
Concern regarding the means by which such a waste will be safely transported to the facility from unknown sources and whether the use of local rail networks or other means can be explored.	The location in terms of transport links is a planning consideration. Waste will be transported to the proposed Installation by road.
Concern regarding the security of the plant and its potential vulnerability to hostile acts (terrorism, dumping etc.)	Site security and prevention of unauthorized access is part of an Operator's Environmental Management System (EMS) and is a permit requirement for many regulated activities (see condition 1.1 in the Permit). The Applicant confirms that the site EMS will be certified to ISO 14001 following the commencement of site operations. Pre-operational condition 1 requires the Operator to provide the site's EMS and Improvement condition 1 requires a report on the progress made by the Operator to gain certification of the site EMS.
What provision is in place to alert the public to a disaster, to give the public the best chance to evacuate the area?	Accident management plan is discussed in section 4.3.4 of this decision document. Emergency procedures based on realistic scenarios will be specified in the accident management plan which will form part of the site EMS. We have include pre-operational condition 1 which requires the submission of site EMS to the Environment Agency for approval prior to the commencement of commissioning of each

	activity in Table S1.1 in the Permit.
Concern regarding the storage of waste and the impact of amenity issues – odours, flies, seagulls, germs and vermin.	Storage of wastes will be limited to the internal areas of the proposed Installation i.e. inside enclosed buildings. No wastes will be stored externally. The site has a pest management plan in place and an odour management plan will be submitted to the Environment Agency for approval prior to the commencement of site commissioning. It is not considered that the proposed Installation will give rise to any amenity issues.
The Applicant has limited or no experience /track record of operating any waste management operations.	We are satisfied that Gent Fairhead & Co. Limited will be able to operate the proposed Installation so as to comply with the conditions we have included in the Permit. Gent Fairhead & Co. Limited have sufficient resources and expertise to operate the proposed Installation. The decision was taken in accordance with our guidance on what a competent operator is.
The Environment Agency should ensure that the Applicant complies with all regulations on noise, odours, water, vermin, traffic and light levels.	The Permit includes conditions which ensures that the operation of the proposed Installation will not cause significant pollution of the environment or harm to human health. In particular, it contains conditions relating to noise, odour, water pollution and pests. Traffic-related matters will be considered by the planning authority.

B) Advertising and Consultation on the Draft Decision

This section reports on the outcome of the public consultation on our draft decision carried out between 20 June 2017 and 18 July 2017. Some issues raised in the consultation were the same as those raised previously and already reported in section A of this Annex. Where this is the case, the Environment Agency response has not been repeated and reference should be made to section A for an explanation of the particular concerns or issues. Also some of the consultation representations received were on matters which are outside the scope of the Environment Agency's powers under the Environmental Permitting Regulations. Our position on these matters is as described previously.

a) Representations from Statutory and Non-Statutory Bodies

Representations were received from Essex County Council and Public Health England, who raised the following issues:

Representations from Essex County Council dated 12/07/17	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
The expression "*as rapidly as possible*" in permit condition 2.3.10 is not considered specific enough. What is meant by "rapidly"?	The permit condition referred to ensures that the requirements of Article 47 of the Industrial Emissions Directive are complied with. Article 47 states that "*In the case of a breakdown, the operator shall reduce or close down operations as soon as practicable until normal operations can be restored."* "As rapidly as possible" is clear, precise and enforceable. It does mean the same thing as "as soon as possible". It is actually more onerous than "as soon as practicable" as something may be possible even when it is not practicable.
For permit condition 3.4.1, the term "*as perceived by an authorised officer of the Environment Agency*" is subjective. What is meant by "perceived" and is it therefore not difficult to enforce?	The word "perceived" carries its ordinary meaning and the definition of pollution includes subjective elements in relation to what would cause offence to human sense or interfere with amenity. The wording clarifies who makes this decision. Permit condition 3.4.1 is a standard condition in our environmental permits and we are satisfied that it is clear, precise and enforceable.
No capacity is stated in Table S1.1 of the permit for the following activities – AR2, AR3 & AR4, AR5 and AR10	The capacity of each activity (AR1 to AR5) is stated in Tables S2.2 to S2.6. The storage capacity of waste pending recovery or disposal (AR10) is stated in the site's operating techniques which has been included in Table S1.2 in the Permit.
AR3 & AR4 – it states 75 tonnes, but it is not clear whether this is per hour/day etc.	This is an error. The activity description has been amended to read as follows – *Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day involving biological treatment.*

Representations from Public Health England dated 19/07/17	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
We have reviewed the draft permit and decision document. We also note that the Environment Agency have assessed the anaerobic digestion facility using Best Available Techniques (BAT) in accordance with the relevant sector guidance in this determination and thus further to our initial response on 5 April 2017 we have no further comments to make at this stage.	No further action.

b) Representations from Local MP, Councillors and Parish / Town / Community Councils

Representations were received from the Member of Parliament, Rt. Hon. Priti Patel MP, Local Councillors (Essex County Council), Parish Councils (Rivenhall, Cressing and Bradwell) and Witham Town Council who raised the following issues:

Representations from the Rt. Hon. Priti Patel MP for Witham Constituency	
Brief summary of issues raised:	**Summary of action taken / how this has been covered**
Letter and email received from Local MP containing representations from a constituent.	We have taken the relevant comments into account in the determination (see comments from individual members of the public in this Annex).

Representations from Local Councillors (Essex County Council), Parish Councils (Rivenhall, Cressing, Bradwell) and Town Council (Witham).	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
Stack height assessment	
The previous application was refused because the stack height was not within the BAT range (70 to 120 metres) for plants of a similar size. Nothing has changed in terms of national or EU policy to alter such a consideration and so that should still apply.	Stack height is discussed in section 6.1.2 of this decision document. The stack height of plants of similar size we have permitted are in the region of between 70 and 120 metres above surrounding ground levels which we regard as the "indicative BAT" for plants in the UK. However this range is only "indicative" and it is based on plants we have permitted and not based on any specific legislation, national or EU policy. The reason for this is that there is no "recommended" or "mandatory" stack height

	specified in any BAT reference documents (BREFs) or BAT Conclusions for any industrial sector. Note that under the Industrial Emissions Directive (IED), the BAT conclusions for any industry sector shall be the reference for setting permit conditions. Reference to stack height is found in Article 46(1) of the IED for waste incineration and co-incineration plants which requires an Applicant to demonstrate that waste gases are discharged in a controlled way by means of a stack height which is calculated in such a way as to safeguard human health and the environment. The IED allows for Applicants to demonstrate that BAT is being applied at a particular location using other alternative measures taking local environmental conditions into account. This may mean looking at emissions reduction at source compared to raising the height of a stack. A cost benefit analysis is used to demonstrate BAT under the IED. The Applicant has submitted a cost benefit analysis in this Application. We are satisfied that the proposed stack height of 58 meters above surrounding ground levels (78 metres from the base) is BAT for the proposed Installation.
All of the "lowered plants" compared with the proposed Installation have stacks higher than 58 metres. The appropriate stack height should be at least 90 metres given the risks to human health.	The 3 plants with stacks beneath the surrounding ground levels ("lowered stack") have higher stacks and also have higher NO_2 impacts (predicted environmental concentration = process contribution and background concentration) compared to the proposed Installation (see Table 6.4 in this decision document). An examination of the process contribution of each plant shows that only one plant has a lower NO_2 impact (1.6% of the ES) compared to that of the proposed Installation (2.2% of the ES). The two other plants have higher NO_2 impacts (5.5 and 6.3% of the ES). Please note that the proposed Installation has adopted a more stringent daily average NOx ELV (150 mg/Nm^3) compared to the other 3 plants (200 mg/Nm^3). The Application has been assessed against air quality and other environmental standards. For many pollutants, these standards are specifically set to be protective of public health. The Environment Agency is satisfied that the proposed Installation will not result in the exceedance of these environmental standards or give rise to any significant health impacts.

Figure 4 in the Applicant's dispersion modelling is misleading and does not clearly set out the stack height. It does not clearly explain the relationship between the base of the stack and the plant.	The stack height and the relationship of the base of the stack and the plant is clearly explained in several parts of the information supplied with the Application. However, the Applicant provided an updated diagram (Figure 4) during the consultation of our draft decision which was uploaded on our consultation web site (Citizen Space). We consider that the schematic figure explains the relationship between the base of the stack and the plant. Please refer to Figure 6.1 in section 6.1.2 of this decision document where this diagram is shown.
The impact of annual mean NO_2 cannot be screened out as insignificant at all sensitive receptors until the stack height reaches around 95 metres. Why is the Environment Agency minded to grant a permit for a stack height less than 95 metres?	Our assessment of impact of air quality is discussed in section 5.2 of this decision document. Our guidance would screen out process contributions of less than 1% of the ES as insignificant. The emissions of NO_2 in this Application do not screen out as insignificant, but given the uncertainties of modelling and the conservative nature of the assumptions used in the model in this instance, a predicted process contribution of 2% at the most impacted residential receptor is considered to be acceptable. Just because an emission does not screen out as insignificant (i.e. less than 1% of the ES) does not automatically mean that it is then significant. The stack height assessment is discussed in section 6.1.2 of this decision document. The graph submitted in the Application's supporting document shows the impact of stack height on the peak predicted ground level NO_2 concentration. The graph shows that further increases in stack height will reduce the predicted peak ground level concentration. There is a diminishing benefit as the stack height increases and it is always a matter of judgement when the point is reached where the additional costs outweigh the environmental benefits. The Applicant's view that 58 metres is that point is backed up with a detailed analysis of the environmental impact of emissions from the stack which we have considered in detail in this determination. Taking all these matters into account, we are satisfied that a stack height of 58 metres above surrounding ground levels is BAT for the proposed Installation.
Has increase in the stack to 70-120 metres been avoided due to planning, light pollution or air traffic factors?	Please refer to section 6.1.2 of this decision document. The stack height has been assessed in accordance with BAT and not on other factors such as planning, light pollution or air traffic which are matters for consideration by the planning authority.

Water usage	
Uncertainty over the use of the River Blackwater, the abstraction and overall water usage. The impact of abstraction of water on the Wheatmead Nature Reserve and River Walk further downstream. The Environment Agency should openly commit to not providing such a permit now, nor in the future. If a permit is granted, it should be based on the information provided in this application and there shall never be any discharge from the site into the River Blackwater.	Please refer to our response regarding abstraction of water and discharge to surface waters in section A of this Annex and section 6.5.1 of this decision document. It is possible that the Applicant may submit a variation application to discharge to surface waters at a future date. The Environmental Permitting Regulations allow Applicants to vary their environmental permits (see Regulation 20(1) of EPR 2016). However, any such application will be subject to the same scrutiny as the current Application. This Permit does not allow any discharge from the proposed Installation into surface waters and/or groundwater. It is not appropriate for the Environment Agency to pre-determine any permit applications now or in the future.
The Applicant's water use data should be re-visited using up to date relevant information from local data sources such as rainfall and river flow.	We re-visited the Applicant's water supply data. The Applicant submitted further information (river flow and rainfall data) to clarify certain aspects of the data which we have reviewed. We consider that there will be sufficient water for use at the proposed Installation at the time of commissioning scheduled in 2021 (see section 4.3.9 of this decision document).
How many days did the River Blackwater flow actually exceed 1,309 l/sec throughout the day during the past three years?	The Applicant provided water flow data from 2006 to 2016. The results show that the River Blackwater flow exceeded 1,309 l/sec on 886 days. The Applicant confirms that commissioning of the waste treatment processes will be undertaken by July 2021. Hence, we consider that there is sufficient period (at least 3 years) for the Applicant to fill up the two lagoons prior to the commencement of commercial operations on site (see section 4.3.9 of this decision document).
We note that there will be no point source emission to controlled waters (particularly the River Blackwater – direct or indirect), groundwater or public sewer from the IWMF." We would like to see this statement as a condition of the permit.	Please refer to condition 3.1.1 in the Permit. Schedule 3 to the Permit has no point source emissions to surface waters.

Air dispersion modelling	
How can the Environment Agency assess the air quality of the plant when it relies on the Applicant's model? Why has the Environment Agency not conducted their own modelling and independent measurements upwind and downwind of the site? We understand that the Environment Agency wish to test the air outside the actual plant but legally could not do so. What legal advice has been secured on this issue? Why are you testing water quality off-site but not air?	Our role is not to carry out modelling for Applicants but to ensure that the modelling that they have carried out is correct and robust. We do this by using technical specialists within the Environment Agency who will look in detail at the modelling that has been carried out by the Applicant. They will ensure that the input data is correct and has been correctly applied and all factors have been taken into account, such as appropriate emissions data and also human and ecological receptors. We have audited the Applicant's modelling and have made several observations relating to their methodologies and assumptions. We have also carried out detailed check modelling relating to all aspects of their assessments and undertaken sensitivity analysis relating to our observations. Based on this work, we conclude that the proposed Installation will not cause significant pollution or harm. We are not clear on how the respondent received advice from the Environment Agency as we did not propose at any time to monitor air quality outside the Installation boundary. We regulate emissions from samples of air taken from within the stack. This means that we monitor emissions from the source and it is from that point that the emission limits are enforced. This monitoring will give a more accurate picture of the emissions from the proposed Installation as opposed to off-site monitoring which will measure contributions from other sources as well. When monitored off-site, it is likely that releases from the proposed Installation will be a very small proportion of this pollution. It will therefore be very difficult to get any meaningful data from this monitoring approach in terms of what the proposed Installation is contributing to ambient air. Furthermore, we are confident in any case from our review of the Applicant's air quality assessments that emissions at the proposed emission limit values will not cause pollution and are not a priority for further control.
What is the level of statistical confidence in the Environment Agency's air quality assessments of the Applicant's modelling and how can you be certain theirs is entirely credible when you admit you have not done your own modelling nor plan to	Please refer to our response above with respect to air dispersion modelling. We undertake a detailed review of dispersion modelling submitted to us by Applicants. Provided we are satisfied that the Applicant's modelling is correct, we then look at the conclusions of the modelling and make a decision on the acceptability of the impact. We look at whether or not there is a

measure air quality outside the site?	significant impact and whether there is the potential to reduce any such impacts so that they are no longer significant. If there are significant impacts determined which cannot be controlled or reduced in our opinion, and which could cause harm to human health and the environment, we will refuse the permit application.
The performance of the plant does not allow for the background air quality to be lower than expected therefore increasing the emphasis on the plant's contribution and requiring further reductions in emissions.	Tables 5.1 and 5.2 in section 5.2 of this decision document shows the process contribution of pollutants from the proposed Installation in comparison with the existing background concentration for each pollutant. The results show that the predicted environmental contribution is well below 100% of the ES. We have assessed the Applicant's proposed abatement to reduce the emissions from the proposed Installation (see chapter 6 of this decision document) and agree that the measures are in line with the EU Waste Incineration Bref document and our technical guidance note EPR 5.01.
Why is the Environment Agency not considering noise and air pollution from 400 heavy goods vehicle movements a day across the county and beyond? Are these not environmental consequences?	Transport of waste and any associated environmental impact across the county and beyond is a matter for consideration by the local planning authority and Highways Authority and not relevant to our determination. We have assessed the impact of air emissions and noise from within the Installation boundary in this determination. Our assessments show that noise and air emissions releases will not have a significant impact on people or the environment.
The air quality impact assessment (background analysis and calculations) does not include the following future developments: • the proposed possible routes of the A120; • the additional receptors of the proposed 350 new houses at Silver End • the proposed housing developments in Feering, Kelvedon, West Tey, Marks Tey; • the upgrade of the A12; and • the future expansion of Stansted Airport.	We have checked the Applicant's estimation of background concentrations and reviewed available information including Defra's published background maps. We have considered the site setting and proximity to local sources and how this would impact background concentrations. We are satisfied that the Applicant's selected background data is reasonably representative and any changes would not change the overall conclusions. We have taken into account the locations of the proposed housing developments (Silver End, Feering, Kelvedon, West Tey and Marks Tey), the additional contribution from road traffic (re-routing of the A120 and A12) and the future expansion of Stansted Airport (if granted) in the audit of the Applicant's air dispersion modelling. Our check modelling indicates that the impacts at these locations would be significantly lower than the worst-case locations assessed in the Applicant's air dispersion modelling. Our conclusion is that the

	predicted pollutant impacts at these locations will not be significant and will not exceed the ES/EQS.
Impact of emissions on human health	
The local community should be protected from the residue released by the plant in accordance with the highest standards not the lowest.	We have considered the impact of emissions and abatement in this determination (Please refer to chapters 5 and 6 of this decision document). We are satisfied that the releases from the proposed Installation will not cause any significant pollution of the environment or harm to human health.
The Environment Agency should provide assurances with regard to the short, medium and long term effects of all pollutants as Coggeshall will be exposed to increased and significant levels of pollutants, thereby impacting the entire community.	Please refer to section 5.3 of this decision document with respect to our assessment of the human health effects from the proposed Installation.
The Royal College of Physicians report reveals a link between small aluminium particles and Parkinson's Disease and dementia. There is no explanation for how these will be filtered out.	The Royal College of Physicians report discusses general air pollution including outdoor and indoor sources. It makes no mention of particulates released by modern waste incineration plants. Sections 5.3.3 and 6.2.2 of this decision document discusses the health impact of emissions released from the proposed Installation and abatement of particulates. The Applicant proposes to use bag or fabric filters for the abatement of particulate matter at the proposed installation. Bag filters are the Best Available Technique (BAT) used across Europe for controlling particulate emissions from EfW plants. There has been much research on the use and effectiveness of bag filters over a number of years. For example, some detailed investigations in the USA looked at the collection efficiency of fabric filters for particle sizes from 10 microns down to 0.2 microns (i.e. 200 nm). The efficiency of fabric filters ranged from 99.2% to over 99.9%. More recent research in Finland provided similar results, showing collection efficiencies from 99% to well over 99.99% for fabric filters. Additionally, a research team in Italy examined the emissions of nanoparticles from several energy from waste plants and found that fabric filters were effective at collecting well over 99.99% of nanoparticles (measured by weight). At their smallest, nanoparticles behave rather like ‘sticky’ gas molecules. The mechanism by which they are collected on the dust cakes which form on filter

	bags means that these filters are particularly effective on the finest of particles. Thus, applying the research data conservatively, fabric filters are effective at removing at least 99% of all particle sizes. At this level of performance, the key measure is the concentration of particulates remaining in the gases after the filter and therefore emitted from the stack and at the levels that will be emitted, there will be no significant impact on human health.
We would like reassurance that nanoparticles are specified within the emission criteria and will be continuously monitored and should further evidence of the harmful effects of nanoparticles emerge, the permit will be reviewed.	The Permit specifies the continuous monitoring of total particulate matter in accordance with Part VI of the IED. There is currently no emission limit prescribed nor any continuous emissions monitor for particulate matter specifically in the PM_{10} or $PM_{2.5}$ individual fractions. 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, Improvement condition 2 has been set in the Permit which requires a full analysis of particle size distribution in the flue gas, and hence the determination of the ratio of fine to coarse particles. In light of current knowledge and available data, the Environment Agency is satisfied that the health of the public would not be put at risk by such emissions. The Permit will be kept under review throughout the operational life of the Installation and will be varied whenever it is necessary or appropriate to do so.
Concern regarding the combustion process not eliminating dioxin emissions.	Dioxins are generated and emitted to atmosphere from the vast majority of industrial processes, accidental fires/bonfires, transport etc. The emissions from incinerators are small compared to sources such as bonfires. The main exposure to dioxins is ingestion via the food chain. We require Applicants to submit a worst case Human Health Risk Assessment (HHRA) using a methodology developed by the US EPA. This determines the intake of a range of people from child to adult, and compares against the tolerable daily intake set by the Committee on Toxicity of Chemicals in Food (COT). We have assessed the HHRA submitted by the Applicant (see section 5.3.2 of this decision document) and we are satisfied that there will be no significant impact of dioxins and dioxin-like PCBs on human health.

Management of odour emissions	
Concern regarding odour impact.	The impact of odour emissions is discussed section 6.5.4 of this decision document. The current measures proposed in the Application allows us to make a decision to grant an environmental permit to the Applicant subject to a pre-operational condition. Our experience from permitting and regulating other energy from waste plants and other facilities indicate that amenity issues such as odour are best formalised during the commissioning stage. Prior to the commencement of commissioning, the Applicant will provide an updated OMP for us to approve. It is only when we are satisfied that odour emissions will not have significant impact on the local community would we approve the plan. The Applicant cannot commence commissioning or accept waste on site until we give our approval, hence the local community is protected. We shall also take into account any developments in odour abatement technology and regulations at that time prior to formally approving the plan. Please note that this is the same approach taken by the Secretary of State for Communities and Local Government as specified in the current planning consent – the submission and approval of an OMP prior to beneficial occupation of the IWMF (condition 52b).
Fire prevention measures	
Concern regarding the impact of fires.	Please refer to section 4.3.5 of this decision document. The requirement for a fire prevention plan should not be confused with Building Regulations or other legislation that incorporate fire prevention. The Environment Agency's fire prevention plan only address the waste materials stored and processed on site. The Applicant is required to comply with all other relevant regulations that cover fire prevention. An updated fire prevention plan will be submitted to the Environment Agency for formal approval prior to the commencement of commissioning of each activity. The Environment Agency shall take into account any developments in technology and regulations at that time prior to formally approving the plan. We consulted Essex County Fire & Rescue Service on two separate occasions in this determination. They have not raised any concerns to the Applicant's proposal or our decision. Reference to DSEAR has been discussed in section

	A of this Annex.
Best Available Techniques	
The process to address emissions should be determined solely on what is the most effective and it should look at the worst case scenario to ensure that this does not happen and is avoided and prevented at all costs.	We have determined the Application based on BAT as specified by the Industrial Emissions Directive. With respect to emissions and their abatement, please refer to chapters 5 and 6 of this decision document. BAT as specified by the Industrial Emissions Directive considers the cost to the Operator and the benefits to the environment.
Public consultation	
How can the public have confidence in the Environment Agency's objectivity when it informs the public that they are minded to grant a permit before the consultation is completed?	We informed the public about our intention to grant an environmental permit to Gent Fairhead & Co. Limited based on the information provided and our assessment of it. The consultation of our draft decision opened on 20 June 2017 and closed on 18 July 2017. We did not make our final decision within the consultation period. We have now made our final decision to grant the permit to Gent Fairhead & Co. Limited following our consideration of all the representations received during the consultation. We have already consulted on the application, the point of this consultation is to explain to the public our position and give them a further opportunity to comment before we do make a final decision.
The Application that should be determined is for a stack height of 55 metres not 58 metres above surrounding ground levels. The Applicant should submit a new application with no variations allowed to the height, should this be recommended.	As part of the Environment Agency's standard procedures, an Applicant may change parts of their application during the determination process. A change to a duly made application can be made if the Environment Agency gives approval to it. Any decision to approve changes to parts of an application currently being determined is made on case by case basis using a common sense approach. Each decision takes into account any impact on the environment and human health as a result of any changes. Where any change to an application is significant or the change has the potential to have a negative impact on the environment and human health, we could request that the Applicant withdraw the current application and submit a new one or undertake an extended public consultation. We do not consider that an increase in stack height by 3 metres (55 to 58 metres) is a significant change to the application warranting the withdrawal of the current application and submission of a new one or an extended public consultation. The change in the stack height provides additional benefit to people and the environment by increasing

	dispersion and a further reduction of NOx emissions. In order to be consistent, we have made the same decision in another permit application for an energy from waste plant where the increase in stack height was from 85 metres to 95 metres (an increase of 10 metres). We have provided two opportunities to the public and statutory consultees to provide representations to us on the Application which we consider to be appropriate.
Other issues	
Does the main fuel type listed as “biological solid waste” and the percentage of renewable fuel (99.64%) stated in the Applicant’s CHPQA certificate relate to part or all of the Installation?	The Applicant confirms that the CHPQA Certificate only relates to the waste incineration plant. The reference to “biological solid waste” within the application is taken from the CHPQA guidance which identifies solid recovered fuels, such as the RDF proposed for the waste incineration plant, as a renewable fuel.
Additional waste may be required to sustain this plant and ensure its viability. Waste will first be transported to Thurrock for 'processing' and then transported again to Rivenhall. This is an incredibly polluting method of delivery. The notion of transporting one area’s waste to another and in the process polluting the recipient area is wrong.	The export/import of waste is not an issue controlled under the Environmental Permitting Regulations. It is a consideration of the local planning authority in accordance with its Local Waste Strategy /Plan.
Why is the Environment Agency minded to approve this large new plant when there is spare recycling and port capacity at Basildon and Tilbury?	The siting of a plant and whether or not it should be built at a particular location is a decision made by the local planning authority. We determine the impact on human health and the environment from the operation of the plant.
With respect to the site drawings, it is not known what the final process arrangements for the plant will be.	Please refer to section A of this Annex where we have addressed this issue.
What analysis have the Environment Agency done on the chance of technical or legal challenge from the Applicant if the Application is refused?	We are minded to grant an environmental permit to Gent Fairhead & Co. Limited. The Environment Agency does not undertake an analysis on the probability of technical or legal challenge by Applicants in the event an application is refused. We will refuse a permit application where we

	believe that the proposal will have an unacceptable impact on the environment and human health whether or not we consider it likely that we will be challenged.
How has the Environment Agency independently challenged both the Applicant and Essex County Council who both set minerals policy and are likely to rule on the planning application? Who is rigorously regulating and holding both interested parties to account especially if the Environment Agency is not doing its own primary modelling and external modelling?	The Environment Agency consults the local planning authority when determining an environmental permit application as we have done in this case (see Essex County Council's comments in this Annex). The local authority also consults us when determining planning applications and we provide our representations for consideration. The guidance on the interaction between planning and pollution control is given in the National Planning Policy Framework. It says that the planning and pollution control systems are separate but complementary. Please refer to our response to modelling and monitoring concerns in this Annex.
What is the worst case scenario if this plant goes ahead for example toxic emissions beyond predictions, hacking or terrorism, sabotage, prolonged lack of wind so toxic emissions sit above the plant or drifting over Coggeshall, Bradwell, Kelvedon? List all worst scenarios you have modelled with their likelihood and impact and response plans.	Appropriate security measures for the site are a consideration for permit determination in so far as they relate to control of access to the Installation. Security fencing, 24 hour staff presence and the management procedures for the site are considered appropriate to achieve this. The Applicant's response to hacking, terrorism and sabotage will be covered under the site's Environmental Management System. The Permit requires that the Applicant provides the EMS to the Environment Agency prior to the commencement of site commissioning. Note also that the Applicant will be working towards accreditation of the site EMS following commercial operation. The site will not hold any fissile material and it is not considered to be a nationally strategic element of the electricity supply network. Worst case scenarios were taken into account by the Applicant in their air impact assessment. The worst case scenarios are based on all emissions at the maximum emission limit values allowable and also for scenarios representing failure of pollutant abatement systems. Our audits have checked this thoroughly and have confirmed that significant pollution is not likely at any receptors including those at Coggeshall, Bradwell and Kelvedon.
What are all the risks, costs and environmental benefits and economic need and technical surety of the Environment Agency granting	The Environmental Permitting Regulations does not require an Applicant to demonstrate the economic need of a facility within the proposed location. This is a decision for the local planning authority and has been addressed under the original planning

such a plant which is up river and upwind of the architectural gem of Coggeshall with 2 NT properties; over 200 listed buildings; the remains of a 12th century Cisterican Abbey all sited in the unique valley of the Blackwater?	application. We have undertaken the assessment of operating the proposed Installation and the associated impact on the environment and human health. We consider that the risks of operating the proposed Installation will be adequately managed by the Operator (please refer to the main body of this decision document). We also consider that the emissions from the proposed Installation will not have any significant impact on any buildings.
The Environment Agency should attend a meeting with Coggeshall parish council prior to making a final decision on the application.	The Environment Agency have undertaken two separate public consultations (three public drop-in sessions) in the determination of this permit application. As part of our procedures, it is important that all bodies and individuals are given the same information and opportunities to comment and as such it would not be appropriate to attend any meetings ahead of us making a final decision on the application. There is a Rivenhall Liaison Group which will be regularly attended by the Environment Agency following permit issue and during the life of the proposed Installation.
Incineration is at the bottom of the waste hierarchy. The processing of waste should be at the top not the bottom.	We believe that everyone needs to reduce waste, recycle more and dispose of the remainder in a safe and environmentally friendly way. We support the 'waste hierarchy' as a general guide to selecting the best option for dealing with waste: reduce, re-use, recycle, recover, and dispose. Recycling can and should be increased. However, there will inevitably be residual wastes that cannot be technically or economically reused or recycled. With declining landfill availability and landfill directive requirements, alternatives are needed such as incineration or co-incineration to recover energy from residual wastes.
The plant should be built with the highest standards not the lowest.	The building (construction) of the proposed Installation is a matter for the building control authority. We will regulate the operation of the proposed Installation in accordance with the Permit to ensure that a high level of protection for the environment and people is achieved. The proposed Installation will be operated using the Best Available Techniques (BAT).
The granting of a permit is in contradiction to the Essex Joint Strategic Needs Assessment. There does not appear to have been any consideration of this	Consideration of the Essex Joint Strategic Needs Assessment and the draft Braintree District Local Plan is not relevant to this determination. It is a consideration for the local planning authority. The Environmental Permitting Regulations do not require an Applicant to demonstrate need for a

Assessment and how the IWMF would affect it and the health needs of people living in the surrounding areas. Granting of the permit goes against Braintree District Council's draft Local Plan and its future for the district.	facility. We have assessed the impact of the proposed Installation on the environment and human health in this decision document (see chapter 5 of this decision document).

c) Representations from Community and Other Organisations

Representations were received from No2incinerator, SE Essex Organic Gardeners, Parishes Against Incineration (PAIN), UK Without Incineration (UKWIN) and Coggeshall Neighbourhood Plan Steering Group. A number of these issues are the same as those raised by the Councillors /Town Councils. Additional issues raised are shown below:

Representations from No2incinerator, SE Essex Organic Gardeners, Parishes Against Incineration (PAIN), UK Without Incineration (UKWIN) and Coggeshall Neighbourhood Plan Steering Group	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
Stack height assessment	
The Secretary of State imposed a stack height of 85 m AOD (35 metres) in the current planning consent. The proposed change is contrary to the Secretary of State's decision.	The current planning consent specifies a stack height of 35 metres above the surrounding ground levels (85 metres AOD). Any variation of the existing stack height will require approval by the local planning authority. The granting of a Permit does not override the planning permission and the Operator will be required to comply with both regimes.
There are concerns that costs are being cut, as the recent application provides a lower cost for a 58-metre chimney above ground level compared to the cost given in the previous application for a 35 metres chimney.	The Applicant did not provide a cost-benefit analysis in the previous application which was refused. A cost-benefit analysis has been provided in this application to support the stack height of 58 metres above surrounding ground levels. Please refer to section 6.1.2 of this decision document.
The Environment Agency advised ADM Ltd that there would be no "horse trading" over stack height and that if the Applicant came back with a higher stack then that would require a new application.	This is not so. Applicants can make changes to an application during a determination under the Environmental Permitting Regulations. Refer to our response to the parish councils above.

PAIN are concerned that Figure 4 in the Applicant's dispersion modelling report is misleading and requests for modelling to be carried out with the correct stack height taking into account the base of the building. PAIN ask several questions about the actual /effective height of the stack above surrounding ground levels, the base of the stack. PAIN mentions "Environment Agency comments" on stack height. PAIN requests further explanation, revised drawings and re-modelling.	We note that PAIN have referred to both "height above surrounding ground levels" and "height above ordnance datum (AOD)" in their representations. These heights are not the same. The surrounding ground level (outside of the excavation area where the proposed Installation will be founded) is at an average height of 50 m AOD. This means that the surrounding ground level is 50 metres above the base height used by the Ordnance Survey in mapping the UK, which is sea level (specifically MHWS, or Mean High Water Spring Tides measured at Newlyn, Cornwall). The top of the stack is at a level of 108 m AOD. This means that it is 58 metres above the surrounding ground levels. The base of the stack is at a level of 30 m AOD, which is 20 metres below the surrounding ground level. This means that the stack is 78 metres tall from the base of the foundation to the top of the stack. The term "effective stack height" was included in error. This should read "equivalent stack height" which is 58 metres. The only revision to Figure 4 is the height of the top of the stack, which was revised from 55 to 58 metres above surrounding ground level (i.e. 105 to 108 m AOD) during the determination. The Applicant's dispersion modelling is appropriate.
PAIN state that the assumptions regarding the Applicant's selection of stack height is incorrect and the assertion that the base below ground is undermined by a previous Environment Agency advice that "only stack height above ground is relevant".	We have no knowledge of the source of claims made by PAIN with respect to a statement from the Environment Agency that "only stack height above ground level is relevant" as we have not communicated this at any time. The Applicant has submitted additional information for clarification of the points raised by PAIN. We have reviewed the additional information on the stack height assessment as part of our determination. We are satisfied that the Applicant's assessment is robust and that a stack height of 58 metres above surrounding ground levels is BAT for the proposed Installation taking the local environmental conditions into account. Please refer to section 6.1.2 of this decision document.
PAIN state that Figure 6.1 in the draft decision document demonstrates that an incinerator of the size of the proposal for Rivenhall should be between 90 and 100 m "above AOD".	We do not understand the term "above AOD" used by PAIN. It is assumed that PAIN refers to 90 and 100 metres above surrounding ground levels. If that is the case, we do not agree with PAIN's statement – the point at which costs begin to outweigh environmental benefits is at 57.4 metres (~ 58 metres) above surrounding ground levels as determined in the cost benefit analysis.

PAIN suggest that the building heights for other plants could be wrong as the height AOD of the base of those buildings is not stated.	The Applicant confirms that, with the exception of Hartlebury, Newhaven and Allington plants, the base of the building, and indeed the base of the stack, is at the same height AOD as the surrounding ground level for all the plants shown in the diagrams. The data is believed to be accurate based on the Applicant's consultants' extensive knowledge of numerous applications and permits throughout the United Kingdom.
PAIN assume that the base of the building is 50 m below AOD.	This is incorrect and there are no drawings that have shown this, as already explained above. Please refer to Figure 6.1 in section 6.1.2 of this decision document.
PAIN reproduce Figure 7 from the stack height justification but adds additional points showing Rivenhall with a building of 50 m AOD and 61 m AOD.	This is incorrect. As explained above, "AOD" is height "above ordnance datum" not height above surrounding ground levels. The top of the building is at 60.75 m AOD, which is 10.75 m above surrounding ground level and this is shown correctly in Figure 7, which compares building height with stack height above surrounding ground levels.
PAIN extend Figure 8 to show a building height of 60 m AOD	This is incorrect as all building heights shown in Figure 8 are heights above base level. The proposed Installation was correctly positioned at building height from the base (60.75 – 30 m AOD = 30.75 metres from base) and stack height 78 metres from the base (108 m AOD – 30 m AOD).
PAIN state that the costs in the stack height assessment have been reviewed by their financial analysts from a funding perspective and it is concluded that the justification is flawed.	PAIN did not provide the review undertaken by their financial analysts. The cost benefit analysis has been carried out using a methodology requested by the Environment Agency which is in accordance with the H1 Annex K guidance which may well be different from the approach taken by funding institutions. We are satisfied that our approach is appropriate.
PAIN state that in the experience of their financial analysts, financiers do not support new build infrastructure on a 30 year asset life' as this will depend on the warranties the component suppliers will offer up. Renewable energy new build deals are modelled at 25 years or below (nearer 20).	The approach of financiers may be different and the purpose of their assessment may be different. We are satisfied our assessment is appropriate for undertaking a cost benefit analysis in the determination of an application under the Environmental Permitting Regulations 2016. The capital costs are spread across a 30 year life span as this is the Environment Agency's standard assumption and is consistent with Treasury Green Book guidance.
PAIN state that changing the life span to 25 years or	We agree with PAIN that if a shorter lifespan is used, then the annualised cost of the capital investment

below moves the optimal stack height to below 50 metres.	increases and so less capital intensive options would be promoted. If the lifetime is changed to 20 years, then the stack height calculated from the 45º line approach is reduced to 55 metres, instead of 58 metres.
PAIN state that the marginal stack costs are totally distorted and ask why they are not the same as those used in the 3.5% capital cost.	The stack costs for 35 metres and above are quotations from the nominated construction contractor and suppliers. The stack costs for 25 metres and 30 metres were extrapolated from these quotations. The costs changed from those submitted with the original Application because the Environment Agency requested some changes in the stack height assessment – the removal of the costs of SNCR. The revised stack costs were included because a new quotation was received from the contractor and some inconsistencies in the exchange rate were corrected. This is explained in the Applicant's response to our information notice dated 26 April 2017 which was received on 12 May 2017.
PAIN state that the results have been presented as a result of a 'goal seeking exercise' where the sheet works backwards from the required results and enters corrected values in the cells associated with the calculation.	This is not so. The Applicant has undertaken a cost benefit analysis using our methodology which we consider appropriate.
PAIN state that the modelling assumes negative marginal stack costs for very low stack heights (25 and 30 metres).	The maintenance costs are changes from the base case of a stack height of 35 metres and so a negative maintenance cost for a stack height of 30 metres simply indicates that the maintenance costs for this stack height will be lower than the base case.
PAIN state that the treatment of capital costs, whilst accepted in the engineering field, would never be acceptable in a project finance context and the project should be on a fully projected basis and conducting a net present value analysis.	This may be the correct approach for certain financing projects but not for undertaking a cost benefit analysis in the determination of an application under the Environmental Permitting Regulations 2016. We consider the approach used by the Applicant as appropriate.
PAIN state that the spreadsheet has been manipulated.	We do not believe this is the case. We have examined the spreadsheet in our assessment and we confirm that the spreadsheet has not been manipulated by the Applicant.

PAIN request that the analysis should be repeated, taking into account the key externalities of the impact on air quality and visual amenity.	The impact on air quality is already taken into account, as the cost benefit analysis is based on the annualised cost to achieve a reduction of 1% of the air quality assessment level of nitrogen dioxide. The impact on visual amenity is not included because it does not fall under the environmental permitting regime. Visual impact is relevant to the planning authority. As noted in section 3.4 of the stack height justification, if it were taken into account, it would lead to the selection of a shorter stack, rather than a taller one.
PAIN state that cost is the primary issue of the Applicant's cost benefit analysis and not performance.	The stack costs for 35 metres and above were taken from quotations by the construction contractor and technology supplier. The Applicant reports that there is a slight variation in costs per metre but these are not significant. To confirm that the point is not significant, the Applicant re-calculated the 45º line with a constant cost per metre of £55,556, which is derived from the difference between the shortest stack (35 metres) and the tallest one (95 metres). The change in stack costs is less than 1% and the intersection point moves from 57.38 metres to 57.39 metres. The reason the cost for a 58 metres stack in the final stack height justification document is lower than the cost for a 35 metres stack in the original application is because the costs in the original application included the SNCR system, which was removed as requested by the Environment Agency (see information notice dated 26 April 2017). We do not believe that there is a distortion of figures by the Applicant.
PAIN state that the cost presented by the Applicant is flawed and requests that an independent economist analyses the cost.	The cost benefit analysis has been reviewed by our principal economist. Based on the information provided during the determination, we are satisfied that the costs presented by the Applicant are appropriate.
PAIN do not agree with the 45º line methodology in the cost benefit analysis as it is flawed.	The 45º line methodology is discussed in section 6.1.2 of this decision document. We consider that the approach is appropriate.
PAIN recommend that a stack height of between 85 and 90 metres will reduce NO_2 impact by half and should be considered by the Applicant as background concentrations are higher than is stated in the modelling.	While an increase in stack height will reduce the impact of pollutants, the importance of the cost benefit analysis is to determine at which point the increase in cost outweighs the increase in benefits to people and the environment. Figure 4 in the stack height assessment document shows that there is a change in slope in the graph at a stack height of between 50 to 60 metres above surrounding ground levels. The stack height of 58 metres above surrounding ground level is justified on these grounds.

	We do not consider that background concentrations are higher than stated in the Application. We have carried out sensitivity checks using our own data and we consider that the Applicant's modelling is robust and impacts are not significant. Please refer to our response to comments on stack height made by the parish councils above.
The Environment Agency should explain why it considers that the proposed stack height is comparable to that of other plants and the influence of building height in the context of the effects on the overall pattern of emissions dispersion.	Please refer to section 6.1.2 of this decision document which explains the relationship between stack height, terrain and the height of buildings on site. We have examined the data provided by the Applicant with respect to building height and stack height of other energy from waste plants permitted in the United Kingdom. We have compared the building height of the proposed Installation with those of other plants and the resulting NO_2 impact (see Table 6.4 in this decision document). Our review leads us to believe that building height, terrain and meteorology (location) have an influence on the height of a plant's stack and the magnitude of pollutant impact. Note that the proposed Installation will adopt a more stringent daily average NOx emission limit (150 mg/Nm^3) compared with that of other similar or larger plants (200 mg/Nm^3).
Air dispersion modelling	
PAIN does not agree with the Applicant's statement that "*the wind tunnel validation studies (CERC 2013) shows that with stack building height ratios of more than 1.5, the model performs well*".	The Applicant provided further information which showed that the wind tunnel validation studies referenced in the dispersion modelling report do demonstrate that the model performs well at predicting the maximum concentrations under the circumstances pertaining at the proposed Installation. We agree with the Applicant's statement.
PAIN suggests that the sensitivity of the calculated stack height should be tested for a reasonable range of modelling accuracy (+/- 25 %).	The Applicant's model already includes a number of in-built and inherent conservative assumptions, which means that the predicted concentrations are already conservative. Even if a model uncertainty of 25% were considered, it would be more than covered by the conservative assumptions. As part of our auditing of the Applicant's dispersion modelling, we have undertaken sensitivity checks. We are satisfied with the Applicant's predictions.
PAIN recommend that the stack height should not be compared with other energy from waste plants but should be based on the site and its determining factors. Given recent reports showing the	PAIN argues that the proposed stack height of 58 metres is low when compared to other plants of similar or greater size but then states that the stack height of the proposed Installation should not be compared with that of other plants. We consider that the appropriate approach is to consider the stack heights of other similar plants and

Braintree area as high for pollution in NO_2, the stack height should be between 75 metres and 85 metres.	the impact of emissions on the environment and human health taking the local environmental conditions into account. We assume that PAIN is referring to the Friends of the Earth's report – "Unmasked: the true story of the air you're breathing". The author of the report states that "*the readings from the tubes are snapshot measurements which have not been collected for a whole year, and as weather (and air pollution with it) can vary over the year, they are not strictly comparable with the results of official monitoring stations*". For this application, the Applicant has used 5 consecutive years of meteorological data in their air dispersion modelling which takes into account inter-annual meteorological variation. The use of the background concentration data is in accordance with our guidance. We have reviewed the air quality dispersion modelling provided in the Application which assessed the maximum potential impact of the proposed Installation. We are therefore satisfied that the Applicant has used appropriate methodology and that the conclusions presented in the reports represent a reasonable assessment of the predicted emissions from the proposed Installation and their potential impact on human health. These assessments conclude that there will be no significant impact to human health. As the assessments have been based on the maximum potential impact, we are therefore satisfied that there would be no significant impact to human health at any receptors within the locality of the proposed Installation.
Braintree has been identified as a hotspot for NO_2 in the report *Unmasked: the true story of the air you're breathing* These new findings must be included in the assessment of background air quality and included in the baseline analysis.	Please refer to our response above with respect to proposed housing developments and impact of air emissions. The Applicant has provided background data from the official sources of background concentrations of pollutants in their air dispersion modelling which we consider appropriate.
PAIN is concerned that the Applicant's air quality and human health impact assessment reports appear to show significantly high levels of cadmium and chromium VI.	We have examined the Applicant's air quality dispersion modelling. We consider that cadmium and chromium VI concentrations are not significantly high as claimed by PAIN. Please refer to section 5.2.3 of this decision document.

PAIN is concerned that the Applicant's air quality modelling shows H26 as a sensitive receptor and is denoted as "Agricultural". This is incorrect as the receptor is at the centre of Coggeshall village.	The Applicant confirms that the receptor (H26 Coggeshall) identified in the HHRA report was conservatively assessed as an agricultural receptor. It is understood that in rural areas, such as the areas around the proposed Installation, some local residents grow their own food, such as vegetables or have livestock (chickens). If this receptor was identified as a residential receptor, the predicted impact on this receptor would be less. Consequently, the designation of H26 as an agricultural receptor does not change our conclusion on the human health impact of emissions from the proposed Installation (Refer to section 5.3.2 of this decision document).
PAIN is concerned that the Applicant has under-reported the moisture content of the flue gas from the waste incineration plant.	We have considered the claim made by PAIN. The Applicant provided additional information demonstrating how the moisture content was calculated. We consider the calculation to be correct. Even if there is a change from 17.46% to 20.2% in moisture content as PAIN suggests, the change in the emission rates will be negligible and well within the inherent modelling uncertainties that have already been considered as part of our audit.
Air quality and impact of emissions on human health	
It was queried whether a stack height of 58 metres was sufficient to protect health.	Stack height is discussed in section 6.1.2 of this decision document. Emissions to air from the Installation and their potential impacts on human health are discussed in sections 5.2, 5.3 and 5.5 of this decision document. We have audited the Applicant's air quality and human health impact assessment and agree that the conclusions drawn in the reports are acceptable, that there would be no significant impact on the environment or human health.
Emissions of nitrogen oxides are recognised as too high and will impact human health and businesses in the area. The way in which emissions should be reduced should be determined by the best technology available not by cost.	Please refer to sections 5.2.1 and 5.2.2 of this decision document for an assessment of NOx emissions. The impact on air quality from NO_2 emissions has been assessed against the ES of 40 µg/m^3 as a long term annual average and a short term hourly average of 200 µg/m^3. Section 5.2.1 shows that the peak long term process contribution is greater than 1% of the ES (2.2%) and therefore cannot be screened out as insignificant. Even so, the emissions are well below 100% of the ES. The peak short term PC is less than 10% and is screened out as insignificant. Best available techniques (BAT) considers cost to the Operator and benefits to people and the environment. The abatement of emissions is discussed in chapter 6 of this decision document. We are satisfied that the

	abatement of emissions proposed by the Applicant is BAT for the proposed Installation.
PAIN ask how the Applicant will filter and minimise the small particles PM_{10} and $PM_{2.5}$ as new air quality objectives for $PM_{2.5}$ are being introduced and will need to be met between 2010 and 2020. BAT for filtration will still allow <$PM_{2.5}$ to escape in some measure and it is known that a small percentage of this matter will be dioxin/furan or other toxic material.	The impact of particulate matter (PM_{10} and $PM_{2.5}$) on human health is shown on Tables 5.1 and 5.2 in this decision document and the emissions are insignificant. Abatement of particulate matter is discussed in section 6.2.2 in this decision document. The Incineration BREF states that fabric filters generally provide effective abatement down to below 5 mg/m^3 of particulate material. A European Commission's science alert report issued on 2 February 2012, reported actual measurement of ultrafine particles on a waste to energy plant where the bag filters were shown to capture more than 99.99% of such particles. As discussed in chapter 6 in this decision document, we are satisfied that the abatement systems and techniques represent BAT for the proposed Installation.
PAIN ask the Environment Agency to demonstrate how the average exposure indicator targets for $PM_{2.5}$ have been applied in this case.	The average exposure indicator (AEI) is a measure of UK average $PM_{2.5}$ concentrations using Government monitoring locations pursuant to the Ambient Air Directive 2010. We consider the impacts from the proposed Installation on ambient $PM_{2.5}$ levels in the local community as insignificant (see Table 5.1 in this decision document) and hence likely to have only a negligible effect on the UK average exposure indicator.
PAIN ask how the Applicant has met or exceeded the national exposure reduction target to ensure that the AEI for 2015 does not exceed 20 µg/m^3 and that the revised targets for 2018-2020 are met or exceeded (i.e. when the proposed plant may be operational).	The national exposure reduction target (NERT) is defined by the Ambient Air Directive 2010 as a target for reduction in $PM_{2.5}$ exposure for 2020 by a re-evaluation of the AEI. From our detailed audit of the Applicant's air dispersion modelling, we are satisfied that the $PM_{2.5}$ impacts are insignificant and therefore priority for further control is not necessary other than the stringent standards required by IED and by BAT. The proposed Installation is likely to have a negligible effect on $PM_{2.5}$ concentrations locally and will not affect UK compliance on NERT and AEI targets.
PAIN ask how the national exposure reduction target targets will be met and implemented as the plant is unlikely to be in operation by the time these limits are increased and applied and adherence will therefore be mandatory.	As the impact is likely to be insignificant, the effect on UK compliance with NERT will be negligible.

PAIN request that the entire application be reviewed with respect to 8 reports clearly showing the efficacy of the mitigation measures proposed by the Applicant.	We have reviewed the reports referred to by PAIN. The contents of the reports cover a wide variety of issues and are summarised below: • A discussion on the impact of air pollution in general (from outdoor and indoor sources) with no specific reference to waste incineration plant. There are recommendations for European, national and local government, business and industry, schools and the NHS, as well as individuals in society at large (*Every breathe we take – the lifelong impact of air pollution*); • A general review of EU Directives on air quality and emissions and five case studies on conflicts between citizens and installations devoted to the incineration or co-incineration of waste. The report criticises EU legal framework on setting emission limit values, defining BAT, compliance breaches, public consultation and calls for more stringent emission limit values (*Air Pollution from Waste Disposal: Not for Public Breath*); • Monitoring of nitrogen dioxide levels by means of a kit by volunteers. It is on the basis of the data collected via this method that identified Braintree as a one of the "13 new hot spots for nitrogen dioxide". However the report also states that the results are based on a "snapshot measurement" of nitrogen dioxide and not collected for a whole year. • Advice to the Government on estimating mortality effects associated with long-term NO_2 concentrations from all sources for use in developing plans to reduce NO_2 and improve air quality (*COMEAP interim statement on quantifying the association of long term average concentrations of nitrogen dioxide and mortality*). • A report produced by British Society of Ecological Medicine on the impact of incinerators on human health (*The Health Effects of Waste Incinerators)*. We have discussed this report in section 5.3.1 of this decision document. For the 2008 edition, please see Public Health England's comments below. • Two research papers on emissions of particulate matter from incinerators: *Ashworth*

et. al. (2013) – which found that the PM_{10} concentrations from two UK incinerators were within the IED emission limits and supports the use of dispersion modelling compared to distance as a proxy measure to pollutant exposure and *Douglas et. al. (2017)* – which found that PM_{10} exposures related to municipal waste incinerators in Great Britain were extremely low compared to annual mean background concentrations.

- An online survey of the opinions of 100 expert stakeholders regarding evidence of new emerging issues on risks to health from air pollution. The main finding was that 40.7% of respondents considered that road transport posed an emerging health risk compared to waste activities at 1.8%. (*Health risks of air pollution in Europe – HRAPIE project*).

Public Health England (PHE) is the expert body on public health and as such it is their responsibility to take a balanced view regarding the evidence of the impact of incinerators on human health. The Environment Agency takes advice from PHE on the health implications of incinerators generally and specifically on each application for an environmental permit. Our role is then to act on their advice.

In 2010, the Health Protection Agency (now Public Health England) published advice on the health impact from incinerators (see RCE-13: the impact on health of emissions to air from municipal waste incinerators). They reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. They state 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". This view is based on detailed assessments of the effects of air pollutants on health and on the fact that modern and well managed municipal waste incinerators make only a very small contribution to local concentrations of air pollutants.

The Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment reviewed the cancer data and has concluded that there is no need to change its previous advice, namely that any potential risk of cancer due to residency near to municipal waste incinerators is exceedingly low and probably not measurable by the most modern techniques. Since any possible health effects are likely to be very small, if detectable, studies of public health

	around modern, well managed municipal waste incinerators are not recommended. We have considered whether the contents in the reports above have changed PHE's position on the health impacts of emissions from waste incinerators and our assessment of the Application including the abatement of pollutants proposed by the Applicant. We consider that they do not. We consulted PHE on two separate occasions during this determination. Their comments are summarised in this Annex. Please refer to section 5.1.2 of this decision document, which discusses our use of air dispersion modelling. As already mentioned, the particulate matter process contribution (PM_{10} and $PM_{2.5}$) from the proposed Installation is predicted to be less than 1% of the long term ES at the point of maximum impact, hence likely to be insignificant. Chapter 6 of this decision document discusses the proposed abatement (mitigation) of pollutants from the Installation. We are satisfied that the abatement systems and operating techniques proposed by the Applicant represent BAT for this Installation as specified in the EU Waste Incineration Bref documents and our technical guidance note EPR 5.01.
How can this new polluting facility be put in service unless pollution from other sources is reduced to achieve the Government's pollution reduction targets especially that of particulate matter?	Most of the contribution to air quality comes from sources such as traffic. The particulate matter process contribution (PM_{10} and $PM_{2.5}$) from the proposed Installation is predicted to be less than 1% of the long term ES at the point of maximum impact. The setting of targets for reduction of air pollution and how to achieve these targets is a matter for the Government.
The stack finish needs cleaning at least twice a year and as such the plant will need to be shut down and this will significantly impact the abnormal emissions thereby increasing the amount of time the emission limits are exceeded.	This is incorrect. Stack cleaning will be part of the annual maintenance procedures specified in the Applicant's Environmental Management System and is undertaken during periods where no waste will be charged. The Operator has adequate systems in place to ensure that no fugitive emissions are released into the environment during this exercise. The emission limit values specified in Table S3.1(a) in the Permit applies during abnormal periods as defined by the IED.
Discharge to surface water & water usage	
PAIN ask why the water usage used in the public drop-in session indicated the abstraction of water greater than those stated in	The figure in water usage diagram displayed at the public drop-in session was not correct. We rectified this by showing the correct figure in the Applicant's supporting documents to members of the public who attended the event. The correct figures submitted with

the abstraction licence.	the Application are available on our public register.
The Applicant states that they will use a closed loop system which will not require extraction from the River Blackwater. Extraction of water in the summer would harm the river and its wildlife. A closed loop system should be enforced, allowing no extraction or discharge of water from the river to prevent any pollution or other damage.	The Applicant has proposed a closed loop system which ensures no discharge of any liquids to the River Blackwater. The permit ensures that this is the case – there is no point source emission to surface waters. Part of the Applicant's water use system involves the abstraction of water from the River Blackwater under an existing abstraction licence. The abstraction of water from the River Blackwater is from November to March of every year as specified in the separate abstraction licence.
Best Available Techniques (BAT)	
PAIN ask why the Applicant has not included plasma gasification in their BAT review.	Gasification technology was considered by the Applicant in their BAT review (refer to section 2.6.5 of the Supporting Information of the Application). The Applicant reports that various suppliers are developing pyrolysis and gasification systems for the disposal of waste-derived fuels, however these systems are not considered proven. Currently there are no pyrolysis or gasification systems which are of a capacity required to process the nominal design capacity for the proposed Installation. Therefore the Applicant has not considered these incineration technologies any further. We are satisfied that the technology the Applicant has chosen is BAT (see chapter 6 of this decision document).
PAIN is concerned that BAT is not being applied at the Installation in accordance with the IPPC Directive. Emission limit values should be set in accordance with BAT taking into account the immediate geographical area and not by comparison with other plants.	Directive 2008/1/CE on Integrated Pollution Prevention and Control (The IPPC Directive) was replaced by the Industrial Emissions Directive (IED) in January 2013. We have determined the application in accordance with BAT as specified in the IED. Emission limit values have been set in accordance with Part 3, Article VI of the IED. In our determination of BAT, we have examined the emission limits set for other installations and the immediate geographical area. By way of illustration, the Applicant has proposed a more stringent daily average NOx ELV (150 mg/Nm^3) than that allowed under IED for other installations (200 mg/Nm^3). We are satisfied that BAT as specified by the IED will be implemented at the proposed Installation.
Other issues	
PAIN request that the Environment Agency undertake a review of the Applicant's plume	Please refer to our response in section A of this Annex. Plume management is a specific condition in the current planning consent and a matter for the local planning authority.

management plan as it is inadequate.	
PAIN request that the Applicant provides more information about the amount, type and hazardous nature of the bottom ash produced and plans for the safe disposal of bottom ash that cannot be directed to landfill.	Please refer to section 4.3.10 of this decision document which addresses the production of wastes including incinerator bottom ash. The estimated annual throughput of incinerator bottom ash is 145,000 tonnes. The estimated annual throughput of fly ash/air pollution control residues is given as 18,000 tonnes. We are satisfied that we have sufficient information to determine this Application.
PAIN is concerned that different set of documentation to those posted with the application have been amended (stack height) March 2017 and changes are not shown or notified and it is difficult to assess changes within the subsets.	All documents submitted in this determination have been uploaded onto the public register. The version of each document is stated and is available to the public.
With the design of the incinerator being made to blend into the environment, it will require additional lighting as a safety measure. The impact of the light pollution has not been taken into account.	Light pollution at the proposed Installation has been considered by the Applicant as part of their planning application. It is not for the Environment Agency to revisit matters properly considered by another authority who can be relied on to do its role.
The design of the incinerator has safety concerns for aircraft, particularly with the location of a nearby airfield.	The construction of the proposed Installation with respect to risk to aircraft has been considered by the Applicant as part of their planning application under the planning regime. We do not consider that the height of the stack at 58 metres above surrounding ground levels will change the risk of danger to flying aircraft. The stack is comparable to the existing telecommunications mast located at Sheepcotes Farm and the network of high voltage electricity pylons that cross the open countryside which stand unlit at 50 metres above surrounding ground levels. The high voltage electricity pylons skirt the perimeter of Earls Colne Airfield and are unlit. The Applicant reports that confirmation has been received from the Civil Aviation Authority that the proposed stack height will not require a lighting beacon. The lighting of en-route obstacles only becomes legally mandatory for structures at a height of

	150 metres or more above ground level. The Applicant confirms that the location of the stack and elevation will be notified for aviation purposes to the Ministry of Defence Geographic Centre. In addition, Essex Police and Essex and Hertfordshire Air Ambulance will also be informed so they can enter its position into their flight system(s).
The visual impact of the stack and physical impact of emissions upon the landscape setting and the fabric of listed historic buildings has not been properly assessed. The increase of the stack height has not been taken into account with the zone of theoretical visibility. This requires updating and a year-round assessment needs to be made before a permit should be issued.	Visual impact will be addressed by the planning authority in any revised planning application. See our response to the initial consultation with respect to the impact of air emissions on listed buildings in section A of this Annex.
Incineration should not be considered an acceptable form of disposing waste given that CO_2 is an inevitable product of the combustion of waste. It also results in high levels of greenhouse gas emissions, which is not compatible with low-carbon sustainable approaches to dealing with waste.	Incineration is specifically provided for under the IED and so is considered acceptable for dealing with residual wastes not suitable for other forms of waste treatment. The need or otherwise for an incinerator is with the waste planners. We regulate the emissions from the process. The impact of the Installation and the global warming potential is discussed in section 6.3 of this decision document. The CO_2 emissions from incineration is a combination of direct CO_2 as a combustion product and as CO_2 equivalent from other substances such as N_2O, which has a GWP rating of 310 (i.e. it has 310 times the effect of CO_2 as a greenhouse gas (GHG)). The electricity that is generated by the incineration of waste will displace emissions of CO_2 released from a landfill or other forms of waste treatment. A landfill also emits CO_2, which may be in lower quantities than an incinerator. However it also emits methane in large quantities which has a GWP rating of 25. We assess GWP as a whole and not just in relation to CO_2. Our assessment includes “on the credit side” CO_2 saved from the GHG emissions by displacement of waste disposal to landfill. The GHG referred to here includes methane. In addition, the electricity that is generated by the incineration of waste will displace emissions of CO_2 released elsewhere in the UK, as virgin fossil fuels will

	not be burnt to create the same electricity.
The goal of the Environment Agency is to work to create better places for people and wildlife and support sustainable development. This permit is in contradiction to that objective.	Part of the Environment Agency's role is to assess applications for environmental permits and issue permits as required by national and EU legislation. In reaching our decision to grant the permit, we have assessed the impact from the operation of the proposed Installation and 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. When assessing an application for an environmental permit, our priority is to ensure that the proposed Installation will be designed and operated without posing a significant risk to the environment and the health of local people. Before we consider issuing a permit, the Applicant must demonstrate that the proposed Installation will meet all the legal requirements, including environmental, technological and health requirements. In this instance, having considered all the relevant factors including representations received from our consultation (see list of consultees in Annex 4), we have reached the decision that the proposals would not give rise to any significant pollution of the environment or harm to human health. On that basis, we consider that there is no contradiction to our objective or goal.
Given the Applicant's continued misleading information over the last few years, the proposed Installation will not be a 'well managed incinerator' or a 'state of the art incineration'. The Applicant is not committed to protecting the environment only the pursuit of profit.	We have no reason to believe that the Applicant has submitted misleading information during the determination of this Application. We are satisfied that the Applicant will operate the proposed Installation in accordance with the Permit conditions. The decision was taken in accordance with our guidance on what a competent operator is.
The permit should contain a condition to the effect that, following commissioning, the Applicant should work with the relevant Local Authority and local communities to monitor the ground concentrations at the sensitive receptors.	We do not support the monitoring of pollutants off-site. Please see our response to the parish councils' comments on off-site monitoring above.

The quality of graphical presentation by the Applicant is unacceptable. The geographical features and location names are very difficult or impossible to determine. The Applicant should reproduce the emissions plots with ordnance survey 1:50,000 maps as the background.	We have examined the emission plots provided by the Applicant. The emission plots are consistent with plots submitted by other applicants for permit applications submitted to us for determination. We consider that they are acceptable. A reproduction of the emission plots is not required.
The documents submitted to vary the stack height for the planning application differ from those submitted to the Environment Agency. The planning documents submitted to Essex County Council should be reviewed by the Environment Agency	Under the planning regime, the Environment Agency will be consulted by Essex County Council to make representations on the planning application. We will do this at the appropriate time. We suggest that any issues with respect to the documents submitted for the planning application should be directed to Essex County Council.

d) Representations from Individual Members of the Public

This section reports on the outcome of the public consultation on our draft decision carried out between 20 June 2017 and 18 July 2017. Copies of the draft decision were placed on our web site (GOV.UK), our consultation web site (Citizen Space) and on the Environment Agency Public Register at the Environment Agency Office, Rivers House, Threshelfords Business Park, Inworth Road, Feering, Kelvedon, Colchester, CO5 9SE. Anyone wishing to see the draft decision could do so and arrange for copies to be made.

The public drop-in event was held at Christ Church, Stoneham Street, Coggeshall CO6 1UH on Friday 30 June, 2017. This event was aimed at explaining our decision making on the Application to the public and also to give the public the opportunity of providing any new relevant information which may not have been considered during the initial consultation. Notice of the public drop-in event was sent to interested parties by email on 20 July 2017 and 26 July 2017.

The drop-in event was attended by about 100 persons, who were a mixture of local residents and the business community likely to be impacted by the proposed Installation. They were provided with feedback sheets to help facilitate the recording and collation of comments on our draft decision. The attendees were advised that if they had any relevant issues about the determination that had not been resolved in the drop-in event discussions and not considered in the draft decision document, they should respond by providing representations using our online consultation system (Citizen Space), consultation email inbox or write to the designated Environment Agency address. We acknowledged and continued to give consideration to

representations that were received after the stated consultation end date (18 July 2017). The representations subsequently received are included in summary in the table below.

We received a total of 2,025 representations from individual members of the public in response to this stage of consultation, including those submitted by attendees at the public drop-in event described above. A majority of the issues raised in the submitted representations were extracted from the no2incinerator website. Some respondents submitted several representations which contained the same comments during the consultation period.

In some cases, the issues raised in the second round of consultation were the same as those raised previously and already reported in section A of this Annex. Where this is the case, the Environment Agency response to those issues have not always been repeated. Reference should be made to section A for an explanation of the particular concerns or issues. Some of the consultation representations received were on matters which are outside the scope of the Environment Agency's powers under the Environmental Permitting Regulations. Our position on these matters is as described previously.

Representations from individual members of the Public	
Brief summary of issues raised	**Summary of action taken / how this has been covered**
Public consultation	
It is understood that 2,000 signatures are required to lodge a formal objection to the Environment Agency before the permit application can be refused. What would need to happen, in order that the 'minded to issue' decision be reversed?	No, this is incorrect. There is no specified number of representations required that means we can refuse an Application for an environmental permit. Our decision is made on the merits of each Application and the applicable legislation. It is **the relevance of comments** made that is an important consideration to the Environment Agency and not the number of objections or representations received. Strength of public feeling is not something we can take into account when determining an environmental permit application. We carry out a technical assessment of impacts and techniques as described in the body of this decision document. We consult the public in order that they can input into this process. We will only issue a permit after carefully considering the Application and all other relevant information along with all representations made to us as set out in this Annex.
Concern regarding whether sufficient awareness and full consultation on the proposal has being undertaken as the local community were unaware of the extent of the proposal and people	Due to the level of the local community's concerns about this Application, we have been keen to speak to local people, valuing the opportunity to hear about any local factors that could be important in our decision making. Our intention was to reach as many people as

have not been given adequate opportunity to absorb the facts and decide if they wish to object. A public drop-in event should have been held in Silver End.	possible. We sent out email notifications to all interested parties which included the MP's office, local action group (PAIN), parish councils, county and parish councillors and people who responded to the original application which was refused in 2016, to make them aware of our draft decision and the public drop-in event. Details of the draft permit, decision document and supporting documents were placed on the Environment Agency's consultation web site (Citizen Space) and on our public register. We held two separate public drop-in events in Silver End and Coggeshall (March 2017) following receipt of the Application. With respect to our draft decision, we held another public drop-in event in Coggeshall on 30 June 2017. This was undertaken in order for the public to come and ask questions about our draft decision and learn how to make representations on the Application before the consultation closing date (18 July 2017). Hard copies of the draft permit, decision document and supporting documents were made available at the event for members of the public to peruse and ask questions. We extended the closing time of the event from 7 pm to 8 pm to ensure that people could attend after work. About 100 people attended the event. We also received public representations after the closing date. The Environment Agency is satisfied that the consultation of our draft decision is in accordance with its Public Participation Statement (PPS) and was adequate and effective. This is evidenced by the number of people who attended the drop-in event and those who submitted representations on our draft decision.
The public have not been given sufficient time and appropriate non-technical information to understand what impact the Installation will have on the environment and how this impacts the air and water quality. There should be much longer public consultation and public debates before a "minded to" decision is made.	We have given the public two separate opportunities to comment on the application in March 2017 (initial application) and June 2017 (draft decision). We consider that sufficient time has been given for consultation.

The public consultation should have been undertaken at a time when people were not on holidays. Consultation should have been carried out before a minded to decision was published.	Two public drop-in events were carried out in March 2017 (before a "minded to" decision) and another drop-in event in June 2017 ("minded to" decision). We do not consider that these periods fall within the "holiday period".
The draft decision document is huge and filled with technical information and terms that cannot be comprehended. The information sheet that was handed out at the public consultation contains technical terms that are not understood and falls short of the requirements under the Plain English Campaign.	We try to explain our decision as accurately, comprehensively and plainly as possible. Achieving all three objectives is not always easy. The information sheet is one part of the information provided during the consultation of our draft decision and should be read in conjunction with the permit and decision document. A lot of technical terms and acronyms are inevitable in documents of this nature. We provided a glossary of acronyms for ease of reference in the decision document and definition of some technical terms in the Permit (see schedule 6 to the Permit). This is a technical decision which we have made as plain as we can.
Support for the project	
The proposed development is the best way to deal with waste. This development is massively overdue. The application should be approved as soon as possible. Too much waste is going to landfill in this area. It has already been delayed many years by NIMBY objectors. No objection to the development provided the Environment Agency is satisfied that there will be no emissions harmful to public health and no contamination of water courses.	Please refer to our response above with respect to waste hierarchy. We have assessed the information provided by the Application in this determination. We are satisfied that the emission limits applied to the proposed Installation mean that public health and the environment will be protected. There will be no discharges to water courses and there are appropriate measures on site to prevent the contamination of water courses.
Stack height assessment	
The respondent has raised concerns about some discrepancies in the stack height justification documents with respect to pricing information, exchange rates used, marginal and annualised costs. The Applicant appears to have	The reason for the "assumed discrepancy" is that the respondent is referring to previous versions of the documents which have been superceded. • The respondent includes a link to a spreadsheet entitled "*Additional information stack height justification revised v2*". However, this link is

done a miscalculation and assumed the exchange rate as £1.3 = €1, instead of £1 = €1.3. The Applicant has also presented the costs in Euros rather than in British Pounds Sterling.	associated with the initial public consultation on the Application which started on 9 March and ended on 13 April 2017. The spreadsheet was superceded by the current one entitled "*24 Additional Information Stack Height Justification Calculations 58m.xlsx*" • The respondent quotes Tables 2-1 and 2-3 from the stack height justification document supplied with the original Application. This was superceded by the revised document "*12 Additional Information S1552-0720-0012JRS Stack height Justification v9 clean_Redacted.pdf*" These issues were resolved in the revised documents, as explained in the responses to questions in the information notice received on 12 May 2017. The responses were uploaded onto the consultation web site (Citizen Space) during the consultation of our draft decision from 20 June to 18 July 2017. Please refer to our response to PAIN's comments above with respect to the stack height which addresses other comments raised.
What is the rationale for allowing the Applicant to calculate the marginal increase in cost against the reduction in emissions based on the 35 metre stack given that the stack is half the minimum height specified in the Environment Agency's refusal notice in 2016? Any incremental costs should be from 70 metres.	We consider that the Applicant's calculations from 35 metres above surrounding ground levels is appropriate given that this is the current stack height stated in the planning consent and which was refused an environmental permit in 2016. In addition, the stack height calculations have been benchmarked against a 35-metre stack because this is the original quote provided by the Applicant's contractors. The maintenance costs are similarly benchmarked against that height of stack. Whether absolute values or values relative to a benchmark are used makes no difference to the overall calculation because we are interested in the difference between the costs of different stack heights, not the absolute amounts.
The incremental stack height cost is not disproportionately high as a percentage of the overall project. The incremental stack height is only £2.5 million from 58 metres to 95 metres. Given that the cost of the overall plant is in excess of	The Applicant does not need to increase the stack to 95 metres as the cost benefit analysis indicates that the point at which the costs outweigh the benefits is around 57.4 metres. This is substantiated by the other two methods used by the Applicant as specified in the stack height assessment document – that there are

£200 million, the additional stack height cost is insignificant. It is noted that the Applicant stated in the previous application that a potential planning enquiry would cost £2 million.	changes in the slopes of the graph between 45 metres and 60 metres. Note that the impact of nitrogen oxides is further reduced as a result of the more stringent emission limit (150 mg/Nm^3) the proposed Installation will be operating under. The respondent provides unsubstantiated costs of the overall Installation and argues that the cost of increasing the stack to 95 metres is insignificant. The total cost of constructing the proposed Installation is not in contention. What is important to this determination is the point at which any further benefits to the environment as a result of increasing the stack begins to diminish compared to the increase in costs. BAT takes into account the cost to the Operator and the benefits to the environment under IED. Please refer to section 6.1.2 of this decision document.
The only reason the Applicant does not want to increase the stack height to 95 metres is that planning permission is likely to be refused since the site is in a totally flat rural area.	We cannot provide any response to this comment. The decision to grant or refuse a planning application rests with Essex County Council. We understand that a planning application to vary the stack height from 35 to 58 metres is currently in progress.
A respondent provides a calculation of the required stack height of 140 metres above surrounding ground levels based on annual throughput only.	A calculation of an appropriate stack height simply based on annual throughput only is incorrect and will yield no benefit. Other factors such as the height of the buildings on site, terrain, location of plant and meteorological conditions are some of the important factors to consider when selecting an appropriate stack height.
Why have you considered the cost of the height of the stack when it falls under the planning regime?	Stack height and the impact on dispersion is relevant to our determination. We consider the cost to the Operator of implementing BAT at an Installation compared to the benefit to the environment and people under the IED.
The stack height for the plant keeps changing, therefore dispersion models need to be redone. The stack height is 58 metres above surrounding ground level and not 55 metres.	The dispersion modelling has been undertaken for the originally proposed stack height (55 metres) and the currently proposed stack height (58 metres). The result shows a reduction in environmental impact of air emissions with the latter stack height. The Permit granted to the Applicant is for a 58-metre stack height above surrounding ground levels.
Independent infrastructure specialists must be consulted to ensure that this application is	We have determined the Application under the Environmental Permitting Regulations 2016. As part of this process, we have undertaken checks

financially sound at the beginning of construction through to completion, operation and provide sufficient funds to safeguard the environment.	on the Applicant. There is no known reason to consider that the Operator will not be financially able to comply with the permit conditions. The decision was taken in accordance with our guidance on what a competent operator is.
If the Applicant is not prepared to build the stack to a height which may safeguard the local population or is too expensive, then, the whole project should be delayed until such time as a suitable height chimney can be afforded; or the Applicant must be made to comply with other measures such as effective monitoring of pollutants, number of lorry movements per day, pollutants into the river and light pollution from the plant.	Our assessment of the stack height proposed in this Application is protective of the health of the local community and is considered BAT. The Permit specifies monitoring requirements (Schedule 3). Monitoring of lorry movements and light pollution are matters to be considered by the planning authority.
The cost benefit analysis is based on nitrogen levels only from a model based on data from Stansted Airport. Other pollutants should be considered when choosing stack height.	There is no benefit to be derived from including other pollutants especially where there is no likelihood of an exceedance of the ES /EQS. Our principal focus is with the long term impact of NO_2. We can use this as an indicator against which we carry out analyses of stack height, BAT and appropriate levels of dispersion. This is because the annual NO_2 level is the most sensitive to pollution taking into account the environmental impacts from likely emissions to atmosphere from this type of process.
The cost benefit analysis was carried out by the Applicant rather than an independent body.	As with dispersion modelling, we do not undertake cost benefit analyses for Applicants. We undertake an assessment of any cost benefit analysis submitted in a permit application or a derogation application.
Air dispersion modelling	
The NO_2 emissions data in previous applications and that of the current application are inconsistent.	The respondent's comments are incorrect with respect to the air quality assessments submitted by the Applicant as summarised below: <u>2008 air quality assessment – planning application – emission from two separate stacks</u> The NO_2 process contribution (PC) stated by the Applicant in the air dispersion modelling in 2008 was comparing the impact of the **short-term NO_2 concentration from two stacks** – the waste incineration plant with a stack height of 35 metres and a biogas engine stack with a stack height of 22 metres.

	The process contribution referred to by the respondent in the 2015 and 2017 environmental permit applications is the **long term** or **annual NO_2 concentration from one stack** of 35 metres and 58 metres respectively. Consequently, the short term NO_2 process contributions (2008 planning application) and the long term NO_2 (2015 and 2017 applications) cannot be the same. In the 2008 planning application, the Applicant compared the impact of short-term NO_2 from the waste incineration plant stack alone and when combined with the gas engine stack at different stack heights (35, 40 and 45 metres). The gas engine stack height remained unchanged at 22 m. The results showed that the impact of short term NO_2 varied from 14.4% to 77% of the short term ES. Please note that for this Application (single stack height of 58 metres), the short term NO_2 PC is 8.11% of the Environmental Standard, which we consider as insignificant. <u>2015 air quality assessment – environmental permit application – emission from one stack of 35 metres</u> In the previous 2015 application, the NO_2 process contribution (PC) as a percentage of ES at 35 metres applying the NOx daily average of 200 mg/Nm^3 and 150 mg/Nm^3 was provided by the Applicant. The PCs (as a % of ES) for other stack heights were derived from the Applicant's air quality assessment data by the Environment Agency. The application was subsequently refused in December 2016. <u>2017 air quality assessment – environmental permit application – emission from one stack of 58 metres</u> The NO_2 process contribution at the varying stack heights in this Application were provided by the Applicant. When compared with the figures in the previous 2015 application, they are not markedly different. Any minor differences would not change our conclusion that nitrogen dioxide emissions are well below 100% of the ES. To conclude, it is important to note that the emission rates in the previous 2008 planning application and in this Application will not be the same due to changes in the plant design, stack

	parameters and emissions profile – for example the original planning application was for a waste incineration plant with an annual throughput of 360,000 tonnes and a proposed NOx daily average emission limit value of 200 mg/Nm^3. This Application is for a plant with an annual throughput of 595,000 tonnes and a proposed NOx daily average emission limit value of 150 mg/Nm^3. Hence, the impact of NO_2 on human health is further reduced in this Application compared to the previous applications (2008 and 2015).
Concern that the Environment Agency have not compared the modelling of other incinerators and compared results with actual emissions data to confirm that the Applicant's modelling is genuine. Ambient air and water quality readings of the surrounding villages and towns have not been provided in the modelling. As a minimum, an independent model should be used with measurements taken from both inside the site and outside the site within an appropriate radius of countryside. The public should be given information on the actual emissions readings from other incineration plants against the information provided in the modelling on which the decisions are based.	We require Applicants to provide a detailed justification for their choice of models (including the version) and then assess their choice of model and its use to ensure it is appropriate. The chosen model (and the specific version) must be fit for purpose and based on established scientific principles. It also needs to have been validated and independently reviewed. We carry out our own modelling of Applicants' air quality impact assessments to assure ourselves that the models that are used are fit for purpose (as we have done in this determination). Currently the most frequently used models are AERMOD and ADMS. These have been widely used by Applicants for permits for many years now and we are very familiar with how they work and what they can do. However when they are updated, we do still carry out our own validation checks as above to satisfy ourselves that the software remains fit for purpose. We undertake emission data checks of similar applications submitted to us for determination as part of our validation checks. We have taken background concentration of pollutants into account in our assessment of this Application. Validation of dispersion modelling against real ambient measurements has been undertaken by the software developers of AERMOD (United States Environmental Protection Agency) and ADMS (Cambridge Environmental Research Consultants). The validation documents are freely available to the public. We have used these studies to help us interpret the Applicant's predictions and our own check modelling in order to make judgements about confidence in the predictions. Information regarding the emissions data from

	other regulated incineration plants can be accessed at the relevant Environment Agency public registers. It is not standard practice to publish actual emissions data from other incineration plants or take "measurements" from within the site and outside the site when auditing Applicants' dispersion modelling, although we do take background concentrations into account. The air dispersion modelling assumes emissions are at IED limits, therefore using actual measurements from other plants would give lower results.
The Applicant claimed originally that a stack height of 55 metres would not change the level of emissions from that of 35 metres, yet now they state that they will have an impact.	In the previous application, the Applicant stated that although increasing the stack height would lead to a reduction in the process contribution, it would not change the significance of the impact and the conclusions of the air quality assessment. Please refer to Table 6.2 which shows the ground level NO_2 process contribution (PC) as a percentage of the Environmental Standard. The PC at 35 metres (4.85% of the ES) is higher than the PC at 55 metres (2.4% of the ES). At both stack heights, the PCs and PECs are well below 100% of the ES and would not change the significance of the impact and the conclusions of the air quality assessment.
The prevailing wind direction is from the southwest with direct impact on Coggeshall residents. It will be much more difficult to accurately predict the dispersal of the pollutants in the future as a result of climate change and more extreme weather conditions.	We have taken meteorological conditions into account in our audit of the Applicant's air dispersion modelling. The Applicant provided 5 years meteorological data which takes into account any variations caused by climate change (Please refer to chapter 5 of this decision document).
Does the increase in stack height mean the dispersion of pollutants will cover a wider geographical area?	A higher stack creates better dispersion which covers a wider area but will result in insignificant concentrations, hence lower impact than near the stack.
There is no clear evidence that the emissions from the stack will be harmless to the environment other than the use of "modelling" which is a prediction rather than being based on facts.	Using dispersion models, it is possible to predict where the plume from the proposed Installation will travel and where it will come to ground, taking into account different weather conditions. These models are able to predict the concentration of pollutants from the Installation in the atmosphere on an hourly, daily or yearly basis. The Applicant has used computer dispersion models to estimate the effect of the emissions on local air quality. The results of the

	modelling, which are presented in detail in the Application, indicate that the impact from the proposed Installation is small. The modelling results also indicate that overall levels of pollutants, when combined with existing air quality, are well within the air quality standards laid down in the regulations. As part of our determination of the Application, we have audited the dispersion modelling which has been carried out by the Applicant. Modern atmospheric dispersion models have been extensively tested to check whether the predictions given by the models match up with actual measurements. We would only accept well validated models used to predict effects from industrial processes that we regulate.
How far away will the stack and plume be visible?	We have determined the application based on a 58-metre stack above surrounding ground levels. The visibility of the stack and the plume will be dependent on terrain and where it is viewed from. The visual impact of the plant will be assessed by the planning authority.
The environmental permit application site includes the haul road to the A120 so this should form an integral part of the facility and air pollution emissions from vehicles using the haul road should therefore be considered by the Environment Agency.	Refer to the Installation boundary submitted as part of the Application (see Schedule 7 to the Permit). The boundary does not include the haul road to the A120.
It is stated that VOCs emissions are unlikely to give rise to significant pollution from both long term and short term ES yet table 5.2 does not contain VOCs.	The reference to Table 5.2 by the respondent is incorrect. This is because there is no short term ES for VOCs. We have reported the process contribution and compared it with the annual mean. The correct reference is Table 5.1 in this decision document.
The emissions of arsenic have not screened out as insignificant yet it has been assessed as being unlikely to give rise to significant pollution. There is no justification for this.	Please refer to section 5.2.3 of this decision document which explains our assessment of emission of metals and the use of the Environment Agency guidance note on impact assessment of Group 3 metals stack releases (version 4).
Where has the Applicant's air dispersion modelling taken background readings from? How does the Applicant's analysis of the existing air quality compare	The Applicant has obtained background concentration data from Defra, Braintree District council's diffusion monitoring tubes, the UK Automatic Urban and Rural Network (AURN), the UK Eutrophying and Acidifying Atmospheric Pollutants (UKEAP) project, the Rural Metals and UK Urban/Industrial Networks (previously

with that of Friends of the Earth?	the Lead, Multi-Element and Industrial Metals Networks) and the Automatic and Non-Automatic Hydrocarbon Network. With respect to the comparison of background concentration with that of the Friends of the Earth report, please refer to our response to similar comments made by PAIN above.
Please provide a copy of your review of the Applicant's assessment and details of the audit undertaken of the air quality and human health impact assessment.	A copy of our assessment of the Applicant's air quality, ecological impact assessment and human health risk assessment is available to view on our public register.
Air quality and impact of emissions on human health	
General comments regarding guarantee of no health impact, lack of sufficient information provided on potential health impact, reduction of good air quality, increase in illnesses, research showing impact of pollutants on human health and businesses (respiratory and cardiac problems), bias of previous research, more research required, individual and combined effect of pollutants not considered.	Please refer to chapter 5 of this decision document which discusses the impact of pollutants on human receptors including expert scientific opinion. In reaching our decision, we have assessed the health effects from the operation of the proposed Installation and 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. When assessing an application, our priority is to ensure that the proposed Installation will be designed and operated without posing a significant risk to the health of local people and the environment. Before we consider issuing a permit, the Applicant must demonstrate that the proposed Installation meets all the legal requirements, including environmental, technological and health requirements. In this instance, having considered all the relevant factors including comments received from our consultation, we have reached the decision that the proposals would not give rise to any significant pollution of the environment or harm to human health. This is in line with the advice from Public Health England 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 are confident that the stringent UK and European legislation and

	effective regulation will mean that people are not harmed by the operation of the proposed Installation.
Independent reviews of the proposal indicate that emissions from the development will pose a very serious risk to public health for anyone living within a few miles radius of the development. What research has been done to demonstrate the health effects of local pollution by using a lower than recommended stack height?	The respondent did not submit the independent review referred to. As part of our decision making process, we have thoroughly checked the air quality and human health impact modelling assessments provided within the application. We have also undertaken a rigorous sensitivity analysis of these assessments including the effect of local topography and the proximity of buildings on the dispersion of pollutants (i.e. using a range of different input parameters within the modelling). Our conclusion is that the proposed Installation is unlikely to contribute to any breach of the relevant air quality standards for human health and the environment. There is no recommended stack height for any industry sector (please refer to our response to the parish councillors above with respect to stack height).
A map showing the number of schools that will be affected by air emissions from the plant was presented. The Environment Agency must not issue a permit until all standards on air pollution and health are properly addressed. There is concern over the health of the community as the information given at the public consultations was contradictory	Please refer to chapter 5 of this decision document for the impact of the proposed Installation on air quality and our assessment of it. We do not believe that information provided during the public consultation was contradictory.
The draft decision document says that people with existing cardiac issues are at risk.	This is not so. Please refer to section 5.3 of this decision document for our assessment of the health impact from the proposed Installation.
There are farms with crops and animals in the vicinity of the incinerator – what checks will be made to ensure any food from farms is not contaminated with emissions (such as metals, particulates and dioxins) from the incinerator?	Please refer to our response in section A of this Annex regarding the impact of pollutants on crops, animals and soils. Given the low risk of exceeding the TDI (dioxins) and the ES (particulates and metals), further checks or monitoring is not considered necessary. We consulted the Food Standards Agency, Public Health England and the Director of Public Health during the determination of this Application. They have not raised any concerns with respect

	to the contamination of the food chain.
Concern regarding increased nitrogen oxides in the atmosphere which will have a negative impact causing the formation of N-Nitrosodimethylamine (NDMA) during food processing.	Emissions of nitrogen oxides from the proposed Installation which could lead to the formation of nitrosamines in the atmosphere is not likely to be significant (Refer to chapter 5 of this decision document).
Incineration is against the Government's target of zero emissions and clean quality air.	This is not so. The Government's target of zero emissions and clean air quality seeks to tackle pollution from all sources, the majority which results from road traffic. We believe that incineration has a role in waste management.
Has the PHE study been completed? If the study has not been completed, how can the Environment Agency make a "minded to" issue decision? The PHE's decision to undertake another study suggests there may be a variation from the national average for people living close to installations. The Environment Agency must fully investigate micro-particles from incineration and links to dementia and small aluminium particles links to Parkinson's disease. Is there evidence of the effect on health of the population, damage to property and contamination of arable land from similar plants?	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. The study is designed to extend the evidence base and provide the public with further information. To our knowledge, the study has not been completed. PHE's current position that modern, well run municipal waste incinerators are not a significant risk to public health remains valid. As such it does not justify a delay in our decision making on permit applications. An interim study was published in June 2017 as part of PHE's ongoing studies on the health impact of incinerators. The study examined particulate matter emissions from 22 municipal waste incinerators in Great Britain. The findings showed that human exposure to particulate matter emissions from municipal waste incinerators are extremely low especially when compared to the annual mean background concentrations. The emissions of particulate matter from the Applicant's dispersion modelling supports this finding, as process contributions of both $PM_{2.5}$ and PM_{10} are considered insignificant. We are not aware of any cases of damage to property or contamination of arable land as a result of emissions from waste incineration plants.
Has evidence to prove no significant long term health issues from such facilities been undertaken?	We have considered a range of reports as described in chapter 5 and more research is being undertaken although it is not anticipated to change anything significantly.

The use of terms such as 'unlikely' with respect to health impacts shows significant flaws in understanding the impact of the incinerator's emissions on local communities. More clarity is required including those with pre-existing health conditions.	We have conveyed Public Health England's position on the impact of incinerators on human health. We consulted Public Health England and the Director of Public Health (Essex County Council) during this determination. Please refer to their comments in this Annex. Ultimately we need to determine whether the proposals will cause significant pollution of the environment or harm to human health and we do not consider that they will.
The consultation document (point 16) suggests that the incinerator could be allowed to continue operation under specific circumstances without abatement equipment. This would certainly have health implications to those living nearby and the environment.	We have addressed concerns regarding abnormal emissions in section A of this Annex. The impact of abnormal emissions as specified in the IED is described in detail in section 5.5 of this decision document. See also Table S3.1(a) of the Permit for the applicable emission limits during abnormal operation. The emission limits imposed are protective of human health and the environment.
Compliance issues	
How will the Environment Agency control the pollution of land, air and water course? How will the Environment Agency ensure that the air emissions from the Installation will not damage the quality of the air within the local community? Will announced inspections give the Applicant time to "tidy up" the plant?	We will regulate the proposed Installation by making sure that the Operator complies with the conditions of the Permit. We will do this by: • requiring continuous monitoring of the main pollutants for which limits are set and periodic monitoring for the other substances (as mentioned previously); • carrying out audits of the Operator's procedures and methods for emissions monitoring; • regular announced and occasional unannounced inspections; • adding or changing conditions in the Permit if required; • requiring the Operator to inform us if they exceed any of the emission limits in the Permit, or if they fail to comply with any operating conditions; • investigating non-compliance with any condition of the Permit; and • taking enforcement action if needed, including issuing notices, prosecuting serious breaches or potentially revoking the Permit. We undertake a combination of announced and unannounced compliance visits as we do for other plants. There is no reason to believe that the Operator is unable to comply with the conditions of the Permit. In the event there are

	breaches of the Permit conditions, we will take appropriate action.
The monitoring seems very infrequent considering the pollutants which will be discharged and it is not clear where the monitoring will be taken from and how it will be done.	Please refer to conditions 3.5.1 to 3.5.5 in the Permit that cover monitoring of emissions from the stack, process monitoring and residue quality. Schedule 3 to the Permit specifies when and where monitoring shall take place. Monitoring of stack emissions shall be in accordance with the Environment Agency's guidance notes M1 and M2 (see pre-operational condition 8 in the Permit). Monitoring of pollutants from the stack shall be in accordance with the requirements of the IED (Annex VI).
How will the audit of the operator's procedures and methods for emissions monitoring be carried out and how will this be a true reflection of the discharge?	The Operator is required to prove its monitoring results. It is standard practice for Operators to have independent contractors undertake periodic monitoring to verify these results. We will also check this monitoring using independent contractors who do unannounced sampling of the exhaust gases. The results of all monitoring will be submitted to us as specified in the Permit. This information will be placed on the public register. If a limit is exceeded, the Operator must inform us within 24 hours.
How will the Environment Agency ensure that the Operator informs them if they exceed the emissions limit or fail to comply with the operating conditions?	It is a standard condition of environmental permits for Operators to notify the Environment Agency in the event that operations on site give rise to an incident or accident which significantly affects or may significantly affect the environment. A failure to do this will be a breach of the Permit conditions. Refer to conditions 4.3.1 and 4.3.2 in the Permit. We will also carry out audits of the Operator's emissions monitoring results and make unannounced inspections to undertake an audit.
The Applicant should operate a monitoring station to detect levels in Coggeshall. If dangerous levels are detected, the stack should be switched off until safe levels return.	It is not a requirement under the IED for an Operator to maintain a monitoring station off-site. As explained above, our approach is for the Operator to monitor emissions from the stack. Compliance with the operating conditions will ensure the situation never arises.
The Environment Agency should provide information of air and water quality readings of the surrounding villages for the past year and also provide monthly regular readings of both air and water quality once the plant is	Information regarding air and water quality of the surrounding villages and towns near the proposed Installation should be sought via the local planning authority and the local Environment Agency office. The emissions data from the proposed Installation will be put on our public register once operational and will be

operational.	available to the public.
The Environment Agency will be monitoring dioxins, heavy metals every 3 months in the first year and even less going forwards. This is not sufficient as depending on what is burnt (plastics for example) on any one day will affect the emissions.	The Applicant will be undertaking monitoring of emissions as specified in the Permit, not the Environment Agency. Please refer to the list of wastes that will be incinerated at the proposed Installation (Table S2.2 of the Permit). The emission limits and monitoring requirements are specified under the Industrial Emissions Directive (Annex VI) and apply to the proposed Installation, irrespective of the proportion of wastes incinerated on any given day.
How will air quality be monitored within the surrounding areas?	Emissions are measured at source – i.e. in the chimney stack. There is no provision in the permit for monitoring of ambient air quality within the surrounding areas, because the impact is too low to be measured in this way. Ambient air quality monitoring is the responsibility of the local authorities. By way of illustration – the daily limit for particulates is 10 mg/m^3 – the maximum impact of PM_{10} from the proposed Installation is predicted to be 0.08 $\mu g/m^3$, which is more than 100,000 times smaller than the emission limit. It is also less than the natural variation particulate levels in the environment from other sources, e.g. traffic. Therefore any impact that the Installation might have would therefore be undetectable through ambient air quality monitoring.
Can the Environment Agency provide a timetable to explain what it means by "regular compliance checks"?	Our compliance checks against a permit involve a number of different types of assessment. These assessments include our evaluation of the emissions monitoring data submitted to us by the Operator together with our review of operational procedures, for example different elements of the Operator's Environmental Management System. Our compliance assessments also include announced and unannounced site visits to assess compliance with permit conditions. Whilst the submission of monitoring data has a set frequency within the permit (no less than quarterly for the majority of emissions), our other compliance assessments are timetabled on the basis of the Operator's performance at any given time. Poor performance from the Operator (as evidenced for example by breaches in

	emission limits) will result in a greater site presence in order to ensure non-compliances are rectified as soon as possible. In addition, we undertake a significantly greater amount of compliance assessment activity during the commissioning and early phases of any new development of this nature.
Can the Environment Agency publish the number of staff who will be involved in carrying out regular announced and unannounced compliance checks at the facility?	The proposed Installation will have one dedicated, locally based, site inspector who will become intimately familiar with the operation of the site. This site inspector will be supported by a team of 10 other inspectors as the need arises together with a team of specialist national technical advisors, including our Air Quality Monitoring & Assessment Unit.
Recommendations for permit conditions to include: • no discharge to the River Blackwater now or in the future; • monitoring to be undertaken and results published regularly; • a requirement for the Environment Agency and Essex County Council to work collaboratively throughout the life of the plant and responsibilities to be clearly laid out for decommissioning.	No discharge into surface waters is allowed in the Permit (condition 3.1). Monitoring and reporting conditions are specified in the Permit (conditions 3.5 and 4.2). All monitoring data will be put on our public register and it is available to the public. The Environment Agency and Essex County Council are conversant with the details of the Application and will be working together during the operation and decommissioning of the proposed Installation. A permit condition is therefore not necessary.
Water usage	
If water extraction is monitored through an extraction point, how will the water level of the River Blackwater be monitored?	The river flow level is monitored by the Environment Agency via the flow gauging station at Appleford Bridge.
What will happen if there are regular dry winters' and the level of the river is consistently low? Would it mean that the plant would cease to function or take water from the mains?	The Applicant proposes to only abstract water from the River Blackwater on "as needed basis". Effluent from the paper pulp plant will be treated at the on-site waste water treatment plant. Treated water will be stored in two lagoons and will be re-used on site. The Applicant can also take water from the mains to supplement supplies on site or reduce the scale of production at the paper pulp plant in the event of low water supply. We are satisfied that there will be sufficient water available to the Applicant for site processes.

The abstraction licence for water extraction from the River Blackwater is lax and easily circumvented. This should be revoked.	The abstraction licence sets specific conditions with respect to when extraction of water from the River Blackwater shall take place. We do not consider that the licence is lax or easily circumvented.
Operational issues	
Concern that the Applicant relies on their "enhanced capability" for their own environmental impact statement which is unproven.	We are satisfied that the Applicant has the resources and the technical capability to operate the proposed Installation. We shall ensure that this remains the case during the subsistence of the Permit.
How much waste is going to be held on the site?	Section 4.3.5 of this decision document details the maximum storage capacity of the waste incineration plant, MRF, MBT and paper pulp plant. The AD digestate storage tanks will hold up to 10,000 m^3 of digestate.
Has provision for vermin been taken into account either from the ground or from the air?	The Applicant submitted a pest management plan which we have approved. We are satisfied that appropriate measures will be in place to prevent pollution from vermin.
The transport of waste from the storage area to the feeder will produce high amounts of fugitive dust and vapour emissions to the environment and have a great potential for a fire hazard.	All waste transfer will take place in enclosed buildings fitted with abatement and on hardstanding with a sealed drainage system. Emissions of dust from treatment operations is unlikely to be significant and will be managed on site (see section 6.5.3 of this decision document). The prevention and management of fires is discussed in section 4.3.5 of this decision document. Permit conditions 3.2.1 to 3.2.3 will ensure that fugitive emissions do not cause pollution off-site.
Concern was raised about the proposed abatement ensuring no release of emissions into the environment.	Emissions from the stack will pass through an abatement system prior to release into the atmosphere. Fugitive emissions will be controlled by means of a management plan.
How is solid waste going to be disposed of? If it is disposed of in a landfill, will it not leach into the ground and water courses?	Air pollution control residues are designated as hazardous waste and must be disposed at a hazardous landfill unless another outlet is not available. Incinerator bottom ash will be despatched to an off-site processing plant or to landfill as a last resort. Condition 2.3.6 in the Permit specifies that in the event waste is destined for a landfill, that the Operator should only send waste that meets the waste acceptance criteria for that landfill. The receiving landfill will have measures in place to protect surface and/or groundwater.

Concern was raised about smoke from vehicle plant and equipment exhausts.	We do not regulate emissions limits imposed on vehicles by the Vehicle and Operator Services Agency. The plant that will be used on site will be maintained in line with the site's Environmental Management System.
Concern regarding the impact of background noise and noise impact during operation. Will noise be kept to a level as low as it is now?	A noise assessment was undertaken as part of the Application (see section 6.5.5 of this decision document). 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. As this assessment has been based on plant that has not yet been built, we have included pre-operational condition 11 which requires the Operator to submit a detailed programme of noise and vibration monitoring at the commissioning stage and when the facility is fully operational. Permit condition 3.4 covers on-going compliance with noise control.
Concern was raised about waste catching fire in the holding area and feed area.	See section 4.3.4 and 4.3.5 of this decision document that addresses accidents and fire prevention. An accident management plan and a fire prevention plan will form part of the Applicant's Environmental Management System. This will ensure that appropriate measures are in place to deal with accidents and fires if they arise at the proposed Installation.
What waste is going to be incinerated?	Wastes that will be incinerated are specified in Table S2.2 of the Permit. We are satisfied that the proposed Installation can safely incinerate the permitted waste types.
Is the plant going to handle hazardous solid waste, hazardous liquid waste and medical waste?	One hazardous waste will be accepted for treatment at the anaerobic digestion facility (07 01 08* – *glycerol waste from bio-diesel manufacture from non-waste vegetable oils only*). This is a standard feedstock across anaerobic digestion plants in England and is specified in our permit templates for biowaste treatment facilities. All other wastes are non-hazardous. There will be no medical wastes accepted for treatment at the proposed Installation.
Where will carbon and waste water from combustion that may also contain chemicals be disposed of?	The carbon will be in the burnt out ash following the incineration of waste. The burnt out ash will be sent for recycling or disposal off-site. Any waste water generated from the handling of ash will be tankered off-site for disposal at an appropriate facility.

Will the incinerator remove all pollutants in accordance with any new emission limits at the time of operation?	The abatement of pollutants as proposed by the Applicant is BAT across the industry sector in Europe and is capable of achieving the emission limits imposed in the Permit. It is unlikely that the emission limits will change across the energy from waste industry sector between now and at the time of operation.
Apart from exhaust stack pollution, will discharge into water courses be free from particulates and acid liquids and chemicals of any type?	There is no discharge from the proposed Installation to any water course.
How will the operation be monitored and linked to an operational "kill switch" if safety limits are flouted /missed.	The waste treatment processes will benefit from a number of process control features and prevent the development of abnormal operating conditions. Operations will be controlled and monitored using the Supervisory Control and Data Acquisition (SCADA) system which creates documentation that can be accessed on site and in remote locations. The system will provide a range of control and monitoring functions that automate and monitor actions throughout the plant. Any malfunction will be detected by the Operator and dealt with appropriately. These procedures are designed to ensure the integrity of the plant throughout its life.
Energy efficiency	
The degree of overall energy production is minimal. Concern that there is no tolerance built into the application should assumptions on the efficiency of the proposed plant be wrong. The proposed facility claims to offer benefits from reclaiming energy, yet there are few heat customers available, meaning it will operate in a less efficient electricity only mode. As other electricity supplies are being decarbonised, this will offer no benefit.	We consider that the Installation is high up within the BAT range when both electricity and heat output are taken into account (see section 4.3.8 of this decision document). The normal mode of operation will be combined heat and power (CHP). In CHP mode, steam will be extracted from the steam turbine to provide heat to processes at the paper pulp plant, WWTP and heat for plume abatement and space heating. The waste incineration plant is designed to accommodate variations in steam and heat loads from the various consumers on the site. If the paper pulp plant and WWTP are not operating, the waste incineration plant can continue to operate in 'power only' mode. In this mode, the steam turbine will operate in fully condensing mode, i.e. all steam produced by the boilers will pass through the steam turbine. If necessary, excess steam can be bypassed around the turbine. The steam turbine and bypass system will be designed and tested to

	react instantaneously to sudden and unplanned reductions in steam demand. If the steam turbine is out of service, the boilers can continue to operate in 'turbine bypass mode'. In this mode, all steam bypasses the turbine to the air-cooled condenser (ACC). Steam can still be provided to the paper pulp plant via equipment to reduce pressure and temperature installed at the waste incineration plant. If the plant is disconnected from the local electricity distribution network (e.g. because of a problem on the network), the waste incineration plant can continue to operate in 'island mode'. In this mode, the steam turbine generator will generate sufficient power to supply the waste incineration plant and the other processes on the site. Excess steam will go directly to the ACC, bypassing the steam turbine. Steam for processes, plume abatement and space heating will be extracted in the same way as in CHP mode.
The local community will not benefit from the plant such as cheaper electricity, just the pollution.	The identification of users of electricity and heat is dependent on the location of an Installation. The proposed Installation will not cause pollution.
Odour management	
There is little mention of odours which would emanate from the plant, the visiting garbage lorries and the solid fraction to be used as soil improver.	Please refer to section 6.5.4 of this decision document.
Best Available Techniques	
What definition is the Environment Agency using for BAT based on the Government's definition specified below? https://www.gov.uk/guidance/best-available-techniques-environmental-permits	The Environment Agency adopts the definition of Best Available Techniques (BAT) as specified in Article 3 of the Industrial Emissions Directive (IED).
If the Environment Agency approves this application at 55 metres they are failing to adhere to government guidelines on utilising BAT as the stack height should be 70 metres.	Please refer to our response to comments made by the parish councils above on stack height. The Applicant has proposed a stack height of 58 metres above surrounding ground levels. We have applied BAT at the proposed Installation in accordance with the Industrial Emissions Directive.

The Environment Agency also states that stack height is an important aspect of impacting emissions and as the competent authority under IED, the Environment Agency must offer protection for the environment as a whole.	We consider that the Application ensures the protection of the environment as a whole as required by the Industrial Emissions Directive. Refer to chapter 6 of this decision document for a discussion on BAT.
Matters of cost have been prioritised over matters of safety and the health of residents.	This is not so. The Application has been determined in accordance with BAT as specified by the IED. We have taken safety and human health into account in our determination.
The abatement of the emissions of nitrogen oxides levels should be chosen by the appropriate best technology available and intelligence rather than cost.	The abatement of emissions of nitrogen oxides by selective non-catalytic reduction (SNCR) is BAT in accordance with the EU Waste Incineration Bref documents and our sector guidance note EPR 5.01. The determination of BAT considers the cost to the Operator and the benefits to the environment. Based on the process contribution of NO_2, we consider that SNCR can achieve the appropriate abatement at the proposed Installation.
If this plant is to be built, BAT should be implemented from day one and upgraded with new technology as it becomes available. Corners should not be cut because of costs.	The Installation will be operated in accordance with BAT as specified in the EU Waste Incineration Bref documents and our technical guidance note EPR 5.01. The permit will be reviewed in accordance with any future BAT Conclusions which takes into account advances in technology.
The best available technology must be applied in order to reduce any risks for health and future monitoring plans outlined.	We have addressed BAT in chapter 6 of this decision document. We are satisfied that BAT will be implemented at the proposed Installation. Monitoring requirements have been specified in the Permit (see Schedule 3 to the Permit).
In the absence of a detailed process design, how can the Environment Agency accept the Applicant's figures, assessments and predictions in relation to BAT, modelling emissions and impact of visible plumes, fires and odour from the proposed installation? The plans and designs are constantly changing requiring a further final new submission in the future. It is impossible to agree whilst so much information is missing from the plans.	Please refer to our response to the parish councils in section A of this Annex with respect to plant design. We do not require to view the complete process design of an Installation before we can make a decision to grant or refuse an application for an environmental permit. Applicants are required to provide adequate process descriptions of the activities and the abatement and control equipment for all of the activities such that we can understand the process in sufficient detail to assess the proposals and in particular to be able to assess opportunities for further improvements. Information that is required in an

	environmental permit application include waste types, operating techniques, process flow diagrams, point source emissions, proposed abatement etc. In the determination of an application, we assess an Applicant's proposal and compare these with the relevant industry sector guidance notes and the EU Bref notes. The information provided in the Application is sufficient to enable us come to a reasonable conclusion to grant the environmental permit to the Applicant. Where some aspects are not available during a determination, they can be addressed through the use of pre-operational conditions in the Permit. We use 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 commencement of commissioning. Where we are not satisfied with the information submitted by the Operator, they will not be allowed to commence commissioning until the issues are satisfactorily dealt with. Note that pre-operational condition 3 in the Permit requires the Operator to submit a commissioning plan for approval by the Environment Agency. It is at this stage that the final design will become available. Please refer to chapters 5 and 6 for our assessment of emissions from the proposed Installation and BAT. We are satisfied that the Applicant's pollutant predictions are accurate and that BAT will be implemented at the proposed Installation.
Other waste treatment options – these issues are not relevant to this determination. We have provided responses for completeness only.	
The Environment Agency should be working to reduce the amount of waste at source by seeking legislation that promotes standardised recyclable packaging instead of awarding permits to pollute.	We have considered the size of plant as presented. It is argued that as the quantity of residual waste reduces over the lifetime of the installation, the need to maximise efficiency by maintaining the incinerator at full capacity will suppress waste recovery and recycling initiatives, which are higher up the waste hierarchy. The proposed facility forms part of an integrated waste management strategy. The shape and content of this strategy is a matter for the local authority. The incinerator is one element in that strategy, and the Permit will ensure that it can be operated without giving rise to significant

	pollution or harm to human health. In any event, permit conditions will prohibit the burning of any separately collected or recovered waste streams, unless contaminated and recovery is not practicable.
Changes to the landfill tax means that the cost of incineration will increase. Defra has stated that this will have an impact on the viability of incineration sites and alternatives need to be found to landfill and incineration. It has also been noted that Defra has started withdrawing funding for incinerator sites.	Changes to the landfill tax and the withdrawal of funding for incineration sites is a matter for the Government. The comments are not a consideration in this determination.
How can this plant be better than recycling given that for every 4 tonnes of rubbish there is one ton of ash of which 10% is lethal?	The proposed Installation is an integrated waste management facility which consists of other activities on site other than waste incineration. Incineration is part of an overall strategy and currently there are still residual waste streams that cannot be recovered/recycled and will require treatment. Please note that the proposed Installation reduces the waste going to landfill whilst generating electricity and heat.
The incinerator is not needed now that the Basildon one is up and running, and is coping well whilst not even running at full capacity. There is limited combustible materials availability for incineration and it is understood that no further incinerators need to be built. There is no need for the plant. The capacity of the incinerator is far in excess of local need creating a disincentive to recycle, reuse and recover waste in the local area and an increase in transportation of waste over long distances.	The Environmental Permitting regime does not require an Applicant to demonstrate need. We have had regard to the objectives of the Waste Framework Directive (see section 7.1.2). Condition 2.3.3 and Table S2.2 in the Permit specify which wastes can be burned in the incinerator so as not to undermine recycling/recovery. The capacity of the incinerator is primarily a matter for the Applicant designed to meet the waste disposal needs of the local authority. It should form part of an integrated waste management strategy which is a matter for the waste planning authority. The Permit will ensure that it can be operated without giving rise to significant pollution of the environment or harm to human health.
The Environment Agency should be encouraging autoclaving, superheated steam or enclosed microwave disinfection which achieve complete combustion of waste gases and minimal particulate emissions instead of	The BAT for choice of incineration technology and abatement of emissions is discussed in Section 6.1 of this decision document. The Applicant carried out a review of the candidate furnace types in the Application. The Applicant concluded that only moving grate and fluidised bed were technically proven options at large

incineration which is outdated and is not sustainable. More measures and tests need to be made to make sure that the incinerator is the safest recycling option.	scale. Moving grate and fluidised bed technology were considered in more detail. We consider that the proposed operating temperature and BAT assessment submitted by the Applicant are in accordance with the EU Waste Incineration Bref documents and our sector guidance note EPR 5.01. It is generally argued that incineration is not an environmentally sustainable technology and therefore almost by definition cannot be considered to be BAT. The Environment Agency is aware that a number of proposals are coming forward for other ways of dealing with waste streams. Mass burn incineration at this scale can still be considered BAT, subject to the appropriate assessments being made. Some technologies such as plasma arc gasification are currently considered not to meet the definition of "availability" due to their very limited application worldwide.
Carbon emissions & global warming	
Concern regarding the effect on the environment in the form of global warming, acidification and photochemical ozone.	We have discussed global warming in section 6.3 of this decision document. The Applicant submitted a greenhouse gas assessment in the Application which included acidification and photochemical ozone. We have reviewed the assessment and agree that the chosen options are BAT for the proposed Installation.
Why has carbon capture technology not been examined by the Applicant?	Carbon capture and storage (CCS) is an issue for consideration in plant design and specification for the production and supply of electricity from large scale combustion plants generating capacity at or over 300 MWe. It is of a type covered by the EU's Large Combustion Plant Directive (LCPD) that use primary fuels (gas, oil, coal) to prevent increasing the amount of CO_2 (and methane) in the air. The proposed Installation is permitted as an integrated waste management facility. In the event that CCS becomes 'available' for plants such as this, it will be included as part of our periodic reviews.
Other issues	
The Environment Agency must clarify the standards that will apply to the construction of the Installation during the determination and during its operation prior to granting the permit, given that the UK will be leaving the European Union.	Construction of the proposed Installation is outside our remit. The Application has been determined under the Industrial Emissions Directive and will be regulated under the same Directive upon permit issue. The United Kingdom remains a member of the European Union until March 2019. On leaving the European Union in 2019, we shall follow the

	advice given by the Government on the regulation of new and existing Installations.
A decision on the re-routing of the A12 and A120 will be made later this year. In addition, the Draft Local Plan has not been decided and could result in new housing close to the site. Therefore, the permit should not be granted until these decisions are made.	The designation of new route for traffic and housing development is a planning issue. However we have taken the possible routes of the A120 and the improvement of the A12 into account in our air quality assessment. Please refer to our response to air quality responses raised in this Annex.
Please confirm if the Environment Agency is aware of all the planning conditions on the site which in turn affects the environment?	See section 7.1.1 of this decision document – we have had regard to the decision of Essex County Council to grant a variation to the original 2010 planning permission on 26 February 2016.
No confidence in the Applicant as their earlier calculations were wrong.	The Environment Agency's role is to verify the supporting documents of a permit application during the determination stage. Our feedback to Applicants following our checks includes additional information /clarification and a review of the information where we consider there are errors. This is what we have done in this determination. We are satisfied that the Operator is competent.
Chlorine is going to be used in the paper pulp plant.	The Applicant will not use chlorine-based compounds in the paper pulp plant (refer to section 6.1.3 of this decision document).
There has been no engagement by the Applicant with the local community. There has been no attempt to sell the benefits of the scheme to impacted residents. There is only an expectation that we will bear the health costs.	We do encourage Applicants to engage with members of the local community prior to the submission of applications and during the determination. We understand that there is a liaison group set up for the development that consists of the Applicant, Essex County Council, the parish councils and the Environment Agency.
There are rare plants and insects in this area. Has adequate consideration been given to ensure their environment is not damaged?	The Applicant carried out a habitats survey report at the proposed site as part of the planning application. We reviewed the details of the survey report during this determination and agree with the Applicant's conclusion. We carried out an audit of the Applicant's air quality impact assessment (including impact on ecological receptors). Our assessment shows that site emissions will not have a significant effect on any ecological site, protected species or interest features of the habitat sites.

Concern regarding lack of road infrastructure to accommodate the plant.	This is a consideration of the local planning authority.
Concern regarding the handling of ash from incineration of waste.	Ash (incinerator bottom, fly ash and air pollution residues) will not be treated at the proposed Installation. Handling of ash will be undertaken within enclosed buildings. Any fugitive emissions of steam will be directed to the furnace. Particulates will abated via the particulate filters within the buildings. Excess quench water will be tankered off-site for disposal.
The Environment Agency is not in a position where it can legitimately take a 'minded to grant' position with regards to the permit application.	We consider that we are in a position to grant an environmental permit to the Applicant. We have taken into account all relevant considerations legal requirements and representations to ensure that the permit provides a high level of protection for the environment and human health. Consequently we are granting an environmental permit to Gent Fairhead & Co. Limited subject to any conditions imposed.
The site's current natural and historical areas should not be destroyed.	We have no reason to believe that the emissions from the proposed Installation will have a significant impact on the site's natural and historical areas.
What does "minded to grant or issue" mean?	"Minded to grant" or "Minded to issue" means that we are intending to approve the environmental permit application submitted by an Applicant based on the information that has been provided during the determination and subject to the conditions imposed in the Permit. Prior to granting a permit to an Applicant, we take into account all relevant considerations and legal requirements to ensure that a high level of protection is provided for the environment and human health. At the "minded to grant" stage, our mind remains open as we have not yet made a final decision. We make a final decision only after carefully taking into account any relevant matter raised in the representations we receive following the end of the consultation period as we have done for this Application.
Concerns raised about the financial viability of the project from recent media report and the market for processing of waste paper.	The issue of the financial viability of the development and market for waste paper is a business risk and material consideration for the Applicant. We are satisfied that the Operator has demonstrated sufficient financial competence to have an environmental permit.

	Where a particular part of the Installation will no longer continue, the Applicant can submit a partial surrender application to the Environment Agency for determination. We will only approve the application if we are satisfied all pollution risk has been removed from the part of the site and the land has been returned to its original state.
There is a considerable number of serious flaws and inconsistencies in the proposals for this site. A permit should not be granted until all these issues are properly addressed.	The respondent did not provide the basis for this statement. We do not believe that there are flaws or inconsistencies in the Applicant's proposals. Where there were lack of clarity or errors, we have required the Applicant to address those issues during this determination.
Can the public hold the Environment Agency accountable if the pollution in the air and water are much higher than what has been reported?	We do not consider that there will be significant pollution from the proposed Installation. The Applicant's air quality 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 human and ecological receptors as a result of emissions from the proposed Installation. We have no reason to believe that the emissions impact will be higher than that stated in the Application. We will regulate the site in accordance with the conditions specified in the Permit as we do for other plants.
Impact on existing infrastructure will compromise the area further with spillage from lorries fouling the surrounding roads and fields and endangering wildlife. The operation of the incinerator will generate excessive traffic on the A120 which will present a comparatively high accident risk.	We do not regulate the transport of waste by vehicles outside of the Installation boundary. The local planning authority considers the location of the proposed Installation and issues regarding emissions from vehicular movement in their determination of planning consent. The impact of accidents on public roads such as the A120 is also a matter for the planning authority.
The site will be extremely complex with multiple and inter-connected facilities. There is a significant risk of failure in the interfaces between these overly complex facilities resulting in pollution and damage to the environment.	There are standard operating techniques for each facility and this will form the site Environmental Management System of the proposed Installation. We have permitted Installations with different facilities operating at the same time. We do not consider that there is a significant risk of failure at the proposed Installation.
There are houses being built near the incinerator plant, and the	We have taken into account all human receptors who could be impacted by the proposed

gravel pit is moving in that direction. Has adequate allowance been made for these three developments?	Installation in our assessment of impact on human health and the environment.
The Applicant has started to clear the woodland despite the fact that they do not have a permit.	The Applicant does not require an environmental permit in order to commence construction of the Installation as this is covered by the planning permission. The Applicant requires an environmental permit in order to commission and operate the Installation following construction. If the Applicant commences construction work before they are granted a permit, they would do so at their own risk.
The Applicant is not trying to construct the facility in accordance with the current standards.	Construction of the proposed Installation is a matter for the building regulation authority and therefore not part of this determination.
The building of the proposed Installation in such close proximity to human receptors is a breach of basic human rights.	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. Our view is that the site will not cause any problems which would infringe human rights. Please refer to section 7.2.2 of this decision document.
The proposed Installation will deplete natural resources and diminish the quality of human life and therefore is not a sustainable development and is a threat to people and wildlife.	The process has been designed to ensure that only residual waste is accepted. The proposed Installation will provide a safety net or 'final polish' to ensure that any recyclable materials are removed from the residual waste stream. Our assessment of the Application leads us to believe that the operation of the proposed Installation will not have a significant impact on people and the environment.
Concern regarding the effect of pollution on the fabric of residential properties.	Please refer to section A of this Annex for our response to impact of emissions on the Listed Buildings at Woodhouse Farm.
The Applicant has proposed a "franchise" operational model that will reduce their accountability.	Gent Fairhead & Co. Limited applied for an environmental permit under the Environmental Permitting Regulations 2016 to operate the Rivenhall Integrated Waste Management Facility. We have determined the application submitted to us. We have decided to grant an environmental permit to Gent Fairhead & Co. Limited, the operator. Gent Fairhead & Co. Limited will operate the proposed Installation under an Environmental Management System

	(see condition 1.1 in the Permit) and all conditions specified in the Permit.
Why has the Environment Agency ignored the criteria in the National Planning Policy Framework?	The National Planning Policy Framework acts as guidance for local planning authorities and decision-takers, both in drawing up plans and making decisions about planning applications. The planning regime is separate from the environmental permitting regime. We have determined the application under the Environmental Permitting Regulations 2016.