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

Including BATc Additions. Jan 2020

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/GP3535QS
The Applicant / Operator is: Cory Environmental Holdings Ltd.

The Installation is located at: Riverside Energy Park.
Norman Road North
Belvedere
London
DA17 6JY

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 draft permit we are proposing to issue 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/GP3535QS/A001. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we propose to give to the permit is EPR/GP3535QS. We refer to the proposed permit as "the **Permit**" in this document.

The Application was duly made on 17TH December 2018.

The Applicant is Cory Environmental Holdings Limited. We refer to Cory Environmental Holdings Limited as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit is granted (if that is our final decision), we call Cory Environmental Holdings Limited "the **Operator**".

Cory Environmental Holdings Limited's proposed facility is located at Riverside Energy Park. Norman Road North, Belvedere, London. DA17 6JY. We refer to this as "the **Installation**" in this document.

How this document is structured

- Glossary of acronyms
- Our proposed decision
- How we reached our decision
- The legal framework
- The Installation
    - Description of the Installation and general issues
    - The site and its protection
    - Operation of the Installation – general issues
- Minimising the installation's environmental impact
    - Assessment Methodology
    - Air Quality Assessment
    - Human health risk assessment
    - Impact on Habitats sites, SSSIs, non-statutory conservation sites etc.
    - Impact of abnormal operations
    - Other Emissions
- Application of Best Available Techniques
    - Scope of Consideration
    - BAT and emissions control
    - BAT and global warming potential
    - BAT and POPs
    - Other Emissions to the Environment
    - Setting ELVs and other Permit conditions
    - Monitoring
    - Reporting
- Other legal requirements
    - The EPR 2016 and related Directives
    - National primary legislation
    - National secondary legislation
    - Other relevant EU legislation
    - Other relevant legal requirements
- Annexes
    - Application of the Industrial Emissions Directive
    - Pre-Operational Conditions
    - Improvement Conditions
    - Consultation Reponses

Glossary of acronyms used in this document

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

AAD	Ambient Air Directive (2008/50/EC)
AD	Anaerobic Digestion
APC	Air Pollution Control
APCR	Air Pollution Control Residues
AQS	Air Quality Strategy
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	Best Available Techniques (BAT) Reference Documents for Waste Incineration
BAT C	BAT conclusions
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
CNG	Compressed Natural Gas
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
DCO	Development Consent Order – Riverside Energy Park Order 2020, Made 9th April 2020 Coming into force 1st May 2020
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended
ES	Environmental standard
EWC	European waste catalogue
FSA	Food Standards Agency
FGC	Flue Gas Cleaning

GWP	Global Warming Potential
GUP	Gas Upgrading Plant
HHRAP	Human Health Risk Assessment Protocol
HPA	Health Protection Agency (now PHE – Public Health England)
HW	Hazardous waste
HWI	Hazardous waste incinerator
IBA	Incinerator Bottom Ash
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LCV	Lower calorific value – also termed net calorific value
LfD	Landfill Directive (1999/31/EC)
LADPH	Local Authority Director(s) of Public Health
LOI	Loss on Ignition
MBT	Mechanical biological treatment
MCPD	Medium Combustion Plant Directive
MSW	Municipal Solid Waste
MWI	Municipal waste incinerator
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
OTNOC	Other than normal operating conditions
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

RGN	Regulatory Guidance Note
REP	Riverside Energy Park
RGS	Regulatory Guidance Series
RRRF	Riverside Resource Recovery Facility
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SGN	Sector guidance note
SHPI(s)	Site(s) of High Public Interest
SPA(s)	Selective non-catalytic reduction Special Protection Area(s)
SS	Sewage sludge
SSSI(s)	Site(s) of Special Scientific Interest
SWMA	Specified waste management activity
TDI	Tolerable daily intake
TEF	Toxic Equivalent Factors
TGN	Technical guidance note
TOC	Total Organic Carbon
UHV	Upper heating value –also termed gross calorific value
UN_ECE	United Nations Environmental Commission for Europe
US EPA	United States Environmental Protection Agency
WFD	Waste Framework Directive (2008/98/EC)
WHO	World Health Organisation
WID	Waste Incineration Directive (2000/76/EC) – now superseded by IED

1 Our proposed decision

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

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

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

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

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on 17TH December 2018. 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, 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 News Shopper – Bexley, Greenwich, Dartford and Swanley on 13th February 2019.

We made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Public Register. Anyone wishing to see these documents could do so and arrange for copies to be made. The Applicant also provided a number of copies of the Application on CD which were also made accessible from the Public Register.

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

- National Grid
- Director of Public Health
- Public Health England
- Local Authority Department of Environmental Health
- Wealden Planning Authority
- Health and Safety Executive

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

In addition to the above bodies and as part of our wider consultation and engagement plan we undertook extended consultation additionally seeking the views of the following conservation bodies:

- London Wildlife Trust
- Greenspace Information for Greater London

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 draft 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 information notices 28/02/2019 and 21/07/09. A copy of each information notice was placed on our public register.

In addition to our information notices, we received additional information during the determination from the Applicant via emails, in response to our emailed questions, dated 11/09/19, 27/09/19, 08/10/19, 20/12/19, and 15/01/2020. We made a copy of this information available to the public in the same way as the responses to our information notices.

Finally we have consulted on our draft decision from 25/03/20 to 24/04/20. A summary of the consultation responses and how we have taken into account all relevant representations is shown in Annex 4B.

3 The legal framework

The Permit will be granted, if appropriate, 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 includes 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, if we grant 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 1 of Schedule 1 to the EPR:

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

- Section 5.4 Part A(1)(b) - Recovery or a mix of recovery and disposal of a non-hazardous waste with a capacity exceeding 75 tonnes per day (or 100 tonnes per day if the only waste treatment activity is anaerobic digestion).

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, and the ash storage bunker, are therefore included in the listed activity description.

An installation may also comprise “directly associated activities”, which at this Installation includes the generation of electricity using a steam turbine and a back-up electricity generator for emergencies. These activities comprise one installation, because the incineration plant and the steam turbine are successive steps in an integrated activity.

- Section 5.4 Part A1 (b) Recovery or a mix of recovery and disposal of a non-hazardous waste with a capacity exceeding 75 tonnes per day (or

100 tonnes per day if the only waste treatment activity is anaerobic digestion)

The Installation also includes is a waste activity (A23 – *Anaerobic digestion including the use of resultant biogas*) at which the following waste recovery operations are undertaken:

- R1: Use principally as a fuel or other means to generate energy
- R3: Recycling/reclamation of organic substances which are not used as solvents
- R13: Storage of waste pending operation R1 and R3 (excluding temporary storage, pending collection, on the site where it is produced)

The CHP and Gas Upgrading plant are directly associated activities to the AD plant and so form part of the AD Installation, a full list of directly associated activities is given in table S1.1 of the varied permit

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

The site will have a backup generator <5.0MWth which as discussed above is a directly associated activity. Due to its size it will be subject to the Medium Combustion Plant Directive (MCPD), but as it only be used for emergency use it will be excluded from requiring emission limits under the MCPD. As it will only be tested for less than 50 hours per year it is classed as an excluded generator and is also exempt from the requirements of Schedule 25B "Specified Generator regulations" of the EPR.

4.1.2 The Site

The Application Site comprises the Riverside Energy Park (REP) site, located to the north of Belvedere off Norman Road. The Electrical Connection, running underground between the REP site and the Electrical Connection Point at Littlebrook substation connecting into an existing National Grid building in Dartford.

The Application Site is located within the administrative areas of the London Borough of Bexley (LBB) and Dartford Borough Council (DBC). The REP site is located in Belvedere, in the LBB, in an area bounded to the north by the River Thames and the adjacent Thames Path long distance trail. It is bounded to the east by a boundary fence onto a public footpath linking Norman Road with the Thames Path, and to the west by a boundary fence onto the adjacent undeveloped Crossness Nature Reserve, between the REP site and Thames Water's Crossness Sewage Treatment Works (STW) site, approximately 200m away. Within this area a public footpath links the

Crossness Local Nature Reserve (LNR) with the Thames Path. A number of ditches and small watercourses surround the REP Site. The REP site includes the existing jetty extending out into the River Thames but excludes the existing Riverside Resource Recovery Facility (RRRF) main building itself.
The REP site is accessed by river via the existing jetty and by pedestrians and vehicles from Norman Road, a single carriageway road linking to the dual carriageway A2016 Picardy Manor Way.

To the immediate north of the REP site is the River Thames. Further north, on the opposite bank of the river is an area characterised by manufacturing, including the Ford Motor Company works, and associated car and lorry parking. To the east of the REP site and Norman Road is a large strategic industrial area, accessed via a junction at the southern end of Norman Road. This includes two distribution centres and a document storage facility. East of these are further warehouse, distribution and similar commercial developments. West of the REP site is Crossness STW, which is approximately 1 km in width from east to west and approximately 200 m from the REP site boundary. This operational STW includes settlement and sludge tanks, as well as a sludge powered generator where sludge is thermally treated and used to generate electricity. The Grade I listed Crossness Pumping Station, built by Sir Joseph Bazalgette, is located at the western end. Further to the west of the STW is the Thamesview Golf Centre, beyond which is the Thamesmead residential area. To the south and west of the REP site and Norman Road is Crossness Nature Reserve, a 25.5ha LNR which is part of the Erith Marshes Site of Metropolitan Importance for Nature Conservation (SMINC), containing a number of ditches, watercourses and ponds. The site is owned and managed by Thames Water.

To the east of the Crossness LNR, adjacent to Norman Road, is a site owned by the Applicant, with planning permission for a data centre.

South of Norman Road is the A2016, formed by the dual carriageway Picardy Manor Way at its junction with Norman Road (North), and by the dual carriageway Eastern Way, south of Crossness LNR. South of Picardy Manor Way is a recent development consisting of The Morgan pub and a Travelodge hotel building, along with five residential blocks. South of this is the nearest residential area centred on North Road and Norman Road (South). Further south is the main area of Belvedere comprising residential dwellings, Belvedere railway station and retail outlets. South of Eastern Way are areas of undeveloped marshland, containing a number of ponds and watercourses, interspersed with commercial storage and distribution and education development, and bounded to the south and southwest by Yarnton Way, a dual carriageway.

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

Further information on the site is addressed below at 4.3.

4.1.3 What the Installation does

The Applicant has described the facility as an Energy Recovery Facility. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, the installation is primarily a waste incineration plant because:

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

The incinerator RF would include a two-stream energy recovery process. This includes waste reception, waste storage, water, auxiliary fuel and air supply systems, boilers, facilities for the treatment of exhaust gases, on-site facilities for treatment or storage of residues and waste water, flues, stack, devices and systems for controlling operation of the incinerator, including recording and monitoring flue gas conditions.

The AD facility comprises the operation of an AD plant and associated bio-methane upgrade plant and CHP engine plant. The site includes provision for acceptance of feedstock materials, anaerobic treatment within an enclosed digester tank and the harvesting of biogas and provision to:

a.) Upgrade biogas to compressed bio-methane for export off-site; and
b.) Combust biogas in CHP engines for the generation of Electricity for export to the electricity distribution network and to provide parasitic power for the AD plant; and heat for use in the AD system.

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

(Waste Incinerator)

Waste throughput, Tonnes/line	805,920 tonnes/annum	82 tonnes /hour (nominal)
Waste processed	Municipal Solid Waste and Commercial and Industrial Waste (Non-hazardous waste only)	
Number of lines	2	
Furnace technology	Grate	
Auxiliary Fuel	Gas Oil	
Acid gas abatement	Dry	Hydrated lime
NOx abatement	SCR	Ammonia
Reagent consumption	Auxiliary Fuel 1,400 t/annum	

	Ammonia: 1,200 t/annum Hydrated Lime : 9,460 t/annum Activated carbon: 240 t/annum	
Flue gas recirculation	Yes	
Dioxin abatement	Activated carbon	
Stack(s)	Grid Reference 549461, 180749 and 549455, 180749	
	Height 90m	Diameter, 2.2 m
Flue gas	Flow, 59.54 Nm^3/s	Velocity, 19.585 m/s
	Temperature 120 °C	
Electricity generated	67.6 MWe	592,176 MWh
Electricity exported	61.5MWe	538,740 MWh
Steam conditions	Temperature, 439 °C	Pressure, 73.5 bar/MPa
Waste heat use	Temperate control of SCR NOx abatement, Digestate sludge drier	

(Anaerobic digestion facility)

Waste throughput, Tonnes/line	40,000 tonnes/annum	109 tonnes /day (nominal)
Waste processed	Biodegradable Wastes	
Digester Temperature	~57 °C	
Number of lines	1	
CHP Engine Stack	Grid Reference 549391, 180594	
	Height 8m	Diameter, 0.64 m
	Flow, 2.02 Nm^3/s	Velocity, 10 m/s
	Temperature 450 °C	

4.1.4 Key Issues in the Determination

The key issues arising during this determination were

• Emissions to air from the facility and location of the site within close proximity to:

- Human Health receptors and local air quality (London AQMA's)
- Crossness LNR – Short Term atmospheric NOx emissions from the CHP associated with the anaerobic digestion process.
- Inner Thames Marshes SSSI - Rates of nutrient nitrogen and acid deposition associated with the EFW process.

and we therefore describe how we determined these issues in most detail in this document.

4.1.5 Incinerator Plant

- There are twin incineration lines, the furnaces will process a maximum 805,920 tonnes per year of waste and are designed, equipped, built and operated in such a way that the gas resulting from the incineration of waste is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of at least 850 °C for at least two seconds". To ensure that the temperature does not fall below 850°C, auxiliary burners will be automatically switched on. Hot gases from the combustion process will pass to the boilers which will raise steam to operate the steam turbine which in turn will operate electric generating sets for export to the grid.

The main pollutants from the Installation will be gaseous combustion products. Emissions from the waste incineration plant will be controlled to the Industrial Emissions Directive (Chapter IV) standards. Combustion gases from the waste incineration plant will be cleaned before they are emitted to atmosphere. Emissions from the waste incineration process will be routed via one windshield, 90 metres above surrounding ground levels. The abatement techniques proposed for cleaning the gases from the waste incineration plant are as follows:

- Selective catalytic reduction (SCR) where ammonia will be injected into the gas stream to reduce oxides of nitrogen release.
- Hydrated lime will be injected to neutralise acid gases.
- Activated carbon injection will be used to remove mercury, dioxins and furans; and
- Bag filtration system will be used to remove heavy metals and particulates.

Pollutants from the waste incineration plant including oxides of nitrogen, carbon monoxide, particulate matter, sulphur dioxide, hydrogen chloride, ammonia and total organic carbon will be continuously monitored. Hydrogen fluoride, heavy metals, dioxins, dioxin-like PCBs and PAHs will be monitored periodically. Emissions will be abated to low levels by the use of measures that are considered to be in accordance with Best Available Techniques (BAT).

Solid residues produced by the waste incineration plant will be bottom ash (including boiler ash) and air pollution control residues. The bottom ash will be tested to determine its hazard status at the facility prior to despatch to an off-site processing facility for recovery into stabilised aggregate which is suitable for re-use or disposed of at a suitable landfill as a last resort. Air pollution control residues will be collected and temporarily stored on site in a silo prior to being removed from the site in enclosed tankers for subsequent treatment or disposal at an appropriately authorised facility.

There will be no process discharges from the Installation to surface waters or land. Uncontaminated site surface water run-off arising from rain water and process waters will be re-used on site where necessary. Excess process

waters water which cannot be used on site will initially be tankered off-site to a suitable disposal facility.

4.1.6 Anaerobic Digestion (AD) Plant

The anaerobic digestion plant will operate a single anaerobic digestion line processing food and green wastes collected from local sources and delivered to the facility by way of road. The anaerobic digestion plant will have a design capacity of approximately 40,000 tonnes per annum.

The biogas generated by the anaerobic digestion plant would be upgraded to CNG and/or upgraded for injection into a local gas network. CNG would be the preferred option if feasible and viable. However, if a CNG option is not feasible or viable then REP will incorporate a “CHP engine” which would use the biogas to generate electricity and heat, which could be used to support the anaerobic digestion process or added to energy available for export from REP.

The AD facility includes the generation of renewable energy from waste (Waste Framework Directive (WFD) activity code R1) through the up-grade of biogas to bio-methane for export offsite to the gas grid or combustion of biogas onsite for export the electricity distribution network as well as producing power and heat for onsite use via a combined heat and power (CHP) engine.

All feedstock materials/wastes received on site would be delivered to the REP by road, after waste acceptance procedures have been completed vehicles will be directed to the tipping hall.

The digester will be fed with the shredded material by conveyor belt or plug screw conveyor. A magnet will be used to remove any possible metal contaminants from the shredded organic waste prior to it being fed into the digester. The organic material will be moistened by using harvested rainwater or mains water supply, and inoculum from the digester outlet would be recirculated and fed through the inlet.

The anaerobic digester converts organic material to biogas (methane and carbon dioxide) by the fermentation of organic material in the absence of oxygen. The retention time of the digesters is approximately 14 days and biogas is collected within the roof space where it flows through difference in pressure to a double-membrane gas storage tank Ferric Chloride/Ferric Hydroxide and nutrients will be dosed into the anaerobic digester to aid sulphide control and the anaerobic process.

The digester would 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

would be fed to the control room for the anaerobic digestion plant. Pressure within the digester would 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.

Biogas generated in the digester accumulates above the digester and flows to a double-membrane gas storage tank. This intermediate storage compensates for any fluctuations in gas production. The operating pressure of the biogas system is typically 4mbar. An integral gas monitoring and analysis system automatically monitors for parameters such as: Hydrogen Sulphide, Oxygen, Carbon dioxide, Methane, Ammonia, absolute pressure and flow within the digesters and the gas distribution pipeline immediately prior to discharging from the tanks.

The gas holders at the top of the digester has two primary purposes:

Firstly as a safety device acting as a volume buffer to the digester. When liquid is pumped the gasholder provides biogas to replace the lost volume, hence maintaining system pressure. Similarly when biogas is produced within the digester the gasholder acts as a storage volume preventing an increase in gas pressure.

Secondly the gasholder acts as a buffer for biogas production and use. The combined heat and power plant uses biogas at a fixed rate, the gasholder acts as a buffer to allow the CHP/Gas Upgrading plant to operate at a constant rate with varying gas production.

The anaerobic digestion plant will produce approximately 460 Nm^3 per hour biogas with a net calorific value of 19.8 MJ/Nm^3. The biogas will typically contain an average minimum of 55% methane and 45% carbon dioxide. The biogas will also contain traces of hydrogen sulphide and water vapour.

Following anaerobic digestion of the waste within the anaerobic digestion plant there would be approximately 23,000 tonnes per year of dried digestate. This would be transferred off-site to be spread on agricultural land to confer benefit. Should this not be possible, it would be used as a fuel for REP to generate electricity.

4.1.7 Biogas upgrading process

The biogas produced by the AD process will undergo several processes to ‘clean’ the gas prior to reaching the CHP units or further processing to bio-methane for off-site export.

The methane content of the raw biogas generated by the anaerobic digestion process will be approximately 58 vol%. The remaining part of the biogas will consist largely of carbon dioxide (~38% vol) and small quantities of oxygen, hydrogen sulphide, ammonia among other trace gases.

Prior to the raw biogas passing through the gas upgrader membranes, it will undergo a series of filtering and polishing stages to remove any remaining trace particles/impurities as follows:

1. Dehumidification - stage 1;
2. Carbon filtration;
3. Dust filtration;
4. Dehumidification - stage 2; and
5. Membrane separation.

Initially, the raw biogas passes through a dehumidification unit where the biogas is chilled. By chilling the biogas, moisture will be condensed from the biogas. The separated water is collected in a vessel and pumped back into the anaerobic digestion process.

The raw biogas is heated up to reduce the relative humidity of the biogas before passing through two successive activated carbon units. This will remove the majority of the hydrogen sulphide from the raw biogas.

The dust filter contains a demister to remove dust particles. The dust filter will be periodically cleaned or replaced as part of the maintenance regime.

The raw biogas will then undergo another dehumidification process where the biogas is chilled to remove moisture from the demister. The polished biogas will then be transferred to the membrane unit for temporary storage.

The polished biogas is transferred under pressure to the upgrading unit where the methane is separated from the off-gas.

The GUP will utilise membrane technology and will be designed to process the maximum biogas generation of up to 40,000 tonne throughput capacity of the anaerobic digestion facility. This is equivalent to processing ~2,380,000Nm3/annum of raw biogas, and producing up to 1,350,000Nm3/annum (assuming 58 vol% methane) of bio-methane at 99.5% purity.

The membrane separation will include three membrane stages. The first stage membranes produce a biogas with an elevated methane concentration of approximately 80%. The second stage removes the majority of the remaining carbon dioxide producing a biogas that has a methane concentration of over 99.5%. The carbon dioxide rich gas from the stage 1 membrane is passed through a third membrane, where the methane rich proportion is recycled back to the gas compressor. The carbon dioxide rich gas from the second stage membrane is recycled back to the compressor. The carbon dioxide rich gas from the third membrane is released to atmosphere.

The off gas released from the upgrader unit will consist primarily of carbon dioxide. However will also contain a 'methane slip'; and trace concentrations of hydrogen sulphide, nitrogen, oxygen, ammonia and hydrogen. The 'methane slip' from the membranes is assumed to be 0.1% of the methane in the biogas. The concentration of hydrogen sulphide, nitrogen, oxygen, ammonia and hydrogen is expected to be below the limit of detection.

The applicant did not include a risk assessment for point source emissions to air for the GUP plant in the original application paperwork. This information was requested via way of a Schedule 5 request for further information dated 28th February 2019. The Applicant responded to this request on 21st March 2019 providing a full H1 risk assessment of off gases from the upgrader unit.

The potential impacts of emissions to air from the upgrade system were shown to be insignificant. The Environment Agency has audited this assessment and agree with the Applicants findings.

4.1.8 Digestate

Digestate from the anaerobic digestate process will be transferred by means of an enclosed screw conveyor and dried in a digestate dryer, the drier will have the potential to utilise steam from the incineration process. The dried digestate is collected from the discharge point of the driers and transferred via wheel loader to the digestate maturation and storage area prior to PAS100 compliancy or transfer off-site to a suitable licenced facility. Mixed steam and hot air exiting the dryer will be returned into the combustion process of the incinerator, the exhaust air of the boxes and storage area will be collected and fed back to the drier. This will eliminate the potential for odour/bio-aerosol generation.

Dried digestate will be processed in the same storage and loading area until it achieves relevant compliance standard for use in agriculture or for onward transport to a further maturation facility. The digestate storage bay area is designed to store approximately 7 days' worth of dried digestate.

4.1.9 CHP plant and Flare

The CHP plant will consist of one gas engine rated at <3.0MWth (Emission Point A2) the engine will convert biogas into heat and power providing both parasitic energy and heat to the process and export of electricity to the local network via a 5MW local grid connection. This provides the parasitic electricity and heat load for the plant, additional CHP capacity is utilised when the bio-methane upgrade plant is not available.

The engine will be enclosed within dedicated engine bay with exhaust stack, and ventilation cowls for combustion air and engine cooling. These units are installed in a dedicated engine cell with integrated acoustic abatement.

When the gas upgrading plant is not operational the excess biogas will be utilised within the gas engines to produce electricity which will be exported to the national grid whilst the heat from the process will be used within the anaerobic digestion plant.

The flare stack is designed to operate in the event that more biogas is generated in the Anaerobic Digestion plant than is used, and will be operated less than 10% of the time. The flare stack will normally only be required to operate when the Gas upgrading plant and CHP are not running due to routine maintenance or breakdown. This is normal practice for anaerobic digestion plant. The flame of the flare will not be visible outside the associated stack. This is a separate stack to that required for the incinerator and will be no taller than 14m (enclosed ground flare). The exhaust gas temperature would be 850oC, with a calculated NOx emission rate of approximately 0.12 g/s (equivalent to 150 mg/Nm3). The flare emissions are therefore lower than from the biogas engine, and would be released at a higher temperature and from a higher stack. Therefore, the impact of the flare emissions would be lower than for the biogas engine.

The primary function of the flare stack is to prevent the intermediate double membrane gasholder from becoming overfull, which would in turn result in over pressurisation of the gas system and release to atmosphere (by the pressure relief valves) of unburnt biogas.

The flare stack shall be designed to comply with all current standards.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The REP site is located approximately 1.3 km to the north of Belvedere railway station, situated on the southern bank of the River Thames between Erith and Woolwich, in the London Borough of Bexley. The Electrical Connection route extends from the REP site in a south eastwards direction to join Littlebrook substation approximately 7.3 km to the south east of the REP site. The REP site is centred at approximate National Grid Reference TQ 496 806.

The REP site occupies an area of approximately 7.7 ha and comprises an area of land predominantly to the west of but also surrounding the existing RRRF plant. This area specifically excludes the existing RRRF plant. The current land use within the REP site includes the existing ancillary infrastructure (roads, security outbuildings, electrical substation area etc.) associated with the existing RRRF. In addition, the REP site area includes: ancillary soft-landscaped areas; wetland and “habitat areas”; and an ash container storage area. There are also two parcels of land currently used by a Portakabin hire firm and for vehicle/plant maintenance and a partially macadam surfaced former car parking area.

The northern boundary of this area is formed by the Thames Path.

The eastern boundary is formed by a fence line separating the REP site from the Isis Reach Industrial Park to the east.

The western boundary is formed by a fence line at the western edge of the former car parking area, with Crossness Nature Reserve immediately adjacent to the western boundary of the REP site and Crossness Sewage Treatment Works located approximately 200 m to the west of the REP site.

The southern boundary is formed by drainage ditches separating the REP site from grazing land to the south.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

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

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

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

4.2.3 Closure and decommissioning

Having considered the information submitted in the Application, we are satisfied that the appropriate measures will be in place for the closure and decommissioning of the Installation, as referred to in section 2.11 of the Application. Pre-operational condition PO1 requires the Operator to have an Environmental Management System in place before the Installation is operational, and this will include a site closure plan.

At the definitive cessation of activities, the Operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into accounts both the baseline conditions and the

site's current or approved future use. To do this, the Operator will apply to us for surrender of the permit, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the Installation – general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Installation.

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

4.3.2 Management

The Applicant has stated in the Application that they will implement an Environmental Management System (EMS) that will be certified under ISO14001. A pre-operational condition (PO1) is included requiring the Operator to provide a summary of the EMS prior to commissioning of the plant and to make available for inspection all EMS documentation. The Environment Agency recognises that certification of the EMS cannot take place until the Installation is operational. An improvement condition (IC1) is included requiring the Operator to report progress towards gaining accreditation of its EMS.

The site will be managed by sufficient staff, competent to operate the site. Operations of the site are overseen by a technically competent person, who holds the relevant Certificate of Technical Competence (COTC) under the Waste Management Industry Training and Advisory Board (WAMITAB) scheme. Training records will be kept, and will be available for inspection by Environment Agency officers

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

Whist the applicant has submitted an accident assessment, the Applicant has not submitted an Accident Management Plan. An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning as required by a pre-operational condition (PO1).

The Applicant submitted a Fire Prevention Plan (FPP) which we have assessed. 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.

However, as part of this Application, we have assessed the overarching principles of storing and processing large levels of combustible waste at the Installation. Where more information is required to ensure that the detailed design proposals are capable of meeting the FPP guidance or alternative methods, we have set pre-operational condition 15 in the Permit to ensure that the Operator submits a revised FPP to the Environment Agency for assessment and approval prior to the commencement of commissioning. The pre-operational condition will provide the Operator with an appropriate timeframe to develop the detailed site-specific measures prior to commissioning.

We have not approved the FPP and we accept it is not appropriate to finalise it at this present time. 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 commissioning. 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.

We do not require an FPP specifically for a wet AD process. This is because the waste delivered to the site is wet and is rapidly introduced in to the process so there is little chance of it combusting. The biogas is covered by a number of existing regulations (e.g. The Dangerous Substances and

Explosive Atmospheres Regulations – DSEAR) and so has adequate safeguards in place. The dried digestate output is part of the FPP.

4.3.5 Off-site conditions

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

4.3.6 Operating techniques

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

Description	Parts Included	Justification
The Application	Supporting information sections 1.4 to 1.6 and 2.1 to 2.12, appendix-E BAT assessment of the application document provided in response to section 3a – technical standards, Part B of the application form, Appendix G, Preliminary fire prevention plan dated December 2018 Revision 0 and Appendix I, Preliminary Odour Management Plan dated December 2018 Revision 0	Duly Made 17/12/2018
Response to Schedule 5 Notice dated 21/07/19	Sections 1.1 Waste Treatment BAT conclusions compliance in accordance with Commission Implementing Decision (EU) 2018/114. 2.1.1 to 2.1.2 Digester capacity and dimensions. 3.3.25 GUP selection in accordance with BAT, Section 4.1 Digester configuration, 4.3 NOx abatement technology, and Section 5.1 Biogas Engine thermal capacity confirmation.	• Decision 2018/1147 sets out the BAT conclusions for the waste treatment sector for installations permitted under the IED Directive (2010/75/EU) • Digester capacity details and dimensions to ascertain mass balance calculations. • Options appraisal of candidate options for gas upgrading plant to demonstrate BAT. • Stack height sensitivity analysis for CHP stack related to AD process to demonstrate BAT • Confirmation of CHP engine size MWth to ascertain ADMS

		modelling provided is representative
E-Mail dated 11/09/19	Confirmation of removal of process waste waters off site by way of tanker and Justification for waste codes with high water/moisture content.	Required to prevent process waters being discharged to sewer, an appropriate risk assessment was not provided by the applicant and both options were contained within the application documentation. Waste codes justified to ensure optimum combustion conditions.
E-Mail dated 27/09/19	Confirmation regarding frequency of and duration of the incinerator emergency generator operation/maintenance and type of back-up power supply for AD process	Required to ascertain MCPD and Specified Generator regulations applicability
E-Mail dated 08/10/19	E-Mail Confirmation of sizing of the incinerator emergency diesel generator and details relating to power supply for AD process.	Required to ascertain MCPD and Specified Generator regulations applicability
E-Mail dated 20/12/19	Environmental Permit Clarification: AD Process, December 2019 Rev 0. Providing details of disposal routes for whole digestate, pasteurisation process, waste screening process, bund water disposal route and auxilary flare operating techniques.	Required to ascertain final fate destinations for digestate whole and separated fractions, to determine suitability of waste acceptance codes that have been applied for (pasteurisation process). Ascertain suitability of flare ELV's removal as requested by applicant. Establish bund water disposal routes.
E- Mail dated 15/01/2020	Environmental Permit Clarification: BREF report, January 2020 rev 1. Details of shut down and start up procedures, and acid gas abatement.	Required to comply with BAT conclusion document requirements

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

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 requires that the Permit must include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2005/532/EC, EC, if possible, and containing information on the quantity of each type of waste, where appropriate. The Application contains a list of those wastes, coded by the European Waste Catalogue (EWC) number, which the Applicant will accept in the waste streams entering the plant and which the plant is capable of burning in the incinerator and treating in the AD plant in an environmentally acceptable way.

We have questioned the applicant on the inclusion of a number of waste codes proposed in the application for processing in the Incineration facility. These codes may have potentially high levels of water / moisture which could adversely impact on combustion conditions and make then unsuitable for incineration. These wastes have the EWC codes 020501, 020704, 190604,190606 and 191801:

02.05.01 materials unsuitable for consumption or processing
02.07.04 materials unsuitable for consumption or processing

The Applicant states these wastes may be suitable for treatment in composting or anaerobic digestion but if they are rejected for treatment in either of these processes, an alternative treatment method will be required. The Applicant has confirmed that they anticipate that the quantity of waste received at the incineration facility under these EWC codes will be small compared to the other wastes processed at the Facility.

19.06.04 digestate from anaerobic treatment of municipal waste
19.06.06 digestate from anaerobic treatment of animal and vegetable waste

The Applicant anticipates that the quantity of waste received at the incineration facility under this EWC code will be small compared to the other wastes processed.

This would be digestate from anaerobic digestion which does not meet the requirements of PAS 110.

19.08.01 Screenings

The Applicant confirms that screens are used in water treatment plants to separate the liquid fraction from the solid fraction consisting of mainly plastics (which are not suitable for recycling) and other combustible components. Therefore, the solid fraction will typically have a low moisture content. Typically, this waste is either processed in an ERF or transferred for disposal in a landfill.

The full list of waste types permitted to be processed in the incinerator is consistent with those permitted in similar facilities and the adjacent Riverside Resource Recovery Facility (RRRF). In all instances, the wastes listed above will be mixed with the other wastes which are within the waste bunker. The mixing of these wastes within the bunker with the other waste received at the Facility will ensure that there is a homogenous fuel which will be within the capability of the flue gas treatment system to maintain emissions from the Facility within the permitted limits.

We have specified the permitted waste types, descriptions and where appropriate quantities which can be accepted at the incineration plant in Table S2.2.

We are satisfied that the Applicant can accept the wastes contained in Table S2.2 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;
(ii) the wastes are all categorised as non-hazardous in the European Waste Catalogue and are capable of being safely burnt at the Installation.
(iii) these wastes are likely to be within the design calorific value (CV) range for the plant;
(iv) these wastes are unlikely to contain harmful components that cannot be safely processed at the Installation.
(v) do not contain Category 1, 2 or 3 Animal By-Products

The incineration plant will take municipal waste, which has not been source-segregated or separately collected or otherwise recovered, recycled or composted. Waste codes for separately collected fractions of waste (with the exception of waste wood classified under EWC code 20 01 38) are not included in the list of permitted wastes, except that separately collected fractions which prove to be unsuitable for recovery may be included.

The obligation is on waste producers is to apply the waste hierarchy and for local authorities to have their own waste strategy dealing with kerbside collections. Our role in this determination is to assess whether any residual waste that may be sent for incineration can be dealt with in an environmentally acceptable manner. In addition to this we have set permit

condition 2.3.4 (c) that does not allow separately collected fractions to be incinerated unless they are unsuitable for recycling.

We have additionally specified the permitted waste types, descriptions and quantities, which can be accepted at the AD plant in Table S2.3

We are satisfied that the operator can accept these wastes for the following reasons:

- they are suitable for the proposed activities
- the proposed infrastructure is appropriate
- the environmental risk assessment is acceptable.

We have excluded the following wastes as they are not suitable for treatment by anaerobic digestion as specified in our revised biowaste treatment permit templates.

03.03.08 wastes from sorting of paper and cardboard destined for recycling
19.05.01 non composted fraction of municipal and similar wastes
19.05.02 non composted fraction of animal and vegetable waste

We made these decisions with respect to waste types in accordance with Framework Guidance Note – Framework for assessing suitability of wastes going to anaerobic digestion, composting and biological treatment (July 2013).

We have additionally excluded the following wastes,

02.01.02 animal tissue waste
02.02.02 animal tissue waste

The applicant has confirmed there will not be a dedicated pasteurisation stage for the AD process, this being a requirement in accordance with EU standards for acceptance and treatment of non-catering ABP Category 3 wastes.

The applicant confirms however that due to the AD process being Thermophillic they will meet the ‘UK standards’ for treatment of Category 3 Catering wastes which are:

- Minimum temperature – 57^{o}C;
- Minimum time at minimum temperature – 5 hours; and
- Maximum particle size – 50mm.

The applicant has confirmed that they will not be accepting Category 3 ABP wastes.

We have therefore restricted the acceptance of ABP wastes within the permit to those that may be taken under the UK standards only (Table S2.3) which excludes Category 3 ABP wastes which are not catering wastes. The designed storage capacity for dried digestate is 7 days as such this prohibits treatment/storage of non-meat excluded catering wastes which have to be stored for >18 days.

In addition the Environment Agency do not recognise the classification of 02.07.99 spent grains, hops and whiskey filter sheets/cloths which must be categorised in accordance with WM3.

We have limited the capacity of the incineration plant to 805,920 tonnes per annum. This is based on the installation operating 8760 hours per year at a nominal capacity of 82 tonnes per hour. The anaerobic digestion plant will consist of one digester with a nominal design capacity of 1800m^3 operating at a filling level of approximately 85% with a retention time of approximately 14 days at an optimum temperature of approximately 57^{O}c (Thermophillic process) this equates to a daily throughput of approximately 109 tonnes per day or approximately 39,889 tonnes per annum. We have however limited the total annual tonnage in Table S2.3 to a maximum quantity of 40,000 tonnes per annum as requested by the Applicant.

The Installation will be designed, constructed and operated using BAT for the incineration and AD of the permitted wastes. We are satisfied that the operating and abatement techniques are BAT for incinerating and biological treatment (via AD) of these types of waste. Our assessment of BAT is set out later in this document.

We have reviewed the techniques proposed by the Applicant and compared these with the relevant Technical Guidance Note – "Control and monitor emissions for your environmental permit" *www.gov/uk/guidance/control-and-monitor-emissions-for-your-environmental-permit*. The proposed techniques for pollution control are in line with the Technical Guidance Note and we consider them to represent appropriate measures for this facility. The details set out in the table above describe the techniques that will be used for the operation of the facility as specified in Condition 2.3.1 and Table S1.2 in the Permit.

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

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

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

2. The extent to which the Installation meets the requirements of Article 50(5) of the IED, which requires *"the heat generated* during the incineration and co-incineration process is *recovered as far as practicable through the generation of heat, steam or power*". This issue is covered in this section.

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

4. The extent to which the Installation meets the requirement of Article 14(5) of the Energy Efficiency Directive which requires new thermal electricity generation installations with a total thermal input exceeding 20 MW to carry out a cost-benefit assessment 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 detail 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.

Energy recovery facility

The Application details a number of measures that will be implemented at the Installation in order to increase its energy efficiency. The Incinerator will be designed to achieve a high thermal efficiency. In particular:

- 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 avoided, to avoid the loss of boiler water treatment chemicals and the heat contained within the steam and water;
- 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.

- Due consideration will be given to the recommendations given in the Environment Agency sector guidance on waste incineration, titled 'Incineration of waste (EPR5.01)' and waste treatment activities 'Recovery and disposal of hazardous and non-hazardous waste (S5.06)'. A CHP Assessment for REP has been developed and is presented in Appendix F of the Application. This demonstrates that REP achieves the relevant BAT requirement for the export of heat.

Energy Efficiency Measures including an energy efficiency plan will be built into the operation and maintenance procedures of REP ensuring maximum, practical, sustainable, safe and controllable electricity generation. This plan will be reviewed regularly as part of the environmental management systems. During normal operation, procedures will be reviewed and amended, where necessary, to include improvements in efficiency as and when proven new equipment and operating techniques become available. These will be assessed on the implementation cost compared with the anticipated benefits.

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, will be 66.3kWh/tonne. The installation capacity is *805,920* t/a.

The BREF says that electricity consumption is typically between 60 KWh/t and 190 KWh/t depending on the LCV of the waste.

The LCV in this case is expected to be 11.0 MJ/kg. The specific energy consumption in the Application is in line with that set out above.

<u>Anaerobic digestion facility</u>

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 anaerobic digestion plant will be designed to achieve a high thermal efficiency. In particular:

• The digester will be clad in in a weather proof housing and insulated to minimise heat losses; the digester will also comprise of a central heat distribution system to reach and maintain a stable process temperature

- Constant gas feed to the engines by the use of buffer storage and by controlling the digester feed rate will ensure optimal performance of the gas engines/Gas upgrading plant

The Installation has been designed to be as efficient as possible in order to maximise the available energy for export from the site. The plant will be operated and maintained in accordance with manufacturer's recommendations and during normal operating conditions supplies its own parasitic energy needs in the form of heat and electricity. The heat and electrical load required for the ongoing operation of the Installation are met by the available heat and electricity produced. Only during 'start-up' periods, where the plant has had to shut down, may a draw on external energy sources be required. In such circumstances, electricity will be imported from the grid and heat provided by the dual fuel boiler until such time as sufficient biogas is available to fire the CHP engines and for the plant to return to 'island' mode. During normal operating procedures the vast proportion of energy exported from the site will be as bio-methane; with the balance being electricity used to power the plant; and any surplus then being exported to the grid.

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 4. The following parameters are required to be reported: total electrical energy generated; bio-methane generated, electrical energy exported; total energy usage, electricity exported, bio-methane exported, CHP engine usage, CHP engine efficiency and emergency flare operation. This will enable the Environment Agency to monitor energy efficiency of the plant and take action if at any stage the energy efficiency is not considered acceptable.

There is no specific BAT requirement to reduce the energy consumption to a set level. The Applicant's commitment to ensure efficient operation and to monitor and report on energy usage annually is considered to be BAT.

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

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

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

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

the outset (i.e. when a plant is first consented, constructed and commissioned).

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

The BREF says that 0.4 – 0.8 MWh of electricity can be generated per tonne of waste. Our technical guidance note, SGN EPR S5.01, 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 Installation will generate electricity only and has been specified to maximise electrical output with little or no use of waste heat. The Sankey diagram in section 2.8.6 of the Application shows 67.6MW of electricity produced for a design capacity of 655,000 tonnes per annum, which represents 10.32MW per 100,000 tonnes/yr of waste burned (0.82 MWh/tonne of waste). The Installation is therefore above the indicative BAT range.

The Applicant provided a calculation of the gross electrical efficiency and compared it to the BAT AEEL specified in BAT conclusions BAT 20.

The gross electrical efficiency was calculated as 34.26%.

The BAT AEEL for gross electrical efficiency is 25-35%. The value calculated by the Applicant is at the upper end of the BAT AEEL range which is good. In accordance with BAT 2, table S3.4 of the Permit requires the gross electrical efficiency to be measured by carrying out a performance test at full load.

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

The Installation will be installed and equipped as CHP Ready (CHP-r).

A review of the potential heat demand within a 10 km radius of REP has been undertaken in accordance with the requirements set out in Section 4 of the EA's CHP Ready Guidance. The area surrounding the REP site comprises heat demand predominantly from the residential, transport, industrial and retail sectors, primarily due to high proportion of industrial estates, distribution centres and warehousing facilities located to the south and east of the REP site.

In most cases, existing domestic buildings are unsuitable for inclusion in a District Heating network as a result of the prohibitive costs of replacing existing heating infrastructure and connecting multiple smaller heat consumers to a network. However, seven prospective residential and commercial developments have been identified to the west of the REP site in Thamesmead. The Applicant is engaging with the developer and local planning authorities regarding feasibility of connecting up to 20,000 new residential dwellings and additionally commercial premises. Connecting to new developments exclusively will have the benefit of reducing system operating temperatures, which will increase the amount of heat that can be exported and reduce heat losses.

Of the four existing large heat consumers identified only a rapeseed oil refinery, is located on the south bank of the River Thames and could therefore present a connection prospect. This potential consumer may offer an anchor load for future connections to businesses in the locality. However, the heat demand requirements of individual businesses, and whether the REP incinerator facility could supply the heat grade required, is unknown. Given the industrial nature of the sites, it is likely that high grade heat (steam) may be required and the practicality of collecting and returning condensate is unknown. These considerations are likely to worsen the technical and economic feasibility of a connection. Additionally, business owners would need to be willing to contribute to the cost of upgrading existing heating systems to accept heat from a network, and to accept the resulting operational interruptions, which may present major barriers.

Developing a District Heating (DH) network to initially serve new-build consumers within Thamesmead would present the most favourable configuration. Work undertaken in this area has also identified this as a realistic and deliverable project. With the exception of one scheme which is currently under construction, the prospective developments are due to complete mid 2020s and therefore align with the construction programme for REP, which is anticipated to commence operations and reliability testing in 2024.

A heat demand profile has been developed to model the seasonal and diurnal variation of the preferred DH network option. Accounting for network heat losses and diversity, a heat demand of 114,385 MWh/annum is projected, equating to an average and peak demand of 10.9 MWt and 30.9 MWt respectively. The capacity and grade of heat available from the REP incinerator facility aligns with the projected network heat demands. Additional capacity could potentially be added to the network by connecting existing developments in the town of Woolwich / West Thamesmead, which is located along the proposed DH pipeline corridor. Subject to the level of uptake achieved on deployment of a DH network and final pipe routing, owners of these existing developments will be approached to determine appetite for and feasibility of connection.

The heat demand profile indicates that base loads, including the anticipated demand from the onsite Anaerobic Digestion facility, could be met by the REP

incinerator facility independently, except for periods of downtime when a back-up system would be required. Projected peak loads are likely to exceed the maximum heat export capacity, so that peak lopping plant or accumulators (thermal stores) may be required. Incorporation of an accumulator would minimise the use of fossil fuelled peak lopping boilers, by storing excess heat generated during off-peak periods for supply at times of peak heat demand. Alternatively, the existing RRRF, which has been operated reliably by the Applicant since 2011, could be utilised to supply network peak demands or when REP is unavailable.

The adjacent RRRF is configured as CHP-Ready and in 2015, the Applicant implemented modifications to the low pressure steam system to facilitate steam extraction for potential future heat export. Assuming sufficient additional heat demand could be identified and connected, the RRRF could be utilised to increase the capacity of the heat network by up to 30 MWt, or to complement REP by increasing the resilience of the heat supply system.

The location of the Installation largely determines the extent to which waste heat can be utilised, and this is a matter for the planning authority. The Applicant carried out a feasibility study and provided a CHP-R assessment as part of their application, which showed there was potential to provide district heating to local businesses; suitable opportunities are being explored, though there are no firm commitments at this stage. There is provision within the design of the steam turbine to extract low-grade steam for a district heating scheme. Establishing a district heating network to supply local users would involve significant technical, financial and planning challenges such that this is not seen as a practicable proposition at present.

Our CHP-r guidance also states that opportunities to maximise the potential for heat recovery should be considered at the early planning stage, when sites are being identified for incineration facilities. 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 Kent 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 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 presented a calculation of the R1 factor (as defined under the WFD 2008). The R1 formula is a measure of the extent to which energy is recovered from incineration plant. The formula is:

$$R1 = (Ep – (Ef + Ei)) / (0.97 \times (Ew + Ef))$$

Where:

- Ep means annual energy produced as heat or electricity. It is calculated in the form of electricity being multiplied by 2.6 and heat for commercial use being multiplied by 1.1 (GJ/yr).
- Ef means annual energy input to the system from fuels contributing to the production of steam (GJ/yr).
- Ew means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/yr).
- Ei means annual energy imported excluding Ew and Ef (GJ/yr)
- 0.97 is a factor accounting for energy losses due to bottom ash and radiation.

Where municipal waste incinerators can achieve an R1 factor of 0.65 or above, the plant will be considered to be a 'recovery activity' for the purposes of the Waste Framework Directive. Again whether or not an installation achieves an R1 score of >0.65 is not a matter directly relevant to this determination. However by being classified as a 'recovery activity' rather than as a 'disposal activity', the Operator could draw financial and other benefits.

The R1 factor predicted by the Applicant is 0.87.

The R1 factor can only be determined from operational data over a full year. At application stage it is only possible to make a provisional assessment. Ep measures the energy recovered for use from the incinerator. This energy will have been recovered not just from the combustion of waste (Ew), but also from the combustion of the support fuel at start up and shut down and where required to maintain the 850 ºC combustion temperature (Ef). Ei is additional energy imported, which will primarily be electricity from the grid. These parameters will depend on the way in which the plant is operated, e.g. number of start-ups and shut downs.

Note that the availability or non-availability of financial incentives for renewable energy such as the ROC and RHI schemes is not a consideration in determining this application.

(v) Choice of Steam Turbine

The turbine is a high efficiency turbine which has been designed to generate up to 67.6 MWe and up to 30 MWth of heat. The incinerator facility will have a parasitic load of an estimated 6.1 MWe. Therefore, the maximum export capacity of the incinerator facility will be 61.5 MWe.

(vi) Choice of Cooling System

The Applicant has proposes to use air cooled condensers to condense the exhaust steam from the steam turbine. The Applicant states that the system will be designed to be of low noise to ensure that impacts associated with the ACCs are at an 'acceptable' level and that they will be designed with sufficient capacity to maintain turbine efficiency during warm summertime periods.

In choosing an air cooled system, the Applicant has also considered the candidate options of a once through cooling system utilising abstracted waters from the River Thames and evaporative/hybrid condenser options. The Applicant has identified that the River Thames may have been a suitable source for cooling waters however concludes that these systems require significant quantities of water and extensive facilities to abstract and discharge large volumes of water. The River Thames is navigable at this location and the infrastructure required to abstract/discharge the water from once through cooling and evaporate systems could negatively impact upon traffic to navigate the river. In addition any abstraction/discharge infrastructure would need to cross the River Thames flood defences. The Applicant further highlights that evaporative condenser systems can create visible plumes which have a negative visual impact. In conclusion these extractive systems are not considered to be an available technology for cooling in REP and therefore air cooled condensers is optimal and site specific BAT.

Although once through cooling is considered to be more energy efficient than evaporative condenser options or air cooling, the Environment Agency agrees with the Applicant that in this instance closed loop air cooling represents Site Specific BAT for this location as access to cooling waters (Thames) is not viable due to engineering, flood defence and river traffic navigational issues.

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

The Applicant submitted a cost-benefit assessment of opportunities for high efficiency co-generation within 10 km of the installation, in which they calculated net present value. If the NPV is positive (i.e. any number more than zero) it means that the investors will make a rate of return that makes the

scheme commercially viable. A negative NPV means that the project will not be commercially viable.

The Applicant's assessment showed a net present value of -14.07 which demonstrates that operating as a high-efficiency cogeneration installation will not be financially viable. We agree with the applicant's assessment and will not require the installation to operate as a high-efficiency cogeneration.

The principal fiscal support mechanism for REP would be the Capacity Market, so the exported heat would not qualify for support under the Renewable Heat Incentive (RHI). The results of the CBA indicate that the estimated £17.6 million capital investment would not be offset by heat sales revenue alone. The nominal project internal rate of return and net present value (before financing and tax) over 32 years (comprising 2 year build and 30 year operational life) would be negative. We therefore consider that the proposed heat network does not yield an economically viable scheme in its current configuration. The Applicant is committed to exploring project delivery models and financial mechanisms to realise a scheme, through active engagement with key network stakeholders.

The economic feasibility of the scheme will be reassessed in the future when there is more certainty over heat loads and in light of any developments to the subsidy landscape and permit condition have been set that require this.

(viii) Permit conditions concerning energy efficiency

Pre-operational condition PO2 requires the Operator to carry out a comprehensive review of the available heat recovery options prior to commissioning, in order to ensure that waste heat from the plant is recovered as far as possible.

Conditions 1.2.2 and 1.2.3 have also been included in the Permit, which require the Operator to review the options available for heat recovery on an ongoing basis, and to provide and maintain the proposed steam/hot water pass-outs.

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 5. The following parameters are required to be reported for the EfW plant: 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 Installation and take action if at any stage the energy recovery efficiency is less than proposed.

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

In respect of the anaerobic digestion facility the Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 4. The following parameters are required to be reported: total electrical energy generated; bio-methane generated, electrical energy exported; total energy usage, electricity exported, bio-methane exported, CHP engine usage, CHP engine efficiency and emergency flare operation. This will enable the Environment Agency to monitor energy efficiency at the Facility and take action if at any stage the energy efficiency is not considered acceptable.

There is no specific BAT requirement to reduce the energy consumption to a set level. The Applicant's commitment to ensure efficient operation and to monitor and report on energy usage annually is considered to be BAT. There is no Climate Change Agreement (CCA) in place for the facility. The anaerobic digestion facility is not subject to a greenhouse gases permit under EU ETS.

4.3.8 Efficient use of raw materials

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

The Operator will store fuel, oils and lubricants on site. The Operator is required to report with respect to raw material usage for both the incineration facility and the AD facility under condition 4.2 and Schedule 4, including consumption of hydrated lime, activated carbon, ammonia used per tonne of waste burned in the Incinerator (Including ammonia used per tonne of waste anaerobically digested), water usage and energy usage. This will enable the Environment Agency to assess whether there have been any changes in the efficiency of the AD/Incineration facility relating to air pollution control plant, and the operation of the SCR to abate NO_x. These are the most significant raw materials that will be used at the Installation, other than the waste feeds itself (addressed elsewhere). The efficiency of the use of auxiliary fuel will be tracked separately as part of the energy reporting requirement under condition 4.2.1. Optimising reagent dosage for air abatement systems and minimising the use of auxiliary fuels is further considered in the section on BAT.

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

This requirement addresses wastes produced at the Installation and does not apply to the waste being treated there. The principal waste streams the REP will produce are bottom ash, air pollution control residues and recovered metals (Incineration activity) and digestate (AD activity)

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 3.1.3 and associated Table S3.4 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.

Incinerator bottom ash (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.

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 residues are adequately characterised, pre-operational condition PO3 requires the Operator to provide a written plan for approval detailing the ash sampling protocols. Table S3.05 requires the Operator to carry out an ongoing programme of monitoring.

The Application states that metal fractions will be recovered from the bottom ash by the use of a magnetic separator and sent for recycling. The Application also proposes that, where possible, bottom ash will be transported to a suitable recycling facility, from where it could be re-used in the construction industry as an aggregate.

The digestate from the Anaerobic Digestion facility will be dried in a belt drier, and processed (through maturation) in the same storage and loading area until it achieves compliance to standards that will be required before use in agriculture (PAS 110), or for onward transportation to a further maturation facility. As an alternative, the Applicant suggests that the digestate could be used as a fuel in the incinerator facility to generate electricity however this is less preferable than use in agriculture and will be a last resort.

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

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

5. Minimising the Installation's environmental impact

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

For an installation of this kind (EfW and AD facility), 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 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 model as part of their application. Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Standards (ES). ES are described in our web guide 'Air emissions risk assessment for your environmental permit'.

Our web guide sets out the relevant ES as:

- Ambient Air Directive Limit Values
- Ambient Air Directive and 4th Daughter Directive Target Values
- UK Air Quality Strategy Objectives
- Environmental Assessment Levels

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

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

PCs are screened out as **Insignificant** if:

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

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

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

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

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

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

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

For those pollutants which do not screen out as insignificant, we determine whether exceedances 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 exceedence 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 exceedances are considered likely, the application is subject to the requirement to operate in accordance with BAT.

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

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

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in Appendix D 'Air Quality Assessment, Dispersion modelling report, Dated December 2018' of the Application. The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the incinerator and AD plant.

- A study of the impact of emissions on nearby sensitive habitat / conservation sites.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the incinerator chimney, CHP associated with the AD facility and gas upgrading plant 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 model used 5 years of meteorological data collected from the weather station at London City Airport between 2013 and 2017. 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 (Except NOx) in the Permit will be the maximum permitted by Article 15(3), Article 46(2) and Annex VI of the IED, for the incinerator plant. These substances are:

    - 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)
    - Ammonia (NH_3)

- Oxides of nitrogen (NOx), expressed as NO_2, the Long-Term (LT) assessment of pollutants from the incinerator facility are in agreement with the lower-end of the range of Best Available Technique Associated Emission Levels (BAT-AELs) for new waste incineration facilities published in section 5.1.5.2 of the Draft BREF document. This is due to the incinerator facility operating Selective Catalytic Reduction (SCR) for the abatement of NOx.

- For the CHP engine on the AD facility, they have assumed that the ELV's in the permit would be the maximum permitted in accordance with the ELV's contained in the Medium Combustion Plant Directive (MCPD) for gaseous fuels other than natural gas

- 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 from the incinerator 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 5.2.5.

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

The Applicant has used background data from different air quality networks spread across the UK and DEFRA background maps for the pollutants considered. We have reviewed the data and can confirm they are reasonably representative. We have however identified some minor differences and have included the most conservative background data for all the pollutants in our check modelling assessments.

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 consultant claims that the point of maximum impact from both the facilities will be the same as impact from the incinerator facility will be insignificant and impact from the biogas engine will occur very close to the site due to its short stack of 8m. The "annual mean impacts from the biogas engine that do not screen out as 'insignificant' extend approximately 350m from the stack, and short-term impacts that do not screen out as 'insignificant' extend approximately 70m from the stack". We agree with this claim noting that the closest human health receptor is a bus stop approximately 870m from the site.

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

Our review of the Applicant's assessment leads us to agree with the Applicant's conclusions. We have also audited the air quality and human health impact assessment and similarly agree that the conclusions drawn in the reports were acceptable.

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

5.2.1 Assessment of Air Dispersion Modelling Outputs

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

The Applicant's modelling predicted peak ground level exposure to pollutants in ambient air and at discreet receptors. The tables below show the ground level concentrations at the most impacted receptor.

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

Assessment of Emissions to Air (1)

Pollutant	EQS / EAL	Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³	µg/m³	µg/m³	% of	µg/m³	% of EAL

					EAL		
NO_2	40	1	16.6	0.66	1.65	17.3	43.2
	200	2	33.2	14.78	7.4	47.98	24.0
PM_{10}	40	1	14.5	0.06	0.15	14.6	36.4
	50	3	29	0.19	0.38	29.19	58.4
$PM_{2.5}$	25	1	9.6	0.06	0.24	9.66	38.6
SO2	266	4	4	20.83	7.8	24.83	9.3
	350	5	4	20.83	5.95	24.83	7.1
	125	6	4	1.96	1.6	5.96	4.8
HCl	750	7	2	11.67	1.556	13.7	1.82
HF	16	8	0.5	0.01	0.06	0.510	3.19
	160	7	1	0.78	0.4875	1.78	1.1
CO	10000	9	1	12.7	0.13	14	0.1
TOC	2.25	1	0.3	0.13	5.78	0.430	19.11
PAH	0.00025	1	2.00E-04	1.33E-06	0.53	0.000201	80.5
NH_3	180	1	2	0.13	0.07	2.13	1.18
	2500	10	4	1.94	0.08	5.94	0.2
PCBs	0.2	1	0.0001	0.0001	0.05	0.00020	0.10
	6	10	0.0002	0.00097	0.02	0.00117	0.0
Dioxins			8.00E-09	7.60E-10		8.76E-09	

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

1 Annual Mean
2 99.79th %ile of 1-hour means
3 90.41st %ile of 24-hour means
4 99.9th ile of 15-min means
5 99.73rd %ile of 1-hour means
6 99.18th %ile of 24-hour means
7 1-hour average
8 Monthly average
9 Maximum daily running 8-hour mean
10 1-hour maximum

Assessment of Emissions to Air (2)

Pollutant	EQS / EAL	Back-ground	Process Contribution		Predicted Environmental Concentration	
	µg/m³	µg/m³	µg/m³	% of EAL	µg/m³	% of EAL

Cd	0.005	1	0.0003	0.00025	5.0	0.00055	11.0
Hg	0.25	1	0.002	0.00025	0.10	0.00225	0.90
	7.5	2	0.004	0.0068	0.09	0.01080	0.144
Sb	5	1	0.001	0.0038	0.08	0.0048	0.10
	150	2	0.002	0.0583	0.04	0.06030	0.040
Pb	0.25	1	0.011	0.0038	1.52	0.01480	5.92
Co			0.0001	0.038		0.03810	
Cu	10	1	0.011	0.038	0.38	0.049	0.490
	200	2	0.022	0.0583	0.029	0.08030	0.040
Mn	0.15	1	0.005	0.0038	2.53	0.0088	5.87
	1500	2	0.01	0.0583	0.004	0.06830	0.0046
V	5	1	0.001	0.0038	0.08	0.0048	0.10
	1	3	0.002	0.0583	5.83	0.06030	6.03
As	0.003	1	0.001	0.0038	126.67	0.00480	160.0
Cr (II)(III)	5	1	0.0032	0.0038	0.08	0.00700	0.140
	150	2	0.0064	0.0583	0.04	0.06470	0.0431
Cr (VI)	0.0002	1	0.00064	0.0038	1900.00	0.00444	2220.0
Ni	0.02	1	0.001	0.0038	19.00	0.00480	24.0

1 Annual Mean
2 1-hr Maximum
3 24-hr Maximum

(i) Screening out emissions which are insignificant

From the tables above the following emissions can be screened out as insignificant in that the process contribution is < 1% of the long term ES and <10% of the short term ES. These are:

- *PM10, PM2.5, SO2, HCl, HF, CO, PAH, NH3 and PCB's*
- *Hg, Sb, Cu, V and* Cr (II)(III)

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

(ii) Emissions unlikely to give rise to significant pollution

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

- *NO_2, TOC.*

- *Cd, Pb, Mn and Ni*

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

(iii) Emissions requiring further assessment

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

- AS and CR (IV)

These are further addressed in section 5.2.3

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO_2)

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

The above tables show that the peak long term PC is greater than 1% of the 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% of the ES and so can be screened out as insignificant and is not expected to result in the ES being exceeded.

(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 $\mu g/m^3$ and a short term daily average of 50 $\mu g/m^3$. For $PM_{2.5}$ the ES of 25 $\mu g/m^3$ as a long-term annual average to be achieved by 2010 as a Target Value and by 2015 as a Limit Value has been used.

The Applicant's predicted impact of the Installation against these 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 plant emits particulates continuously at the IED Annex VI limit for total dust, whereas actual emissions from similar plant 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 below 10% of the short term ES and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of particulates to be BAT for the Installation.

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

There is currently no emission limit prescribed nor any continuous emissions monitor for particulate matter specifically in the PM_{10} or $PM_{2.5}$ fraction. Whilst the Environment Agency is confident that current monitoring techniques will capture the fine particle fraction ($PM_{2.5}$) for inclusion in the measurement of total particulate matter, an improvement condition (IC2) has been included that will require a full analysis of particle size distribution in the flue gas, and hence determine the ratio of fine to coarse particles. In the light of current knowledge and available data however the Environment Agency is satisfied that the health of the public would not be put at risk by such emissions, as explained in section 5.3.3.

(iii) <u>Acid gases, SO_2, HCl and HF</u>

From the tables above, emissions of HCl and HF can be screened out as insignificant in that the process contribution is <10% of the short term 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 <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 <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 the Installation.

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

The above tables show that for CO 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 and so can be screened out as insignificant. Therefore we consider the Applicant's proposals for preventing and minimising the emissions of these substances to be BAT for the Installation.

The above tables show that for TOC emissions, 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 Applicant has used the ES for 1,3 butadiene for their assessment of the impact of VOC. This is based on 1,3 butadiene having the lowest ES of organic species likely to be present in VOC (other than PAH, PCBs, dioxins and furans).

The above tables show that for PAH and PCB 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 the Installation.

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.

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 < 1% of the long term ES and <10% of the short term ES.

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 an SCR NO_x abatement system.

Whilst all emissions cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the

EAL. The Applicant is required to prevent, minimise and control PAH and VOC emissions using BAT, this is considered further in Section 6. We are satisfied that PAH and VOC emissions will not result in significant pollution.

(V) Summary

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

5.2.3 Assessment of Emission of Metals

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

Annex VI of IED sets three limits for metal emissions:

- An emission limit value of 0.05 mg/m^3 for mercury and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.05 mg/m^3 for cadmium and thallium and their compounds (formerly WID group 2 metals).
- An aggregate emission limit of 0.5 mg/m^3 for antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium and their compounds (formerly WID group 3 metals).

However, there are now three sets of BAT AELs for metal emissions:

- An emission limit value of 0.02 mg/m^3 for mercury and its compounds (formerly WID group 1 metals).
- An aggregate emission limit value of 0.02 mg/m^3 for cadmium and thallium and their compounds (formerly WID group 2 metals).
- An aggregate emission limit of 0.3 mg/m^3 for antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium and their compounds (formerly WID group 3 metals).

The Applicant's modelling was based on the Annex VI limits of IED, which are higher than the BAT AELs and so provide a more conservative assessment of the impacts of the emissions and so remains valid for this Application. The Permit imposes the new stricter BAT AELs.

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

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

- *Hg, Sb, Cu, V, Cr (ii)(iii)*

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

- *Cd, Pb, Mn, and Ni*

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

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

For metals *As and Cr (VI) th*e Applicant Used representative emissions data from other municipal waste incinerators using our guidance note Please refer to "Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4".

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

- *CR (VI)*

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

- *As*

5.2.4 Consideration of Local Factors

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

London Borough of Bexley, Haverley and Barking and Dagenham has declared Air Quality Management Areas (AQMAs) with respect to NO_2 and PM10. These are located as follows:

- Bexley AQMA (London Borough of Bexley)
- Havering AQMA (London Borough of Haverley)
- Barking and Dagenham AQMA (London Borough of Barking and Dagenham)

From the Applicants model, the process contribution at all points (Residential receptors) within each of the AQMAs is predicted to be below 1% of the ES and can therefore be considered insignificant.

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

5.2.4 Bio-aerosols

At the request of the Environment Agency the operator has submitted a bioaerosol risk assessment in accordance with Environment Agency Regulatory Position Statement 031, which we consider to be satisfactory.

Bio-aerosols are generally less than 10µm in size and therefore are not filtered out by the hairs and specialised cells that line the nose. They can therefore penetrate into the lungs, causing respiratory inflammation, coughs and fever exacerbating respiratory diseases. Bio-aerosols have also been known to cause gastrointestinal illness, eye irritation and dermatitis. Particularly relevant to waste management facilities are infections caused by Aspergillus fumigatus. Invasive aspergillosis is a particularly severe infection, which may be fatal and is primarily a concern with at risk and immune-suppressed patients.

The AD process is a fully enclosed. Organic waste will be delivered to the REP in enclosed vehicles. The waste reception bunker and digestate storage area are located within the waste reception hall which will be fully enclosed and maintained at a negative pressure, the air from the reception hall will be extracted through to the incinerator process to be used as combustion air.

Digested material will be air dried via an enclosed belt drier and transferred to a dedicated digestate storage area within the reception hall. Air from the drying process would be extracted and ducted to the incinerator process to be used as combustion air.

There are no unabated channelled emissions which could potentially give rise to bio-aerosols The risk of bio-aerosols being released to the external atmosphere from REP is therefore considered to be negligible.

5.3 Human health risk assessment

5.3.1 Our role in preventing harm to human health

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

i) Applying Statutory Controls

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

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

ii) Environmental Impact Assessment

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

iii) Expert Scientific Opinion

We take account of the views of national and international expert bodies. The gathering of evidence is a continuing process. Although gathering evidence is not our role we keep the available evidence under review. The following is a

summary of some of the publications which we have considered (in no particular order).

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

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

HPA (now PHE) in 2009 stated that "The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable".

In 2012 the UK Small Area Health Statistics Unit (SAHSU) at Imperial College was commissioned by Public Heath England (PHE) to carry out a study to extend the evidence base and to provide further information to the public about any potential reproductive and infant health risks from municipal waste incineration (MWIs).

A number of papers have been published by SAHSU since 2012 which show no effect on birth outcomes. One paper in the study looked at exposure to emissions from MWIs in the UK and concluded that exposure was low. Subsequent papers found no increased risk of a range of birth outcomes (including stillbirth and infant mortality) in relation to exposure to PM10 emissions and proximity to MWIs, and no association with MWIs opening on changes in risks of infant mortality or sex ratio.

The final part of the study, published on 21/06/19, found no evidence of increased risk of congenital anomalies from exposure to MWI chimney emissions, but a small potential increase in risk of congenital anomalies for children born within ten kilometres of MWIs. The paper does not demonstrate

a causal effect, and it acknowledges that the observed results may well be down to not fully adjusting the study for factors such as other sources of pollution around MWIs or deprivation.

PHE have stated that 'While the conclusions of the study state that a causal effect cannot be excluded, the study does not demonstrate a causal association and makes clear that the results may well reflect incomplete control for confounding i.e. insufficiently accounting for other factors that can cause congenital anomalies, including other sources of local pollution. This possible explanation is supported by the fact no increased risk of congenital anomalies was observed as a result of exposure to emissions from an incinerator.'

Following this study, PHE have further stated that 'PHE's position remains that modern, well run and regulated municipal waste incinerators are not a significant risk to public health, and as such our advice to you [i.e. the Environment Agency] on incinerators is unchanged.'

The **Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment (CoC) issued** a statement in 2000 which said that "any potential risk of cancer due to residency (for periods in excess of 10 years) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern epidemiological techniques." In 2009, CoC considered six further relevant epidemiological papers that had been published since the 2000 statement, and concluded that "there is no need to change the advice given in the previous statement in 2000 but that the situation should be kept under review".

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

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

Health Protection Scotland (2009) considered scientific studies on health effects associated with the incineration of waste particularly those published after the Defra review discussed earlier. The main conclusions of this report were: "(a) For waste incineration as a whole topic, the body of evidence for an association with (non-occupational) adverse health effects is both inconsistent

and inconclusive. However, more recent work suggests, more strongly, that there may have been an association between emissions (particularly dioxins) in the past from industrial, clinical and municipal waste incinerators and some forms of cancer, before more stringent regulatory requirements were implemented. (b) For individual waste streams, the evidence for an association with (non-occupational) adverse health effects is inconclusive. (c) The magnitude of any past health effects on residential populations living near incinerators that did occur is likely to have been small. (d) Levels of airborne emissions from individual incinerators should be lower now than in the past, due to stricter legislative controls and improved technology. Hence, any risk to the health of a local population living near an incinerator, associated with its emissions, should also now be lower."

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

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

The BSEM report was reviewed by the HPA and they concluded that "Having considered the BSEM report the HPA maintains its position that contemporary and effectively managed and regulated waste incineration processes

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

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

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

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

iv) Health Risk Models

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

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

HHRAP has been developed by the US EPA to calculate the human body intake of a range of carcinogenic pollutants and to determine the mathematic quantitative risk in probabilistic terms. In the UK, in common with other European Countries, we consider a threshold dose below which the likelihood of an adverse effect is regarded as being very low or effectively zero.

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

In addition to an assessment of risk from dioxins, furans and dioxin like PCB's, the HHRAP model enables a risk assessment from human intake of a range of heavy metals. 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 the applicability of applying its methodology to small affected areas. Those concerns generally relate to the fact that the exposure-response coefficients used in the COMEAP report derive from studies of whole urban populations where the air pollution climate may differ from that around a new industrial installation. COMEAP identified a number of factors and assumptions that would contribute to the uncertainty of the estimates. These were summarised in the Defra review as below:

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

- In the same way, a difference in the pattern of personal exposures between the areas to be studied and the reference areas will affect the accuracy of the predictions of effects.

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

Our recommended approach is therefore the use of the 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 document.

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

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

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

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

Receptor	adult	child
Farmer	0.0578132	0.0857192
Resident	0.0002150	0.0006946

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

Based on a paper by the European Food Safety Authority (EFSA) the COT have recently revised their advice on dioxin/dioxin like PCBs. This has resulted in a change from a tolerable daily intake (TDI) of 2pg I-TEQ/Kg-body weight to a tolerable **weekly** intake (TWI) of 2pg I-TEQ/Kg-body weight. We have reviewed our audit of the Applicant's human health risk assessment (HHRA), taking into account the possible lower tolerable daily intake (TDI) of approximately 0.29 pgTEQ/Kg body weight/day, based on a tolerable weekly intake (TWI) of 2 pgTEQ/Kg body weight/week. We conclude that based on the risks the lower TDI is not likely to change our conclusions that the impact of dioxin and furan and dioxin-like PCB emissions are not significant.

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

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

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

5.3.3 Particulates smaller than 2.5 microns

The Operator will be required to monitor particulate emissions using the method set out in Table S3.1 of Schedule 3 of the Permit. This method requires that the filter efficiency must be at least 99.5 % on a test aerosol with a mean particle diameter of 0.3 µm, at the maximum flow rate anticipated. The filter efficiency for larger particles will be at least as high as this. This means that particulate monitoring data effectively captures everything above 0.3 µm and much of what is smaller. It is not expected that particles smaller

than 0.3 µm will contribute significantly to the mass release rate / concentration of particulates because of their very small mass, even if present. This means that emissions monitoring data can be relied upon to measure the true mass emission rate of particulates.

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

The HPA (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 µg/m^3 would result in an increase in life expectancy of 20 days for people born in 2008." However, "The Committee stresses the need for careful interpretation of these metrics to avoid incorrect inferences being drawn – they are valid representations of population aggregate or average effects, but they can be misleading when interpreted as reflecting the experience of individuals."
PHE also point out that in 2007 incinerators contributed 0.02% to ambient ground level PM_{10} levels compared with 18% for road traffic and 22% for industry in general. PHE noted that in a sample collected in a day at a typical urban area the proportion of $PM_{0.1}$ is around 5-10% of PM_{10}. It goes on to say that PM_{10} includes and exceeds $PM_{2.5}$ which in turn includes and exceeds $PM_{0.1}$. The National Atmospheric Emissions Inventory (NAEI) figures show that in 2016 municipal waste incineration contributed 0.03% to ambient ground level PM_{10} levels and 0.05% to ambient ground level PM2.5 levels. The 2016 data also shows that road traffic contributed to 5.35% of PM10 and 4.96% of PM2.5 and that domestic wood burning contributed 22.4% to PM10 and 34.3% of PM2.5 levels.

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

A 2016 a paper by Jones and Harrison concluded that 'ultrafine particles (<100nm) in flue gases from incinerators are broadly similar to those in urban air and that after dispersion with ambient air ultrafine particle concentrations are typically indistinguishable from those that would occur in the absence of the incinerator.

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

5.3.4 Assessment of Health Effects from the Installation

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

Taking into account all of the expert opinion available, we agree with the conclusion reached by 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 from *PM10, PM2.5, SO2, HCl, HF, CO, PAH, NH_3 and PCB's and Metals Hg, Sb, Cu and Cr (II)(III)* have all indicated that the Installation emissions screen out as insignificant; where the impact of emissions of NO_2, TOC and Metals Cd, Pb, Mn, Ni As and Cr(VI) 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 to carry out the health impact assessment.

With regard to sensitive human receptors, our checks indicate that the worst case PCs for most pollutants are likely to be "insignificant". The PCs "not insignificant" for long term VOC's as Benzene, long term Cadmium, long term

arsenic, long term chromium (VI), long term Manganese, long term Nickel and SO2 15-min. However, exceedances are unlikely.

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

Public Health England and the Local Authority Director of Public Health were consulted on the Application, Public Health England concluded that they had no significant concerns regarding the risk to the health of humans from the installation Local Authority Director of Public Health did not respond to the consultation. Details of the responses provided by Public Health England to the consultation on this Application can be found in Annex 2.

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

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

5.4.1 Sites Considered

There are no Habitats (i.e. Special Areas of Conservation, Special Protection Areas and Ramsar) sites are located within 10Km of the Installation:

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

- Inner Thames Marshes SSSI 1942m

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

- Lesnes Abbey Woods (LNR) 1893m
- Crossness (LNR) 74m
- Rainham Marshes (LNR) 1957m
- Southmere Park and Woodland

- Erith Marshes 75m
- Crossness Sewage Treatment 952m
- Works Pond
- Belvedere Dykes 249m
- Franks Park 1795m
- Church Manorway Nature Area 1571m
- Wennington, Aveley and Rainham 1940m
- Marshes
- Name: Lesnes Abbey Woods and Bostall 1890m
- The Ridgeway 1337m
- Crossway Park and Tump 52 1405m
- Thamesview Golf Course 1148m
- Crossways Lake Nature Reserve 1676m
- River Thames and tidal tributaries 128m
- Dagenham Breach and the lower 967m
- Beam River in Dagenham
- Lower River Beam and Ford 965m
- Works Ditches
- LESNES ABBEY 1911m

5.4.2 SSSI Assessment

The Applicant's assessment of SSSIs was reviewed by the Environment Agency's technical specialists for modelling and air quality. Consultation was recommended with Natural England on potentially significant contributions to acid deposition and atmospheric NOx at the Inner Thames Marshes SSSI.

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
Direct Impacts[2]						
NO_x Annual	30	35.4	0.51	1.6	35.91	119.7
NO_x Daily Mean	75	-	-	3.5	-	
SO_2	20		2.78	0.9	-	
Ammonia	3[(1)]	2.4	0.066	2.1	2.46	
HF Weekly Mean	0.5	-	-	4.9	--	
HF Daily Mean	5	-	-	0.7	-	
Deposition Impacts[2]						
N Deposition (kg N/ha/yr)	*20-30[(3)]*	16.94	0.374	1.9	17.314	86.57
Acidification	*No*	-	-	-	-	-

Pollutant	ES (µg/m³)	Back-ground (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES	Predicted Environmental Concentration (PEC) (µg/m³)	PEC as % ES
(Keq/ha/yr)	*critical load available for site*					

.

(1) Annual mean for all higher plants (all other ecosystems)

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

(3) Impacts assessed against the lower end of the critical load range

Long term atmospheric NOx impacts

Background concentration of NOx is currently estimated at approximately 35.4µg/m3 (Taken from APIS) and therefore is already exceeding the appropriate environmental criterion of 30µg/m^3 the PC is calculated to be 1.6% of the environmental standard which represents an increase of 0.51µg/m^3 although the PC is >1% of the environmental standard and cannot be considered to be insignificant the total PEC is calculated to be 35.91µg/m^3 and will therefore cause an additional small increase across a limited area of the site.

Short Term atmospheric NOx impacts

PC to daily NOx is calculated to be 3.7% of the relevant environmental criterion of 75µg/m3 representing a PC of 2.78u/m3. The PC can be considered to be insignificant as the PC is <10% of the environmental criterion.

Short Term HF impacts

PC to weekly mean for the protection of vegetation and ecosystems is calculated to be 4.9% of the relevant environmental criterion of 0.5µg/m3 representing a process contribution (PC) of ~0.0245ug/m3. The PC can therefore be considered to be insignificant as the PC is <10% of the environmental criterion.

PC to daily mean HF is calculated to be 0.7% of the relevant environmental criterion of 5µg/m3 representing a PC of approximately 2.78ug/m3. The PC can therefore be considered to be insignificant as the PC is <10% of the environmental criterion.

Long Term Ammonia

Background concentration of ammonia is estimated at 2.4µg/m3 (Taken from APIS) the PC is calculated to be 2.2% of the environmental standard which represents ~0.066µg/m3 although the PC is >1% of the environmental standard and cannot be considered to be insignificant the total PEC is calculated to be ~2.46µg/m3, therefore it can be assumed there will be no adverse effect as the PC plus background concentration (PEC) is less than 100% of the appropriate environmental criterion.

Acid deposition

The applicant did not include acid CLo deposition calculations for the Inner Thames Marshes SSSI as no critical loads are provided in relation to notified features for this SSSI. In view of this the Environment Agency have undertaken sensitivity check analysis based on the assumption that Thames Estuary and Marshes (SPA) and Medway Estuary and Marshes (SPA) would have similar habitat (marshes), and we have assessed PCs against the critical loads which are reported on APIS for those individual sites. Acid deposition predictions have been made following AQTAG06 guidelines sensitivity checking for critical levels and loads values are confirmed to be likely representative. The conservative values presented in Table 3 (Which may not be appropriate) were used by the Environment Agency for this purpose:

Thames Estuary and Marshes SPA (Example calculation 1)

Using a conservative CLo function for acidity deposition taken from APIS for the Thames Estuary and Marshes SPA and the operators calculated PCs from their acid deposition results together with existing background deposition rates (Average) for the Inner Thames Marshes SSSI taken from APIS the results derived using the APIS critical load function tool for acidity shows a PC of ~5.2% of the acidity CLo environmental criterion for this location

(The existing background concentration in this example is already over the relevant CLo function at 137.3% and the PEC is calculated to be 143.1% of the environmental criterion representing a small increase over existing background levels)

Medway and Estuary marshes (SPA) (Example Calculation 2)

Using a conservative CLo function for acidity deposition taken from APIS for the Medway and Estuary Marshes SPA taken from APIS and the operators calculated PCs from their acid deposition results at the Thames Inner Marshes SSSI together with existing background deposition rates (Maximum) taken from APIS for the Inner Thames Marshes Area the following results derived using the APIS CLo function tool shows a PC of ~6.3% of the acidity critical load environmental criterion for this location.

(The existing background concentration in this example is 78.7% of the relevant CLo with the PEC of the relevant acidity CLo function calculated to be 87.2% of the relevant CLo. It can be assumed there will be no adverse effect as the PC plus background concentration (PEC) is <100% of the relevant environmental criterion.

Nutrient Nitrogen Deposition

APIS describes the background level of Nitrogen deposition at a Maximum of 18.9 kgN/ha/yr with an Average of 17.5 kgN/ha/yr (Taken from APIS) the PC is calculated to be ~1.9% of the lower range of the environmental standard of 20 kgN/ha/yr which represents an increase of ~0.38 kgN/ha/yr although the PC is >1% of the environmental standard and cannot be considered to be insignificant, the total calculated PEC (Against Maximum background) is calculated to be ~19.28 kgN/ha/yr and against the Average background concentration PEC is calculated to be 17.88 kgN/ha/yr, therefore it can be assumed there will be no adverse effect as the PEC is less than 100% of the appropriate environmental criterion.

We have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances.

Long term Sulphur Dioxide

PC to annual mean S02 is calculated to be 0.9% of the relevant environmental criterion of 20µg/m3 representing a PC of ~2.78ug/m3. The PC can therefore be considered to be insignificant as the PC is <1% of the environmental criterion.

We have carefully scrutinised the Applicant's proposals to ensure that they are applying the Best Available Techniques to prevent and minimise emissions of these substances.

Consultation Section 28I of the Wildlife and Countryside Act 1981 as amended by the Countryside and Rights of Way Act (CRoW) 2000

Natural England (NE) were consulted on the 4th July 2019 in accordance with our Duty relating to granting any consent, licence or permit for activities likely to damage Sites of Special Scientific Interest (SSSI).

The EA concluded that the permission was not likely to damage any of the flora, fauna or geological or physiological features which are of special interest because of conditions:

The air dispersion modelling assumes a 'worst case scenario'.

The modelling assumes that plant will be operational continuously each hour of the year.

All assumptions for Nutrient Nitrogen deposition rates have been risk assessed/check modelled at lower end of the critical range of 20kgN/ha/yr and the PEC is <100% of the CLo) and a conclusion of no adverse effect can therefore be made.

All assessed atmospheric pollutants of concern (Background concentration + PC) except for Long Term atmospheric concentrations of NOx are either <1% of the relevant CLe and are considered to be insignificant or PEC is <100% of the relevant CLe and a conclusion of no adverse effect can be made. For Long term NOx the PC represents a small increase over existing background levels that are already exceeding the relevant environmental criterion.

Affected area represent a small area of the designated SSSI site to the North East.

The Applicant has undertaken sensitivity analysis for stack height and is operating selective catalytic reduction as secondary abatement and we consider the proposal to represent BAT.

Based on the two examples for Acidity Clo function (completed by the Environment Agency) either a no adverse effect can be concluded as PEC <100% of Clo (Example 1) or a small increase over background concentrations that already exceed the Clo levels (Example 2) is shown.

The Environment Agency were minded to issue the permission and consultation was sought with NE particularly with regard to the effects of acid deposition where APIS did not provide Clo functions for designated features, the Environment Agency checks against similar habitat types and the suitability and representativeness of these assumptions.
NE accented on the 28th August 2019 and advised that the operation could go ahead.

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

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

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

Crossness LNR

The consultant presented their results for long-term and short-term impact on ecological receptors from the incinerator facility in Appendix D of their report. Since they claim that the impact of emissions from the anaerobic digestion facility will be close to the installation boundary (section 8.6 of their report), they have analysed the impacts from the CHP engine using contour plots. The Environment Agency agrees with this approach.

A review of these plot files shows that the process contribution for all pollutants and averaging periods is less than 100% of the Critical Level or Load within the Crossness LNR, with the exception of maximum 24 hour NOx. Therefore, the impact of the biogas engine can be screened out as 'insignificant' for all pollutants and averaging periods with the exception of maximum 24 hour NOx.

The plot file of maximum 24 hour NOx (Appendix A.23 of the applicants modelling report) shows that the process contribution exceeds the Critical Level across a section of the Crossness LNR close to REP, and exceeds 200% of the Critical Level across a small section of the LNR closest to the biogas engine. The significance of this impact has been considered in Chapter 11 of the ES for the DCO application. In paragraph 11.9.25 of the ES it was concluded that:

The consultant claimed that unfavourable conditions at the site were “not due to nitrogen deposition from atmospheric pollutants but are instead due to unrelated issues. Hence, the integrity of the site is not likely to be compromised by the small additional contributions from the REP”

The Applicant’s assessment was reviewed by the Environment Agency’s technical specialists for modelling, air quality who recommended that the Applicant confirm the building configuration for the horizontal anaerobic digester as this would likely affect our conclusion with regard to daily NOx at Crossness (LNR)

Further consultation with Greenspace Information for Greater London (GiGI) and London Wildlife Trust was made on the 21st May 2019 to establish if the applicant’s evidence and justification was appropriate/correct and whether their current proposal was acceptable with regard to the affected area of the sites/features not being sensitive to NOx impact.

Consultation responses were not received. A copy of the consultation documents can be found on the public register.

In order to demonstrate BAT in relating to the emissions from the CHP for the AD process the operator was requested via way of a Schedule 5 on the 21st July 2019 to:

- Provide a stack height assessment for emissions to air from the proposed CHP stack and resultant predicted impacts of NOx at the Crossness LNR and Erith Marches (LWS).

- Provide proposals together with a cost benefit analysis for reducing the impacts of NOx at these localised receptors.

- Confirm the building configuration for the horizontal anaerobic digester

The operator responded on the 16th August 2018.

The Applicant confirmed ‘Following submission of the EP application, Cory has undertaken additional design for the biogas combustion system. As part of the design process, Cory has decided to apply Selective Catalytic Reduction (SCR) to the biogas engine.

The detailed modelling results tables show that including SCR on the biogas engine significantly reduces the NOx impacts. With the use of SCR on the biogas engine, the NOx impact at all ecological receptors can be screened out as insignificant as the process contributions at receptors are now predicated to be 4.6% and 4.1% of the relevant ST critical level of 75ug/M^3 respectively.

In view of the Applicant committing to the use of SCR as secondary NOx abatement for the CHP engine, we have set oxides of nitrogen emission limits more stringent than those required by the MCPD (500mg/m^3) for the CHP plant associated with the AD facility at 125mg/m^3 (These limits are based on normal operating conditions and load - temperature 0°C (273K); pressure: 101.3 kPa and oxygen: 5 per cent (dry gas). We are satisfied that emission levels will provide adequate protection for Crossness Local Nature Reserve.

We are satisfied that the Installation will not cause significant pollution at the sites. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.

5.5 Impact of abnormal operations

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

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

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

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

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

- Dioxin emissions of 10 ng/m^3 (100 x normal)
- Mercury emissions are 100 times those of normal operation
- NO_x emissions of 550 mg/m^3 (~7 x normal)
- Particulate emissions of 150 mg/m^3 (5 x normal)
- Metal emissions other than mercury are 5 times those of normal operation
- SO_2 emissions of 450mg/m^3 (15x normal)
- HCl emissions of 900mg/m^3 (150x normal)
- PCBs (100 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 short-term environmental impact is summarised in the table below.

Assessment of Emissions to Air 3)

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m^3		µg/m^3	µg/m^3	% of EAL	µg/m^3	% of EAL
NO_2	200	2	33.2	20.33	10.2	53.53	26.8
PM_{10}	50	3	29	5.7	11.40	34.7	69.4
SO_2	266	4	4	41.65	15.7	45.65	17.2
	350	5	4	48.45	13.84	52.45	15.0
	125	3	4	26.62	20.9	30.62	24.4
HCl	750	6	2	155.54	20.738667	157.5	21.01
HF	160	6	1	1.9	1.1875	2.90	1.8
Hg	7.5	1	0.004	0.11666	1.56	0.12066	1.609
Sb	150	1	0.002	0.06708	0.04	0.06908	0.046
Cu	200	1	0.022	0.16915	0.08	0.19115	0.096
Mn	1500	1	0.01	0.34997	0.02	0.35997	0.0240

PCBs	6	1	0.0002	0.00097	0.02	0.00117	0.0195
Cr (II)(III)	150	1	0.0064	0.53662	0.36	0.54302	0.3620
Dioxins			8E-09	7.60E-08		8.40E-08	

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

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

- HF, HG, Sb, Cu, Mn, PCB's and Cr (II)(III)

Also from the table above emissions of the following emissions (which were not screened out as insignificant) have been assessed as being unlikely to give rise to significant pollution in that the predicted environmental concentration is less than 100% of short term ES.

- NO_2, PM10, SO_2 and HCL

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

We have not assessed the impact of abnormal operations against long term ES's for the reasons set out above. Except that if dioxin emissions were at 10 ng/m^3 for the maximum period of abnormal operation, this would result in an increase of approximately 70% in the TDI reported in section 5.3.3. In these circumstances the TDI for a farmers child would be 0.14572264 pg(I-TEQ/ kg-BW/day), which is 4.28% of the COT TDI. At this level, emissions of dioxins will still not pose a risk to human health.

5.6 Impact of emissions during OTNOC

IED article 14 (3) states that BAT conclusions shall be the reference for setting the permit conditions. Article 14 (3) states that the competent authority shall set emission limit values that, under normal operating conditions, do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions. These limits are set in Table S3.1. In addition, the IED also sets maximum limits for certain emissions that should not be exceeded and would still apply outside normal operating

conditions. These limits are set in Tale S3.1(b) and are normally higher that the BAT AELs

The IED and BAT conclusions therefore make provision for plants to have short term fluctuations where BAT AELs could be exceeded but the IED limits are not other than under abnormal operation. These periods are called 'Other than normal operation.' (OTNOC). Although the BAT AELs can be exceeded during OTNOC setting BAT AELs as emission limits is controlling emissions because plants will need to ensure that the plant is capable of meeting the BAT AELs during normal operation which will apply for most of the time the plant is operational.

Although BAT AELs do not apply during periods of OTNOC the IED annex VI emission limits do still apply.

Periods of OTNOC will be of short duration and limited in nature. The Applicant used the IED annex VI half hour average limits to assess short term impacts, therefore no further specific assessment of the impacts during OTNOC was required.

Pre-operational condition PO1 requires the Operator to have an EMS and that the EMS will include an OTNOC management plan in line with BAT conclusions 1 and 18. The Operator will be required to identify potential OTNOC scenarios and any required monitoring in their management plan and will require our approval of scenarios before they can be classed as OTNOC. We may impose further monitoring and limits, through tale S3.1(b) of the Permit, once we have approved the OTNOC scenarios.

6. Application of Best Available Techniques

6.1 Scope of Consideration

In this section, we explain how we have determined whether the Applicant's proposals are the Best Available Techniques for this Installation. Sections 6.1 to 6.4 discuss BAT for the solely for the Incinerator, section 6.5 discusses BAT solely for the AD plant.

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

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

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

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

Chapter IV of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter IV. The BAT conclusions were published in December 2019.

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 will 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 BREF states that Municipal Waste can be incinerated in traveling grates, rotary kilns and fluidised bed technology. Fluidised bed technology requires MSW to be of a certain particle size range, which usually requires some degree of pre-treatment even when the waste is collected separately.
The BREF describes other process such as gasification and pyrolysis. The BREF notes that some of the processes have encountered technical and economic problems when scaled up to commercial, industrial sizes. Some are used on a commercial basis in Japan and are being tested in demonstration plants in Europe but still only have a small share of overall capacity.

Section 4.3 of the BREF provides a comparison of combustion and thermal treatment technologies, used in Europe and factors affecting their applicability and operational suitability for various waste types. There is also some information on the comparative costs. The table below has been extracted from the BREF tables. This table is also in line with the Guidance Note "The Incineration of Waste (EPR 5.01)). However, it should not be taken as an exhaustive list nor that all technologies listed have found equal application across Europe.

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

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

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

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

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Rotary Kiln	Can accept liquids and pastes as well as gases Solid feeds more limited than grate (due to refractory damage) often applied to hazardous Wastes	<16 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	• Wide range of CV (5-25 MJ/kg) • Only finely divided • consistent wastes. • Limited use for raw MSW Often applied to sludges co fired with RDF, shredded MSW, sludges, poultry manure	Up to 25 t/h	Good mixing Fly ashes of good leaching quality	Careful operation required to avoid clogging bed. Higher fly ash quantities.	TOC <1 %	FGT cost may be lower. Costs of waste preparation
Fluid bed - circulating	• Wide range of CV (6-25 MJ/kg) • Only finely divided consistent wastes. • Limited use for raw MSW • Often applied to sludges co-fired with	Up to 70 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 <1 %	FGT cost may be lower. Costs of preparation.

	RDF, coal, wood waste					

Technique	**Key waste characteristics and suitability**	**Throughput per line**	**Advantages**	**Disadvantages / Limitations of use**	**Bottom Ash Quality**	**Cost**
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	Up to 20 t/h	-low leaching residue -good burnout if oxygen blown - syngas available - Reduced oxidation of recyclable metals	- limited waste feed - not full combustion - high skill level - tar in raw gas - less widely proven	-Low leaching bottom ash -good burnout with oxygen	High operation/ maintenance costs

Technique	Key waste characteristics and suitability	Throughput per line	Advantages	Disadvantages / Limitations of use	Bottom Ash Quality	Cost
Gasification - entrained flow	- mixed plastic wastes - other similar consistent streams - not suited to untreated MSW - gasification less widely used/proven than incineration	To 10 t/h	- low leaching slag - reduced oxidation of recyclable metals	- limited waste feed - not full combustion - high skill level - less widely proven	low leaching slag	High operation/ maintenance costs pre-treatment costs high
Gasification - fluid bed	- mixed plastic wastes - shredded MSW - shredder residues - sludges - metal rich wastes - other similar consistent streams - less widely used/proven than incineration	5 – 20 t/h	• Can use low reactor temperatures e.g. for Al recovery • Separation of main 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 level. - not widely proven - need market for syngas	- dependent on process temperature - residue produced requires further processing e.g. combustion	High pre-treatment, operation and capital costs

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

- Moving Grate Furnace
- Fluidised Bed

The Applicant has proposed to use a furnace technology comprising an air-cooled moving grate of inclined fixed and moving bars that would move the fuel from the feed inlet to the residue discharge. The grate movement would turn and mix the fuel along the surface of the grate to ensure that all fuel would be exposed to the combustion process, all of which are identified in the tables above as being considered BAT in the BREF or TGN for this type of waste feed. Further consideration of the unlisted techniques is made below:

Emissions to Air
The emissions to atmosphere would not be affected by the choice of combustion technology. Although NOx concentrations from the furnaces would be different as illustrated below, both options would require further abatement to achieve the relevant emission limits. This means that the actual effect would be to change the amount of reagent required to abate the NOx.

	NOx emissions from furnace (mg/Nm3)
Moving Grate	320-380
Fluidised Bed	250-300

Presented at 11% oxygen with standard reference conditions

Deposition to Land
Deposition from atmospheric emissions would be unchanged.

Emissions to Water
There are no emissions to water for either system.

Photochemical Ozone Creation Potential (POCP)
There would be no change to POCP for either system.

Global Warming Potential
The direct emissions of carbon dioxide are the same for each option. However, whilst fluidised beds have lower emissions of nitrogen dioxide, they can have elevated emissions of nitrous oxide. Nitrous oxide is a greenhouse gas with a global warming potential (GWP) nearly 300 times that of carbon dioxide. Fluidised beds can be designed to minimise the formation of nitrous oxide. For the purposes of this assessment we have assumed that the fluidised bed has been well-designed, and the emissions of nitrous oxide are the same as a grate and would be released at a concentration of 10mg/Nm3.

A fluidised bed has a higher parasitic load than a moving grate system due to the additional sand system and fly ash separation system. The additional parasitic load in the case of the fluidised bed option has been estimated at 10%. This means that the reduction in greenhouse gas emissions due to the

displacement of power generated by other power stations would be different for both options.

The results are presented in below demonstrate that in each case the overall GWP is less than zero, as there would be a net reduction due to displacement of, primarily, fossil fuel power generation. Thus, the more negative figure produced by the grate is better.

	Unit	**Grate**	**Fluidised Bed**
Power generated	MWh p.a.	492,000	487,000
Parasitic Load	MWh p.a.	6.10	6.71
GWP	t CO2 p.a.	-176,000	-174,000

Raw Materials
The estimated consumption of raw materials for each option is shown below.

	Unit	**Grate**	**Fluidised Bed**
Ammonia	t.p.a.	1,200	1,000
Sand	t.p.a.	-	6,740

Waste Streams
The two options produce several solid waste streams:

i). It is assumed that most metals within the waste would have been removed during any pre-treatment of the incoming waste. Therefore, it is assumed that it would be identical for both options.
ii). The bottom ash generation is lower for fluidised beds. Assuming a suitably licensed facility can be identified, bottom ash would be recovered as a secondary aggregate.
iii). Fluidised beds have much greater carry-over of fine particles and so produce an additional fly ash stream, which is removed in a cyclone before the acid gas abatement reagent is added. This separate fly ash stream could be usable for building aggregate, but this is not certain, and it is possible that it would need to be sent to a hazardous landfill. For the purposes of this assessment it has been assumed that it cannot be used as a building aggregate and requires disposal in a non-hazardous landfill.
iv). Both options produce APCR. The fluidised bed option would generate less APCR because more of the fly ash would have been removed from the gas stream.
Estimated figures are shown below.

	Unit	**Grate**	**Fluidised Bed**
Bottom Ash	t.p.a.	157,000	59,340
Fly Ash	t.p.a.		105,100
APC Residue	t.p.a.	24,000	20,700

Costs
Fluidised bed technology is typically up to 5% more expensive than a grate, due to the additional waste screening equipment, sand dosing and recycling equipment, and fly ash separation. Capital costs are not readily available for the different options. Therefore, it has not been possible to consider the capital costs for the two technologies within this assessment.
Similarly, although fluidised beds typically have significantly higher maintenance costs than grate systems, maintenance costs are not readily available for the different options, so these were not considered for the proposed incinerator facility in this assessment.

The fluidised bed option has higher costs associated with the purchase of reagents and the disposal of residues, assuming that the costs for treatment and re-use of fly ash are similar to those for bottom ash.
The power generated by the two systems is comparable, if it is assumed that the incinerator facility would only receive pre-processed fuels and therefore the parasitic load associated with fuel preparation is excluded from the assessment.

For a fluidised bed there may be costs associated with screening the fuel to ensure that there are no contaminants which could affect the operation of the fluidised bed.

Conclusions
The grate has a lower global warming potential than the fluidised bed, and it would use slightly more ammonia to abate emissions of NOx. Both combustion technologies would produce similar quantities of ash, although the fluidised bed produces more fly ash.
The material costs are approximately 10% higher for the fluidised bed than the grate, whereas the grate system would result in a slightly higher power revenue due to a lower parasitic load.
The grate combustion systems are designed for large quantities of heterogeneous waste, whereas fluidised bed systems are more sensitive to inconsistencies within the fuel. Due to the robustness of grate combustion systems and Applicants existing experience of these systems, a grate is the preferred option and considered to represent BAT for the combustion of waste within the incinerator facility.

The Applicant proposes to use gasoil as support fuel for start-up, shut down and for the auxiliary burners. The choice of support fuel is based on storage and availability over a natural gas supply as no gas supply is currently available.

<u>Boiler Design</u>

In accordance with BAT 30 of the BATc and 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 of the boilers using CFD to ensure no pockets of stagnant or low velocity gas;
- boiler passes are progressively decreased in volume so that the gas velocity increases through the boiler; and
- Design of 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 emission of TOC/CO and the TOC on bottom ash.

6.2 BAT and emissions control

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

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

- type of waste, its composition and variation
- type of combustion process, and its size
- flue-gas flow and temperature
- flue-gas content, including magnitude and rate of composition fluctuations
- 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
- noise.
- arrangement of different flue-gas cleaning devices if possible with decreasing flue-gas temperatures from boiler to stack

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

6.2.1 Particulate Matter

Particulate matter				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Bag / Fabric filters (BF)	Reliable abatement of particulate matter to below 5mg/m^3	Max temp 250°C Higher energy use than ESP Sensitive to condensation and corrosion	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 (ESP)	Low pressure gradient. Use with BF may reduce the energy consumption of the induced draft fan.	Not normally BAT. Risk of dioxin formation if used in 200-400^{o}C range		When used with other particulate abatement plant

The Applicant proposes to use fabric filters for the abatement of particulate matter. 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, and so the Environment Agency agrees that the Applicant's proposed technique is BAT for the installation.

6.2.2 Oxides of Nitrogen

Oxides of Nitrogen : Primary Measures				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Low NOx burners	Reduces NOx at source		Start-up, supplementary firing.	Where auxiliary burners required.
Starved air systems	Reduce CO simultaneously.			Pyrolysis, Gasification systems.
Optimise primary and secondary air injection				All plant.
Flue Gas Recirculation (FGR)	Reduces the consumption of reagents used for secondary NOx control. May increase overall energy recovery	Some applications experience corrosion problems. Can result in elevated CO and other products of incomplete combustion		Justify if not used

Oxides of Nitrogen : Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Selective catalytic reduction (SCR)	NOx emissions 40-150mg / m^3 Reduces CO, VOC, dioxins	Expensive. Re-heat required – reduces plant efficiency		All plant
SCR by catalytic filter bags	50-120 mg/m^3			Applicable to new and existing plants with or without existing SNCR. Can be used with NH_3 as slip catalyst with SNCR
Selective	NOx emissions	Relies on an	Port injection	All plant

non-catalytic reduction (SNCR)	typically 80 - 180mg/m^3 Lower energy consumption than SCR Lower costs than SCR	optimum temperature around 900 °C, and sufficient retention time for reduction May lead to Ammonia slip	location	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	Higher N_2O emissions than ammonia, optimisation particularly important		All plant

The Applicant proposes to implement the following primary measures:

- Low NO_x burners – this technique reduces NO_x at source and is defined as BAT where auxiliary burners are required.

- Optimise primary and secondary air injection – this technique is BAT for all plant.

- Flue gas recirculation – this technique reduces the consumption of reagents for secondary NO_x control and can increase overall energy recovery, although in some applications there can be corrosion problems – the technique is considered BAT for all plant.

There are three recognised techniques for secondary measures to reduce NO_x. These are Selective Catalytic Reduction (SCR), SCR using catalytic filter bags and Selective Non-Catalytic Reduction (SNCR) with or without catalytic filter bags. For each technique, there is a choice of urea or ammonia reagent.

SCR can reduce NO_x levels to below 50 mg/m^3 and can be applied to all plant, it is generally more expensive than SNCR and requires reheating of the waste gas stream which reduces energy efficiency, periodic replacement of the catalysts also produces a hazardous waste. . The use of SCR by catalytic filter bags can reduce emissions to 50 -120 mg/m^3 with low investment costs. SNCR can typically reduce NO_x levels to between 80 and 180 mg/m^3, it relies on an optimum temperature of around 900 ^oC and sufficient retention time for reduction. SNCR is more likely to have higher levels of ammonia slip. The technique can be applied to all plant unless lower NO_x releases are required for local environmental protection. Urea or

ammonia can be used as the reagent with either technique, urea is somewhat easier to handle than ammonia and has a wider operating temperature window, but tends to result in higher emissions of N_2O. Both reagents are BAT, and the use of one over the other is not normally significant in environmental terms.

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

Selective Catalytic Reduction v Selective Non-Catalytic Reduction
The use of SNCR has not been considered, as an SNCR system would not be able to achieve the NOx emission concentrations being proposed by the Applicant for the incinerator facility. Due to the very low emission concentrations proposed (75 mg/m3), the use of SCR is considered to represent BAT for the incinerator facility.

The amount of ammonia used for NO_x abatement will need to be optimised to maximise NO_x reduction and minimise NH_3 slip. Improvement condition IC6 requires the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The BAT AEL for ammonia has been set. The Operator is not required to monitor N_2O emissions, as BAT 4 only requires this for fluidised bed furnaces or where SNCR is used, and they are using SCR.

6.2.3 Acid Gases, SO_x, HCl and HF

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

Acid gases and halogens : Secondary Measures (BAT is to apply Primary Measures first)				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Wet	High reaction rates	Large effluent disposal and		Used for wide

	Low solid residues production Reagent delivery may be optimised by concentration and flow rate	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		range of waste types Can be used as polishing step after other techniques where emissions are high or variable
Dry	Low water use Higher reagent consumption to achieve emissions of other FGC techniques but may be reduced by recycling in plant Lower energy use Higher reliability Lowest visible plume potential	Higher solid residue production Reagent consumption controlled only by input rate		All plant
Semi-dry (also described as semi-wet in the Bref)	Medium reaction rates Reagent delivery may be varied by concentration	Higher solid waste residues		All plant

	and input rate			
Direct injection into boiler	Reduced acid loading to subsequent cleaning stages. Reduced peak emissions and reduced reagent usage			Generally applicable to grate and rotary kiln plants.
Direction desulphurisation	Reduced boiler corrosion	Does not improve overall performance. Can affect bottom ash quality. Corrosion problems in flue gas cleaning system.		Partial abatement upstream of other techniques in fluidised beds
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	Efficient temperature range may	Not proven at large plant	CWIs

	Easiest to handle Dry recycle systems proven	be at upper end for use with bag filters – Leachable solid residues Bicarbonate more expensive		

The Applicant proposes to implement the following primary measures:

- Use of low sulphur fuels for start-up and auxiliary burners – gas should be used if available, where fuel oil is used, this will be low sulphur (i.e. <0.1%), this will reduce SO_x at source. The Applicant has justified its choice of gasoil as the support fuel on the basis that a natural gas supply is not readily available and we agree with that assessment.
- Management of heterogeneous wastes – this will disperse problem wastes such as PVC by ensuring a homogeneous waste feed.

There are five recognised techniques for secondary measures to reduce acid gases, all of which can be BAT. These are wet, dry, semi-dry, boiler sorbent injection and direct desulphurisation. 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 in this case. Direct desulphurisation is only applicable for fluidised bed furnaces.

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. Both reagents are BAT, and the use of one over the other is not significant in environmental terms in this case.

Direct boiler injection is applicable for all plants and can improve overall performance of the acid gas abatement system as well as reducing reagent usage. BAT 27 states that BAT is to use one or a combination of the 5 techniques listed above. The Operator states that the dry sorbent injection system they propose to use will ensure compliance with the relevant BAT-AEL's without the need for direct boiler sorbent injection as well.

In this case, the Applicant proposes to a dry filtration system with recirculating hydrated lime. The Environment Agency is satisfied that this is BAT

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

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

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

6.2.5 Dioxins and furans (and Other POPs)

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

	Metallic mercury is also absorbed.			constant and acid gas control also controls dioxin release.
Catalytic filter bags	High destruction efficiency	Does not remove mercury. Higher cost than non-catalytic filter bags		

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

- optimisation of combustion control including the maintenance of permit conditions on combustion temperature and residence time, which has been considered in 6.1.1 above;
- avoidance of de novo synthesis, which has been covered in the consideration of boiler design;
- the effective removal of particulate matter, which has been considered in 6.2.1 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.

In this case the Applicant proposes separate feed and we are satisfied their proposals are BAT.

6.2.6 Metals

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

	with bromine or sulphur to enhance reactivity, for use during peak emissions.			controls dioxin release.
Fixed or moving bed adsorption	Mainly for mercury and other metals, as well as organic compounds			Limited applicability due to pressure drop
Boiler bromine injection	Injection during mercury peaks. Oxidation of mercury leading to improved removal in downstream removal method.	Consumption of aqueous bromine. Can lead to formation of polybrominated dioxins. Can damage bag filter. Effects can be limited use is restricted to dealing with peak emissions		Not suitable for pyrolysis or gasification. Can deal with mercury peaks.

The prevention and minimisation of metal emissions is achieved through the effective removal of particulate matter, and this has been considered in 6.2.1 above.

Unlike other metals however, mercury if present will be in the vapour phase. BAT for mercury removal is one or a combination of the techniques listed above. The Applicant has proposed 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.

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

The major source of greenhouse gas emissions from the installation is however CO_2 from the combustion of waste. There will also be CO_2 emissions from the burning of support fuels at start up, shut down and should it be necessary to maintain combustion temperatures. BAT for greenhouse gas emissions is to maximise energy recovery and efficiency.

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

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

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

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

On the credit side

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

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

The Applicant considered energy efficiency and BAT for the de-NOx process in its BAT assessment. This is set out in sections 4.3.7, 6.1.1 and 6.2.2 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 Applicant's assessment shows that the difference in global warming potential between the best option in terms of GWP and the Applicant's preferred option is minor. The purpose of a BAT appraisal is to determine which option minimises the impact on the environment as a whole. In this context the small benefit in terms of GWP of the other options is considered to be more than offset by the other benefits of the preferred option.

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

6.4 BAT and POPs

International action on Persistent Organic pollutants (POPs) is required under the UN's Stockholm Convention, which entered into force in 2004. The EU implemented the Convention through the POPs Regulation (2019/1021), which is directly applicable in UK law. The Environment Agency is required by national POPs Regulations (SI 2007 No 3106) to give effect to Article 6(3) of the EC POPs Regulation when determining applications for environmental Permits.

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

The unintentionally-produced POPs addressed by the Convention are:

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

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

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

> "Member States shall, when considering proposals to construct new facilities or to significantly modify existing facilities using processes that release chemicals listed in Annex III , 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, without prejudice to Directive 2010/75/EU of the European Parliament and of the Council"

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

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

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

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

The release of **dioxins and furans** to air is required by the IED to be assessed against the I-TEQ (International Toxic Equivalence) limit of 0.1 ng/m^3. Further development of the understanding of the harm caused by dioxins has resulted in the World Health Organisation (WHO) producing updated factors to calculate the WHO-TEQ value. Certain **PCBs** have structures which make them behave like dioxins (dioxin-like PCBs), and these also have toxic equivalence factors defined by WHO to make them capable of being considered together with dioxins. The UK's independent health

advisory committee, the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has adopted WHO-TEQ values for both dioxins and dioxin-like PCBs in their review of Tolerable Daily Intake (TDI) criteria. The Permit requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be monitored for reporting purposes, to enable evaluation of exposure to dioxins and dioxin-like PCBs to be made using the revised TDI recommended by COT. The release of dioxin-like PCBs and PAHs is expected to be low where measures have been taken to control dioxin releases. The Permit also requires monitoring of a range of PAHs and dioxin-like PCBs at the same frequency as dioxins are monitored. We have included a requirement to monitor and report against these WHO-TEQ values for dioxins and dioxin-like PCBs and the range of PAHs as listed in the Permit. We are confident that the measures taken to control the release of dioxins will also control the releases of dioxin-like PCBs and PAHs. Section 5.2.1 of this document details the assessment of emissions to air, which includes dioxins and concludes that there will be no adverse effect on human health from either normal or abnormal operation.

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

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

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

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

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

6.5 Anaerobic Digestion BAT

We have reviewed the techniques used by the operator and compared these with the relevant guidance notes and we consider them to represent appropriate techniques for the facility.

The applicant has provided a full and comprehensive review of operating techniques in accordance with the latest Waste Treatment BAT reference document for waste treatment and associated BAT conclusions document (08.2018) under Directive 2010/75/EU.

The operating techniques that the applicant must use are specified in table S1.2 in the environmental permit.

Activities on site will be managed in accordance with the site's management systems. This will include regular inspections and maintenance of equipment to ensure they continue to operate at optimum conditions. Anaerobic tanks are fitted with a leak detection systems and operational areas of the site will benefit from an impermeable hard standing surface with sealed drainage. These measures will prevent the release of potentially polluting liquids to surface water and groundwater.

The REP tipping hall would be a fully enclosed building, maintained under slight negative pressure to ensure that no odours, dust or litter can escape the building. The incoming organic waste delivery vehicles would tip into the anaerobic digestion bunker. A grab transfers the waste from the anaerobic digestion bunker to the shredder. The grab would also be used to homogenise the incoming organic waste and to identify and remove any unsuitable or non-combustible items.

The Applicant reports that all tanks are provided with secondary containment designed to accommodate a minimum of 110% of the capacity of the largest vessel.

The feedstock for the AD facility will be delivered via vehicles/tankers to the facility from offsite sources in accordance with appropriate waste acceptance procedures.

The digester will be fed with the shredded material by conveyor belt or plug screw conveyor. A magnet will be used to remove metals from the shredded organic waste prior to it being fed into the digester. The organic material will be moistened by using harvested rainwater or mains water supply, and inoculum from the digester outlet will be recirculated and
fed through the inlet. .

The digestate from the anaerobic digestion process will be transferred in an enclosed conveying system from the digester by means of an enclosed screw

conveyor into a hopper. The digestate will fall from the hopper onto a belt drier. Hot air will be blown through the digestate pile on the belt drier to evaporate-off moisture from the digestate. The moisture from the drier will be ducted to the incinerator facility to be combusted as combustion air.

The dried digestate will be processed (through maturation) in the digestate storage area until it achieves compliance to standards that will be required before use in agriculture, or for onward transportation to a further maturation facility. This Permit does not authorise the spreading of digestate (solid or liquid) from this facility on land. The spreading of digestate on land is subject to a separate Permit of which an Application must be submitted by the Applicant to the Environment Agency.

The digestion process 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. The system will provide a range of control and monitoring functions that automate and monitor actions throughout the plant. These procedures are designed to ensure the integrity of the plant throughout the life of the facility.

The Environment Agency considers that the Applicant has proposed appropriate measures to minimise the impact of fugitive emissions from the facility. The Permit conditions (3.2.1 to 3.2.3) are sufficient to ensure that emissions of substances not controlled by emission limits do not cause pollution. The Applicant is required to submit an emissions management plan and implement the mitigation measures, in the event activities on site are causing pollution.

6.6 Other Emissions to the Environment

6.6.1 Emissions to water

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent emissions to water.

Under ‘normal operations’ there would not be any process emissions to water from the REP.

Waste waters generated from the process would be re-used/recycled within the process. Process effluents, and surface water/and wash down waters collected from internal process areas will be collected in a process effluent system. The process effluents would be collected within the sedimentation tank for re-use.

6.6.2 Emissions to sewer

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent emissions to sewer.

The Applicant has confirmed that process effluent generated by Riverside Energy Park (REP) will be tankered off-site to a suitably licenced waste management facility. However they have requested that an Improvement condition is included within the Environmental Permit (EP) which would allow for the discharge of effluent to sewer, subject to the impact being demonstrated as being 'acceptable'.

The Environment Agency agree that this is acceptable and we have included this requirement in Pre-operational condition 14 (PO14) rather than in an Improvement Condition.

6.6.3 Fugitive emissions

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

The incoming waste material storage/handling areas will be constructed of concrete and will be water tight.

All process areas will be located on hard standing.

All bunds provided for chemical and fuel storage tanks will be designed to contain at least 110% of the contents of the largest storage tank or 25% of the total tankage, whichever is the greater and will be impermeable and resistant to the material which they are designed to contain. Procedures will be in place for visual inspection of all bunds to ensure they remain free from accumulation of rainwater. Any discharge of rainwater will go via an interceptor to remove hydrocarbons.

Waste storage and handling/processing areas will be enclosed and maintained at a negative pressure. Any potential odorous/dusty air from waste storage and processing areas will be extracted to the incinerator facility and used as combustion air within the incinerator facility to prevent dust/odour leaving the building.

Design of equipment, buildings and handling procedures will ensure there is insignificant dispersal of litter.

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

6.6.4 Odour

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

The principal control measure for the mitigation of odour from REP impacting upon off-site sensitive receptors is that potentially odorous air from waste storage and processing areas will be enclosed and maintained at a negative pressure. The potentially odorous air from waste storage and processing areas will be extracted to the incinerator facility and used as combustion air within the incinerator facility so that any potentially odorous chemicals are combusted at high temperatures, which *will destroy the odorous substances in the extracted air.* The closest residential receptors are more than 1.5km from the installation boundary.

The operator has confirmed that systems will be developed for investigation of reported odour complaints with necessary actions being taken to resolve issues identified to prevent re-occurrence.

Waste accepted at the Installation will be delivered in covered vehicles or within containers and bulk storage of waste will only occur in the installation's waste bunker. A roller shutter door will be used to close the entrance to the tipping hall outside of the waste delivery periods and combustion air will be drawn from above the waste storage bunker in order to prevent odours and airborne particulates from leaving the facility building.

If an extended unforeseen shutdown of the ERF occurs, waste will be back loaded from the ERF bunker and transferred off-site to a suitably licenced waste management facility. Also, prior to periods of planned maintenance, the quantity of waste within the ERF bunker would be 'run-down' (which is an option in BAT 21) so that the bunker does not contain significant quantities of potentially odorous material during planned shutdown periods. It will be unlikely that both streams of the ERF will be shutdown simultaneously for planned maintenance purposes. Therefore, the periods when negative pressure would not be maintained within the ERF bunker would be kept to a minimum.

The Applicant has submitted an OMP which has been assessed and found to be satisfactory and is required to operate at all times in accordance with the OMP to prevent pollution arising from odours and implement mitigation measures in line with the plan. The odour condition in the Permit (3.3.1) will ensure that odour emissions from the facility do not cause annoyance. Process monitoring conditions including daily olfactory tests by un-sensitised personnel at the site boundary will also ensure that emissions of odour are not causing annoyance.

6.6.5 Noise and vibration

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.

The Application contained a noise impact assessment which identified local noise-sensitive receptors, potential sources of noise at the proposed plant and noise attenuation measures. Measurements were taken of the prevailing ambient noise levels to produce a baseline noise survey and an assessment was carried out in accordance with BS 4142:2014 to compare the predicted plant rating noise levels with the established background levels.

The Application also contained a noise and vibration risk assessment and management plan, which covered noise from vehicle movements and the proposed plant. The conclusion was that the impact from noise and vibration would be considered insignificant.

The Environment Agency's Qualitative Noise Screening Assessment Tool was run using the Application parameters, and the screening outcome was that a Noise Impact Assessment (NIA) or Noise Management Plan (NMP) would not be required.

6.7 Setting ELVs and other Permit conditions

6.7.1 Translating BAT into Permit conditions

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

BAT conclusions for waste incineration or co-incineration were published in December 2019.

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

Below we consider whether, for those emission not screened out as insignificant, different conditions are required as a result of consideration of local or other factors, so that no significant pollution is caused (Article 11(c)) or to comply with environmental quality standards (Article 18).

(i) Local factors

We have considered the following information…

Acid gas process contributions from the REP have not screened out as insignificant for the Inner Thames Marshes SSSI, however our assessment is that stricter requirements were not needed to ensure no adverse impact. We have set improvement condition IC6 for the operator to review the performance of the acid gas abatement and the emission limit for sulphur dioxide set for the incinerator emissions (Emission point A1 and A2) and propose a lower limit if relevant once the plant is operational. This is proportionate to the proposed operation.

Short term (24 Hour) NOx PCs were calculated to be >100% of the relevant critical level of 75ug/m^3 at the Crossness LNR due to localised impact of emissions from the proposed CHP associated with the anaerobic digestion process and therefore we could not conclude that the Installation would not cause significant pollution at this site. The Applicant subsequently agreed (Schedule 5 response dated 16th August 2019) to additionally apply selective catalytic reduction (SCR) to the biogas engine. With SCR fitted operational NOx impact can be screened out as insignificant as the process contributions at this localised receptor are now predicated to be 4.6% and 4.1% of the relevant ST critical level of 75ug/m^3 we conclude that the process is unlikely to damage the site.

In view of the Applicant committing to the use of SCR as secondary NOx abatement for the CHP engine, we have set oxides of nitrogen emission limits more stringent than those required by the MCPD for the CHP plant associated with the AD facility at 125mg/m^3 (These limits are based on normal operating conditions and load - temperature 0°C (273K); pressure: 101.3 kPa and oxygen: 5 per cent (dry gas). We are satisfied that these emission levels will provide adequate protection for Crossness Local Nature Reserve.

Oxides of nitrogen emission limits for the incinerator have been set to 75mg/m^3 daily average which is below the maximum BAT AEL and the IED as the Operator will be operating SCR for secondary NOx abatement.

(ii) National and European ESs

No additional or different conditions are required to achieve any ES.

(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 (ELVs) in Permits.

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

(iv) Commissioning

A pre-operating condition (PO4) has been set to require the submission of a commissioning plan. The plan will 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 is required to be carried out in accordance with the commissioning plan as approved.

A follow up improvement condition (IC3) has also been set to summarise the environmental performance of the plant against the design parameters and against the conditions of the Permit. It also requires details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions.

6.8 Monitoring

6.8.1 Monitoring during normal operations

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

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

There are no emissions to water or sewer.

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

6.8.2 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 on the incinerator. These will be switched into full operation immediately in the event that there is any failure in the regular monitoring equipment. The back-up CEMS measure the same parameters as the operating CEMS. In the unlikely event that the back-up CEMS also fail Condition 2.3.10 of the permit requires that the abnormal operating conditions apply.

6.8.3 Continuous emissions monitoring for dioxins and heavy metals

The BAT conclusions specify either manual extractive monitoring or long term monitoring for dioxins. For mercury either continuous or long term monitoring is specified, manual extractive monitoring is specified for other metals.

For dioxins long term monitoring does not apply if emissions are stable, and for mercury long term monitoring can be used instead of continuous if the mercury content of the waste is low and stable.

Based on the waste types and control measures proposed in the Application we expect that emissions of dioxins will be stable and that the mercury content of the waste will be low and stable. We have therefore set manual extractive monitoring to be carried out, however the Permit requires the stable and low criteria to be demonstrated through Improvement Conditions IC12 and IC13 and we can require long term monitoring for dioxins and continuous monitoring for mercury if required.

6.8.4 Monitoring during periods of 'other than normal operation' (OTNOC)

BAT AELs (daily averages) do not apply during period of OTNOC. However IED chapter IV limits will apply during these periods. Permit table S3.1(b) contains appropriate limits and monitoring requirements during OTNOC. Pre-operational condition PO1 will ensure OTNOC scenarios are defined.

6.9 Reporting

We have specified the reporting requirements in Schedule 5 of the Permit either to meet the reporting requirements set out in the IED, or to ensure data is reported to enable timely review by the Environment Agency to ensure compliance with permit conditions and to monitor the efficiency of material use and energy recovery at the installation.

7 Other legal requirements

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

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

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

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

- The Environmental Statement submitted with the DCO application (which also formed part of the Environmental Permit Application).
- The response of the Environment Agency to the Planning Inspector in its role as consultee to the planning process.

We have complied with our obligation under Article 9(2) so far as we are able in that no conclusion has yet been arrived at. From consideration of the Environmental Statement and our response as consultee to the planning process we are satisfied that no additional or different permit conditions are necessary.

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

7.1.2 Schedule 9 to the EPR 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 facility is minimised. Where the production of waste cannot be prevented it will be recovered wherever possible or otherwise disposed of in a manner that minimises its impact on the environment. This is in accordance with Article 4.

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

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

Article 23(1) requires the permit to specify:

- the types and quantities of waste that may be treated;
- for each type of operation permitted, the technical and any other requirements relevant to the site concerned;
- the safety and precautionary measures to be taken;
- the method to be used for each type of operation;
- such monitoring and control operations as may be necessary;
- 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 document but we consider the conditions of the permit ensure that the recovery of energy take place with a high level of energy efficiency in accordance with Article 23(4).

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

7.1.3 Schedule 22 to the EPR 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 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 has been consulted upon in line with this statement, as well as with our guidance RGS6 on Sites of High Public Interest, which addresses specifically extended consultation arrangements for determinations where public interest is particularly high. This satisfies the requirements of the Public Participation Directive.

Our decision in this case has been reached following a programme of extended public consultation, both on the original application and later, separately, on the draft permit and a draft decision document. The way in which this has been done is set out in Section 2.2. A summary of the responses received to our consultations and our consideration of them is set out in Annex 2.

7.2 National primary legislation

7.2.1 **Environment Act 1995**

(i) Section 4 (Pursuit of Sustainable Development)

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

> "*provides guidance to the Agency on such matters as the formulation of approaches that the Agency should take to its work, decisions about priorities for the Agency and the allocation of resources. It is not directly applicable to individual regulatory decisions of the Agency*".

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

(ii) Section 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 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.

We have also had regard to the clean air strategy 2019 and consider that our decision complies with the Strategy, and that no additional or different conditions are appropriate for this Permit.

(ix) National Emissions Ceiling Regulations 2018

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

7.2.2 **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.

7.2.3 **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.

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

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

7.2.5 **Wildlife and Countryside Act 1981**

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and

enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

We assessed the Application and concluded that the permission was not likely to damage any of the flora, fauna or geological or physiological features which are of special interest because of conditions. This was recorded on a CROW Appendix 4 form.

The CROW assessment is summarised in greater detail in section 5.4.2 of this document. A copy of the full Appendix 4 Assessment can be found on the public register.

7.2.6 **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.

7.2.8 Countryside Act 1968

Section 11 imposes a duty on the Environment Agency to exercise its functions relating to any land, having regard to the desirability of conserving the natural beauty and amenity of the countryside including wildlife. We have done so and consider that no different or additional conditions in the Permit are required.

7.2.9 National Parks and Access to the Countryside Act 1949

Section 11A and section 5(1) imposes a duty on the Environment Agency when exercising its functions in relation to land in a National Park, to have regard to the purposes of conserving and enhancing the natural beauty, wildlife and cultural heritage of the areas, and of promoting opportunities for the understanding and enjoyment of National Parks by the public.

We have done so and consider that no different or additional conditions in the Permit are required

7.3 <u>National secondary legislation</u>

7.3.1 **Conservation of Habitats and Species Regulations 2017**

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.

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, Groundwater directive and the EQS Directive through (inter alia) environmental permits, and its obligation in regulation 33 to have regard to the river basin management plan (RBMP) approved under regulation 31 and any supplementary plans prepared under regulation 32. However, it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified

7.3.3 **The Persistent Organic Pollutants Regulations 2007**

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

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

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

The way in which the Environment Agency has consulted with the public and other interested parties is set out in section 2.2 of this document. The way in which we have taken account of the representations we have received is set out in Annex 4. Our public consultation duties are also set out in the EP Regulations, and our statutory Public Participation Statement, which implement the requirements of the Public Participation Directive. In addition to meeting our consultation responsibilities, we have also taken account of our guidance in Environment Agency Guidance Note RGS6 and the Environment Agency's Building Trust with Communities toolkit.

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

IED Article	Requirement	Delivered by
45(1)(a)	The permit shall include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate.	Condition 2.3.4(a) and Table S2.2 and Table S2.3 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 2.3.4(a) and Table S2.2 and Table S2.3 in Schedule 2 of the Permit.
45(1)(c)	The permit shall include the limit values for emissions into air and water.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 S3.1(a) and S3.1(b) 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
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 3.6.1 to 3.6.4 and Tables S3.1, S3.1(a), S3.1(b), S3.3 and S3.4 in Schedule 3 of the Permit.
45(1)(f)	The permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.	Conditions 2.3.12 and 2.3.14
45(2)(a)	The permit shall include a list of the quantities of the different categories of hazardous waste which may be treated.	Not Applicable
45(2)(b)	The permit shall include the minimum and maximum mass flows of those hazardous waste, their lowest and maximum calorific values	Not Applicable

IED Article	Requirement	Delivered by
	and the maximum contents of polychlorinated biphenyls, pentachlorophenol, chlorine, fluorine, sulphur, heavy metals and other polluting substances.	
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Condition 2.3.1 and Table S1.2 of Schedule 1 of the Permit.
46(2)	Emission into air shall not exceed the emission limit values set out in part of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1, S3.1(a) and S3.1(b) .
46(3)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(4)	Relates to conditions for water discharges from the cleaning of exhaust gases.	There are no such discharges as condition 3.1.1 prohibits this.
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	The application explains the measures to be in place for achieving the directive requirements. The permit requires that these measures are used. Various permit conditions address this and when taken as a whole they ensure compliance with this requirement.
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Conditions 2.3.7 and 2.3.8
47	In the event of breakdown, reduce	condition 2.3.11 and

IED Article	Requirement	Delivered by
	or close down operations as rapidly as practicable. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	2.3.12
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.6.1 to 3.6.4, 3.2.1, 3.2.2, tables S3.1, S3.1(a) and S3.1(b). 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.	Conditions 3.6.1, 3.6.3, and tables S3.1, S3.1(a) and S3.1(b)
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	conditions 3.6.1 pre-operational condition PO8
48(4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	Conditions 4.1.1 and 4.1.2, and Tables S4.1 and S4.4
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	conditions 3.1.1, 3.1.2, 3.2.1, 3.2.2 and tables S3.1, S3.1(a) and S3.1(b)
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Conditions 3.6.1 and Table S3.5
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 PO6 and PO9 - Improvement condition IC5 and Table S3.4
50(3)	At least one auxiliary burner which must not be fed with fuels which can	Condition 2.3.8

IED Article	Requirement	Delivered by
	cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.7
50(4)(b)	Automatic shut to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.7
50(4)(c)	Automatic shut to prevent waste feed if the CEMs show that ELVs are exceeded due to disturbances or failure of waste cleaning devices.	Condition 2.3.7
50(5)	Any heat generated from the process shall be recovered as far as practicable.	(a) The plant will generate electricity (b)Operator to review the available heat recovery options prior to commissioning (Condition PO2) and then every 4 years (Conditions 1.2.1 to 1.2.3)
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 1.1.4 and 2.3.1 of the Permit.
51(1)	Different conditions than those laid down in Article 50(1), (2) and (3) and, as regards the temperature Article 50(4) may be authorised, provided the other requirements of this chapter are me.	No such conditions Have been allowed
52(1)	Take all necessary precautions concerning delivery and reception of Wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.2, 3.3, 3.4 and 3.6.
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Condition 2.3.4 and Table S2.2 and S2.3 in Schedule 3 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 and 3.6.1 with Table S3.5
53(2)	Prevent dispersal of dry residues	conditions 1.4.1 2.3.1,

IED Article	Requirement	Delivered by
	and dust during transport and storage.	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 3.6.1 and Table S3.5 and pre-operational condition PO3.
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 4.2.1, 4.2.2 and 4.2.3.

ANNEX 1B: COMPLIANCE WITH BAT CONCLUSIONS

BAT conclusion	**Criteria**	Delivered by
1	Implement environmental management system	Condition 1.1 and Pre-operational condition PO1
2	Determine gross electrical efficiency	Section 4.3.7 of this decision document. Permit table S3.4
3	Monitor key process parameters	Condition 3.6.1 and table S3.4
4	Monitoring emissions to air	Condition 3.6.1 and table S3.1
5	Monitoring emissions to air during OTNOC	Condition 3.6.1 and table S3.1(b)
6	Monitoring emissions to water from flue gas treatment and/or bottom ash treatment	There are no such emissions from the installation
7	Monitor unburnt substances in slags and bottom ashes	Conditions 3.1.5 and 3.6.1, and table S3.5
8	Analysis of hazardous waste	Not applicable
9	Waste stream management techniques	The Application explains the measures that will be used. Permit condition 2.3.1, table S1.2, and pre-operational condition PO5.
10	Quality management system for bottom ash treatment plant	Not applicable
11	Monitor waste deliveries as part of waste acceptance procedures	The Application explains the measures that will be used. Permit condition 2.3.1, table S1.2 and pre-operational condition PO5
12	Reception, handling and storage of waste	Measures are described in the Application and fire prevention plan and Permit conditions 2.3.1, tanble S1.2 and condition 3.8.1.
13	Storage and handling of clinical waste	Not applicable
14	Improve overall performance of plant including BAT-AELs for TOC or LOI	Techniques described in the Application. Permit condition 2.3.1, table S1.2 Conditions 3.1.5, 3.6.1 and table S3.5

BAT conclusion	Criteria	Delivered by
15	Procedures to adjust plant settings to control performance	Measures described in the Application, condition 2.3.1 and table S1.2
16	Procedures to minimise start-up and shut down	Measures described in the email submission dated 15/1/20, , condition 2.3.1 and table S1.2
17	Appropriate design, operation and maintenance of FGC system	FGC measures described in Application. Operation and maintenance procedures will form part of the EMS
18	OTNOC management plan	Pre-operational condition PO1
19	Use of heat recovery boiler	Heat recovery boiler being used to generate steam as described in the Application. Permit condition 2.3.1, table S1.2
20	Measures to increase energy efficiency and BAT AEEL	Measures described in the Application. Section 4.3.7 of this decision document.
21	Measures to prevent or reduce diffuse emissions including odour	Measures described in the Application, including the OMP. Permit conditions 2.3.1, table S1.2, 3.4.1, 3.3.1, 3.3.2. Section 6.6.4 of this decision document.
22	Handling of gaseous and liquid wastes	Not applicable
23	Management system to prevent or reduce dust emissions from treatment of slags and ashes	Not applicable, as no treatment of slags or ashes.
24	Techniques to prevent or reduce diffuse emissions to air from treatment of slags and ashes	Not applicable, as no treatment of slags or ashes
25	Minimisation of dust and metal emissions and compliance with BAT AEL	Measures described in the Application. Section 6.2.1 of this decision document. Permit conditions 2.3.1, table S1.2, 3.4.1, 3.3.1, 3.3.2. 3.1.1 and 3.1.2 and table S3.1

BAT conclusion	Criteria	Delivered by
26	Techniques and BAT AEL for dust emissions from enclosed slags and ashes treatment	Not applicable, as no treatment of slags or ashes
27	Techniques to reduce emissions of HCl, HF and SO_2	Measures described in the Application and email response dated 15/1/20. Permit condition 2.3.1 and table S1.2 Permit condition 2.3.1 and table S1.2 Section 6.2.3 of this decision document.
28	Techniques to reduce peak emissions of HCl, HF and SO_2, optimise reagent use and BAT AELs	Measures described in the Application. Section 6.2.3 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
29	Techniques to reduce emissions of NO_2, N_2O, CO and NH_3 and BAT AELs	Measures described in the Application. Sections 6.2.2 and 6.2.4 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
30	Reduce emissions or organic compounds including dioxins/furans and PCBs. BAT AELs	Measures described in the Application. Section 6.2.5 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
31	Reduce emissions of mercury. BAT AEL	Measures described in the Application. Section 6.2.6 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1 and 3.1.2 and table S3.1
32	Segregate waste water streams to prevent contamination	Measures described in the Application Sections 6.6.1, 6.6.2 and 6.6.1 of this decision document. Permit conditions 2.3.1, table S1.2, 3.1.1, 3.1.2 and table S3.2

BAT conclusion	Criteria	Delivered by
33	Techniques to reduce water usage and prevent or reduce waste water	Measures described in the Application. Sections 4.3.8 and 6.6.1 of this decision document. Permit conditions 1.3.1, 2.3.1, table S1.2
34	Reduce emissions to water from FGC and/or from treatment or storage of bottom ashes. BAT AELs	Not applicable
35	Handle and treat bottom ashes separately from FGC residues	Permit condition 2.3.14
36	Techniques for treatment of slags and bottom ashes	No treatment carried out on site
37	Techniques to prevent or reduce noise emissions.	Measures are described in the Application. Section 6.6.5 of this decision document. Permit conditions 2.3.1, table S1.2, 3.5.1, 3.5.2

ANNEX 2: Pre-Operational Conditions

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

Table S1.4A Pre-operational measures	
Reference	**Pre-operational measures**
Reference	Pre-operational measures
PO1	For activity AR1 and AR2, referenced in schedule 1, table S1.1 Prior to the commencement of commissioning, the Operator shall send: • A summary of the site Environment Management System (EMS);and • A copy of the full OTNOC management plan which shall be prepared in accordance with BAT 18 of the BAT conclusions to the Environment Agency and obtain the Environment Agency's written approval to the EMS summary and the full OTNOC management plan 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 Environment Agency web guide on developing a management system for environmental permits (found on www.gov.uk) and BAT 1 of the incineration BAT conclusions. The EMS shall include the approved OTNOC management plan. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
PO2	For activity AR1, referenced in schedule 1, table S1.1 prior to the commencement of commissioning, the Operator shall send a report to the Environment Agency, and obtain the Environment Agency's written approval to it, which will contain a comprehensive review of the options available for utilising the heat generated, including operating as CHP or supplying district heating, by the waste incineration process in order to ensure that it is recovered as far as practicable and detail any identified proposals for improving the recovery and utilisation of heat and provide a timetable for their implementation.
PO3	For activity AR1, referenced in schedule 1, table S1.1, prior to the commencement of commissioning, the Operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, a protocol for the sampling and testing of incinerator bottom ash for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.
PO4	For activity AR1 and AR2 referenced in schedule 1, table S1.1, prior to the commencement of commissioning, the Operator shall submit to the Environment Agency, and obtain the Environment Agency's written approval to it, a written commissioning plan, including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include the expected emissions to the environment during the different stages of commissioning, the expected durations

Table S1.4A Pre-operational measures	
Reference	**Pre-operational measures**
	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.
PO5	For activity AR1, referenced in schedule 1, table S1.1, prior to the commencement of commissioning, the Operator shall submit a written report to the Agency, and obtain the Environment Agency's written approval to it, detailing the waste acceptance procedure to be used at the site. The waste acceptance procedure shall include the process and systems by which wastes unsuitable for incineration at the site will be controlled. The procedure shall be implemented in accordance with the written approval from the Agency.
PO6	For activity AR1, referenced in schedule 1, table S1.1, no later than one month after the final design of the furnace and combustion chamber, the operator shall submit a written report to the Environment Agency, and obtain the Environment Agency's written approval to it, of the details of the computational fluid dynamic (CFD) modelling. The report shall explain how the furnace has been designed to comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED whilst operating under normal load and the most unfavourable operating conditions (including minimum turn down and overload conditions), and that the design includes sufficient monitoring ports to support subsequent validation of these requirements during commissioning.
PO7	Prior to the commencement of commissioning, the Operator shall submit a report, and obtain the Environment Agency's written approval to it, on the baseline conditions of soil and groundwater at the installation. 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.
PO8	For activity AR1, referenced in schedule 1, table S1.1, at least three months before (or other date agreed in writing with the Environment Agency) the commencement of commissioning, the Operator shall submit a written report to the Environment Agency, and obtain the Environment Agency's written approval to it, specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance notes M1, M2 and M20. 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
PO9	At least 3 months before the commencement of commissioning of Activity AR1 (or other date agreed in writing with the Environment Agency) the Operator shall submit, for approval by the Environment Agency, a methodology (having regard to Technical Report P4-100/TR Part 2 Validation of Combustion Conditions) to verify the residence time, minimum temperature and oxygen content of the gases in the furnace whilst

Table S1.4A Pre-operational measures	
Reference	**Pre-operational measures**
	operating under normal load, minimum turn down and overload conditions.
PO10	For activity AR1 and AR2 referenced in schedule 1, table S1.1, at least 2 weeks (or any other date as agreed with the Environment Agency) prior to the commencement of commissioning of the installation, the operator shall submit a revised odour management plan to the Environment Agency for written approval. The plan shall take into account the appropriate measures for odour control specified in section 7.6.5 of the Environment Agency Draft Technical Guidance for Anaerobic Digestion (Reference LIT 8737, November 2013). The plan shall also include all the required information as specified in the Environment Agency Horizontal Guidance H4 - Odour Management. No site operations shall commence or waste accepted at the facility unless the Environment Agency has given prior written permission under this condition.
PO11	For activity AR2, referenced in schedule 1, table S1.1, at least 8 weeks (or any other date as agreed with the Environment Agency) prior to the commencement of commissioning of the installation, the operator shall ensure that a review of the design, method of construction and integrity of the proposed site secondary containment for the AD facility is carried out by a qualified structural engineer. The review shall compare the constructed secondary containment against the standards set out in section 7.9.1 of the Environment Agency Draft Technical Guidance for Anaerobic Digestion (Reference LIT 8737, November 2013) and CIRIA C736 - Containment Systems for the Prevention of Pollution - secondary, tertiary and other measures for industrial and commercial premises or other relevant industry standard. The review shall include: - physical condition of the secondary containment - the suitability for providing containment when subjected to the dynamic and static loads caused by catastrophic tank failure; - any work required to ensure compliance with the standards set out in CIRIA C736 or other relevant industry standard; and - a preventative maintenance and inspection regime A written report of the review shall be submitted to the Environment Agency detailing the review's findings and recommendations. Remedial action shall be taken to ensure that the secondary containment meets the standards set out in the technical guidance documents and implement the maintenance and inspection regime. Operation of the anaerobic digestion facility shall not commence or waste accepted at the facility for processing in the anaerobic digestion facility unless the Environment Agency has given prior written permission under this condition.
PO12	For activity AR2, referenced in schedule 1, table S1.1, at least 4 weeks (or any other date as agreed with the Environment Agency) prior to the commencement of commissioning of the anaerobic digestion facility, the operator shall provide written evidence to the Environment Agency of the Technically Competent Manager (TCM) at the proposed facility (Activity reference AR2 Table S1.1). The report shall confirm that the person(s): • hold the relevant qualifications under the CIWM/WAMITAB scheme or other equivalent for the operation of the anaerobic digestion plant, and • have appropriate competence in operating the biogas upgrading plant (including the injection of biomethane into the Gas Grid). No site operations shall commence or waste accepted at the installation unless the Environment Agency has given prior written permission under this condition.
PO13	For activity AR1, referenced in schedule 1, table S1.1, and the storage and handling of dried digestate from activity AR2, referenced in schedule 1, table S1.1, prior to the commencement of commissioning, the operator shall submit an updated fire prevention plan (FPP) and obtain the Environment Agency's written approval to it. The FPP must be written in line with the Environment Agency's guidance, Fire prevention plans:

Table S1.4A Pre-operational measures	
Reference	**Pre-operational measures**
	environmental permits and shall include the following aspects: • Waste pre-acceptance and acceptance procedures which demonstrates how incompatible wastes and hot loads will be prevented from entering the waste bunker. • Bunker management procedures which demonstrate how residual waste will be removed from the bunker when new waste deliveries commence. It must clearly show that the 'first-in first-out' principle will be achieved. • Design specifications and construction details of the firewalls. • Evidence to show that the design, installation and maintenance of the building fire detection and suppression systems will be covered by an appropriate UKAS accredited third party certification scheme or a demonstrable alternative third-party accreditation. • Design of the firewater containment system which shows how all firewater generated when extinguishing a fire will be contained on site. The operator shall provide calculations to demonstrate that the capacity of the containment infrastructure is sufficient. • Final design of systems for the provision of water supported by evidence that the water supply available on site is capable of extinguishing a fire within four hours; or, where appropriate justify alternative measures.
PO14	At least 8 weeks (or any other date as agreed with the Environment Agency) prior to the commencement of discharging process waters to sewer, the operator shall submit in writing to the Environment Agency for review a risk assessment in accordance with our online guidance https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit. The environmental impact assessment shall, as a minimum, include: • a completed H1 assessment software tool • Valid discharge consent issued by the appropriate sewage undertaker No emissions to sewer shall commence at the installation unless the Environment Agency has given prior written permission under this condition.
PO15	Prior to the commencement of commissioning, the Operator shall submit a site plan to the Environment Agency that shows the location of the emission points for the emergency diesel generator, emergency flare, biogas upgrading plant. (Emission Points A4, A5, A6 Table S3.1) and emission point to sewer (S1 Table S3.3)
PO16	Prior to the commencement of commissioning, the Operator shall submit a report to the Environment Agency which considers the technical and commercial viability of generating CNG or exporting biogas to grid, in preference to combustion through the CHP plant, identifying proposals to maximise export together with a timetable for implementation.

ANNEX 3: Improvement Conditions

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

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System (EMS) 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 12 months of the completion of commissioning.
IC2	The Operator shall submit a written proposal to the Environment Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission point A1 and A2, identifying the fractions within the PM10, and PM2.5 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 the completion of commissioning.
IC3	The Operator shall submit a written report to the Environment Agency on the commissioning of the installation. The report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions and confirm that the Environmental Management System (EMS) has been updated accordingly.	Within 4 months of the completion of commissioning.
IC4	The Operator shall submit, for approval with the Environment Agency, a methodology (having regard to Technical Report P4-100/TR Part 2 Validation of Combustion Conditions) to verify the residence time, minimum temperature and oxygen content of the gases in the furnace whilst operating under normal load , minimum turn down and overload conditions.	Report for approval to be submitted at least 2 months before validation testing or as agreed in writing with the Environment Agency.
IC5	The operator shall notify the Environment Agency of the proposed date(s) that validation testing is planned for.	Notification at least 3 weeks prior to validation testing
	During commissioning the operator shall carry out validation testing to validate the residence time, minimum temperature and oxygen content of the gases in the furnace whilst operating under normal load and most unfavourable operating conditions. The validation shall be to the methodology as approved through pre-operational condition	Validation tests completed before the end of commissioning

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	IC4. The operator shall submit a written report to the Environment Agency on the validation of residence time, oxygen and temperature whilst operating under normal load, minimum turn down and overload conditions. The report shall identify the process controls used to ensure residence time and temperature requirements are complied with during operation of the incineration plant	Report submitted within 2 months of the completion of commissioning.
IC6	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of: The Selective Catalytic Reduction (SCR) system and combustion settings to minimise oxides of nitrogen (NOx).The report shall include an assessment of the level of NOx, N2O and NH3 emissions that can be achieved under optimum operating conditions (Activity reference AR1 and AR2 Table S1.1) The hydrated lime injection system for minimisation of acid gas emissions The activated carbon injection system for minimisation of dioxin and heavy metal emissions.	Within 4 months of the completion of commissioning.
IC7	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. 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 environmental standard can be exceeded, the report shall include proposals for further investigative work.	15 months from the completion of commissioning
IC8	The Operator shall submit a written summary report to the Environment Agency to confirm 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. The report shall include the results of calibration and verification testing.	Initial calibration report to be submitted to the Agency within 3 months of completion of commissioning. Full summary evidence compliance report to be submitted within 18 months of completion of commissioning.

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
IC9	During commissioning, the operator shall carry out tests to demonstrate whether the furnace combustion air will ensure that negative pressure is achieved throughout the reception hall. The tests shall demonstrate whether air is pulled through the reception hall and bunker area and into the furnace with dead spots minimised. The operator shall submit a report to the Environment Agency, for approval, summarising the findings along with any proposed improvements if required	Within 3 months of completion of commissioning.
IC10	For activity AR2, referenced in schedule 1, table S1.1 the operator shall carry out a monitoring study to verify the assumptions made in the application in relation to the releases of pollutants to air. The study shall include the monitoring of point source releases to air from the biogas upgrading plant emission point A7 during normal operation, having regard to the Environment Agency technical guidance M2 and to MCERTS standards. As a minimum, two separate monitoring campaigns in a year shall be completed (one monitoring survey six months following commissioning of the biogas upgrading plant). The pollutants to be monitored shall include: • total volatile organic compounds; and • hydrogen sulphide	Within 6 months of commissioning or otherwise agreed in writing by the Environment Agency
IC11	Following the completion of IC10, the operator shall undertake an impact assessment of all point source releases to air, using the information obtained through the emissions monitoring. The environmental impact assessment report and all associated monitoring reports and assessments shall be submitted in writing to the Environment Agency for review. The environmental impact assessment shall, as a minimum, include: • reports showing details of the monitoring undertaken and the results obtained; • results of the assessment of long and short term impacts from the emissions in accordance with Environment Agency Guidance – Air emissions risk assessment for your environmental permit • a completed H1 assessment software tool If the H1 assessment shows potential long or short term impacts from the emissions, the operator shall propose an action plan to reduce the impacts of the substances identified.	Within 2Mths of completion of IC9 or otherwise agreed in writing by the Environment Agency
IC12	The Operator shall carry out a programme of dioxin and dioxin like PCB monitoring over a period and frequency agreed with the Environment Agency. The operator shall submit a report to the Environment Agency with an analysis of whether dioxin emissions can be considered to be stable.	Within 3 months of completion of commissioning or as agreed in writing with the Environment Agency
IC13	The Operator shall carry out a programme of mercury monitoring over a period and frequency agreed with the Environment Agency. The operator shall submit a report to the Environment Agency with an analysis of whether the waste feed to the plant can be proven to have a low and stable mercury content.	Within 3 months of completion of commissioning or as agreed in writing with the Environment Agency
IC14	The Operator shall submit a report to the Environment Agency for approval on start-up and shut-down conditions over the first 12	Within 15 months of completion of

Table S1.3 Improvement programme requirements		
Reference	**Requirement**	**Date**
	months of operation. The report shall identify any amendments to the start-up and shut-down definitions that were described in the application.	commissioning or as agreed in writing with the Environment Agency

ANNEX 4: Consultation Reponses

A) Advertising and Consultation on the Application

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

The Application was advertised on the Environment Agency website from 13th February 2019 to 13th March 2019 and in the News Shopper (Bexley, Greenwich, Dartford and Swanley) on 13th February 2019. The Application was made available to view at the Environment Public Register at Guildborne House, Chatsworth Road, Worthing.

The following statutory and non-statutory bodies were consulted: -

- Public Health England;
- Local Authority Director of Public Health;
- Local planning authority, Wealden;
- Environmental Health, Rotherham;
- National Grid;
- Health and Safety Executive;
- Natural England;
- London Wildlife Trust
- Greenspace Information for Greater London
- Sewer Undertaker

1) Consultation Responses from Statutory and Non-Statutory Bodies

None

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

Response Received from Public Health England	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Based on the information contained in the application supplied to us, Public Health England has no significant concerns regarding the risk to the health of the local population from the	We are satisfied that the Applicants proposals utilise the Best Available Techniques. This is discussed in section 6 of this document,

installation. This consultation response is based on the assumption that the permit holder shall take all appropriate measures to prevent or control pollution, in accordance with the relevant sector guidance and industry best practice.	

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 25th March 2020 and 24th April 2020.

Some of the consultation responses 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 Shirley Rodrigues Deputy Mayor for Environment & Energy (GLA) and Abena Oppong-Asare MP (Erith and Thamesmead) who raised the following issues:-

Issue Raised	Our response
Waste hierarchy – incinerator Only truly unrecyclable waste should be incinerated. We note that the EA has set permit condition 2.3.4 (c) in the draft EP to prevent separately collected fractions being incinerated unless they are unsuitable for recycling. Whilst Condition 2.3.4 (c) is welcomed, it does not place any restriction on the amount of such wastes that could be combusted, nor how 'unsuitable' is defined. We believe that the EP should also set a requirement to define the criteria that will be used to confirm that any source segregated wastes accepted at the site are 'unsuitable for recycling'. This should be subject to the EA's approval and	The proposed facility forms part of an integrated waste management strategy; any material arriving at the facility will be residual waste arisings following upstream waste segregation, recovery and recycling initiatives. 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. Condition 2.3.4 (c) prevents waste being accepted if having been separately collected for recycling, it is suitable for recovery by recycling.

form part of the site's Waste Acceptance Procedures believe that the EP should also include a requirement to report annually the amount of source-segregated wastes that are accepted and burned on the basis that they are unsuitable for recycling. .	Unsuitable means anything that is contaminated that can't be recovered by recycling. The incineration of waste that is suitable for recovery or recycling unless it's contaminated would be a breach of permit condition 2.3.4 and therefore would be subject to enforcement action. The facility will be subject to regular site inspections to ensure compliance with this condition. Source-segregated wastes that are unsuitable for recycling may already have been mixed in with other wastes before it arrives at the facility. It is also the waste producer's responsibility to recycle and recover as much waste as possible, and so we consider that a permit reporting requirement for this waste would be difficult for the operator to complete and does not relate to emissions which is the primary concern of the permit. Consequently we have not included it in the permit. However, the condition we have imposed requires the operator to ensure they do not knowingly accept waste that should be recycled. We have placed a requirement into the EP (Pre-operational condition PO5) requiring the operator to submit for approval the waste acceptance criteria to be used at the site which will also form part of the Environmental Management System prior to commencement of operations. We will ensure that unsuitable wastes are clearly defined and appropriate waste management techniques and provisions for dealing and recording such wastes are in place.

Combined heat and power (CHP) The applicant predicts that the efficiency of electricity generation will be 34.26%, at the upper end of indicative BAT-associated energy efficiency levels of between 25-35%. Further, the EA in its draft EP has set an Improvement Condition IC3 requiring the operator to summarise the environmental performance of the plant as installed against the design parameters (which is assumed to include electrical efficiency). However, we believe that to secure commitment to this high level of efficiency, the draft EP condition IC3 should be strengthened to additionally require the applicant to identify actions to be taken in order to meet the approved design parameters, in the event that the actual performance does not achieve them. The EA's conclusion that it is satisfied that its requirements for energy recovery have been met, within the constraints of the location. We also note that the EA has considered the applicant's cost-benefit analysis of potential heat off-take schemes and agrees with the conclusion that no schemes are currently commercially viable. It is unclear from the EA's DD whether the applicant's analysis has taken into account the existing potential heat supplier that is the neighbouring Riverside Resource Recovery Facility (RRRF), which also has obligations to identify potential heat off-take schemes. During the DCO Examination the GLA submitted detailed evidence that demonstrated the potential heat supply capability of RRRF and the fact that it had not been realised in over 8 years of operation. Whilst the DD notes that	The operator is required to operate the facility in accordance with the design parameters contained within the Permit application and we expect the efficiency levels presented to be met as a result of this. This requirement has been embedded in the Operating Techniques Table S1.2 in the EP. Should the facility be operated outside of the design parameters then this would effectively be a breach of the Permit and the Environment Agency would if necessary take enforcement action or raise an Environment Agency initiated variation. Heat supply capability/availability is considered on an installation by installation basis REP and RRRP are effectively two distinct separate facilities. The Environment Agency's remit is to ensure that heat is recovered as far as practicable. Whilst the presence of another plant nearby may affect what is practicable whether this is suitable location is a land use planning matter. However with the two facility's being in close proximity it may prove to be beneficial by combining and sharing services making the possibility of CHP more viable in the long term. Permit condition 1.2.3 requires the operator to review the viability of Combined Heat and Power implementation 'at least' every 4 years. The requirement of the Environmental Permit and DCO are separate and complementary and we consider the change not to be necessary. We do not think it necessary to

the REP could also supply heat to complement the existing RRRF or provide resilience of supply, it does not consider whether the ability of the proposed facility to find appropriate off-take schemes might be much reduced given that there is already a significant amount of unused capacity available from existing facilities. We believe that the EA should show how it has considered this in its decision-making process. The EA has set a pre-operational condition PO2 in the draft EP requiring the options to be reviewed as well as Condition 1.2.3 which requires further review every 4 years, or sooner depending on certain relevant factors. We request that the EA amends the timescale for review of options required under Condition 1.2.3 in the draft EP to a 3-year period, in alignment with the DCO agreed by the Secretary of State. In addition, that Pre-operational condition PO2 should include a requirement for the applicant to take into account the findings of the Working Group that is required under Requirement 24 of the DCO.	specifically include a requirement to take into account the working group findings under Requirement 24 of the DCO. Pre-operational condition PO2 requires a comprehensive review of the options for utilising generated heat and we consider the wording of the condition to be sufficient to incorporate that, if the Agency thinks that the submission is inadequate we will require more work on it.
Use of compost material and gas from the anaerobic digestion (AD) plant The draft EP requires the operator to apply the waste hierarchy to wastes produced by the installation by virtue of Condition 1.4.1, and that this must be reviewed every 4 years in accordance with Condition 1.4.2. This would apply to the digestate and biogas produced by the AD plant. Requirement 25 of the DCO also considered these matters. The EA's DD confirms that the use of digestate as a fuel is less preferable than use in agriculture and 'will be a	Permit condition 1.4.2 requires the operator to review appropriate measures relating to avoidance, recovery and disposal of wastes produced by the activities 'at least' every four years. The requirement of the Environmental Permit and DCO are separate and complementary and we consider the change not to be necessary. We have amended Table S4.2 to include the requirement to report

last resort'. Whilst the DD notes that the applicant anticipates that the quantities of digestate used as a fuel will be small, there is no specific requirement in the draft EP to ensure that this is the case. We believe therefore that the EP should include a further safeguard beyond the general requirements of condition 1.4.1 and 1.4.2 to ensure that recovery of digestate to land is maximised in line with the waste hierarchy. We suggest that the EP includes a requirement to report the amount and proportion of digestate produced that is transferred for recovery to land within Table S4.2 Annual production/treatment or Table S4.3 Performance Parameters. Further, that an appropriate action level for the amount of digestate burned in the incinerator should be established in the EP, which would trigger the operator to identify and carry out appropriate actions to maximise recovery to land. This would align with the applicant's obligation for complying with DCO Requirement 25. Whilst condition 1.4.2 requires a review of changes to the appropriate measures to apply the waste hierarchy to wastes produced at the site, we consider that this could be carried out every 2 years, in line with the DCO, rather than 4 years. The draft EP allows the operator to burn biogas in a CHP if the preferred option to generate compressed natural gas (CNG) is not feasible and viable. However, in order to support the preferred option, we consider that the EP should include an additional requirement, in the form of an Improvement Condition, requiring a review of the technical and commercial viability of generating CNG or exporting biogas to grid within	annually the Total volume of digestate that has been incinerated or recovered to land to demonstrate compliance with condition 1.4.1. In order to ensure compliance with Permit condition 1.4.1 and 1.4.2 we have included Pre-Operational measure PO16 to the Environmental Permit requiring the operator to submit to the Environment agency a commercial and technical viability report for the preferred option of maximising the generation of CNG in preference to combustion in the CHP engine. Reporting requirements under condition 4.2.2 (b) and Table S4.2 of the Environmental Permit require the operator to report both digestate sent to land spreading and total digestate incinerated, this will ensure that Environmental Permit condition 1.4.1 is being met.

12 months of the completion of commissioning, identifying proposals to maximise export and a timetable for their implementation.	
Impacts of emissions to air – ERF The applicant has committed to use Selective Catalytic Reduction (SCR) technology for the abatement of NOx from the ERF, which is capable of achieving significant reductions in NOx emissions and goes beyond what has been required at EfW permitted by the EA in other locations. The EA has set an emission limit of 75mg/m3 in the draft permit which is toward the lower end of 'indicative BAT- AEL' range stated in the Waste Incineration Bref. However, the emission limit is not set at the tightest limit stated as achievable by new plant using SCR in the Waste Incineration Bref of 50mg/m3. The EA's DD does not explain why this lower limit has not been set in the draft EP.	The Applicant has chosen to undertake SCR for NOx abatement in preference to SNCR to minimise emissions to air, at an increased financial cost to themselves. The limit 75mg/m3 set within the Permit is within the acceptable BAT range for SCR. 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, and so a lower limit is unnecessary. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.
Replace with Concerns raised over in-combination effects of emissions to air from RRRF.	The RRRF and REP Installations are considered to be two separate and distinct facilities and therefore emissions of the power plants are considered separately. The environmental impact on human health has been assessed as part of the determination process and has been reported upon in the main body of this document (sections 5.3.1 to 5.3.4) as the RRRF is an existing operational facility its stack emissions will form part of existing background air quality concentrations which have been considered in the air dispersion modelling and impact assessment. We are satisfied that the emissions

	from the Installation will not cause a breach of the NO_2 Environmental Standards We are satisfied that compliance with Permit conditions will ensure protection of the environment and human health.
Water runoff from the additional hard standing areas will affect salinity levels of ditches in nearby nature reserves, which in turn could lead to the extinction of Skylark and Ringed Plover as breeding species within Bexley.	There are no permitted discharges of process waters to controlled waters either direct or indirectly from the facility. The EP allows for discharge of 'clean' surface waters from 'non-process' areas only, this is essentially rainwater from hard standing and roof structures (Point W1, as Shown in Schedule 7 of the EP) We are satisfied that the Installation will not cause significant pollution at the sites and that sufficient information was available to make our decision.

d) Representations from Individual Members of the Public

A total of five responses were received from individual members of the public including J.White for Bexley Environment Alliance.

Issue Raised	**Our response**
Comments about impacts at ecological sites	
Concern that the ecological surveys undertaken for the Development Consent Order were conducted at the wrong time of year and do not provide	Decisions over land use are matters for the planning system. The location of the installation is a relevant consideration for Environmental

a true reflection of which ground nesting birds may be disturbed by the development and that the ecological survey did not record Shrill Carder Bee whose presence on the nature reserve and southern marsh have been verified.	Permitting, but only in so far as it's potential to have an adverse environmental impact on communities or sensitive environmental receptors. The environmental impact on localised habitat sites, has been assessed as part of the determination process and has been reported upon in the main body of this document (Section 5.4). These assessments used the appropriate EQSs and critical levels or loads for these sites, and so we had sufficient information to make our assessment. We are satisfied that the Installation will not cause significant pollution at the sites and that sufficient information was available to make our decision. The Applicant is required to prevent, minimise and control emissions using BAT, this is considered further in Section 6.
Comments about human health impacts	
Concern about in-combination effects as although RRRF and REP Installations are technically classed as single facilities as they are adjacent to one another the combined Nitrous Oxide emissions of the two power plants should be considered as one emission (170 mg/Nm3 + 120 mg/Nm3) and therefore exceed the European environmental directive of 200 mg/Nm3 per day, placing the health of local communities at risk. Concern that the Environment Agency's has not undertaken its duty to ensure statutory emission levels are not breached.	The RRRF and REP Installations are considered to be two separate and distinct facilities and therefore emissions of the power plants are considered separately. The environmental impact on human health has been assessed as part of the determination process and has been reported upon in the main body of this document (sections 5.3.1 to 5.3.4) as the RRRF is an existing operational facility its stack emissions will form part of existing background air quality concentrations which have been considered in the air dispersion modelling and impact assessment. We are satisfied that the emissions from the Installation will not cause a breach of the NO_2 Environmental Standards

	We are satisfied that compliance with Permit conditions will ensure protection of the environment and human health.
Concern regarding impacts on health of residents of pollutants from the facility including Particulate matter (PM2.5 and PM10), Nitrogen dioxide (NO_2) and Metals.	The environmental impact on human health has been assessed as part of the determination process and has been reported upon in the main body of this document (sections 5.3.1 to 5.3.4). We are satisfied that the emissions from the Installation will not cause a breach of Environmental Standards. We are satisfied that compliance with Permit conditions will ensure protection of the environment and human health.
Concern of a lack of accurate pollution monitoring systems in the area.	In the modelling of emissions the consultant has used background data from different air quality networks spread across the UK and DEFRA background maps for the pollutants considered. We reviewed the data and confirmed they are reasonably representative. We did however identify some minor differences and included the most conservative background data for all the pollutants in our check modelling assessments, to cover this. We do not require pollution monitoring in the area, as we control the emissions “at source” by setting emission limits and monitoring requirements, in tables S3.1 and S3.1a in the permit, for the emissions from the stacks.
Concern regarding pollution from the facility and the reliability of the dispersion modelling system.	The modelling data (Including existing background concentration) is used to inform an assessment of the environmental and health impacts of the installation. The Environment Agency has audited the model and found that its predictions are soundly based.

	The subsequent impact assessment uses environmental quality standards, objectives and targets that are drawn from a range of sources including EU and UK legislation and guidance and WHO guidance to be protective of public health. The modelling does not predict the exceedence of any of these standards.
Concern that that water courses are being polluted in Bexley and other outer London areas by run off from road traffic pollution, including harmful particulates. There is a major concern for Particulate emissions which maybe brought to ground level in rain or other bad weather.	The environmental impact on human health including Particulates has been assessed as part of the determination process and has been reported upon in the main body of this document (sections 5.3.1 to 5.3.4). The air quality assessment considered existing background pollution levels which includes emissions from traffic. The air quality assessment shows that the process contributions of particulate (PM2.5 and PM10) from the Installation are insignificant when compared against both Short Term and Long Term Environmental standards. Also the maximum predicted emissions from the Installation are less than 1% of the background particulate (PM2.5 and PM10) levels. Predicted environmental concentrations (PEC) of particulate which take into consideration existing background levels of particulate additionally show that levels are substantially lower than relevant Environmental Standards. We are satisfied that the emissions from the Installation will not cause a breach of Environmental Standards, and that compliance with Permit conditions will ensure protection of the environment and human health.

Comments about recycling	
Concern regarding recyclates particularly the burning of clothing/carpets and associated climate impact. Concern whether the process of incineration is the right waste management strategy and the potential impacts on the reduction of recycling rates.	The proposed facility forms part of an integrated waste management strategy; any material arriving at the facility will be residual waste arisings following upstream waste segregation, recovery and recycling initiatives. 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. In addition to this we have set permit condition 2.3.4 (c) that does not allow separately collected fractions to be incinerated unless they are unsuitable for recycling. We are satisfied that compliance with Permit conditions will ensure protection of the environment and human health.
Comments about the location of the facility	
Concern raised about the location of the facility.	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 document. We are satisfied that compliance with Permit conditions will ensure protection of the environment and human health.

Site boundary description on the draft EP does not correctly reflect the current landscape.	The Introductory note descriptions on the EP and site setting section 4.1.2 of the decision document are used to set the context of the site and do not materially affect the assessment of the site condition report. Visual impacts are not part of our assessment remit. We are satisfied that the Installation will not cause significant pollution at the sites and that sufficient information was available to make our decision.
Comments about Global Warming	
Concern that Incinerators contribute to global warming.	The environmental impact Of greenhouse gas emissions has been assessed as part of the determination process and has been reported upon in the main body of this document (Sections 6.1, 6.3 and 6.7.1).
Comments about Public consultation	
Concern regarding public consultation procedures and how responses have been taken into account.	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 and this has been detailed in the main body of this document (sections 2.2, 7.1.4 and Annex 4). Details of how the responses have been taken into account, are detailed in this section (Annex 4) of the document.