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

Decision document recording our decision-making process

The Permit Number is:	EPR/DP3797SE/V006
The Operator is:	Crapper & Sons Landfill Ltd
The Installation is located at:	Park Grounds Farm Brinkworth Road Royal Wootton Bassett Wiltshire SN4 8DW

What this document is about

This is a decision document, which accompanies a permit variation notice.

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

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

Preliminary information and use of terms

We gave the application the reference number EPR/DP3797SE/V006. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we have given to the permit variation is EPR/DP3797SE/V006.

The Application was duly made on 29/06/2017.

The Applicant is Crapper & Sons Landfill Ltd. We refer to Crapper & Sons Landfill Ltd as "the **Applicant**" in this document. Where we are talking about what would happen after the Permit Variation Notice is granted, we call Crapper & Sons Landfill Ltd "the **Operator**".

The Crapper & Sons Landfill Ltd Regulated Facility is located at Park Grounds Farm, Brinkworth Road, Royal Wootton Bassett, Wiltshire, SN4 8DW.

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)
APC	Air Pollution Control
AQS	Air Quality Stratergy
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CEM	Continuous emissions monitor
CFD	Computerised fluid dynamics
CHP	Combined heat and power
COMEAP	Committee on the Medical Effects of Air Pollutants
CROW	Countryside and rights of way Act 2000
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2016 (SI 2016 No. 1154) as amended
ES	Environmental standard
EWC	European waste catalogue
FSA	Food Standards Agency
GWP	Global Warming Potential
HHRAP	Human Health Risk Assessment Protocol
HPA	Health Protection Agency (now PHE – Public Health England)
HRA	Human Rights Act 1998
HW	Hazardous waste
HWI	Hazardous waste incinerator

IBA	Incinerator Bottom Ash
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
I-TEF	Toxic Equivalent Factors set out in Annex VI Part 2 of IED
I-TEQ	Toxic Equivalent Quotient calculated using I-TEF
LCPD	Large Combustion Plant Directive (2001/80/EC) – now superseded by IED
LCV	Lower calorific value – also termed net calorific value
LfD	Landfill Directive (1999/31/EC)
LADPH	Local Authority Director(s) of Public Health
LOI	Loss on Ignition
MBT	Mechanical biological treatment
MSW	Municipal Solid Waste
MWI	Municipal waste incinerator
NOx	Oxides of nitrogen (NO plus NO_2 expressed as NO_2)
Opra	Operator Performance Risk Appraisal
PAH	Polycyclic aromatic hydrocarbons
PC	Process Contribution
PCB	Polychlorinated biphenyls
PEC	Predicted Environmental Concentration
PHE	Public Health England
POP(s)	Persistent organic pollutant(s)
PPS	Public participation statement
PR	Public register
PXDD	Poly-halogenated di-benzo-p-dioxins
PXB	Poly-halogenated biphenyls
PXDF	Poly-halogenated di-benzo furans
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SED	Solvent Emissions Directive (1999/13/EC) – now superseded by IED
SCR	Selective catalytic reduction
SGN	Sector guidance note
SHPI(s)	Site(s) of High Public Interest

SNCR	Selective non-catalytic reduction
SPA(s)	Special Protection Area(s)
SS	Sewage sludge
SSSI(s)	Site(s) of Special Scientific Interest
SWMA	Specified waste management activity
TDI	Tolerable daily intake
TEF	Toxic Equivalent Factors
TGN	Technical guidance note
TOC	Total Organic Carbon
UHV	Upper heating value –also termed gross calorific value
UN_ECE	United Nations Environmental Commission for Europe
US EPA	United States Environmental Protection Agency
WFD	Waste Framework Directive (2008/98/EC)
WHO	World Health Organisation
WID	Waste Incineration Directive (2000/76/EC) – now superseded by IED

1 Our decision

We have decided to grant the variation for Park Grounds Farm operated by Crapper & Sons Landfill Limited.

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.

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.

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

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

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

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

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

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on 29/06/2017. This means we considered it was in the correct form and contained sufficient information for us to begin our

determination but not that it necessarily contained all the information we would need to complete that determination: see below.

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

2.2 Consultation on the Application

We carried out consultation on the Application in accordance with the EPR, our statutory PPS and our own internal guidance RGS Note 6 for Determinations involving Sites of High Public Interest. We consider that this process satisfies, and frequently goes beyond the requirements of the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, which are directly incorporated into the IED, which applies to the Installation and the Application. We have also taken into account our obligations under the Local Democracy, Economic Development and Construction Act 2009 (particularly Section 23). This requires us, where we consider it appropriate, to take such steps as we consider appropriate to secure the involvement of representatives of interested persons in the exercise of our functions, by providing them with information, consulting them or involving them in any other way. In this case, our consultation already satisfies the Act's requirements.

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

We made a copy of the Application and all other documents relevant to our determination (see below) available to view on our Public Register at:
Rivers House, Wylds Road, East Quay, Bridgwater, TA6 4YS.
Anyone wishing to see these documents could do so and arrange for copies to be made.

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

- Local Authority – Planning and Environmental Health departments
- Director of Public Health/PHE
- Food Standards Agency
- Health & Safety Executive
- Fire and Rescue Service

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

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

2.3 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, and issued information notices on 03/08/2017 and 04/10/2017. 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 Operator. We made a copy of this information available to the public in the same way as the responses to our information notices.

3 The legal framework

The Permit Variation Notice will be granted, under Regulation 20 of the EPR. The Environmental Permitting regime is a legal vehicle which delivers most of the relevant legal requirements for activities falling within its scope. In particular, the Regulated Facility is:

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

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

We consider that, in granting the permit variation, it will ensure that the operation of the Regulated Facility 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 Regulated Facility

4.1 Description of the Regulated Facility and related issues

4.1.1 The permitted activities

The Regulated Facility is subject to the EPR because it carries out activities listed in Part 1 of Schedule 1 to the EPR and waste operations, as defined by the WFD.

The previous version of the permit (EPR/DP3797SE/V005) authorised the Operator to undertake the following IED listed activity for the compositing of non-hazardous waste:

- S5.4 A(1) (b) (i) Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 75 tonnes per day involving biological treatment.

The Operator also undertakes the following unlisted Waste Operations at the Regulated Facility, as previously authorised under permit variation EPR/DP3797SE/V005 and defined under the WFD:

- Waste transfer station:

D15 Storage pending any of the operations numbered D1 to D14 (excluding temporary, pending collection, on the site where it is produced).

R13: Storage of waste pending any of the operations numbered R1 to R12 (excluding temporary storage, pending collection, on the site where it is produced).

- Wood and inert waste processing facility:

D9 Physico-chemical treatment not specified elsewhere in Annex IIA which results in final compounds or mixtures which are discarded by means of any of the operations numbered D1 to D8 and D10 to D12.

R3 Recycling/reclamation of organic substances which are not used as solvents.

R4 Recycling/reclamation of metals and metal compounds.

R5 Recycling/reclamation of other inorganic materials.

This permit variation (EPR/DP3797SE/V006) authorises the Operator to undertake the following additional IED listed activities at the Regulated Facility:

- 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 ***(operation of a waste incineration plant*** *and associated material recycling facility)*

- Section 1.2 Part A(1)(f) – activities involving the pyrolysis, carbonation, distillation, liquefaction, gasification, partial oxidation or other heat

treatment of – (iv) other carbonaceous material, otherwise than with a view to making charcoal ***(operation of a waste gasification plant)***

- Section 5.4 Part A(1)(a) – disposal of non-hazardous waste with a capacity exceeding 50 tonnes per day, involving (ii) physico-chemical treatment ***(operation of a waste drying plant)***

The waste gasification plant (6 gasifiers in total) will gasify waste wood processed (shredded) on-site to produce a syngas, which will fuel three Jenbacher spark ignition engines in order to generate electricity for export to the national grid. The three engines will each have a thermal input capacity of 5.2MW.

The Applicant has confirmed that the syngas will be cleaned up to the extent that it will no longer be a waste and to ensure that when burned it can cause emissions no higher than those resulting from burning natural gas. Article 42(1) of IED excludes such plant from the requirements of chapter IV of IED. Therefore we consider that the most appropriate activity is:

- 1.2 Part A(1)(j) - gasification of carbonaceous material.

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 incineration activity description.

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

- Storage of waste prior to composting
- Pre-treatment of waste prior to composting and post-treatment of composted material
- Storage of compost material
- Operation of Materials Recycling Facility associated with the waste incineration plant; pre-treating waste prior to incineration, including the recovery of recyclable fractions
- Storage of raw materials
- Collection and storage of process water from composting activity

- Generation of electricity using steam turbine associated with waste incineration plant
- Operation of emergency electrical power plant.
- Generation of electricity using a steam turbine and a back up electricity generator for emergencies
- Generation of electricity using Jenbacher gas engines associated with the waste gasification plant
- Clean up of syngas produced by the gasification plant
- Operation of emergency flare associated with the gasification plant
- Handling, storage and disposal of char produced by gasification plant
- Handling, storage and recirculation or disposal of tar produced by the gasification plant
- Operation of effluent treatment plant associated with the gasification plant
- Management of site surface waters
- Operation of air extraction system and biofilter serving the waste reception and material recovery building

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

4.1.2 The Site

The facility operated by Crapper and Sons Landfill Limited, is located at Park Grounds Farm, near Wootton Bassett, approximately 10km west of Swindon Town Centre and 2km northwest of Wootton Bassett. The site is located immediately adjacent to the existing Crapper and Sons non-hazardous waste landfill site.

The site lies to the south of Brinkworth Road. The areas to the north, east and west of the site comprise largely open farmland, whilst the main landfill mass extends to the south, with the M4 motorway beyond. The nearest residential property to the site is located approximately 250m to the north-west of the installation boundary. The nearest controlled watercourse is the Thunder Brook (a tributary of Brinkworth Brook), located approximately 550m south of the site at its closest point, flowing in a south-westerly direction. The Regulated Facility is located approximately 9.7km to the south of North Meadow & Clattinger Farm SAC and within 2km of 14 non-statutory local wildlife and conservation sites.

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 in section 4.3.

4.1.3 What the Regulated Facility does

The Regulated Facility includes a plant referred to in the application as a combustion plant. Our view is that for the purposes of IED (in particular Chapter IV) and EPR, this plant is a waste incineration plant. Notwithstanding the fact that energy will be recovered from the combustion process; the process is never the less 'incineration' because it is considered that its main purpose is the thermal treatment of waste.

The waste incinerator plant will burn refuse derived fuel (RDF) produced by the on-site material recovery facility (MRF). The MRF will have the capacity to process up to 80,000 tonnes of mixed non-hazardous waste per annum. The MRF will take a range of industrial, commercial and household wastes and will include a waste reception area, waste shredding and screening plant, a windsifter to remove light fractions, an inline electro-magnetic separation step to remove ferrous metal and an eddy current separator to remove non-ferrous metal. The purpose of these processes is to recover recyclable materials from the waste before it is incinerated. All MRF activities will be undertaken within a fully enclosed building. Air from the building will be extracted and directed to a biofilter. The air extraction system will ensure that the building is subject to 3 air changes per hour.

The waste incineration plant will consist of one line employing a moving grate furnace design. The maximum waste input capacity of the plant is 45,000 tonnes per annum. The RDF material (fuel) will comprise of different materials that are unsuitable for recycling. Other than the initial sorting/separation undertaken at the MRF, the waste material will not undergo any further significant pre-treatment to improve its fuel quality (e.g. to a relevant standard). Heat produced by the incineration process carried out in the furnace will be used to raise steam in a boiler and generate electricity from this using a steam turbine. The plant will generate approximately 4MWe of electricity, which will be exported to the national grid.

The key features of the waste incineration activity can be summarised in the table below.

Waste throughput, Tonnes/line	45,000 tonnes/annum	5.4 tonnes/hour
Waste processed	RDF	
Number of lines	1	
Furnace technology	Moving Grate	
Auxiliary Fuel	Light fuel oil	
Acid gas abatement	Dry	Sodium bicarbonate
NOx abatement	SNCR	Urea
Reagent consumption	Auxiliary Fuel : Maximum 6,487 te/annum Urea : 460 te/annum Sodium bicarbonate : 637.5 te/annum Activated carbon: 75 te/annum Process water: 13,720 te/annum	
Flue gas recirculation	Yes	

Dioxin abatement	Activated carbon	
Stack	Height 30m	Diameter 1m
Flue gas	Flow 9.58 Nm^3/s	Velocity 20 m/s
	Temperature 180°C	
Electricity generated	4.7 MWe	36,800 MWh
Electricity exported	4.1 MWe	32,800 MWh
Steam conditions	Temperature, 400°C	Pressure, 40 Bar(a)

The Regulated Facility also includes a downward draft waste gasification plant. The plant will contain 6 individual gasifier plant, arranged into 3 pairs. The waste gasification plant will gasify non-hazardous waste wood at a temperature between 800-900ºC under low oxygen conditions. Waste wood will be fed into the gasifiers at a rate of approximately 1 tonne per hour.

The gasifiers will produce a syngas, which will be used to fuel three Jenbacher JGS 620 spark ignition engines, in order to generate electricity for export to the national grid. Each gas engine will be served by two of the gasifiers. Waste wood will predominantly be sourced from the wood shredding operation carried out on-site and will be sampled to ensure it meets the gasification plants required specification.

Each engine is designed to produce a power output of approximately 2MWe per hour. The gasification plant will include flare stacks, which will be used to burn off the syngas in the event of engine malfunction or during periods of engine maintenance.

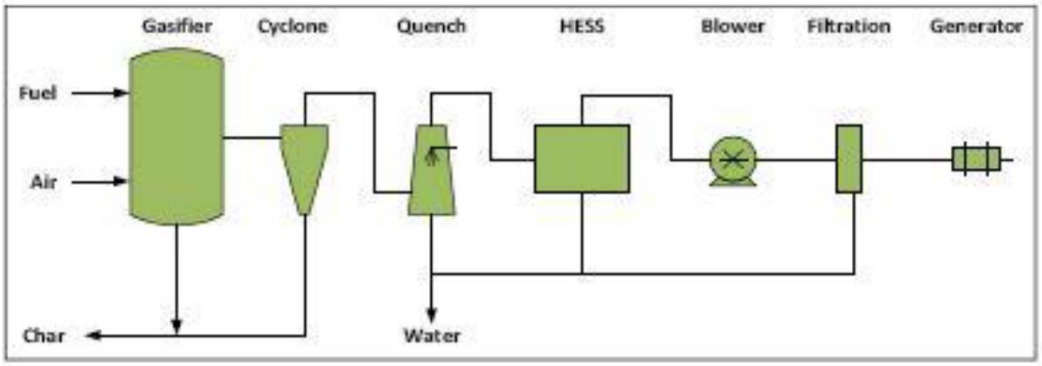
Gas produced by the gasifiers is subject to a multi-stage gas clean-up process prior to being transferred to the gas engines. The gas is subject to the cleaning process (summarised further below) in order to ensure that it is comparable in composition to that of natural gas and that combustion of the gas does not result in emissions higher than those from burning natural gas. These requirements must be met for the gas to be considered as a non-waste material and for the burning of the waste not to be considered a waste incineration activity.

The raw syngas leaves the gasifiers at a temperature of between 550 – 650°C and is passed through cyclones to remove char particulates. The cyclones are designed to provide a removal efficiency of 90%. The cyclones also recover waste heat from the gas, which is used to pre-heat the air fed to the gasifiers. The gas is then passed through a quenching/condensing process in order to remove tars and particulates, with an 80% removal efficiency. Following this cooling process the gas is then passed through a high efficiency scrubbing system, consisting of a two-stage cyclonic wet-scrubbing system, designed to remove 99.8% of the residual particulates and tars. Hydrogen peroxide is added to the second scrubber in order to remove sulphur compounds from the gas. Caustic soda is added to the scrubber liquor to maintain a suitable pH (10-10.5). The syngas is further cooled to 15°C via a final heat exchanger before being passed through as additional gas filtration system in order to remove any residuals contaminants. The filtration system consists of duty and

standby biochar filters, an activated carbon filter,1-micron coalescing filter, oil-mist coalescing filters (2 operting in series) and a bio-diesel packed scrubber.

The gasification plant will be monitored and controlled continuously using a SCADA system and central control room. The SCADA system will monitor and control all aspects of the facility, including fuel feed systems, ash extraction, gasifier, flares, gas engines and water treatment plant. The system will continuously monitor syngas quality (e.g. gas CV, pressure and moisture content) and gas engine emissions. The syngas will also be monitored periodically in order to assess and confirm that it meets the relevant end-of-waste specification, as required by the conditions of the Environmental Permit.

A process diagram of the gasification plant and associated gas clean-up process are shown below, taken from the application support documentation:



The key features of the waste gasification plant are summarised in the table below.

Waste throughput, Tonnes	45,000 tonnes /annum	5.6 tonnes /hour
Waste processed	RDF	
Technology	Gasification	
Auxiliary Fuel	LPG (propane)	
Syngas clean-up	Thermal cracking of tars, cyclones to remove char particulates, quench, two-stage High Efficiency Scrubbing System to remove particulates and tars (cyclonic wet scrubbing, including treatment with hydrogen peroxide to remove sulphur compounds) followed by a gas filtration unit consisting of biochar filters, activated carbon filter, 1-micron polypropylene coalescing filter, oil-mist coalescing filters (2 operating in series) and bio-diesel packed scrubber.	
Combustion units	Gas burner for LPG or syngas	
Stack	Height 30m	Diameter 0.6m
Flue gas	Flow 2.43 Nm^3/s	Velocity 15m/s
	Temperature 120°C	

Electicity generated	6 MWe	45,000 MWh
Electricity exported	5.4 MWe	40,500 MWh

The purpose-built waste dryer plant authorised by this Permit Variation Notice will use waste heat recovered from the water jackets of the gas engines operated as part of the waste wood gasification plant. The hot air used to dry the waste (as received from the gasification plant) will have a temperature of approximately 70°C.

The purpose of the waste dryer plant is to reduce the water/moisture content of non-hazardous waste soils. Waste acceptance procedures will ensure that only non-odorous waste is processed through the dryer plant.

Wastes accepted for treatment will typically have a moisture content of 30% and following treatment this will be reduced to 10%. Processed wastes will either be sent for disposal in the neighbouring landfill site or, in the case of refuse derived fuels, sent for (D10) incineration (on-site or off-site). The waste dryer will have the capacity to process up to 20,000 tonnes of waste per annum. The maximum capacity of the dryer plant is 7.4 tonnes per day.

Like the waste incineration plant and gasification plant, the dryer plant will be monitored, operated and controlled using a SCADA system, allowing the continuous monitoring and control of key operating parameters including belt speed, temperature, fan operation and air flow.

The facility will also continue to carry out the existing waste activities and operations authorised under the previous permit variation (EPR/DP3797SE/V005), specifically:

- Compositing of non-hazardous waste in outdoor windrows (including associated storage and pre-treatment of waste).
- Operation of a non-hazardous waste transfer station, for the storage and transfer of waste to off-site locations.
- Wood processing facility, for shredding/screening of waste wood prior to off-site transfer.

4.1.4 Key Issues in the Determination

The key issues arising during this determination were point source emissions to air and water, odour management, fire prevention, noise and the end-of-waste status of the gasification plant syngas. We therefore describe how we determined these issues in most detail in this document.

4.2 The site and its protection

4.2.1 Site setting, layout and history

The areas to the north, east and west of the site comprise largely open farmland, whilst the main landfill mass extends to the south, with the M4 motorway beyond. The nearest controlled watercourse is the Thunder Brook (a tributary of Brinkworth Brook), located approximately 550m south of the site at its closest point, flowing in a south-westerly direction.

The site is located approximately 9.7km to the south of North Meadow & Clattinger Farm SAC and within 2km of 14 non-statutory local wildlife and conservation sites.

The available historical mapping has indicated that the site has a relatively long history of agricultural use, followed by the landfilling and recycling operations associated with Crapper and Sons (Landfill) Ltd.

Surveys of the site have shown that it is covered by between 0.5 and 1.35 m of Made Ground, which is underlain by Oxford Clay Formation. The Oxford Clay Formation, which has low permeability, is classed as Unproductive Strata and is located within an Outer (Zone 2c) Source Protection Zone. The site is not within a flood plain and is in an area with low flood risk.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

The materials recycling facility associated with the operation of the waste incineration plant does not require large volumes of process chemicals or raw materials beyond the solid wastes stored and treated on-site. Other than the wastes stored/treated through the existing waste composting activity and wood shredding and waste storage/transfer operations, wastes will be stored within buildings.

All internal and external waste processing and storage areas are to be constructed with impermeable concrete hardstanding which has been designed in accordance to the load bearing requirements of the processing equipment and vehicles used at the facility.

All surface water run-off arising from the operational areas of the site are contained and discharged to a holding lagoon. All compost leachate and rainwater collected within the lagoon is recirculated through the composting

process and used to maintain moisture content levels. There are no discharges from this lagoon to controlled waters.

Any potentially contaminated water captured within the incineration plant building and the gasification plant building will be recycled within the waste treatment process. Any potentially contaminated water captured within the material recycling facility building will be diverted into the sites existing holding lagoon.

The facility has one point source emission to surface water from the facility's existing site attenuation pond. The attenuation pond is clay-lined and has a capacity of 2014m3. The discharge is made to Thunder Brook via a drainage channel that runs along the northern perimeter of the site. The emission to water will predominantly be of clean uncontaminated surface water collected from areas of the site where waste storage/treatment operations are not undertaken, which passes through an oil interceptor prior to discharging to the pond. Along with the site surface water, treated process effluent from the gasification will be discharged to the brook, via the attenuation pond. We have assessed the potential environmental impact of this discharge and are satisfied that it will not impact upon water quality or result in any deterioration.

The key process consumable used on-site that has a pollution potential is gas oil which is predominantly utilised for vehicles, plant and equipment as well as a back-up fuel for the incinerator plant. This material will be stored within a bunded steel tank that meets the requirements of our technical guidance. Other potentially polluting substances held on site include lubrication, hydraulic and turbine oils, urea, sodium bicarbonate, activated carbon, water treatment chemicals, bio-diesel, hydrogen peroxide and caustic soda. Other than the sodium bicarbonate and activated carbon, which will be stored in external silos, the other chemicals used on-site will be stored within enclosed process buildings and will be provided with bunds to contain leaks or spillage. Emergency Spill kits (oils and chemical response) will also be provided throughout the site. All storage tanks will be fitted with level gauges, alarms and hardwired into the plant online (SCADA) monitoring system.

A comprehensive maintenance and management system will be implemented at the site to include all storage areas, hardstanding and storage vessels, to ensure that they are physically inspected to detect any signs of deterioration, leaks or spillage. Site drainage systems will be inspected annually, including shut-off valves, culverts, ditches, ponds, lagoons and flow control devices. An annual CCTV drainage survey will also be carried out to ensure it is working correctly and interceptors will be inspected bi-annually or following any spillage incident.

Taking into account the location and history of the site, the nature of the activities undertaken at the site, the quantity and nature of materials stored on-site and the control measures proposed, we are satisfied that pollution of land and water is unlikely.

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 the Site Closure Plan Report submitted as part of the Application in response to the Schedule 5 Notice dated 03/08/2017 (received 15/09/2017). Pre-operational condition PO2 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 Regulated Facility – general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Regulated Facility.

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

The incineration and gasification of waste are not specified waste management activities (SWMAs). However, other specified waste management activities are undertaken at the facility, specifically the existing waste composting, waste wood treatment and waste storage and transfer operations and the proposed waste drying activity. The Operator is a member of an agreed technical competence scheme and we are satisfied that the Operator is technically competent.

The Case Management System has been checked to ensure that all relevant convictions have been declared. No relevant convictions were found. The Operator satisfies the criteria in our guidance on Operator competence.

There is no known reason to consider that the Operator will not be financially able to comply with the permit conditions.

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 (PO2) 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.

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 and fire prevention

The Applicant has submitted an Accident Management Plan. Having considered the Plan and other information submitted in the Application, we are satisfied that appropriate measures will be in place to ensure that accidents that may cause pollution are prevented but that, if they should occur, their consequences are minimised. An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning as required by a pre-operational condition (PO2).

The Applicant submitted an updated Fire Prevention Plan for the facility, including the proposed and existing waste activities. We have reviewed the submitted Fire Prevention Plan and are satisfied that it meets the relevant requirements of our guidance. Key features of the fire prevention plan are summarised below.

The waste dryer plant will only process non-combustible wastes (e.g. non-hazardous soils) and therefore is not subject to the requirements of the fire prevention guidance.

The perimeter of the site will be fenced and access will only be available via the gated access road. The site will be supervised 24 hours a day with a minimum of 5 trained staff on-site at any one time and provided with CCTV.

No waste will be stored on-site for more than 3 months, and most waste (specifically including that associated with the proposed activities permitted through this variation) will be stored on-site for significantly less than this. Waste will be managed and treated at the facility on a first-in/first-out basis through bay and pile rotation.

Waste will be stored at the materials recycling facility for up to 3 days prior to processing in dedicated reception bays and for up to 3 days in the waste sorting bays. Recovered recyclable waste will be held in bins for no longer than 5 days.

Waste (RDF) transferred to the waste incineration plant will be stored in one of two receiving pits for up to 1 day prior to being transferred to the fuel bunker. Waste will be held in the fuel bunker for up to 7 days prior to incineration. The crane serving the incineration plant will ensure that waste in the bay is mixed and older waste does not remain at the bottom.

Wood waste delivered to the waste gasification plant will be stored within dedicated bays for no longer than 1.5 days before being treated.

All piles of waste stored at the facility will be within the maximum pile sizes specified in our fire prevention guidance. All plant and machinery will be located a minimum of 10 meters from waste piles and a minimum separation distance of 6 meters will be maintained between wastes piles, unless provided with fire walls. All fire walls will be constructed of concrete designed to meet the requirements of BS8110 and BS EN 1992-1-2, with a fire resistance of 1200°C for 4 hours, and a freeboard of 1m will be maintained at the top of fire walls.

Waste stored at the facility will be subject to temperature monitoring to ensure that the temperature of the waste is below 50°C. Any waste with a temperature exceeding this will be moved to one of the proposed waste quarantine areas for further monitoring and cooling. Green waste and wood waste will be subject to daily monitoring. Material stored in the material recovery facility building, incineration building and gasification building will not be monitored due to the limited time waste will be stored in them (less than 3, 7 and 1.5 days respectively). However, the temperature of the waste following processing in the material recovery facility building will be monitored to ensure it is less than 40°C prior to it being transferred to the incineration or gasification buildings. All waste will be visually inspected twice per day as part of the site's inspection procedures.

All vehicles will be provided with fire extinguishers. The site will also have its own dedicated fire engine holding 10m^3 of water. We are satisfied that adequate fire water will be available on site, taking into account the volume of water that will be available from the fire engine, the site attenuation pond

(minimum of 900m3), dirty water lagoon (up to 7200m^3), surface water tanks (160m^3) and water bowser (10m^3).

Buildings containing the material recycling facility and waste incineration plant will be provided with fire detection and suppression systems, with automatic sprinkler systems linked to heat and smoke detection systems. The fire prevention plan confirms that these systems will be designed, installed and maintained in accordance with an UKAS-accredited third party certification scheme.

The building containing the waste wood storage bays that serve the waste gasification plant will be provided with smoke and heat detection systems, but not automatic suppression systems. However, we are satisfied that the measures proposed for the storage of waste within this building are in accordance with the objectives of the fire prevention guidance. This is on the basis that:

- waste wood will be stored in individual bays with a volume of no more than 260m3;
- waste will be stored in these bays for no more than 1.5 days, with bays being filled and emptied on an alternative basis to ensure waste is managed on a first-in, first-out basis;
- the piles of waste wood will be no more than 15 meter long;
- the waste wood bays will be provided with fire walls (as detailed above) and a 1m freeboard;
- the bays/piles are accessible externally from both ends of the building (i.e. from the open end of the building adjacent to the gasification plant and via the roller doors that serve each of the bays at the opposite end), which will enable firewater to be applied to the bays from either end of the building in the case of an emergency.

Pre-operational condition PO12 has been included in the permit to ensure it is confirmed that the fire detection and suppression systems installed in the materials recycling facility building are covered by an appropriate UKAS accredited certification scheme and have been installed and commissioned appropriately prior to operation of the building.

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 Regulated Facility in accordance with the following documents contained in the Application:

Description	Parts Included	Justification
Application	Part C3 of the application, Table 3 – Technical standards.	Existing composting activity and waste recovery operations
Application	All supporting documentation provided in support of application variation no. EPR/DP3797SE/V005.	Existing composting activity and waste recovery operations
Application	Part C3, Appendix 5 and Appendix 6 of the application. Permit Application Support Document (SOL1701CR01), Section 3, Section 4, Section 5, Section 6 (including Tables 6.2, 6.3, 6.4 and 6.5).	Operating techniques detailing the design and operation of the waste incineration, gasification and drying activities, including compliance with the relevant IED requirements.
Response to Schedule 5 dated 03/08/2017	Response to questions 4 a), 4 b); 9. Waste Wood Gasification Plant Operation a), c), d); 9. Waste Dryer Plant a), c); 10, 11, 12, 13, 15 a), 15 d).	Operating techniques detailing the design and operation of the waste incineration, gasification and drying activities.
Response Schedule 5 dated 03/08/2017	Site Closure Report	Measures proposed for site closure
Response to Schedule 5 dated 04/10/2017	Response to questions 1.1 f) ii); 1.3 a), 1.3 b), 1.3 c); 1.8 a) to h) inclusive; 2 a) to 2 m) inclusive; 7 a), 7 b); 9 b), 9 c), 9 d), 9 e), 9 g), 9 i), 9j).	Operating techniques detailing the design and operation of the waste incineration, gasification and drying activities.
Odour management plan, Version 4	All parts.	Details measures for preventing and controlling emissions of odour from site activities.
Fire prevention plan, November 2017	All parts.	Details measures for preventing and controlling fire incident resulting from on-site activities.

Additional information	Syngas clean up response (dated 01 December 2018)	Provides details regarding the syngas clean-up process to ensure the gas meets relevant end-of-waste requirements.
Written correspondence (2 emails)	Confirmation that a back-up CEMS will be available on site for the incineration plant. Confirmation of status of Crapper & Sons Landfill Ltd as Operator.	Confirmation of incinerator plant design and operating techniques and status of Crapper & Sons Landfill Ltd as operator of Regulated Facility for existing and new activities.
Written correspondence (2 emails)	Confirmation of design and operation of coalescing filters that will be operated as part of syngas clean-up process.	Provides further details regarding the syngas clean-up process to ensure the gas meets relevant end-of-waste requirements.

The details set out above describe the techniques that will be used for the operation of the Regulated Facility 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 lists of those wastes coded by the European Waste Catalogue (EWC) number, which the Applicant will accept at the facility and which the plant is capable of treating in an environmentally acceptable way. We have specified the permitted waste types, descriptions and where appropriate quantities which can be accepted at the facility in Tables S2.2, S2.3, 2.4, 2.5, 2.6, 2.7 and 2.8. Each permitted waste operation and activity carried out at the facility has been permitted with its own table of acceptable wastes.

We are satisfied that the Applicant can accept the wastes contained in the Schedule 2 waste tables of the Permit because:

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

The incineration plant will take and burn non-hazardous waste refuse derived fuels, which have been produced from the on-site material recovery activities, or other refuse derived fuels received from similar off-site facilities.

The waste gasification plant will take and process non-hazardous waste wood that has been produced by the on-site wood shredding activities, or comparable waste received from off-site sources.

The waste drying plant will take non-hazardous waste soils only. The non-hazardous waste soils will be subject to waste pre-acceptance and acceptance checks to ensure that they do not contain any potentially odorous or harmful substances.

The capacity of the incineration plant is limited to 45,000 tonnes per annum. This is based on the plant operating 8,300 hours per year at a treatment capacity of 5.4 tonnes per hour.

The capacity of the gasification plant is limited to 45,000 tonnes per annum, based upon the plant operating 8,000 hours per year at a treatment capacity of 5.6 tonnes per hour.

The capacity of the waste drying plant is limited to 20,000 tonnes per annum, based upon the plant operating 4,000 hours per year at a treatment capacity of 5 tonnes per hour.

The material recovery facility supporting the waste incineration activity (through the production of RDF and separation, storage and off-site transfer of other waste fractions) can accept up to 80,000 tonnes of non-hazardous waste per year.

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

4.3.7 Energy efficiency

(i) Consideration of energy efficiency

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

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

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

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

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

(ii) Use of energy within the Installation

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

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

- All plant and equipment will be individually monitored and controlled PLC controls, optimised for efficiency of operation;
- All aspects of the combustion plant are controlled in real time to ensure maximum thermal efficiency and operational control;
- The plant has provision for the use of waste heat for preheating combustion air;
- The plant will use flue gas recirculation for NOx reduction also achieving the additional benefit of increasing the plant energy efficiency;
- The furnace will be integrated into the boiler to retain the heat;
- SNCR has been chosen as the secondary NOx abatement technique for the incinerator plant, which uses less energy than SCR as it does not involve the reheating of waste gases.
- The pre-treatment of the RDF helps to maintain steady plant capacity;
- In order to maintain high heat transfer, effective maintenance (reducing fouling) of the heat exchanges is achieved due to low flue gas velocities, adapted pitches of the heat exchangers, flue gas inlet

temperatures of the heat exchangers and on-line effective cleaning devices;
- Water sealed de-ashing devices to avoid uncontrolled air ingress;
- Under pressure control of the furnace is achieved by means of a variable speed drive controlled ID-fan
- Efficient water treatment (water softener in combination with reverse osmosis) to minimise blow down;
- Optimised steam conditions for an improved Rankine cycle efficiency;
- Variable speed drives on all major power consumers and high efficiency motors to optimise the parasitical load of the plant;
- Low flue gas speed for lower pressure drop over the system; and
- Provisions have been made to integrate future energy consumers should they become available (uncontrolled low pressure outlet on turbine).
- As part of the company's environmental management system, targets will be set regarding the increased thermal efficiency of the plant and the potential export of heat to neighbouring facilities.
- The gasification process is exothermic and therefore, other than a small amount of fuel required for start-up, the gasification process is a self-sustaining process with no additional heat required to power the gasifier once it is operating.
- Up to 7MWth of waste heat from the gasification plant engines (heat jacket and exhaust) will be recovered and utilised for absorption chilling and for drying wastes within the wider recycling site.
- Electricity will be generated from the gasification process using Jenbacher gas engines, more efficient than traditional steam turbine systems (>38% efficient).
- The waste drying process takes places over 5 different stages in order to control the air flow and temperature.
- Heat exchangers used in the dryer plant adapt the air flow rate and temperature to suit the characteristics (e.g. moisture) content of the waste being treated.
- Site inspection and maintenance procedures will be used to ensure energy efficiency is maintained across the site.
- Relevant plant will be insulated to prevent heat-loss.
- Site energy use will be monitored, recorded and reviewed.
- An energy management plan will be developed as part of the company EMS.

The Application states that the specific energy consumption, a measure of total energy consumed per unit of waste processed, of the waste incineration plant will be between 65 and 75 kWh/tonne. The installation capacity is 45,000 t/a.

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

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

The waste incineration BREF says that it is BAT to reduce the average installation electrical demand to generally below 150 kWh/tonne of waste with an LCV of 10.4 MJ/kg. The LCV in this case is expected to be 13.85 MJ/kg. Taking account of the difference in LCV and the relatively small size of the incineration plant, the specific energy consumption in the Application is in line with that set out above.

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

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

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

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

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

The BREF says that where an incineration plant generates electricity only, it is BAT to recover 0.4 – 0.65 MWh/ tonne of waste (based on LCV of 10.4 MJ/kg) for raw waste inputs or 0.6 – 1.0 MWh/tonne of waste (based on LCV of 15.2 MJ/kg) for pre-treated wastes. 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 waste incineration plant will generate electricity only and has been specified to maximise electrical output with little or no use of waste heat. According to the application, 36,800 MWh of electricity will be generated by the incinerator plant for an annual burn of 45,000 tonnes, which represents 0.81 MWh/tonne of waste. The Installation is therefore within in the indicative

BAT range for burning pre-treated wastes (e.g. RDF). The gasification plant is expected to generate 45,000 MWh of electricity for an annual burn of 45,000 tonnes of waste, which represents 1.0 MWh/tonne of waste wood.

The waste gasification plant is not an incineration or co-incineration plant, however the incineration BREF still provides a useful benchmark for efficiency of electricity generated from waste. According to the application, the gasification plant will generate electricity and also provide up to 7MWth of waste heat for use in the proposed waste drying process The Application shows that 6 MW of electricity will be generated from 45,000 tonnes of waste treated which represents 13MW per 100,000 of waste. The gasification plant will therefore be highly efficient if compared to the incineration BREF.

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 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 steam turbine of the incineration plant has the capacity to be modified to operate in CHP mode and steam could be diverted to heat exchangers if required (CHP-ready). However, the site is located in a predominantly rural location without any additional heat consuming users, other than the thermal drying process of the facility, which will use waste heat from the engines of the facility's gasification plant. The Operator has confirmed that this situation will be reviewed on a periodic basis and the feasibility re-appraised.

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 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

The R1 calculation does not form part of the matters relevant to our determination. It is however a general indicator 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 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 850ºC 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.

The R1 application provided by the applicant showed that the waste incineration plant is unlikely to meet the R1 score based upon information provided by technology provider and therefore has not been considered further as a waste recovery activity.

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 steam will be fed to a steam turbine which will be used to generate electricity. The steam turbine generator unit will consist of a steam turbine, a reduction gear and an electrical generator with auxiliary systems, instrumentation and controls. The electricity produced by the generator will be transferred onto the Local Distribution network.

(vi) Choice of Cooling System

The waste incineration plant will operate air cooled condensers to condense the steam output from the turbine to allow return of the condensate to the boiler. The Applicant has chosen air cooled condensers as they do not require large volumes of water, the use of biocides or result in any release to surface

water or land. The Applicant considers that air cooled condensers are BAT for the installation. The Environment Agency agrees with this assessment.

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

The applicant has considered the potential for operating the installation as a high-efficiency cogeneration installation and has concluded that this will not be possible because there are currently insufficient heat loads available other than the thermal dryer plant of the facility, which will be provided with heat from the CHP engines of the facility's gasification plant. Therefore no cost benefit assessment is required. The steam turbine of the incinerator plant has the capacity to be modified to operate in CHP mode and the applicant has committed to periodically reviewing opportunities for further heat recovery.

(viii) Permit conditions concerning energy efficiency

Pre-operational condition PO13 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: 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.

4.3.8 Efficient use of raw materials

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

The Operator is required to report with respect to raw material usage under condition 4.2. and Schedule 5, including consumption of fuel oil, sodium bicarbonate, activated carbon and urea used per tonne of waste incinerated.

This will enable the Environment Agency to assess whether there have been any changes in the efficiency of the air pollution control plant, and the

operation of the SNCR to abate NO_x. These are the most significant raw materials that will be used at the Installation, other than the waste feed itself (addressed elsewhere). The efficiency of the use of auxiliary fuel will be tracked separately as part of the energy reporting requirement under condition 4.2.2. 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 Installation will produce are bottom ash and air pollution control residues from the incinerator plant; tar, char and filter residues from the gasification plant, and recovered materials (i.e. plastics and metals) from the material recovery facility.

The first objective is to avoid producing waste at all. Waste production from the incineration plant 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 3.1.5 and associated Table S3.10 specify limits for loss on ignition (LOI) of <5% 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.

Incinerator bottom ash will be dampened down using a submerged chain conveyor system before being stored within a sealed skip. Incinerator bottom ash produced by the waste incineration plant will not be treated on-site and instead will be sent to an off-site facility for further treatment.

Recyclable materials recovered from the material recovery process will be collected and sent off-site for recycling.

Fly ash (air pollution control residues) from the waste incinerator plant will be transferred to a sealed and abated silo, from where it will be transferred to

tanker for delivery to a permitted waste facility for treatment for recovery or disposal.

Char resulting from the operation of the gasification plant will be transferred to an enclosed container via an enclosed conveyor. The Operator intends to carry out detailed sampling and analysis of the char to establish whether or not the material is suitable for use as a stabiliser in the PAS100 compost produced on-site.

Ash and char resulting from the operation of the waste incineration plant and waste gasification plant will be sampled in accordance with the Environment Agency's Technical Guidance Note M4 – Guidelines for Ash Sampling and Analysis.

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.

In order to ensure that the incinerator IBA and gasification char, tar and filter residues are adequately characterised, pre-operational conditions PO9 and PO14 require the Operator to provide a written plan for approval detailing the ash sampling protocols. Table S3.5 requires the Operator to carry out an ongoing programme of monitoring.

5. Minimising the Installation's environmental impact

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

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

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

5.1 Assessment Methodology

5.1.1 Application of Environment Agency guidance 'risk assessments for your environmental permit'

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

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

the AQS objective is more stringent that the AAD value. In such cases, we use the AQS objective for our assessment.

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

PCs are considered **Insignificant** if:

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

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

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

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

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

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

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

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

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 the air quality assessment of the Application. The assessment comprises:

- Dispersion modelling of emissions to air from the operation of the incinerator.
- A study of the impact of emissions on nearby sensitive habitat / conservation sites.
- Dispersion modelling of odour impacts.

The amenity impacts during construction and air quality impacts arising from additional road traffic have not been considered as these are essentially matters for the local planning authority when considering the parallel application for planning permission, and outside the scope of our determination under the Environmental Permitting Regulations.

This section of the decision document deals primarily with the dispersion modelling of emissions to air from the incinerator chimney and its impact on local air quality. The impact on conservation sites is considered in section 5.4 and potential odour impacts are considered in section 5.6.2.

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 AERMOD 7 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 Lyneham between 2011 and 2015. The impact of the terrain surrounding the site upon plume dispersion was considered in the dispersion modelling.

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

- First, they assumed that the ELVs in the Permit would be the maximum permitted by Article 46(2) and Annex VI of the IED. These substances are:
    - Oxides of nitrogen (NO_x), expressed as NO_2
    - Total dust
    - Carbon monoxide (CO)
    - Sulphur dioxide (SO_2)

    - Hydrogen chloride (HCl)
    - Hydrogen fluoride (HF)
    - Metals (Cadmium, Thallium, Mercury, Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel and Vanadium)
    - Polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans)
    - Gaseous and vaporous organic substances, expressed as Total Organic Carbon (TOC)
- Second, they assumed that the Installation operates continuously at the relevant long-term or short-term ELVs, i.e. the maximum permitted emission rate (except for emissions of arsenic, chromium and nickel, which are considered in section 5.2.3 of this decision document).
- Third, the model also considered emissions of pollutants not covered by Annex VI of IED, specifically ammonia (NH_3), polycyclic aromatic hydrocarbons (PAH) and Polychlorinated biphenyls (PCBs).

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

We have checked the background pollution data used by the Operator for those pollutants which did not screen out as insignificant. The Operator has reviewed background data available on Defra's background maps as well as measured data where available. We consider the assumed background concentrations to be appropriate.

For metals, the assessment has assumed maximum metal concentrations measured at rural sites across the UK. Given the site's location is in a rural area, away from any identified significant sources, it is unlikely that background metal concentrations would be higher than those used. In the absence of any site specific or locally measured data, we therefore consider this a reasonable assumption.

As well as calculating the peak ground level concentration, the Operator has modelled the concentration of key pollutants at a number of specified locations within the surrounding area corresponding to the location of sensitive receptors.

The assessment has made predictions at 12 residential receptors and the on-site office (receptor D1). Since the general public will not have access within their site boundary, ambient air quality standards will not apply here. We consider their residential receptors to be representative.

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

We have audited and checked the air quality and human health impact assessment provided and agree with the conclusions drawn from them.

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 modelling showed that the relevant environmental standards will not be exceeded by any of the modelled emissions, either at the most impacted receptor or at the point of maximum modelled ground level exposure. 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 – non-metals

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	40	1	13	3.8	9.50	16.8	42.0
	200	2	26	50.4	25.2	76.4	38.2
PM_{10}	40	1	15.2	0.18	0.45	15.4	38.5
	50	3	15.2	1.04	2.08	16.24	32.5
$PM_{2.5}$	25	1	10.6	0.18	0.72	10.78	43.1
SO_2	266	4	5.6	59.8	22.5	65.4	24.6
	350	5	5.6	39.3	11.23	44.9	12.8
	125	6	5.6	11	8.8	16.6	13.3
HCl	750	7	0.29	17.3	2.31	17.6	2.35
HF	16	8	0.5	0.019	0.12	0.519	3.24
	160	7	0.5	1.2	0.75	1.70	1.1
CO	10000	9	217	72.1	0.72	289	2.9
	30000	10	217	171.2	0.57	388	1.3

TOC	5	1	0.19	0.11	2.20	0.300	6.00
	195	7	0.38	5.8	2.97	6.180	3.17
PAH	0.00025	11	0.000062	0.0000012	0.48	0.000063	25.3
NH_3	180	1	3	0.11	0.06	3.11	1.73
	2500	10	6	2.9	0.12	8.9	0.4
PCBs	0.2	1	0.0000256	0.000057	0.03	0.00008	0.04
	6	10	0.0000512	0.001446	0.02	0.00150	0.0
Dioxins	NA	12	6.9	1.14		8.04	

TOC as Benzene
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
11 Annual mean based upon maximum reported concentration from operating incinerator plant (from operator self-monitoring data reported to the EA)
12 Annual mean in femtograms (fg/m^3)

Assessment of emissions to air – metals

Pollutant	**EQS / EAL**		**Back-ground**	**Process Contribution**		**Predicted Environmental Concentration**	
	µg/m^3		**µg/m^3**	**µg/m^3**	**% of EAL**	**µg/m^3**	**% of EAL**
Cd	0.005	1	0.00025	0.0006	12.0	0.00085	17.0
Tl	1	1	-	0.0006	0.06	0.0006	0.1
	30	2	-	0.0151	0.05	0.01510	0.1
Hg	0.25	1	0.0113	0.0006	0.24	0.01190	4.76
	7.5	2	0.0113	0.0151	0.20	0.02640	0.352
Sb	5	1	-	0.0057	0.11	0.0057	0.11
	150	2	-	0.1446	0.10	0.14460	0.096
Pb	0.25	1	0.00967	0.0057	2.28	0.01537	6.15
Co	1	1	0.00021	0.0057	0.57	0.00591	0.6
	30	2	0.00021	0.1446	0.48	0.14481	0.5

Cu	10	1	0.0102	0.0057	0.06	0.0159	0.159
	200	2	0.0102	0.1446	0.07	0.15480	0.077
Mn	0.15	1	0.011	0.0057	3.80	0.0167	11.13
	1500	2	0.011	0.1446	0.01	0.15560	0.0104
V	5	1	0.00118	0.0057	0.11	0.00688	0.14
	1	3	0.00118	0.0362	3.62	0.03738	3.74
As	0.003	1	0.00064	0.0057	190.00	0.00634	211.3
Cr (III)	5	1	0.0075	0.0046	0.09	0.01210	0.242
	150	2	0.00021	0.1157	0.08	0.11591	0.0773
Cr (VI)	0.0002	1	0.00190	0.0011	550.00	0.00300	1500.0
Ni	0.02	1	0.00419	0.0057	28.50	0.00989	49.5

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: (non-metals) PM_{10}, $PM_{2.5}$, SO_2 (24hr mean), HCl, HF, CO, TOC (1 hr mean), PAH, NH_3, PAHs, and (metals) Ti, Hg, Sb, Co, Cu, Mn (1-hr Max), V, Cr III & Cr VI.

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 70% (taking expected modelling uncertainties into account) of both the long term and short term ES. These are:
NO_2 (annual and hourly means), SO_2 (hourly and 15 min means), TOC (annual mean), Cd, Pb, Mn (annual mean) and Ni.

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

(iii) Emissions requiring further assessment

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

- Cr VI and Arsenic

These emissions are considered further in Section 5.2.3 below.

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 above the level that would screen out as insignificant (>10% of the ES). However it 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 monitoring 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) Acid gases, SO_2, HCl and HF

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

Whilst SO_2 emissions cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the ES. The Applicant is required to prevent, minimise and control SO_2 emissions using BAT, this is considered further in Section 6. We are satisfied that SO_2 emissions will not result in significant pollution.

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

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

The above tables show that for VOC emissions (as benzene), 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 for VOC

emissions is below the level that would screen out as insignificant (<10% of the ES).

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

The predicted emission of ammonia from the waste incineration plant (associated with the operation of the SNCR abatement system) has been assessed and it has been concluded that emissions are insignificant in relation to both the long term and short term ES.

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 assessed EALs.

(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 from the proposed incineration plant, as previously described.

Annex VI of IED sets three limits for metal emissions:

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

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

In section 5.2.1 above, the following emissions of metals were screened out as insignificant: Thalium, Mercury, Antimony, Chromium III, Cobalt, Copper, Manganese (hourly mean) and Vanadium.

Also in section 5.2.1, the following emissions of metals whilst not screened out as insignificant were assessed as being unlikely to give rise to significant pollution: Cadmium, Lead, Manganese (annual mean) and Nickel.

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

Where Annex VI of the IED sets an aggregate limit, the 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 Arsenic and Chromium VI the assessment used representative emissions data from other municipal waste incinerators using our guidance note “Guidance to Applicants on Impact Assessment for Group 3 Metals Stack Releases – version 4”.

The 2009 report of the Expert Panel on Air Quality Standards (EPAQS) – “Guidelines for Metal and Metalloids in Ambient Air for the Protection of Human Health”, sets non statutory ambient air quality guidelines for Arsenic, Nickel and Chromium (VI). These guidelines have been incorporated as ESs in our guidance 'Air emissions risk assessment for your environmental permit’

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

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

The Applicant has used the above data to model the predicted impact from emissions of Chromium (VI) and Arsenic. The PC for Chromium (VI) is predicted as 0.7% of the EAL and screens out as insignificant. The PC for Arsenic is predicted as 9.5% of the EAL and therefore does not screen out as insignificant, however based upon the predicted environmental concentration the emissions are unlikely to give rise to significant pollution. We agree with the Applicant's conclusions.

Assessment of emissions to air – Arsenic and Chromium VI using maximum measured values

Pollutant	EQS / EAL		Process Contribution		Background	Predicted Environmental Concentration	
	µg/m³		µg/m³	% of EAL	µg/m³	µg/m³	% of EAL
As	0.003	1	0.00028	9.5	0.00064	0.00092	30.8
Cr VI	0.0002	1	0.0000015	0.7			

1 Annual Mean

The assessment details above was carried out using data from existing incinerator plant and therefore Improvement Condition IC6 has been included in the permit requiring the Operator to carry out a further assessment of the emissions of these two metals using monitoring data collected from the first 12 months of plant operation in order to confirm and validate the conclusions of this assessment.

The installation has been assessed as meeting BAT for control of metal emissions to air. See section 6 of this document.

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

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

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

5.3 Human health risk assessment

5.3.1 Our role in preventing harm to human health

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

i) Applying Statutory Controls

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

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

ii) Environmental Impact Assessment

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

iii) Expert Scientific Opinion

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

An independent review of evidence on the health effects of municipal waste incinerators was published by **DEFRA** in 2004. It concluded that there was no convincing link between the emissions from MSW incinerators and adverse effects on public health in terms of cancer, respiratory disease or birth defects. On air quality effects, the report concluded “Waste incinerators contribute to local air pollution. This contribution, however, is usually a small proportion of existing background levels which is not detectable through environmental monitoring (for example, by comparing upwind and downwind

levels of airborne pollutants or substances deposited to land). In some cases, waste incinerator facilities may make a more detectable contribution to air pollution. Because current MSW incinerators are located predominantly in urban areas, effects on air quality are likely to be so small as to be undetectable in practice."

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

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

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

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

Republic of Ireland Health Research Board report stated that "It is hard to separate the influences of other sources of pollutants, and other causes of

cancer and, as a result, the evidence for a link between cancer and proximity to an incinerator is not conclusive".

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

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

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

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

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

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

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

From this published body of scientific opinion, we take the view stated by the HPA that "While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very

small, if detectable". We therefore ensure that permits contain conditions which require the installation to be well-run and regulate the installation to ensure compliance with such permit conditions.

iv) Health Risk Models

Comparing the results of air dispersion modelling as part of the 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 with regards to waste incineration plant 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, associated with emissions from the proposed incinerator plant, 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. The HHRA provided as part of the variation application was audited by the Environment Agency, including undertaking sensitivity tests for abnormal emissions, and we agree with their conclusion that there would be no significant risk from the proposed facility.

The assessment provided predicts a maximum process contribution of 8.9% of the COT-TDI for dioxins and furans and dioxin-like PCBs for the worst affected farmer receptor and 0.02% for the corresponding residential receptors. Public Health England have confirmed that an intake of less than 10% of the COT-TDI can be considered insignificant.

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

Receptor	Adult (pg I-TEQ kg-BW)	% of COT-TDI	Child (pg I-TEQ kg-BW)	% of COT-TDI
Farmer	0.12	6.1	0.18	8.9
Resident	0.00013	0.007	0.00038	0.02

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 0.3µm, 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 0.3µm and much of what is smaller. It is not expected that particles smaller than 0.3µm 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 0.1µm in diameter ($PM_{0.1}$). Questions are often raised about the effect of nano-particles on human health, in particular on children’s health, because of their high surface to volume ratio, making them more reactive, and their very small size, giving them the potential to penetrate cell walls of living organisms. The small size also means there will be a larger number of small particles for a given mass concentration. However the HPA statement (referenced below) says that due to the small effects of incinerators on local concentration of particles, it is highly unlikely that there will be detectable effects of any particular incinerator on local infant mortality.

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

In December 2010, COMEAP published a report on The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. It says that “a policy which aims to reduce the annual average concentration of $PM_{2.5}$ by 1 $\mu g/m^3$ would result in an increase in life expectancy of 20 days for people born in 2008.” However, “The Committee stresses the need for careful

interpretation of these metrics to avoid incorrect inferences being drawn – they are valid representations of population aggregate or average effects, but they can be misleading when interpreted as reflecting the experience of individuals."

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

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

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

5.3.4 Assessment of Health Effects from the Installation

We have assessed the health effects from the operation of the proposed incineration plant 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 for the proposed activities (including both the gasification plant and incineration plant) 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.

As detailed in Sections 5.2.1, 5.2.2 and 5.2.3, the Applicant's assessment of the impact from relevant pollutants showed that the Installation emissions either screened out as insignificant or, where the impact of emissions of did not screen out, 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 and agree with the

conclusions drawn, that there would be no significant risk from the proposed facility upon human health.

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 and concluded that they had no significant concerns regarding the risk to the health of humans from the installation. The Food Standards Agency was also consulted during the permit determination process and concluded that it is unlikely that there will be any unacceptable effects on the human food chain as a result of the operations at the Installation. Details of the responses provided by Public Health England, the Local Authority Director of Public Health and the FSA 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

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

- North Meadow & Clattinger Farm Special Area of Conservation

There are no Sites of Special Scientific Interest within 2Km of the proposed Installation.

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

- Jubilee Lake (LNR)
- Withybed (Local Wildlife Site)
- Morris's Copse (Local Wildlife Site & Ancient Woodland)
- Bridge House Copse (Local Wildlife Site)
- Cowleaze Copse (Local Wildlife Site)
- Plain Copse (Local Wildlife Site)
- Echo Lodge Farm Meadows (Local Wildlife Site)
- Callow Hill Farm Meadow (Local Wildlife Site)
- Hookers Gate Farm Meadow (Local Wildlife Site)
- Flaxlands Wood (Ancient Woodland)

- Midgehall Copse (Ancient Woodland)
- Webbs Wood (Ancient Woodland)
- Folly Wood (Ancient Woodland)
- Withybed (Ancient Woodland)

5.4.2 Habitats Sites Assessment

The Applicant's Habitats assessment was reviewed by the Environment Agency's technical specialists for modelling, air quality, conservation and ecology technical services, who agreed with the assessment's conclusions, that there would be no likely significant effect on the interest features of the protected site.

Emissions from the facility can be considered to be insignificant with respect to the assessed Special Area of Conservation, with process contributions for all assessed pollutants being less than 1% of the relevant critical loads, levels and concentrations, as shown in the table below.

Pollutant	ES / EAL (µg/m³)	Process Contribution (PC) (µg/m³)	PC as % of ES
NO_x Annual	30	0.06	0.19
NO_x Daily Mean	75	0.7	0.93
SO_2	20	0.01	0.03
Ammonia	3	0.01	0.04
HF Weekly Mean	0.5	0.02	0.32
HF Daily Mean	5	0.01	0.13
N Deposition (kg N/ha/yr)	20 – 30	0.01	0.1
Acidification (Keq/ha/yr)	0.223 - 1.17	0.0017	0.76

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.

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

5.5 Impact of abnormal operations

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

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

Article 45(1)(f) requires that the permit shall specify the maximum permissible period of any technically unavoidable stoppages, disturbances, or failures of the purification devices or the measurement devices, during which the

concentrations in the discharges into the air may exceed the prescribed emission limit values. In this case we have decided to set the time limit at 4 hours, which is the maximum period prescribed by Article 46(6) of the IED.

These abnormal operations are limited to no more than a period of 4 hours continuous operation and no more than 60 hour aggregated operation in any calendar year. This is less than 1% of total operating hours and so abnormal operating conditions are not expected to have any significant long term environmental impact unless the background conditions were already close to, or exceeding, an 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 (1.4 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 500 mg/m^3 (2.5 x normal)
- HCl emissions of 900 mg/m^3 (15 x 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 for the worst impacted sensitive receptor.

Assessment of emissions to air – abnormal emissions

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	µg/m³		µg/m³	µg/m³	% of EAL	µg/m³	% of EAL
NO_2	200	2	22	40.2	20.1	62.2	31.1
PM_{10}	50	3	16.5	1.0	2.00	17.5	35.0
SO_2	266	4	4.2	131.6	49.5	137.2	51.1
	350	5	4.2	98.2	28.06	102.4	29.3
HCl	750	6	0.58	259.9	34.65	260.5	34.7
HF	160	6	1	26.0	16.25	27.0	16.9
Hg	7.5	1	0.0113	1.443	19.24	1.5	19.4
Ti	30	1		0.072	0.2		
Sb	150	1		0.723	0.48		
Co	30	1		0.723	2.4		
Cu	200	1		0.723	0.36		
Mn	1500	1		0.723	0.05		
PCBs	6000	1		144.6	2.41		
Cr (III)	150	1		0.579	0.39		
Dioxins			6.9	1.15		8.05	

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: PM_{10}, Ti, Sb, Co, Cu, Mn, PCBs and Cr (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, SO_2, HCl, HF and Hg.

The Operator also considered the maximum modelled off-site concentrations of the assessed emissions. All emissions were less than 100% of the short term ES with the exception of SO_2 emissions when assessed against the 15 minute mean ES. However, we have considered the probability of abnormal

emissions coinciding with the worst meteorological hours that result in an exceedence of the ES and consider this to be sufficiently low risk.

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 ESs 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 5.3.2. In these circumstances the maximum predicted TDI for a child farmer receptor would be 0.306 pg(I-TEQ/ kg-BW/day), or 15.3% of the COT TDI, and the maximum predicted TDI for a child residential receptor would be 0.00065 pg(I-TEQ/ kg-BW/day), or 0.03% of the COT TDI. As detailed in section 5.3.2, these calculations are very conservative as they assume that the receptors only consume food and water sourced from the locality where the deposition of dioxins, furans is predicted to be the highest and in this case also assumes operation of the plant at abnormal emission levels. Based upon this assessment, we are satisfied that emissions of dioxins from the facility will not pose a risk to human health.

5.6 Other Emissions

5.6.1 Emissions to Water

The facility has one point source emission to surface water from the facility's site attenuation pond. The discharge is made to Thunder Brook via a penstock valve, which runs along the northern perimeter of the site. Thunder Brook feeds into Brinkworth Brook. The emission to water will predominantly be of clean uncontaminated surface water, which is discharged to the pond via an oil/water interceptor. As stated in the application, a minimum of 900m^3 water will be held within the pond. The maximum discharge to Thunder Brook will be limited to 15.8 litres per second. An automatic shut-off valve will be installed at the pond, linked to the site fire detection system.

Along with the site surface water, treated process effluent from the gasification will be discharged to the Brook, via the attenuation pond. The treated process effluent discharge rate will be up to 2m^3 per hour. Prior to discharge to the drainage system, the effluent will be treated on-site in a purpose built effluent treatment plant. The effluent will be treated through 3 sand filters, 2 bentonite filter presses, 2 carbon filter and subjected to pH correction prior to use back in the plant or discharge.

An H1 assessment was undertaken for the process effluent discharge to water. The H1 assessment considered predicted concentrations of ammonia and phenol in the discharge and assumed that the discharge was made direct to the watercourse (i.e. excluding any dilution in the attenuation pond) and therefore represented a conservative assessment. The application confirmed that the effluent would not contain any other hazardous or sanitary substance.

Predicted phenol concentrations were screened out as being insignificant in accordance with stages 3 and 4 of the H1 methodology (PEC minus background concentration was below 10% of the EQS, and PEC was below 100% of the EQS). The predicted process contribution of ammonia to the watercourse did not screen out through the H1 methodology and therefore further detailed modelling was undertaken by the Environment Agency. The modelling concluded that the modelled downstream water quality would be well below the relevant EQS of 300ug/l and therefore that it would be unlikely to impact upon water quality or result in any deterioration.

Because the assessment was based upon the expected/design quality of the effluent, pre-operational and improvement conditions (PO8 and IC9) have been included in the permit, requiring the Operator to propose and undertake monitoring of the process effluent to confirm its composition and validate the conclusions of the impact assessment undertaken. Ongoing periodic monitoring requirements have also been set in the permit requiring the Operator to monitor the discharge from the site attenuation pond.

5.6.2 Odour

Process air from the Material Recycling Facility will pass through a biofilter system to remove much of the odour from the air within the building before it is vented to atmosphere via a stack. The exhaust air from the Drying Plant may also potentially be odorous. Emissions from the Dryers will be vented to atmosphere via two stacks from the Dryer Building.

Due to the above, the emissions of the non-fugitive releases of odour (the Biofilter and the Dryer Stacks) have been modelled using Breeze AERMOD 7 in order to assess potential impact upon local receptors. The odour modelling undertaken was reviewed and checked by our Air Quality Modelling and Assessment unit.

Whilst the modelling indicates there is a possibility of odour levels being produced at levels that could be indicative of an impact at one receptor (predicted odour level of 1.68 odour units against a threshold of 1.5 odour units for one of the 5 years modelled), it is marginal and highly dependent on inter-annual variation.

The Operator has used conservative odour concentrations in the assessment and concentrations produced during operation are expected to be lower than those modelled. The assessment also assumed that the waste dryer would treat waste processed through the material recovery building (e.g. RDF), which could be a source of odour. However, the Operator has confirmed that the dryer plant will not process this material and will only process waste soils that meet inert waste acceptance criteria and trommel fines from the material recovery building, which will reduce the likely odour potential of this activity.

The Operator has an Odour Management Plan and we are satisfied that through the ongoing management of the facility in accordance with this plan, including the inspection, maintenance and control of the biofilter, complaints

associated with the operation are unlikely and, should any occur, they will be addressed appropriately. The Operator will undertake ongoing odour monitoring at the facility, involving twice-daily olfactory tests at locations around the site and emissions from the biofilter and dryer stacks will also be monitored.

Pre-operational conditions and improvement conditions (PO11, PO17, IC12 and IC13) have been included in the permit requiring the Operator to propose a programme of odour monitoring for these emission points to check and validate the odour concentrations assumed in the permit application and odour modelling. The two sources of odour (biofilter and dryer) have been covered be separate conditions to ensure that an appropriate assessment is undertaken regardless of the order or timescales that the sources (plant) are operated.

Further information has been provided on the facility's odour management plan in Section 6.5.4 of this document.

There are to be no other point source emissions to the facility/permitted activities other than those detailed in Section 5 of this document.

6. Application of Best Available Techniques

6.1 Scope of Consideration

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

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

- We then consider in particular control measures for the emissions which were not screened out as insignificant in the previous section on minimising the installation's environmental impact.

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

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

Chapter IV of the IED specifies a set of maximum emission limit values. Although these limits are designed to be stringent, and to provide a high level of environmental protection, they do not necessarily reflect what can be

achieved by new plant. Article 14(3) of the IED says that BAT Conclusions shall be the reference for setting the permit conditions, so it may be possible and desirable to achieve emissions below the limits referenced in Chapter IV. However BAT Conclusions and a revised BREF for Incineration have not yet been drafted or published, so the existing BREF and Chapter IV of the IED remain relevant.

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

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

6.1.1 Consideration of Incineration Plant Furnace Type

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

The Waste Incineration BREF elaborates the furnace selection criteria as:

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

The BREF also provides a comparison of combustion and thermal treatment technologies and factors affecting their applicability and operational suitability used in EU and for all types of wastes. There is also some information on the comparative costs. The table below has been extracted from the BREF tables. This table is also in line with the Guidance Note "The Incineration of

Waste (EPR 5.01)). However, it should not be taken as an exhaustive list nor that all technologies listed have found equal application across Europe.

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

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

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

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

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

			Low NOX level Low LOI of bottom ash			

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

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

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

- Moving Grate Furnace
- Fluidised Bed
- Pyrolysis / Gasification

The Applicant has proposed to use a furnace technology comprising moving grate furnace, which is identified in the tables above as being considered BAT in the BREF or TGN for this type of waste feed. The moving grate furnace design was chosen in preference to the others considered based upon its ability to take large waste loads that are of variable composition, the significant amount of operational experience associated with the technology, relatively low running costs and high availability, and its proven ability to deliver efficient and complete combustion. In comparison, fluidised beds generally require a higher level of waste pre-treatment and produce higher levels of waste for disposal. Gasification and pyrolysis technologies typically require a more homogenous waste feedstock and are less widely proven for the treatment of mixed wastes.

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

6.1.2 Incineration Plant Boiler Design

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

- ensuring that the steam/metal heat transfer surface temperature is a minimum where the exhaust gases are within the de-novo synthesis range;
- design 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.

6.1.3 Gasification plant BAT design

The proposed down-draft gasification plant is considered to be BAT for the thermal treatment of waste wood compared to other thermal treatment techniques (including mass burn incineration) on the following grounds:

- High energy efficiency with low parasitic load, with on-site utilisation of waste heat and generation of electricity for export.
- Generation of electricity with high efficiency gas engines (thermal efficiency of 38%).
- Minimised waste generation. Gasification ash and char is expected to be 1,440 tonnes per year with 90 tonnes per year of tar;
- Prevention of dioxin formation;
- Technique is suited for treatment of the proposed homogenous shredded waste wood stream;
- Reduced water use compared to mass burn incineration.
- Capital cost per unit of energy generated is less than conventional mass burn systems.
- Ability to produce a syngas that meets End-of-Waste requirements and produces emission no higher than those from burning natural gas.
- Preventing emissions to air at sources (i.e. through gas clean-up) and using primary control measures rather than relying on secondary abatement measures with associated hazardous waste outputs and energy requirements.
- Lower tar generation levels than up-draft and cross-draft designs.

6.1.4 Gasification Syngas clean-up and EoW

The purpose of the syngas clean-up process is to produce a gas that will when burned have emissions no higher than natural gas and meet End-of-Waste requirements. The Applicant's proposed clean up system consists of the following measures:

Thermal cracking of tars, cyclones to remove char particulates, a quench, two-stage High Efficiency Scrubbing System to remove particulates and tars (cyclonic wet scrubbing, including treatment with hydrogen peroxide to remove sulphur compounds) followed by a gas filtration unit consisting of biochar filters, activated carbon filter, 1-micron polypropylene coalescing filter, oil-mist coalescing filters (2 operating in series) and bio-diesel packed scrubber.

The proposed syngas clean-up process is considered BAT in terms of the high (>97%) removal efficiencies of the measures for tars, metals, hydrogen

sulphide/sulphur, halogenated hydrocarbons and aromatics, and the production of a syngas that is capable of meeting the requirements of Article 42(1) of the IED.

In order to meet the requirements of Article 42(1), the syngas must be purified to such an extent that is no longer considered waste and can cause emissions no higher than those from burning natural gas. To achieve this, the syngas must be capable of meeting an agreed specification based upon the Environment Agency's report 'Material comparators for Fuels: natural gas'. The specification is provided in the table below:

Parameter	**Specification (all in mg/m3)**
Total Sulphur	0.57
Hydrogen Sulphide	0.4
Total halogenated hydrocarbons	0.07
Total metals	0.16
Total aromatic hydrocarbons as Xylene	2.6
HF	5
HCl	1.5

Based upon the expected composition of the syngas and information provided during the application determination we are satisfied that the Applicant has supplied sufficient information to show that the syngas will be capable of being classed as a non-waste and be no more polluting than natural gas when burned.

The expected syngas composition, as stated in the response from the applicant on 01/12/2017 and copied below, indicated that the concentration of Total Metals in the syngas may not meet the specification when the relative calorific values of the syngas and natural gas are taken into account.

Parameter	**Calculated Syngas Concentrations (mg/m3)**	**Comparator Specification (mg/m3)**
Total Sulphur	0.041538	0.57
Hydrogen Sulphide	0.0075	0.4
Total Halogenated Hydrocarbons	< L.O.D	0.07
Total Metals	0.044908	0.16
Total Aromatic Hydrocarbons	< L.O.D (<0.03mg/l)	2.6
HF	0.155769	5
HCl	0.004985	1.5

Gas analysis provided by the Operator during the application determination (email dated 12/01/2018) and obtained from initial trials undertaken on the gasification plant showed that the total metal concentration of the syngas was below Limits of Detection (0.01mg/m^3). The analysis also showed that concentrations of Total Sulphur, Hydrogen Sulphide, HF, HCl and Halogenated Hydrocarbons were below the associated limits of detection and met the syngas specification based upon the natural gas comparator report.

However, the gas analysis showed that the total concentration of Aromatic Hydrocarbons in the syngas was significantly higher than expected and exceeded the comparator specification (600mg/m^3). In order to reduce the concentration of total aromatic hydrocarbons in the syngas to a level below the specification, the Operator proposed the use of an additional filtration stage in the gas clean-up process. The Operator trialled the use of a filter (Solberg Oil Mist Coalescing Elements / Air Separator Elements filter) at the facility for the removal of aromatic hydrocarbons. On the basis of this trial, two of these filters are to be installed on each syngas line to provide a design removal efficiency of 99.97%. Operating at this removal efficiency, the filters will reduce the concentration of aromatic hydrocarbons in the syngas from the reported concentration of 600mg/m^3 to below the syngas specification of 2.6mg/m^3, when corrected to take into account the relative calorific values of the syngas (4.5MJ/m^3) and natural gas (37 MJ/m^3):
(600mg/m^3 / 100) x 0.03 = 0.18mg/m3
(0.18mg/m^3 / syngas CV (4.5)) x natural gas CV (37) = 1.48mg/m3

The Operator also reported that the gasification process had been optimised in terms of the syngas cooling process and provided syngas analysis (email dated 13/04/2018) showing a total aromatic hydrocarbon content of 170mg/m^3; significantly lower than the 600mg/m^3 reported in the previous analysis.

Based on the information provided (summarised above), we are satisfied that the proposed gas clean-up system is likely to be capable of cleaning up the syngas to the desired level. Pre-operational condition PO5 requires the Operator to submit a commissioning plan to include a proposal for syngas monitoring during commissioning. IC8 then requires a report on the syngas monitoring carried out during operation of the Installation.

We have set monitoring requirements to ensure that syngas is monitored against this specification on an ongoing basis during the operation of the plant. This is covered in section 6.7.4 of this decision document.

If it turns out that the syngas is more polluting than natural gas, the plant will not be able to operate under this permit due to condition 2.3.6.

The Applicant stated that the flare will be used during start-up and shut down. Out of specification syngas will also be burned in the flare to the protect gas engines. Condition 2.3.6 will prevent waste being fed to the gasifier if the syngas is found to be out of specification. This condition will also prevent waste feed if the flare is operating because operation of the flare will be

indicative of syngas being out of specification. A brief description of start-up and shut-down was provided. PO7 requires detailed procedures to be submitted for approval and PO6 requires the Operator to provide procedures detailing the measures that will be taken for the management of any out-of-spec syngas.

6.2 BAT and emissions control

Waste dryer plant

Emissions from the waste dryer plant are expected to primarily consist of water vapour resulting from the drying of non-hazardous waste soils. No other significant emissions are expected to be released from the dryer plant. This will be controlled through the waste pre-acceptance and acceptance procedures that apply to the operation of the activity, in terms of ensuring that the wastes accepted do not contain substances that could be volatilised by the treatment process and emitted to air.

Emissions of odour from the dryer and the biofilter serving the material recovery building have been assessed separately (Section 5.6.2).

Waste gasification plant

The waste gasification plant will use the syngas produced by the gasifiers as a fuel to generate electricity using three Jenbacher gas engines. The syngas will be passed through a multi-stage clean-up process (as detailed in Section 6.1.4) in order to ensure that its composition is comparable to that of natural gas and its combustion will not result in any emissions higher than that from burning natural gas. Therefore, the emissions and monitoring standards that apply to the syngas-fuelled engines are the same as those applied to engines fuelled by natural gas, with emission limits set for oxides of nitrogen and carbon monoxide.

The emission limits set for oxides of nitrogen and carbon monoxide are the benchmark concentrations taken from the Combustion Sector Guidance Note EPR 1.01 for engines fuelled on natural gas. The NOx emission limit is below that of the Medium Combustion Plant Directive (when corrected for oxygen reference concentration). An emission limit has also been included for emissions of sulphur dioxide, which has been taken from the Medium Combustion Plant Directive (corrected for oxygen reference concentration) for gas engines fuelled on biogas. This limit is used because the gas being burnt in the gas engines is not natural gas (although it is comparable to it in composition) and the combustion sector guidance does not specify a limit for single-fuel gas-fired engines.

Waste incineration plant

The prime function of flue gas treatment is to reduce the concentration of pollutants in the exhaust gas as far as practicable. The techniques which are

described as BAT individually are targeted to remove specific pollutants, but the BREF notes that there is benefit from considering the FGT system as a whole unit. Individual units often interact, providing a primary abatement for some pollutants and an additional effect on others.

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

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

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

6.2.1 Particulate Matter

Gasification facility

Emissions of particulate matter are not expected from the combustion of syngas derived from the waste wood. Consequently, the proposed gas engines will not require particulate matter control. The syngas clean-up process will use scrubbers and cyclones to remove particulates from the gas stream prior to combustion.

Incineration plant

Particulate matter				
Technique	**Advantages**	**Disadvantages**	**Optimisation**	**Defined as BAT in BREF or TGN for:**
Bag / Fabric filters (BF)	Reliable abatement of particulate matter to below 5mg/m^3	Max temp 250°C	Multiple compartments Bag burst detectors	Most plants
Wet scrubbing	May reduce acid gases	Not normally BAT.	Require reheat to prevent	Where scrubbing

	simultaneously.	Liquid effluent produced	visible plume and dew point problems.	required for other pollutants
Ceramic filters	High temperature applications Smaller plant.	May "blind" more than fabric filters		Small plant. High temperature gas cleaning required.
Electrostatic precipitators	Low pressure gradient. Use with BF may reduce the energy consumption of the induced draft fan.	Not normally BAT.		When used with other particulate abatement plant

The Applicant proposes 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.		All plant unless impractical in design (needs to be demonstrated)

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

Reagent Type: Urea	Likely to be BAT			All plant

The Applicant proposes to implement the following primary measures:

- Low NO_x burners – this technique reduces NO_x at source and is defined as BAT where auxiliary burners are required.
- Optimise 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 two recognised techniques for secondary measures to reduce NO_x. These are Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR). For each technique, there is a choice of urea or ammonia reagent.

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

Emissions of NO_x cannot be screened out as insignificant. However, based upon the application and justification provided, we are satisfied that the use of SNCR is BAT for the abatement of NOx emissions resulting from the operation of the incinerator plant. This is on the basis of the higher energy use associated with SCR systems relative to SNCR (8kW/tonne of waste compared to 2kW/tonne), which would reduce the energy efficiency of the facility (as SCR requires reheating of the waste gas stream), the production of hazardous wastes resulting from the use/replacement of the SCR catalyst that require disposal, and the higher capital and operating costs associated with SCR abatement systems.

The Applicant proposes to use SNCR with urea as the reagent. Urea has been selected on the basis that it will be safer to handle at the facility than Ammonia, which is corrosive in nature.

The amount of urea used for NO_x abatement will need to be optimised to maximise NO_x reduction and minimise NH_3 slip. All emissions from the incinerator flue (release point A1) will be monitored using a fully compliant MCERTS accredited Continuous Emissions Monitoring System (CEMS) on the exhaust stack. The NOx measurements will be used to optimise the consumption of reagent by means of a feedback control loop.

Improvement condition IC5 requires the Operator to report to the Environment Agency on optimising the performance of the NO_x abatement system. The Operator is also required to monitor and report on NH_3 and N_2O emissions every 6 months.

Regarding the waste gasification plant, the Operator proposes to use Jenbacher reciprocating (spark ignition) engines to burn the syngas produced from the gasifiers. The principal technique used to reduce NOx emissions is to use lean burn technology. The proposed gas engines will employ the LEANOX combustion control system developed by Jenbacher controlling excess air and combustion conditions to minimise and control NOx emissions. The gas engines will operate below the benchmark emission limits identified for gas engines in the Combustion Sector Guidance Note, which are significantly lower than those set in the Medium Combustion Plant Directive.

SNCR cannot be used on gas engines due to short residence time and SCR has not been proposed for the plant due to its associated energy use, which would reduce the energy efficiency of the facility, the additional production of hazardous wastes resulting from the use of the SCR catalyst and the higher capital and operating costs associated with the technology. Taking into account the number and size of the gas engines, the composition of the fuel used, the primary control measures proposed and the conclusions of the air dispersion modelling, which have been assessed and agreed by our air quality and modelling specialists, we are satisfied that the emission controls represents BAT.

6.2.3 Acid Gases, SO_x, HCl and HF

Gasification plant

The syngas used as a fuel in the gas engines of the gasification plant is required under the conditions of the permit to have a composition comparable to that of natural gas. The auxiliary fuel provided for gasification plant is propane and therefore similarly low in acid gas forming compounds. As such, no further acid gas control or abatement systems are considered necessary for the combustion of the syngas in the gas engines or auxiliary fuel in the gasification plant and we agree that the proposed measures are BAT. The syngas clean-up process (as detailed previously) will involve a scrubber system dosed with hydrogen peroxide in order to remove sulphur compounds.

Incineration plant

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

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

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

The Applicant proposes to implement the following primary measures:

- Use of low sulphur fuels for start up and auxiliary burners – gas should be used if available, where fuel oil is used, this will be low sulphur (i.e. <0.1%), this will reduce SO_x at source. The Applicant has justified its choice of low sulphur gas oil as the support fuel on the basis of fuel availability and we agree with that assessment.

- Management of heterogeneous wastes – a grab will be used to mix waste within the incinerator plant bunker, which will disperse problem wastes such as PVC by ensuring a homogeneous waste feed. The incineration plant will only be permitted to burn refuse derived fuels, which by nature are more homogeneous than untreated mixed municipal waste.

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

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

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

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

In this case, the Applicant proposes to use a dry acid gas system with a sodium bicarbonate reagent. Sodium Bicarbonate has been chosen on the grounds that it is an efficient reagent for acid gas abatement purposes, is easier to store and handle than lime and does not present the caustic hazards associated with lime or lime-based residues. All emissions from the incinerator

flue (release point A1) will be monitored using a fully compliant MCERTS accredited Continuous Emissions Monitoring System (CEMS) on the exhaust stack. The NOx, HCl and SOx measurements will be used to optimise the consumption of abatement reagents by means of a feedback control loop.

The Environment Agency is satisfied that this is BAT and that appropriate measures will be in place to ensure that the use of the proposed reagent is optimised.

6.2.4 Carbon monoxide and volatile organic compounds (VOCs)

The prevention and minimisation of emissions of carbon monoxide and volatile organic compounds from the incineration and gasification plant will be 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 constant and acid gas control also controls dioxin release.

The prevention and minimisation of emissions of dioxins and furans from incineration plant 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.

The potential for dioxin formation will be prevented by the design and operation of the waste gasification plant, specifically the low oxygen conditions and high temperature of the gasifiers, the syngas clean-up process and high temperature of syngas combustion in the gas engines.

6.2.6 Metals

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

The 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 also 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.

The syngas produced by the gasification plant will be treated to be no more polluting than natural gas hence no metals will be present. Activated carbon injection into the syngas will be used to remove metals including mercury. In addition particulate phase metals will be removed in the particulate filtration stage of the syngas cleaning.

6.2.7 Stack height assessment

The height of the stacks proposed for the waste gasification plant and waste incineration plant is 30 metres. The Operator provided an assessment of stack heights in order to demonstrate that the proposed stack height is BAT.

The assessment showed that predicted emission levels (i.e. NOx process contributions) would be reduced if the stack heights are increased above 30m, due to increased dispersion. However, the cost associated with reducing emissions to insignificant levels would incur an additional cost of approximately £900,000.

We have considered the stack heights associated with other comparable thermal treatment and combustion plant (i.e. with similar annual waste throughputs) and we are satisfied that the stack heights proposed are comparable to those of other existing/permitted plant.

Taking into account the predicted emission levels and environmental concentrations of the pollutant emitted by the proposed plant, the conservative nature of the assessment undertaken of potential environmental impact (Section 5 of this document – assumes continuous operation of both plant at emission limits and is based upon maximum predicted emission concentrations), the maximum treatment and thermal capacity of the two plant and the costs associated with increasing stack height, we are satisfied that the stack heights proposed for the facility represent BAT.

Although not a consideration of this variation determination, it is noted that the planning permission granted for the proposed facility was also made on the basis that the stack heights serving the two plant are 30m in height.

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 be constant for all options considered in the BAT assessment. Any differences in the GWP of the options in the BAT appraisal will therefore arise from small differences in energy recovery and in the amount of N_2O emitted.

The Applicant considered energy efficiency and compared SCR to SNCR in its BAT assessment. This is set out in sections 4.3.7, 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 Operator's assessment shows their preferred option is best in terms of GWP.

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

6.4 BAT and POPs

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

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

The unintentionally-produced POPs addressed by the Convention are:

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

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

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

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

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

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

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

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

The release of **dioxins and furans** to air is required by the IED to be assessed against the I-TEQ (International Toxic Equivalence) limit of 0.1 ng/m^3. Further development of the understanding of the harm caused by dioxins has resulted in the World Health Organisation (WHO) producing updated factors to calculate the WHO-TEQ value. Certain **PCBs** have structures which make them behave like dioxins (dioxin-like PCBs), and these also have toxic equivalence factors defined by WHO to make them capable of being considered together with dioxins. The UK's independent health advisory committee, the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) has adopted WHO-TEQ values for both dioxins and dioxin-like PCBs in their review of Tolerable Daily Intake (TDI) criteria. The Permit requires that, in addition to the requirements of the IED, the WHO-TEQ values for both dioxins and dioxin-like PCBs should be monitored for reporting purposes, to enable evaluation of exposure to

dioxins and dioxin-like PCBs to be made using the revised TDI recommended by COT. The release of dioxin-like PCBs and PAHs is expected to be low where measures have been taken to control dioxin releases. The Permit also requires monitoring of a range of PAHs and dioxin-like PCBs at the same frequency as dioxins are monitored. We have included a requirement to monitor and report against these WHO-TEQ values for dioxins and dioxin-like PCBs and the range of PAHs as listed in the Permit. We are confident that the measures taken to control the release of dioxins will also control the releases of dioxin-like PCBs and PAHs. Section 5.2.1 of this document details the assessment of emissions to air, which includes dioxins and concludes that there will be no adverse effect on human health from either normal or abnormal operation.

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

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

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

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

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

6.5 Other Emissions to the Environment

6.5.1 Emissions to water

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

6.5.2 Emissions to sewer

The facility will not have an emission to sewer.

6.5.3 Fugitive emissions

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

The Materials Recycling Facility does not require large volumes of process chemicals or raw materials beyond the solid wastes stored and treated on-site. Other than the wastes stored/treated through the existing waste composting activity and wood shredding and waste storage/transfer operations, wastes will be stored within buildings.

All internal and external processing areas are to be constructed with impermeable concrete hardstanding which has been designed in accordance to the load bearing requirements of the processing equipment and vehicles used at the facility.

All surface water run-off arising from the operational areas of the site are contained and discharged to a holding lagoon. All compost leachate and rainwater collected within the lagoon is recirculated through the composting process and used to maintain moisture content levels. There are no discharges from this lagoon to controlled waters.

Any potentially contaminated water captured within the Combustion Plant Building and the Gasification Plant Building will be recycled within the waste treatment process. Any potentially contaminated water captured within the Material Recycling Plant will be diverted into the sites existing holding lagoon.

The facility has one point source emission to surface water from the facility's existing site attenuation pond. The attenuation pond is clay-lined and has a capacity of 2014m^3. The discharge is made to Thunder Brook via a drainage channel that runs along the northern perimeter of the site. The emission to water will predominantly be of clean uncontaminated surface water collected from areas of the site where waste storage/treatment operations are not undertaken, which passes through an oil interceptor prior to discharging to the pond. Along with the site surface water, treated process effluent from the gasification will be discharged to the brook, via the attenuation pond. We have assessed the potential environmental impact of this discharge and are satisfied that it will not impact upon water quality or result in any deterioration.

The key process consumable used on-site that has a pollution potential is gas oil which is predominantly utilised for vehicles, plant and equipment as well as a back-up fuel for the incinerator plant. This material will be stored within a bunded steel tank that meets the requirements of our technical guidance. Other potentially polluting substances held on site include lubrication, hydraulic and turbine oils, urea, sodium bicarbonate, activated carbon, water treatment chemicals, bio-diesel, hydrogen peroxide and caustic soda. Other than the sodium bicarbonate and activated carbon, which will be stored in external silos, the other chemicals used on-site will be stored within enclosed process buildings and will be provided with bunds to contain leaks or spillage. Emergency Spill kits (oils and chemical response) will also be provided throughout the site.

All storage tanks will be fitted with level gauges, alarms and hardwired into the plant online (SCADA) monitoring system.

A comprehensive maintenance and management system will be implemented at the site to include all storage areas, hardstanding and storage vessels, to ensure that they are physically inspected to detect any signs of deterioration, leaks or spillage. Site drainage systems will be inspected annually, including shut-off valves, culverts, ditches, ponds, lagoons and flow control devices. An annual CCTV drainage survey will also be carried out to ensure it is working correctly and interceptors will be inspected bi-annually or following any spillage incident.

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

Pre-operational condition PO4 of the permit requires the Operator to demonstrate that the impermeable hardstanding and other containment measures proposed for the facility have been constructed and installed to meet relevant standards prior to operation of the activities permitted by this variation.

6.5.4 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 existing facility has an odour management plan, which has been updated with regards to the new activities applied for through the permit variation. The key features of the updated odour management plan are summarised below.

Waste accepted at the installation material recycling facility will be delivered in covered vehicles or within containers.

Fast closing roller shutter doors will be used to close the entrance to the material recycling and waste incineration building. Combustion air will be

drawn from within the incineration plant building in order to prevent odours and airborne particulates from leaving the facility building.

The material recycling facility building will be fully enclosed and contained, with air extracted from the building at a rate of 3 air changes per hour. The extracted air will be directed to a purpose-built two-stage biofilter for treatment prior to release.

The building will be constructed to minimise any air loss and smoke tests will be undertaken to assess this following construction repeated every 5 years.

The building will have 3 roller shutter doors that will remain closed other than during deliveries/exports, and sequencing of door opening will be managed to prevent through-drafts. Airflow and air pressure in the building extraction system will be monitored and recorded and will be integrated with fan operation and door opening operation.

The biofilter will have a control system and associated monitoring/sampling systems for parameters including temperature, moisture, irrigation flow, nutrient composition, pressure drop and pH. Continuous information will be available for water pH, water flow, fan operation, air flow, outlet emissions, system temperatures and pressures. Manual testing will be carried out weekly for dosing levels and nutrient composition. The biofilter will consist of a number of modular units, which will enable individual units to be inspected and maintained whilst ensuring that other units of the biofilter can remain operational.

The waste gasification plant will only process waste wood. The gasification plant is located outside, with the associated waste wood storage bays housed in an adjacent 3 sided building. The closed end of the building is provided with roller shutter doors. Due to the type/nature of the waste being stored and treated, the quantities involved and the rapid turn-over of the material (storage <1.5 days), we are satisfied that the risk of odour from this activity is low and measures proposed are appropriate.

Waste pre-acceptance and acceptance procedures will be implemented at the facility for all waste received. The procedures will include detail of the waste types and sources of material that can be accepted, confirmation that the waste is not odorous, a description of the type/nature of waste and relevant European Waste Catalogue codes. The procedures will ensure that representative samples of waste are taken and obtained to ensure waste is consistent with the description provided, including appearance, colour, pH, and a description of any odour present. All wastes will be weighed and inspected at the site weighbridge by staff trained in odour monitoring and the requirements of the odour management plan. Any waste identified as having a distinct odour will be immediately rejected. Waste will also be subject to further inspection upon tipping in the relevant reception area.

Records will be kept of each load received, including time and date, source and description of waste (including type, quantity and odour intensity). Each

waste load will have an individual reference number and recorded in the site diary. All waste records will be kept on-site for a minimum of 3 years.

The waste dryer plant will only process a limited range of waste, predominantly non-hazardous soils, and waste pre-acceptance and acceptance procedures will ensure that these wastes do not contain substances that could result in significant odour. Waste pre-acceptance and acceptance procedures for the waste dryer plant will ensure that the waste treated will not contain contaminants above the relevant waste acceptance criteria for inert waste. The dryer plant will be located in a fully enclosed building with emissions from the plant discharged to atmosphere via one of two stacks. The dryer plant building will also have fast shutting doors, which will remain closed at all times apart from during deliveries. The dried wastes will be left to cool inside the dryer building before being transferred to the neighbouring landfill for disposal.

No waste will be stored on-site for more than 3 months, and most waste (specifically including that associated with the proposed activities permitted through this variation) will be stored on-site for significantly less than this. Waste will be managed and treated at the facility on a first-in/first-out basis through bay and pile rotation. Waste stockpiles will be reviewed twice daily and process inventory will be maintained by the site manager.

Waste will be stored at the materials recycling facility for up to 3 days prior to processing in dedicated reception bays and for up to 3 days in the waste sorting bays. Recovered recyclable waste will be held in bins for no longer than 5 days.

Waste (RDF) transferred to the waste incineration plant will be stored in one of two receiving pits for up to 1 day prior to being transferred to the fuel bunker. Waste will be held in the fuel bunker for up to 7 days prior to incineration. The crane serving the incineration plant will ensure that waste in the bay is mixed and older waste does not remain at the bottom.

Wood waste delivered to the waste gasification plant will be stored within dedicated bays for no longer than 1.5 days before being treated.

The Operator will undertake ongoing odour monitoring at the facility, involving twice-daily olfactory tests at locations around the site and emissions from the biofilter and dryer stacks will also be monitored. Pre-operational conditions have been included in the permit requiring the operating to proposal a programme of monitoring for these emission points to check and validate the odour concentrations assumed in the permit application and odour modelling.

All areas of the site will be inspected twice per day as part of the site inspection procedures and pre-shift checks will also be carried out to ensure the site is clean. A pressure washer will be used to clean down areas of site hardstanding when necessary. All wastes will be stored on sealed concrete surfaces and all building floors and surfacing will be designed to slope towards the relevant drainage system to aid cleaning.

The site has procedures for receiving and responding to odour complaints and odour-related incidents. The Operator holds monthly site meetings where members of the local community are invited to attend.

6.5.5 Noise and vibration

Section 4.6 of the Permit Application Support Document set out the noise control measures that will be employed at the facility, including the implementation of a plant maintenance programme, the housing of gas engines within acoustic enclosures, provision of exhaust silencers, the selection of low noise coolers, enclosure of fans/blowers and restriction of vehicle deliveries to day time hours.

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 assessment undertaken predicted that noise levels resulting from the operation of the facility will be at worst 9 decibels (dB) below existing background levels during the daytime and 2 dB below existing background levels during the night-time. In accordance with BS4142, this is an indication of a low impact. We have reviewed the noise assessment contained within the application and carried out check modelling, and agree with the conclusion drawn; that emissions of noise are likely to have a low impact upon local receptors.

The noise assessment provided was based upon predicted noise levels resulting from the proposed activities. Improvement condition IC11 has been included in the permit requiring the Operator to undertake a noise monitoring exercise at the facility in order to validate the results and conclusions of the noise assessment provided in the application once the facility is fully operational.

6.6 Setting ELVs and other Permit conditions

6.6.1 Translating BAT into Permit conditions

Article 14(3) of IED states that BAT conclusions shall be the reference for permit conditions. Article 15(3) further requires that under normal operating

conditions; emissions do not exceed the emission levels associated with the best available techniques as laid down in the decisions on BAT conclusions.

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

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

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

(i) Local factors

We have considered the information submitted by the Applicant with respect to the nearby local wildlife sites, ancient woodlands and local human receptors. The impact of the proposed Installation on these features is not significant.

(ii) National and European ESs

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

(iii) Global Warming

CO_2 is an inevitable product of the combustion of waste. The amount of CO_2 emitted will be essentially determined by the quantity and characteristics of waste being incinerated, which are already subject to conditions in the Permit. It is therefore inappropriate to set an emission limit value for CO_2, which could do no more than recognise what is going to be emitted. The gas is not therefore targeted as a key pollutant under Annex II of IED, which lists the main polluting substances that are to be considered when setting emission limit values (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 facility, which is the treatment of waste for disposal, with associated energy recovery. Controls in the form of restrictions on the volume and type of waste that can be accepted at the Installation and permit conditions relating to energy

efficiency effectively apply equivalent technical measures to limit CO_2 emissions.

(iv) Commissioning

The proposed Installation will undergo a period of commissioning before the plant becomes fully operational. The IED and the conditions set out in the permit cover activities at the Installation once it is fully operational. Prior to commissioning of each new regulated activity (AR2 to AR4 in Table S1.1 of the Permit), the Applicant shall submit a commissioning plan (required under pre-operational condition PO1) to the Environment Agency for approval outlining the expected emissions during different stages of commissioning, the expected duration and timeline for completion of activities and any necessary action to protect the environment in the event that actual emissions exceed expected emissions in accordance with the approved commissioning plan.

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

- A commissioning plan to be agreed with the Environment Agency (required under pre-operational condition PO1).
- Development of procedures to demonstrate process control of expected emissions under different operating conditions; plant operation conforms to conditions set out in the permit (required under improvement condition IC4);
- Abatement plant optimisation (required under improvement condition IC5);
- Calibration of CEMs equipment (required under improvement condition IC7);
- Verification of combustion chamber residence times, temperature and oxygen content (required under improvement condition IC4 and pre-operational condition PO15).

6.7 Monitoring

6.7.1 Monitoring during normal operations

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

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

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

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

The Operator has stated that they will provide back-up CEMS working in parallel to the operating CEMS. These will be switched into full operation immediately in the event that there is any failure in the regular monitoring equipment. The back-up CEMS measure the same parameters as the operating CEMS. In the unlikely event that the back-up CEMS also fail Condition 2.3.11 of the permit requires that the abnormal operating conditions apply.

6.7.3 Continuous emissions monitoring for dioxins and heavy metals

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

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

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

In the case of dioxins, equipment is available for taking a sample for an extended period (several weeks), but the sample must then be analysed in the conventional way. A CEN committee has agreed Technical Specifications (EN TS 1948-5) for continuous sampling of dioxins. This specification will lead to a CEN standard following a validation exercise which is currently underway. According to IED Article 48(5), "As soon as appropriate measurement techniques are available within the Union, the Commission shall, by means of

delegated acts in accordance with Article 76 and subject to the conditions laid down in Articles 77 and 78, set the date from which continuous measurements of emissions into the air of heavy metals and dioxins and furans are to be carried out. This is yet to happen. However, our extant 'dioxin enforcement policy' recommends continuous sampling of dioxins where multiple emission exceedances occur and no clear root cause can be identified. Therefore should continuous sampling be required at a later date during the operation of the installation, then sampling and analysis shall comply with the requirements of EN TS 1948.

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

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

6.7.4 Syngas monitoring

We have set a requirement to monitor the syngas in table S3.3 of the permit. Permit conditions 3.5.6 and 3.5.7 set the monitoring frequency of the monitoring.

Section 6.1.4 of this decision document includes the specification that the Applicant provided for their syngas. Monitoring has been set for the key components to ensure that emissions are no higher than the specification that has been based upon the composition of natural gas.

Condition 3.5.6 will require daily sampling to start with for these components but allows the frequency to be reduced if samples are shown to meet the limits. If samples fail then the required monitoring frequency will increase. Condition 3.5.7 ensures that if a sample fails another is taken within a week. Condition 2.3.14 prevents waste from being charged to the gasification plant if any monitoring limit in table S3.3 is exceeded for any two consecutive samples.

Pre-operational condition PO5 has been included in the permit requiring the Operator to submit a Syngas Monitoring Methodology for approval detailing how representative sampling and analysis of syngas will occur to demonstrate that it meets the limits specified in table S3.3.

Improvement condition IC8 has also been included in the permit requiring the Operator to check that the composition of the syngas is lower than the limits in table S3.3 under a range of operating scenarios and to review the performance of the syngas clean up techniques.

6.8 Reporting

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

7 Other legal requirements

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

7.1 The EPR 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 planning application (which also formed part of the Environmental Permit Application).
- The decision of the local planning authority to grant planning permission.
- The report and decision notice of the local planning authority accompanying the grant of planning permission.
- The response of the Environment Agency to the local planning authority in its role as consultee to the planning process.

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

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

These are all covered by permit conditions.

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 Variation 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.

The site in question was not classified as a Site of High Public Interest at the time of permit variation application or determination and therefore extended consultation was not undertaken in accordance with our guidance.

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*".

Paragraph 4.2 of this Guidance provides the objectives we are to pursue when discharging our main operational functions. As far as determining applications for water discharge permits is concerned, this states that we are:

> *'To protect, enhance and restore the environmental quality of inland and coastal surface water and groundwater, and in particular:*
> *to address both point source and diffuse pollution;*
> *to implement the EC Water Framework Directive; and*
> *to ensure that all relevant quality standards are met.'*

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 variation to take account of the Section 4 duty

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 variation to take account of the Section 4 duty.

For waste the guidance refers to ensuring waste is recovered or disposed of in ways which protect the environment and human health. 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 variation 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 variation.

(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 variation.

(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 variation may impose on the applicant are reasonable and proportionate in terms of the benefits it provides.

(vii) Section 108 Deregulation Act 2015 – Growth duty

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

Paragraph 1.3 of the guidance says:

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

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

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

(viii) Section 81 (National Air Quality Strategy)

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

7.2.2 **Human Rights Act 1998**

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

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

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

7.2.4 **Wildlife and Countryside Act 1981**

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

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

We assessed the Application and concluded that the Installation will not damage the special features of any SSSI. This was recorded on a CROW Appendix 4 form,

The CROW assessment is summarised in greater detail in section 5.4 of this document. A copy of the full Appendix 4 Assessment can be found on the public register and a copy was sent to Natural England for information only, in accordance with our guidance.

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

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

7.3 National secondary legislation

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

We have assessed the Variation Application in accordance with guidance agreed jointly with Natural England and concluded that there will be no likely significant effect on any European Site as there are no designated sites within the relevant distance criteria of the facility (within 10km of the facility). Our assessment of the impact upon ecological receptors is summarised in Section 5.4 of this document.

7.3.2 **Water Environment (Water Framework Directive) Regulations 2003**

Consideration has been given to whether any additional requirements should be imposed in terms of the Environment Agency's duty under regulation 3 to secure compliance with the requirements of the Water Framework Directive and the EQS Directive through (inter alia) environmental permits, and its obligation in regulation 17 to have regard to the river basin management plan (RBMP) approved under regulation 14 and any supplementary plans prepared under regulation 16. However, it is felt that existing conditions are sufficient in this regard and no other appropriate requirements have been identified.

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

7.3.3 **The Persistent Organic Pollutants Regulations 2007**

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

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

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

The way in which the Environment Agency has consulted with the public and other interested parties is set out in 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 1: APPLICATION OF CHAPTER IV OF THE INDUSTRIAL EMISSIONS DIRECTIVE

IED Article	Requirement	Delivered by
45(1)(a)	The permit shall include a list of all types of waste which may be treated using at least the types of waste set out in the European Waste List established by Decision 2000/532/EC, if possible, and containing information on the quantity of each type of waste, where appropriate.	Condition 2.3.3(a) and Table S2.2 in Schedule 2 of the Permit.
45(1)(b)	The permit shall include the total waste incinerating or co-incinerating capacity of the plant.	Condition 2.3.3(a) and Table S2.2 in Schedule 2 of the Permit.
45(1)(c)	The permit shall include the limit values for emissions into air and water.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1(a) in Schedule 3 of the Permit.
45(1)(d)	The permit shall include the requirements for pH, temperature and flow of waste water discharges.	Not Applicable
45(1)(e)	The permit shall include the sampling and measurement procedures and frequencies to be used to comply with the conditions set for emissions monitoring.	Conditions 3.5.1 to 3.5.5 and Tables S3.1, S3.1(a), S3.3 and S3.4 in Schedule 3 of the Permit.
45(1)(f)	The permit shall include the maximum permissible period of unavoidable stoppages, disturbances or failures of the purification devices or the measurement devices, during which the emissions into the air and the discharges of waste water may exceed the prescribed emission limit values.	Conditions 2.3.10 and 2.3.11.
46(1)	Waste gases shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Condition 2.3.1(a) and Table S1.2 of Schedule 1 of the Permit.
46(2)	Emission into air shall not exceed the emission limit values set out in part of Annex VI.	Conditions 3.1.1 and 3.1.2 and Tables S3.1 and S3.1a.
46(3)	Relates to conditions for water	There are no such

IED Article	Requirement	Delivered by
	discharges from the cleaning of exhaust gases.	discharges from the waste incineration plant 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 from the waste incineration plant as condition 3.1.1 prohibits this.
46(5)	Prevention of unauthorised and accidental release of any polluting substances into soil, surface water or groundwater. Adequate storage capacity for contaminated rainwater run-off from the site or for contaminated water from spillage or fire-fighting.	The application explains the measures to be in place for achieving the directive requirements
46(6)	Limits the maximum period of operation when an ELV is exceeded to 4 hours uninterrupted duration in any one instance, and with a maximum cumulative limit of 60 hours per year. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Conditions 2.3.10 and 2.3.11
47	In the event of breakdown, reduce or close down operations as soon as practicable. Limits on dust (150 mg/m3), CO and TOC not to be exceeded during this period.	Condition 2.3.10
48(1)	Monitoring of emissions is carried out in accordance with Parts 6 and 7 of Annex VI.	Conditions 3.5.1 to 3.5.5. Reference conditions are defined in Schedule 6 of the Permit.
48(2)	Installation and functioning of the automated measurement systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Condition 3.5.3, and tables S3.1, S3.1(a), and S3.4
48(3)	The competent authority shall determine the location of sampling or measurement points to be used for monitoring of emissions.	Conditions 3.5.3 and 3.5.4
48(4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the	Conditions 4.1.1 and 4.1.2, and Tables S4.1 and S4.4

IED Article	Requirement	Delivered by
	competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	conditions 3.1.1 and 3.1.2 and 3.5.5
50(1)	Slag and bottom ash to have Total Organic Carbon (TOC) < 3% or loss on ignition (LOI) < 5%.	Conditions 3.5.1 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 2.3.9, Pre-operational condition PO15 and Improvement condition IC4 and Table S3.4
50(3)	At least one auxiliary burner which must not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil liquefied gas or natural gas.	Condition 2.3.10
50(4)(a)	Automatic shut to prevent waste feed if at start up until the specified temperature has been reached.	Condition 2.3.9
50(4)(b)	Automatic shut to prevent waste feed if the combustion temperature is not maintained.	Condition 2.3.9
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 2.3.9
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 PO13) and then every 2 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 1.1.3 and 2.3.1 of the Permit.
51(1)	Different conditions than those laid	No such conditions

IED Article	Requirement	Delivered by
	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.	Have been allowed
51(2)	Changes in operating conditions do not cause more residues or residues with a higher content of organic polluting substances compared to those residues which could be expected under the conditions laid down in Articles 50(1), (2) and (3).	No such conditions Have been allowed
51(3)	Changes in operating conditions shall include emission limit values for CO and TOC set out in Part 3 of Annex VI.	No such conditions Have been allowed
52(1)	Take all necessary precautions concerning delivery and reception of Wastes, to prevent or minimise pollution.	Conditions 2.3.1, 2.3.3, 3.2, 3.3, 3.4 and 3.6.
52(2)	Determine the mass of each category of wastes, if possible according to the EWC, prior to accepting the waste.	Condition 2.3.3(a) and Table S2.2 in Schedule 3 of the Permit.
52(3)	Prior to accepting hazardous waste, the Operator shall collect available information about the waste for the purpose of compliance with the permit requirements specified in Article 45(2).	Incineration plant is not permitted to accept hazardous waste
52(4)	Prior to accepting hazardous waste, the Operator shall carry out the procedures set out in Article 52(4).	Incineration plant is not permitted to accept hazardous waste
52(5)	Granting of exemptions from Article 52(2), (3) and (4).	Not Applicable
53(1)	Residues to be minimised in their amount and harmfulness, and recycled where appropriate.	Conditions 1.4.1, 1.4.2 and 3.5.1 with Table S3.5.
53(2)	Prevent dispersal of dry residues and dust during transport and storage.	Conditions 1.4.1 2.3.1, 2.3.2 and 3.2.1.
53(3)	Test residues for their physical and chemical characteristics and polluting potential including heavy metal content (soluble fraction).	Condition 3.5.1 and Table S3.5 and pre-operational condition PO14.
55(1)	Application, decision and permit to	All documents are

IED Article	Requirement	Delivered by
	be publicly available.	accessible from the Environment Agency Public Register.
55(2)	An annual report on plant operation and monitoring for all plants burning more than 2 tonne/hour waste.	Condition 4.2.2 and 4.2.3.

ANNEX 2: Pre-Operational Conditions

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

Pre-operational measures		
Reference	Operation	Pre-operational measures
PO1	The measures stated shall be complete prior to the operation of each of the following activities: waste incineration plant (AR2), waste gasification plant (AR3), waste dryer plant (AR4) and material recycling facility (AR7)	Prior to the commencement of commissioning of each of the activities AR2, AR3, AR4 and AR7, the Operator shall provide a written commissioning plan for the activity (or activities), including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include: • Specific operational parameters required to define "final commissioning", • the expected emissions to the environment during the different stages of commissioning, • the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the Environment Agency in the event that actual emissions exceed expected emissions. Commissioning shall be carried out in accordance with the commissioning plan as approved.
PO2	The measures stated shall be complete prior to the operation of each of the following activities: waste incineration plant (AR2), waste gasification plant (AR3), waste dryer plant (AR4) and material recycling facility (AR7)	Prior to the commencement of commissioning of each of the activities AR2, AR3, AR4 and AR7, the Operator shall send a summary of the site Environment Management System (EMS) to the Environment Agency and make available for inspection all documents and procedures which form part of the EMS. It shall be made clear which documents and procedures have been updated, included or replaced in the EMS in relation to the commissioned activity (or activities). 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). 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. The EMS shall include detailed accident management and emergency plans, and an energy efficiency plan in accordance with Section 2.7 of Environment Agency guidance document EPR5.06 Guidance for the recovery and disposal of hazardous and non-hazardous waste.

PO3	The measures stated shall be complete prior to the operation of each of the following activities: waste incineration plant (AR2), waste gasification plant (AR3), waste dryer plant (AR4) and material recycling facility (AR7)	Prior to the commencement of commissioning of each of the activities AR2, AR3, AR4 and AR7, the Operator shall submit a written report to the Agency providing the waste pre-acceptance and acceptance procedures (including specific waste acceptance criteria) to be employed at the site for the activity (or activities). The waste acceptance procedure(s) shall include the processes and systems by which wastes unsuitable for treatment at the site will be controlled. The procedure(s) shall be implemented in accordance with the written approval from the Agency.
PO4	The measures stated shall be complete prior to the operation of each of the following operations: waste incineration plant (AR2), waste gasification plant (AR3), waste dryer plant (AR4) and material recycling facility (AR7)	Prior to the commencement of commissioning of each of the activities AR2, AR3, AR4 and AR7, the Operator shall provide the Environment Agency with a written report for approval providing details of the impermeable hardstanding and containment measures (including but not limited to tanks, pipework, bunds, above and below ground drainage systems) in place to prevent and control fugitive emissions to land and water from the activity (or activities). The report shall demonstrate that the areas of hardstanding and other containment measures have been constructed and installed to meet relevant standards, including the relevant requirements of CIRIA C736 Containment systems for the prevention of pollution and Section 2.2.5 of S5.06 Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste, and that this has been confirmed by a suitably qualified engineer.
PO5	Operation of waste gasification plant (AR3)	At least 1 month before final commissioning of the gasification plant, the Operator shall submit a Syngas Monitoring Methodology for approval in writing by the Environment Agency - detailing how representative sampling and analysis of syngas will occur to demonstrate that it meets the limits specified in table S3.3. The methodology shall include, but not be limited to; • Sample point location and evidence of homogenous sample collection. • Details of sampling methods, including duration, for representative sampling across different operating loads and waste feedstock. • Sample analysis methods, limits of detection and availability of laboratory accreditation for methods. • Procedures for implementing the requirements of conditions 3.5.6 and 3.5.7, including details of sampling, courier, analysis and reporting responsibilities and timescales. The methodology shall be implemented in accordance

		with the Environment Agency`s written approval.
PO6	Operation of waste gasification plant (AR3)	Prior to the commencement of final commissioning of the gasification plant, the Operator shall submit procedures for the management of out of specification syngas to the Environment Agency for approval in writing. Procedures shall include details of syngas specification and detail processes for the management of syngas where any limit in Schedule 3 Table 3.3 has been exceeded and/or the requirements of conditions 3.5.6 or 3.5.7 are not being met.
PO7	Operation of waste gasification plant (AR3)	Prior to the commencement of final commissioning of the gasification plant, the Operator shall submit details of the start-up and shut down operating procedures to the Environment Agency for approval. The submission shall include the operational parameters which will be met to define start up and shut down and details of how syngas will be dealt with during these periods.
PO8	Operation of waste gasification plant (AR3)	Prior to the operation of the waste gasification plant, the Operator shall provide the Environment Agency with a written report for approval, which details a monitoring programme to characterise and confirm the composition of the process effluent produced by the gasification plant, following its treatment in the associated effluent treatment plant. Proposals shall identify the proposed monitoring location (which shall be before the effluent is released to the site surface water drainage system/site attenuation pond), the duration, frequency and reference period of the monitoring, which shall ensure that representative samples of the effluent are taken, and the monitoring methods/standards to be used, having regards to Monitoring discharges to water and sewer: M18 Guidance Note.
PO9	Operation of waste gasification plant (AR3)	Prior to the commencement of commissioning of the gasification plant (activity AR3), the Operator shall submit to the Environment Agency for approval a protocol for the sampling and testing of the tar and filter residue produced by the gasification plant for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.
PO10	Operation of the materials recycling facility (AR7)	Prior to the acceptance of waste for storage or processing in the materials recycling facility building, the Operator shall provide the Environment Agency with written procedures for approval detailing the measures that will be implemented for the monitoring, inspection and maintenance of the biofilter and associated air extraction system.
PO11	Operation of the materials recycling facility (AR7)	Prior to the acceptance of waste for storage or processing in the materials recycling facility building, the Operator shall provide the Environment Agency with a written report for approval detailing a monitoring programme for point source emissions of odour from the facility's biofilter. The report shall detail the proposed method, duration and frequency of monitoring, which

		shall ensure that representative samples of air are taken over a range of operating scenarios, having regards to the Environment Agency H4 Odour Management guidance document.
PO12	Operation of the materials recycling facility (AR7)	The storage or processing of waste in the materials recycling facility building shall not commence until: ▪ the Operator has provided evidence to the Environment Agency to show that the design, installation and maintenance of the building's fire detection and suppression systems will be covered by an appropriate UKAS accredited third party certification scheme; and ▪ the fire detection and suppression systems are installed and commissioned; ▪ a commissioning plan is submitted to the Environment Agency that includes, but not limited to, the design layout, performance and operating procedure of the systems; ▪ the Environment Agency has agreed in writing that the storage and treatment of combustible waste in the building may commence.
PO13	Operation of waste incineration plant (AR2)	Prior to the commencement of commissioning of the waste incineration plant (activity AR2), the Operator shall send a report to the Environment Agency which will contain a comprehensive review of the options available for utilising the heat generated, 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. The review shall detail any identified proposals for improving the recovery and utilisation of heat and shall provide a timetable for their implementation.
PO14	Operation of waste incineration plant (AR2)	Prior to the commencement of commissioning of the waste incinerator plant (activity AR2), the Operator shall submit to the Environment Agency for approval a protocol for the sampling and testing of incinerator bottom ash for the purposes of assessing its hazard status. Sampling and testing shall be carried out in accordance with the protocol as approved.
PO15	Operation of waste incineration plant (AR2)	After completion of furnace design and at least three calendar months before commencement of commissioning; the Operator shall submit a written report to the Agency of the details of the computational fluid dynamic (CFD) modelling. The report shall demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by Chapter IV and Annex VI of the IED.
PO16	Operation of waste	At least three months before the commencement of commissioning of the waste incineration plant (AR2), the Operator shall submit a written report to the Environment

	incineration plant (AR2)	Agency specifying arrangements for continuous and periodic monitoring of emissions to air to comply with Environment Agency guidance notes M1 and M2. The report shall include the following: • Plant and equipment details, including accreditation to MCERTS • Methods and standards for sampling and analysis • Details of monitoring locations, access and working platforms
PO17	Operation of waste dryer plant (AR4)	Prior to the commencement of commissioning of the waste dryer plant, the Operator shall provide the Environment Agency with a written report for approval detailing a monitoring programme for point source emissions of odour released from the dryer plant exhausts. The report shall detail the proposed method, duration and frequency of monitoring, which shall ensure that representative samples of air are taken over a range of operating scenarios, having regards to the Environment Agency H4 Odour Management guidance document.

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.

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 of the gasification plant.
IC2	The Operator shall submit a written proposal to the Environment Agency to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission point [A1], identifying the fractions within the 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 of the waste incineration plant.
IC3	The Operator shall submit a written report to the Environment Agency on the commissioning of each of the waste gasification, waste incineration and waste drying plant. Each report shall summarise the environmental performance of the plant as installed against the design parameters set out in the Application. Each report shall also include a review of the performance of the plant in question 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 of each plant.
IC4	The Operator shall carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the incinerator plant furnace whilst operating under the anticipated most unfavourable operating conditions. The results shall be submitted in writing to the Environment Agency and include a comparison with the CFD modelling submitted with Pre-Operational Condition PO15.	Within 4 months of the completion of commissioning of the waste incineration plant.
IC5	The Operator shall submit a written report to the Environment Agency describing the performance and optimisation of the following incinerator plant emission abatement systems: • The Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx).The report shall include an assessment of the level of NOx, N_2O and NH_3 emissions that can be achieved under optimum operating conditions.	Within 4 months of the completion of commissioning of the waste incineration plant.

	• The sodium bicarbonate injection system for minimisation of acid gas emissions • The carbon injection system for minimisation of dioxin and heavy metal emissions.	
IC6	The Operator shall carry out an assessment of the impact of emissions to air from the incinerator plant of the following component metals subject to emission limit values, Arsenic and Chromium. A report on the assessment shall be made to the Environment Agency. Emissions monitoring data obtained during the first year of operation shall be used to compare the actual emissions with those assumed in the impact assessment submitted with the Application. An assessment shall be made of the impact of each metal against the relevant EQS/EAL. In the event that the assessment shows that an EQS/EAL can be exceeded, the report shall include proposals for further investigative work.	15 months from the completion of commissioning of the waste incineration plant
IC7	The Operator shall submit a written summary report to the Environment Agency to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for parameters as specified in Table S3.1 and Table S3.1(a) complies with the requirements of BS EN 14181, specifically the requirements of QAL1, QAL2 and QAL3.	Initial calibration report to be submitted to the Agency within 3 months of completion of commissioning of the waste incineration plant. Full summary evidence compliance report to be submitted within 18 months of completion of commissioning of the waste incineration plant.
IC8	The Operator shall carry out checks to verify whether the composition of the syngas from each gasification plant is lower than the limits specified in Table 3.3 across a range of operating scenarios and waste feedstock mixes. A written report shall be submitted to the Environment Agency containing the results of syngas testing, and shall include but not be limited to: • A comparison of the monitored syngas composition with the limits set in table S3.3 • A review of the performance of the syngas clean up techniques to demonstrate the removal of pollutants as detailed in the application, including analysis of syngas and scrubber residues	Within 3 months of the completion of commissioning of the waste gasification plant

	• Details of the waste types that were gasified to generate the syngas which was sampled and analysed during this verification • Details of process parameters which could be used as surrogate monitoring to provide assurance that syngas quality as specified in table S3.3 will be achieved • A statement of action (including timescales for implementation) to be taken should syngas levels be shown to have higher pollutant levels than the limits in table S3.3. The Operator shall seek written approval from the Environment Agency that the syngas quality can meet the limits sets out in table S3.3.	
IC9	The Operator shall submit a written report to the Environment Agency for approval detailing the results of the effluent monitoring programme agreed in accordance with Pre-Operational Condition PO8. The report shall include a comparison of the composition of the monitored effluent with that detailed in the permit application and used in the accompanying H1 assessment. If the composition of the effluent is found to differ from that detailed and assessed in the permit application (in terms of there being additional substances or higher concentrations that those assessed previously, or the effluent is discharged at a higher rate) then a further assessment of the impact of the discharge upon the receiving watercourse shall be undertaken in accordance with our web guidance 'Risk Assessments for your Environmental Permit'. The report shall also propose an ongoing monitoring programme for the discharge of treated effluent.	6 months from the commissioning of the waste gasification plant
IC10	The Operator shall submit a report on the disposal and/or recovery of char produced from process. The report shall include compositional analysis of the char and confirmation of its suitability for available disposal and/or recovery outlets.	8 months following commissioning of the gasification plant
IC11	The Operator shall undertake a noise assessment during normal operations in accordance with the procedures given in BS4142: 2014, or other methodology as agreed with the Environment Agency, in order to validate the results and conclusions of the noise assessment provided as part of the permit variation application. The assessment shall include, but not be limited to: • A review of the noise sources from the facility. Where any noise sources are identified as exhibiting tonal contributions, they shall be quantified by means of frequency analysis. • A review of noise levels from static plant. • Consideration of on-site vehicle movements. A written report shall be submitted to the Agency for approval, detailing the findings of the assessment. If the assessment indicates that noise could have an adverse impact upon then the report shall propose measures for the	Within 6 months of the completion of commissioning of the waste gasification, incineration and drying plant.

	further attenuation and/or management of noise along with a timetable for their implementation. The Operator shall implement the improvements to the approved timetable.	
IC12	The Operator shall carry out odour monitoring for the biofilter as agreed through Pre-Operational Condition PO11 and submit the results of the monitoring to the Environment Agency for approval along with a comparison of the odour concentrations monitored to those used in the odour modelling and assessment provided as part of the permit variation application. If the monitored odour concentrations exceed that used in the odour modelling and assessment of the application then a further odour assessment shall be carried out and submitted to the Environment Agency for approval using this monitoring data. The assessment shall include consideration of any other point source emissions of odour at the facility, including the dryer plant if this has been commissioned and is operational at the time of assessment.	Within 6 months from the completion of commissioning of the material recycling facility.
IC13	The Operator shall carry out odour monitoring for the waste dryer plant as agreed through Pre-Operational Condition PO17 and submit the results of the monitoring to the Environment Agency for approval along with a comparison of the odour concentrations monitored to those used in the odour modelling and assessment provided as part of the permit variation application. Where the monitored odour concentrations exceed that used in the modelling and assessment of the application then a further odour assessment shall be carried out and submitted to the Environment Agency for approval using this monitoring data. The assessment shall include consideration of any other point source emissions of odour at the facility, including the biofilter serving the materials recycling facility building if this is commissioned and operational at the time of assessment.	Within 6 months from the completion of commissioning of the waste dryer plant.
IC14	The Operator shall submit the written protocol referenced in condition 3.1.5 for the monitoring of soil and groundwater for approval by the Environment Agency. The protocol shall demonstrate how the Operator will meet the requirements of Articles 14(1)(b), 14(1)(e) and 16(2) of the IED. The procedure shall be implemented in accordance with the written approval from the Agency.	Within 12 months from the permit issue date.

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 18/07/2017 to 15/08/2017. The Application was made available to view at the Environment Public Register at Rivers House, Wylds Road, East Quay, Bridgwater, TA6 4YS.

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

- Local Authority – Planning and Environmental Health departments
- Director of Public Health/PHE
- Food Standards Agency
- Health & Safety Executive
- Fire and Rescue Service

A copy of the habitats assessment undertaken during the determination was sent to Natural England for information only, in accordance with our Working Together Agreement.

We received consultation responses from the organisations as detailed below. A consultation reminder was sent to the Local Authority (Planning Department), Foods Standards Agency, Health & Safety Executive and Fire and Rescue Service on 06/10/2017 but no responses were received from these organisations during the variation determination.

1) Consultation Responses from Statutory and Non-Statutory Bodies

Response Received from Local Authority – Environmental Health	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Air Quality An appropriate level of conservatism appears to have been applied in the AQA undertaken for this development. Predicted levels of atmospheric pollutants appear to be below levels of concern. Subject to the assessments findings being borne out in the permitted installation I am supportive of what has been presented. Through the permitting process the performance of the installation should be monitored and as such any potential departures from air quality guidelines dynamically managed. This should provide further reassurance where Chromium VI emissions are concerned as per the report.	We have reviewed and audited the air quality impact assessment submitted as part of the variation application and we are satisfied that emissions from the facility will not have a significant impact upon local air quality and that appropriate measures will be taken to prevent and control emissions and minimise their impact. Further detailed information regarding this assessment, which includes emissions of Chromium VI, is provided in Section 5 of this document. Pre-operational conditions, improvement conditions, monitoring requirements and emission limits have been included in the permit to ensure that the emissions from the plant are subject to appropriate monitoring and control and are at or below the levels assessed.
Odour The average odour concentration predicted at receptor R8 (The Paddocks) is 1.45 OUE/m3. The predicted figure for 2015 is 1.68 OUE/m3; this is greater than the 1.50 OUE/m3 odour threshold, hence attention to controlling/managing odours is potentially required at this receptor location. An odour management plan has been submitted with the application and it is noted that the wastes being accepted for processing do not include animal by-products or malodorous wastes.	We have reviewed and audited the odour modelling undertaken and assessed the Odour Management Plan (OMP) provided as part of the variation application. Although the modelling predicts a potential excedence of the odour threshold at one of the local receptors we are satisfied that the facility is unlikely to have a significant impact upon local receptors taking into account the conservative nature of the assessment provided (i.e. using worst-case meteorological data and conservative odour emission levels)

The odour management plan needs to have regard to the identified receptor R8 (The Paddocks or equivalent) in the Air Quality assessments that may be affected by odours above the threshold of 1.50 OUE/m3; and identify the monitoring and controls that will be undertaken both on and off site in respect of this and any other receptors that may be at risk.	and the odour control measures proposed (as set out in the OMP). Having reviewed the odour management plan, we are satisfied that appropriate measures will be taken to prevent and control potentially odorous emissions from the facility and to minimise their potential impact. Further information on the odour impact assessment and odour management plan can be found in sections 5.6.2 and 6.5.4 of this document, respectively. The Operator is required to operate the facility in accordance with the approved OMP in accordance with Condition 2.3.1 and 3.3.1 of the permit. An improvement condition has also been included in the permit requiring the Operator to monitor and assess the point source emissions of odour to air in order to review and validate the odour concentrations used in the odour assessment provided in the variation application.

Response Received from Public Health England (PHE)	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Point source emissions to air The applicant has modelled emissions of key pollutants from the RDF including dioxins and furans Public Health England notes that the emissions were assessed as a worst case basis taking into account different receptor classes. There is not a comprehensive presentation of predicted environmental concentrations (PECs) as a result of the new processes, therefore it is not known how the PECs compare to air quality objectives. We would expect the regulator to ensure that air quality	We have reviewed and audited the air quality impact assessment submitted as part of the variation application and we are satisfied that emissions from the facility will not have a significant impact upon local air quality and that appropriate measures will be taken to prevent and control emissions and minimise their impact. We are satisfied that the operation of the facility will not result in an air quality objective being breached. We have audited the information used in the air quality modelling (including background/ existing air quality

objectives will not be breached. We note the proximity of the motorway and would ask for confirmation that the cumulative impact of NOX sources has been fully considered and that the applicant can demonstrate that the impact of NOX emissions from this plant and the associated gasification plants will be de-minimis.	information) and are satisfied that this is representative. Further detailed information regarding this assessment is provided in Section 5 of this document. Pre-operational conditions, improvement conditions, monitoring requirements and emission limits have been included in the permit to ensure that the emissions from the plant are subject to appropriate monitoring and control and are at or below the levels assessed.
Human health risk assessment This concludes that the tolerable daily intake will not be exceeded. The US EPA model used for these calculations is not endorsed by PHE.	We have reviewed and audited the assessment undertaken and are satisfied that an appropriate approach has been taken and that the relevant tolerable daily intake values will not be exceeded. Further information regarding the human health risk assessment undertaken can be found in Section 5.3 of this document.
Odours Odour is a potential issue at such facilities. The applicant states that a screening assessment has shown odour not to be major issue at the site and this will be covered within the facility's odour management plan and site wide EMS. Based on the application, this development does not present any obvious cause for concern.	Having reviewed the odour management plan, we are satisfied that appropriate measures will be taken to prevent and control potentially odorous emissions from the facility and to minimise their potential impact. Further information on the odour impact assessment and odour management plan can be found in sections 5.6.2 and 6.5.4 of this document, respectively.

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

No representations or responses were received from any members of the public, community organisations, other organisations or individuals (including local MPs or Councillors).