

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

Decision document recording our decision-making process

The Permit Number is: EPR/UP3031VL/A001
The Applicant / Operator is: Energy 10 Greenwich Limited

The Installation is located at: Morden Wharf,
 Tunnel Avenue,
 Greenwich,
 SE10 0NU.

What this document is about

This is a decision document, which accompanies a permit.

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

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

Preliminary information and use of terms

We gave the application the reference number EPR/UP3031VL/A001. We refer to the application as "the **Application**" in this document in order to be consistent.

The number we have given to the permit is EPR/UP3031VL. We refer to the permit as "the **Permit**" in this document.

The Application was duly made on 02/10/14.

The Applicant is Energy 10 Greenwich Limited. We refer to Energy 10 Greenwich Limited as “the **Applicant**” in this document. Where we are talking about what would happen after the Permit is granted we call Energy 10 Greenwich Limited “the **Operator**”.

Energy 10 Greenwich Limited’s facility is located at Morden Wharf, Tunnel Avenue, Greenwich, SE10 0NU. We refer to this as “the **Installation**” in this document.

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Glossary of acronyms used in this document

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

APC	Air Pollution Control
BAT	Best Available Technique(s)
BAT-AEL	BAT Associated Emission Level
BREF	BAT Reference Note
CEM	Continuous emissions monitor
CHP	Combined heat and power
CROW	Countryside and rights of way Act 2000
CV	Calorific value
DAA	Directly associated activity – Additional activities necessary to be carried out to allow the principal activity to be carried out
DD	Decision document
EAL	Environmental assessment level
EIAD	Environmental Impact Assessment Directive (85/337/EEC)
ELV	Emission limit value
EMAS	EU Eco Management and Audit Scheme
EMS	Environmental Management System
EPR	Environmental Permitting (England and Wales) Regulations 2010 (SI 2010 No. 675) as amended
EQS	Environmental quality standard
EU-EQS	European Union Environmental Quality Standard
EWC	European waste catalogue
HRA	Human Rights Act 1998
IED	Industrial Emissions Directive (2010/75/EU)
IPPCD	Integrated Pollution Prevention and Control Directive (2008/1/EC) – now superseded by IED
LCV	Lower calorific value – also termed net calorific value
LPG	Liquid petroleum gas
NOx	Oxides of nitrogen (NO plus NO ₂ expressed as NO ₂)
Opra	Operator Performance Risk Appraisal
PC	Process Contribution
PEC	Predicted Environmental Concentration
PPS	Public participation statement

PR	Public register
RDF	Refuse derived fuel
RGS	Regulatory Guidance Series
SAC	Special Area of Conservation
SCR	Selective catalytic reduction
SGN	Sector guidance note
SNCR	Selective non-catalytic reduction
SPA(s)	Special Protection Area(s)
SSSI(s)	Site(s) of Special Scientific Interest
SWMA	Specified waste management activity
TGN	Technical guidance note
TOC	Total Organic Carbon
UN_ECE	United Nations Environmental Commission for Europe
WFD	Waste Framework Directive (2008/98/EC)

1 Our decision

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

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

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

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

2 How we reached our decision

2.1 Receipt of Application

The Application was duly made on 02/10/14. 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.

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, and our statutory PPS. 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 the Application and all other documents relevant to our determination (see below) available to view on our Public Register. Anyone wishing to see these documents could do so and arrange for copies to be made.

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

- Royal Borough of Greenwich
- Public Health England
- Director of Public Health
- Food Standards Agency
- London Borough of Greenwich Fire Service
- Health and Safety Executive
- Thames Water

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

Further details along with a summary of consultation comments and our response to the representations we received can be found in Annex 3. We have taken all relevant representations into consideration in reaching our decision.

2.3 Requests for Further Information

Although we were able to consider the Application duly made, we did in fact need more information in order to determine it, and issued a request for information on 2nd March 2015. Copies of the request and information notice were placed on our public register as were the responses when received.

3 The legal framework

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

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

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

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

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

4 The Installation

4.1 Description of the Installation and related issues

4.1.1 The permitted activities

The Installation is subject to the EPR because it carries out an activity listed in Part 1 of Schedule 1 to the EPR. The Installation will pyrolyse waste to produce a syngas which will be mainly exported off-site. The Applicant plans to clean the syngas 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 activities are:

- 1.2 Part A(1)(j) - pyrolysis of carbonaceous material.
- 5.6 Part A(1)(a) - storage of hazardous waste prior to treatment

An installation may also comprise “directly associated activities”, which at this Installation includes the purification of syngas, compression of syngas (pending export off-site), the generation of electricity by steam turbine (3MWe), flare operation and a char treatment and recovery process.

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

4.1.2 The Site

The Installation will be located at Morden Wharf in Greenwich. The immediate area around the installation is industrial with the nearest residential properties being approximately 400m away. The Installation will be located on a minor aquifer but not within a source protection zone. The River Thames is immediately to the east of the installation. The Installation is located in an AQMA declared for NO₂ and PM10.

Epping Forest is the nearest habitat site at ~8km away. There are no Sites of Special Scientific Interest within 2km. The closest other ecological site is the River Thames adjacent to the installation.

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

Further information on the site is addressed below at 4.3.

4.1.3 What the Installation does.

The purpose of the Installation is to pyrolyse waste to produce a gas, known as syngas, for export off-site for use as a fuel. A portion of the syngas will be burned on-site to generate heat for the pyrolysis unit. The syngas will be purified to the extent that it will no longer be classed as a waste and can cause emissions no higher than those resulting from the burning of natural gas.

All feedstock will be delivered to the site in prepared format (sealed containers ~ bags and bales). This is a change to the application (as notified within the response to the schedule 5 notice) whereby onsite preparation (such as shredding) has been removed from the application proposal.

The waste will arrive within the following colour coded packaging:-

Black	Non-hazardous refuse derived fuel (RDF).
Green	Non-hazardous biomass / waste wood
Red	Packaging containing hazardous materials (e.g. oil contaminated rags).

Waste will be selected from the site inventory and transferred to the inlet hopper. The selected waste will then be blended within a ball mill and mixing chamber, prior to being conveyed to a series of storage hoppers, prior to being fed into the pyrolysis retort by screw feed under controlled atmospheric conditions. The waste will then be heated to ~ 850°C in the absence of oxygen to undergo pyrolysis. Syngas will be formed from the pyrolysis process, with gas production rate controlled by waste feed rate and pyrolysis chamber rotation speed. The pyrolysis retort will initially be heated by burning LPG.

After exiting the pyrolysis chamber the syngas will be reheated to range of 850°C to 1150°C to crack tar materials. The gas will then cleaned using an inline eductor scrubber, venture and packed tower scrubbers followed by an

activated carbon filter. These processes will quench the gas to ambient temperatures, whilst conditioning and drying the gas.

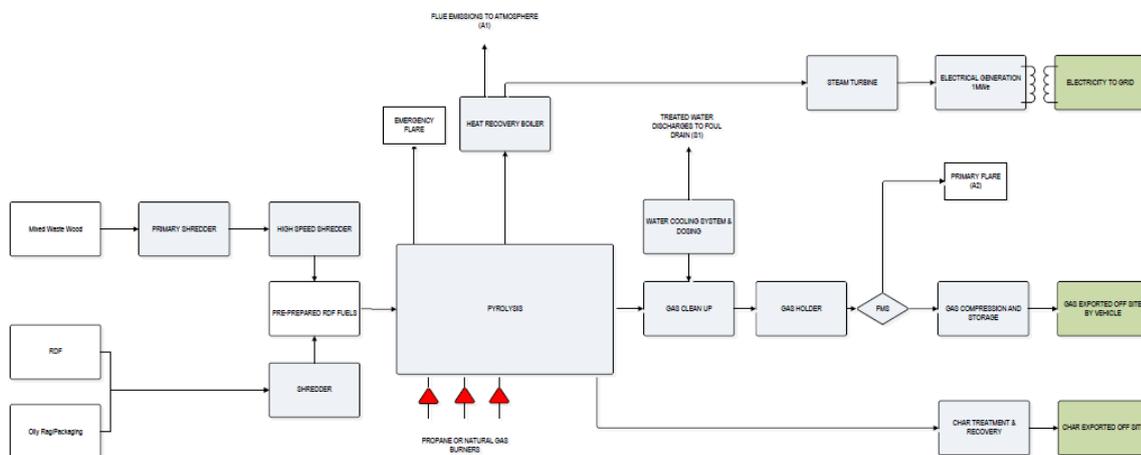
Most of the syngas will be compressed into high pressure storage vessels, and then exported off site for use as a fuel by other users. After start-up a portion of the cleaned syngas will be burned instead of LPG to heat the pyrolysis chamber.

We have examined results from syngas testing at a sister plant to that of this application, and are satisfied that syngas could meet parts of the end of waste criteria relating to emissions— thus no longer deemed a waste, and can cause emissions no higher than those resulting from the combustion of natural gas. In accepting the data for the sister plant, we have progressed this application on the basis that the requirements of Chapter IV of the Industrial Emissions Directive (Incineration and Co-Incineration plant) do not apply to this application.

We have included site specific conditions within the permit for testing and monitoring of the syngas to validate the performance of the Greenwich Plant confirms this approach.

Gases resulting from LPG or syngas combustion will be passed through a waste heat recovery boiler to generate steam. Electricity will be generated from the steam in a steam turbine for export to the grid.

A process diagram is shown below



Note : No shredding activities shall take place on site. Application amended mid-determination.

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

Waste throughput, Tonnes	100,000 tonnes /annum	12 tonnes /hour
Waste processed	Wood, RDF, shredded residual wastes contaminated packaging and textiles	
Technology	Pyrolysis	
Auxiliary Fuel	LPG	
Syngas cleanup	Thermal cracking, inline eductor scrubber, venture and packed tower scrubber followed by an activated carbon filter	
Combustion units	Gas burner for LPG or syngas	
Stack	Height 22 m	Diameter 0.6m
Flue gas	Flow 2.6 Nm ³ /s, actual flow 5.38 m ³ /s	Velocity 5.38 m/s
Electricity exported	1 – 3 MWe	8000 MWh

4.1.4 Key Issues in the Determination

The key issues arising during this determination were the assessment of emissions to air, control of emissions from waste handling, comparison of the syngas with natural gas and monitoring requirements for the 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 Installation will be located at Morden Wharf in Greenwich. The immediate area around the installation is industrial with the nearest residential properties being approximately 400m away. The Installation will be located on a minor aquifer but not within a source protection zone. The River Thames is immediately to the east of the installation.

Epping Forest is the nearest habitat site at ~8km away. There are no Sites of Special Scientific Interest within 2km. The closest other ecological site is the River Thames adjacent to the installation. The Installation is located in an air quality management area declared for NO₂ and PM10.

4.2.2 Proposed site design: potentially polluting substances and prevention measures

The following prevention measures are proposed:

- Storage tanks will be 3 m³ or less and will be within the main building or on concrete hardstanding. They will have secondary containment and be designed to comply with the Environment Protection Pollution Prevention Guideline Above Ground Oil Storage Tanks: PPG 2.
- The majority of the processing equipment will be inside the building
- All external plant is located on a sealed / impermeable concrete hardstanding.
- Electronic monitoring including level gauges for all vessels;
- All external delivery areas will be contained within a sealed drainage and containment system that incorporates bund walls, appropriate falls and drains;
- Tanks will be inspected daily
- Surface water run-off will be collected and discharged to sewer via an interceptor.

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. Pre-operational condition PO1 requires the Operator to have an Environmental Management System in place before the Installation is operational, and this will include a site closure plan.

At the definitive cessation of activities, the Operator has to satisfy us that the necessary measures have been taken so that the site ceases to pose a risk to soil or groundwater, taking into account both the baseline conditions and the site's current or approved future use. To do this, the Operator has to apply to us for surrender, which we will not grant unless and until we are satisfied that these requirements have been met.

4.3 Operation of the Installation – general issues

4.3.1 Administrative issues

The Applicant is the sole Operator of the Installation.

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

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

Following submission of the application, the EPOPRA scored was amended to reflect shredding activities taking place on site, however, provision for this activity has since been removed from the application and the score has been re-amended to reflect this.

The EP OPRA score (at the time of issue) is 177.

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

4.3.2 Management

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

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

4.3.3 Site security

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

4.3.4 Accident management

The Applicant has submitted an Accident Management Plan. An Accident Management Plan will form part of the Environmental Management System and must be in place prior to commissioning as required by a pre-operational condition (PO1).

We asked the operator to provide clarification on compliance with TGN 7.01 (*reducing fire risk at sites storing combustible materials*) within the schedule 5 notice. The operator confirmed that they will comply with the requirements of TGN 7.01, and provided the following comments in relation to this guidance:

- Internal and external storage layout will be subject to a HAZOP study (as part of the final site design and handover), and
- Fire detection and sprinkler system equipment will be provided within the main site building, storage areas, pyrolysis plant and gas processing plant. Further details on fire prevention will be provided by improvement condition IC5, which is a requirement for all Installations storing flammable materials.

Since receipt of the schedule 5 information, the Environment Agency requires Installations to operate to a Fire Prevention Plan. We have incorporated this requirement into the permit by pre-operational condition.

We requested further information on storage of syngas and other hazardous / flammable materials. The operator supplied information on 15/07/2015 confirming storage quantities below COMAH threshold, together with other arrangements. We are satisfied with this information and have included the response within Operating Techniques table S1.2.

4.3.5 Off-site conditions

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

4.3.6 Operating techniques

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

Description	Parts Included	Date Received
Application	<ul style="list-style-type: none"> •Volume 1: Section 3.3.1 (excluding table 3.2, and sections 3.3.2 and 3.3.3), Section 3.3.5, 3.3.6 (site maintenance) and 4.7; •Volume 2: [Annex B, Annex D], and •Application form B3. 	Duly Made 2/10/2014
Response to Schedule 5 Notice dated 02/03/2015	Response to questions 2, 7-11, 15, 20, 21, and annexes 1 and 6.	26/05/2015
Additional information	Email providing clarification over storage of syngas product / any other flammable / hazardous materials onsite.	15/07/2015

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

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

The waste will arrive within the following colour coded packaging:-

Black	Non-hazardous refuse derived fuel (RDF).
Green	Non-hazardous biomass / waste wood
Red	Packaging containing hazardous materials (e.g. oil contaminated rags).

We are satisfied that the Applicant can accept this waste contained in Table S2.2 of the Permit because it will be well suited to the gasification process.

We have limited the capacity of the Installation to 100,000 tonnes per annum. This is based on the installation operating 8,760 hours per year at a nominal capacity of 12 tonnes per hour. This accounts for maximum operating scenario to which the impact assessments cover. In reality, the site is likely to operate at 8,000 hours per annum.

We consider this annual capacity is consistent with the design, scale and nature of waste materials to be processed at the facility.

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

4.3.7 Energy efficiency

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

- i. 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.
- ii. Whether energy is generated efficiently from the activity.
- iii. The process 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.

(i) 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:

- Effective maintenance will be employed
- Heat exchangers are maintained for high heat transfer
- Uncontrolled air ingress will be minimised by the maintenance of seals
- The parasitic energy demand will be of approximately 1.3MWe

(ii) Efficient generation of energy

The main purpose of the Installation is to pyrolyse waste to generate syngas. A small portion of the syngas will be burned to provide heat to the pyrolysis unit. The Sankey diagram shows a gas heating demand of 64,000 MWh which is ~1.5% of the total energy in the syngas produced.

The Sankey diagram shows energy in the waste feedstock of 479,200 MWh producing syngas with energy of 409,310 MWh. In addition 8000 MWh of electricity will be generated through a Steam Turbine, using recovered heat from LPG/syngas combustion, and exported. The Sankey diagram demonstrates a high level of energy efficiency in the process.

(iii) Permit conditions concerning energy efficiency

Permit condition 1.2.1 will ensure that energy is used efficiently and that energy is recovered with a high level of efficiency.

The Operator is required to report energy usage and energy generated under condition 4.2 and Schedule 4. The following parameters are required to be reported:

- Syngas produced
- Syngas burned
- Syngas exported
- Electrical energy generated
- LPG burned

Together with the total waste treated, 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.

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 stream the Installation will produce is pyrolysis char. The Applicant plans to send the char for use off-site as a fuel.

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

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

5. Minimising the Installation's environmental impact

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

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

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

5.1 Assessment Methodology

5.1.1 Application of Environment Agency H1 Guidance

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

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

The H1 methodology uses a concept of “process contribution (PC)”, which is the estimated concentration of emitted substances after dispersion into the receiving environmental media at the point where the magnitude of the concentration is greatest. The guidance provides a simple method of calculating PC primarily for screening purposes and for estimating process contributions where environmental consequences are relatively low. It is based on using dispersion factors. These factors assume worst case dispersion conditions with no allowance made for thermal or momentum plume rise and so the process contributions calculated are likely to be an overestimate of the actual maximum concentrations. More accurate calculation of process contributions can be achieved by mathematical dispersion models, which take into account relevant parameters of the release and surrounding conditions, including local meteorology – these techniques are expensive but normally lead to a lower prediction of PC.

5.1.2 Use of Air Dispersion Modelling

Air dispersion modelling enables the process contribution to be predicted at any environmental receptor that might be impacted by the plant.

Once short-term and long-term PCs have been calculated in this way, they are compared with Environmental Quality Standards (EQS) referred to as “benchmarks” in the H1 Guidance.

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

National EQSs do not have the same legal status as EU EQSs, and there is no explicit requirement to impose stricter conditions than BAT in order to comply with a national EQS. However, national EQSs are a standard for harm and any significant contribution to a breach is likely to be unacceptable.

PCs are considered **Insignificant** if:

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

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

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

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

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

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

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

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

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

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

5.2 Assessment of Impact on Air Quality

The Applicant's assessment of the impact of air quality is set out in Annex C of the Application. The assessment comprises:

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

This section of the decision document deals primarily with the dispersion modelling of emissions to air and the impact on local air quality. The impact on conservation sites is considered in section 5.4.

The Applicant has assessed the Installation's potential emissions to air against the relevant air quality standards, and the potential impact upon local conservation and habitat sites and human health. These assessments predict the potential effects on local air quality from the Installation's stack emissions using the AERMOD dispersion model, which is a commonly used computer model for regulatory dispersion modelling. The model used 5 years of meteorological data collected from the weather station at London City Airport from 2008 to 2012. The weather station is ~3 km northeast of the proposed Installation and the Applicant stated that it is the most representative data available.

Modelling has only been carried out for emission point A1 (table S3.1) and not for A2. This is because A2 is solely for emergency purposes only (emergency gas flare). Any use of the flare will be limited to short durations.

We have required the applicant to monitor and report the number of operational hours to which the flare is used under Schedule 4, table S4.3 of the permit.

The air impact assessments considered emissions of oxides of nitrogen, and carbon monoxide. Emission concentrations used in the model were based on expected emissions as shown below.

Substance	Emission concentration ^[1] (mg/Nm ³)
NO ₂	120
CO	50

[1] 3%O₂, 273K, 101.3 mb, dry

The Applicant has reviewed air quality monitoring data from the local area. The Applicant used data from the Defra UK Background Air Pollution Maps, as the most representative data in order to establish background air quality.

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

The way in which the Applicant used dispersion models, its selection of input data, use of background data and the assumptions it made have been

reviewed by the Environment Agency’s modelling specialists to establish the robustness of the Applicant’s air impact assessment.

Our review of the Applicant’s assessment leads us to agree with the Applicant’s conclusions.

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

5.2.1 Assessment of Air Dispersion Modelling Outputs

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

Pollutant	EQS / EAL		Back-ground	Process Contribution (PC)		Predicted Environmental Concentration (PEC)	
	$\mu\text{g}/\text{m}^3$			$\mu\text{g}/\text{m}^3$	% of EAL	$\mu\text{g}/\text{m}^3$	% of EAL
NO ₂	40	1	33.5	1.8	4.6	35.3	88.3
	200	2	67.0	8.8	4.4	-	-
CO	10000	3	280	0.3	0.1	-	-
	30000	4	400	0.2	0.05	-	-

- 1 Annual Mean
- 2 99.79th %ile of 1-hour means
- 3 1-hour average
- 4 Maximum daily running 8-hour mean

(i) Screening out emissions which are insignificant

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

- CO

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

(ii) Emissions unlikely to give rise to significant pollution

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

- NO₂

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

All emissions either screen out as insignificant or where they do not screen out as insignificant are considered unlikely to give rise to significant pollution.

We have also carefully considered whether additional measures are required above what would normally be considered BAT in order to prevent significant pollution. Consideration of additional measures to address the pollution risk from these substances is set out in section 5.2.4.

5.2.2 Consideration of key pollutants

(i) Nitrogen dioxide (NO₂)

The impact on air quality from NO₂ emissions has been assessed against the EU EQS of 40 µg/m³ as a long term annual average and a short term hourly average of 200 µg/m³. The model assumes a 70% NO_x to NO₂ 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 EUEQS and therefore cannot be screened out as insignificant. Even so, from the table above, the emission is not expected to result in the EU EQS being exceeded. The peak short term PC is marginally above the level that would screen out as insignificant (>10% of the EU EQS). However it is not expected to result in the EU EQS being exceeded.

The maximum long term PC at an existing residential receptor was 2.0%. The Applicant also predicted impacts at possible future developments. A PC of 4.6% of the EQS was predicted in an area immediately to the south of the Installation. This area has been identified for residential development in the Greenwich Peninsula West Masterplan, but does not yet have planning permission.

(ii) Emissions to Air of CO

The above tables show that for CO, the peak long term PC is less than 1% of the EAL/EQS and the peak short term PC is less than 10% of the EAL/EQS and so can be screened out as insignificant.

(iii) 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 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.

5.2.3 Consideration of Local Factors

The impact on local receptors was considered in the air quality assessment.

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

The Royal Borough of Greenwich has declared an Air Quality Management Areas (AQMA) with respect to Nitrogen Dioxide and Pm10. The Installation is located within the AQMA.

Consideration within this application is given for Nitrogen Dioxide as a pollutant. PM10 emissions are not considered relevant for this application which will produce a syngas – of no higher emissions (from combustion) than that of natural gas. Particulate Matter is not a relevant pollutant of natural gas combustion.

The Applicant's modelling predictions for NOx within the AQMA are summarised above (5.2.1). The figures shown indicate the predicted peak ground level impact on pollutant concentrations in ambient air within the AQMA. Whilst emissions cannot be screened out as insignificant, the Applicant's modelling shows that the installation is unlikely to result in a breach of the EU EQS within the AQMA.

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

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:

- Epping Forest (SAC)
- Lee Valley (Ramsar/SPA)

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

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

- Mudchute Park Farm
- The Westcombe Woodlands
- Mycenae House Gardens
- The River Thames and tidal tributaries
- Westcombe Park Railsides
- Robin Hood Gardens
- Millwall Park
- Blackheath and Greenwich Park
- Blackwall Basin
- East India Dock Basin
- Bow Creek Water Park
- Millwall and West India Docks
- Poplar Dock
- Saffron Pond
- Greenwich Peninsula Ecology Park and Southern Park
- Royal Docks

5.4.2 Habitats Assessment

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

Epping Forest (SAC)

Pollutant	EQS / EAL (µg/m ³)	Back-ground (µg/m ³)	Process Contribution (PC) (µg/m ³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m ³)	PEC as % EQS / EAL
Direct Impacts¹						
NO _x Annual	30	-	0.002	0.00080	-	-
NO _x Daily Mean	75	-	0.054	0.072	-	-
Deposition Impacts						
N Deposition (kg N/ha/yr)	10	-	0.00015	0.0015	-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	1.25	-	0.000015	0.0012	-	-

(1) Direct impact units are µg/m³.

Lee Valley (Ramsar /SPA)

Pollutant	EQS / EAL (µg/m ³)	Back-ground (µg/m ³)	Process Contribution (PC) (µg/m ³)	PC as % of EQS / EAL	Predicted Environmental Concentration (PEC) (µg/m ³)	PEC as % EQS / EAL
Direct Impacts¹						
NO _x Annual	30	-	0.00162	0.0054	-	-
NO _x Daily Mean	75	-	0.051	0.068	-	-
Deposition Impacts						
N Deposition (kg N/ha/yr)	15	-	0.000225	0.0015	-	-
Acidification - Nitrogen Dep (Keq/ha/yr)	Note 1	-	-	-	-	-

Note 1 Primary habitat is Rich Fens – not sensitive to Acidification.

5.4.3 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 Applicant carried out an assessment of impacts at other conservation sites within 2km of the Installation. The process contributions were well below the critical levels and critical loads. We checked the assessment and are satisfied that PCs will be below the critical levels and loads at all sites within 2km.

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.

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 treatment technology. There are a number of alternatives, and the Applicant has explained why it has chosen one particular kind for this Installation.
- We consider the options for the syngas clean up system and consider the end of waste status of the syngas;
- We consider control measures for the combustion emissions from syngas combustion
- We also consider the energy efficiency 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.

6.1.1 Consideration of thermal treatment option

The prime function of the pyrolysis plant is production of a gas (syngas capable of export or injection into the gas network) by thermal treatment of waste. The Applicant firstly justified the choice to produce a gas for export as opposed to combusting the gas on-site. The Applicant then carried out a BAT assessment of their method against alternative methods of gas generation.

The Applicant's case for exporting the gas is summarised as follows:

- Reduction in emissions to air from the Installation
- Reduced capital costs
- High efficiency process with lower thermal losses compared to a process in which the gas is burned
- Reduced building footprint
- Reduced need to exhaust gas cleaning

The Applicant considered the following options for gas generation:

- The Applicant's proposed pyrolysis process
- Updraft and downdraught gasification
- Plasma gasification

The Applicant's justification is summarised below:

- Updraft and downdraft gasification systems produce a gas where the CV is too low to be directly supplied to the gas network
- Plasma gasification can produce a syngas but the CV is lower than from pyrolysis. Not proven whether gas could be used for export and direct into gas supply system.
- The proposed pyrolysis process can produce a clean syngas that can be used for export or injection to the gas network.
- Higher energy recovery than other options.

Based on the information supplied by the Applicant we are satisfied that the chosen option to generate syngas from the waste is BAT.

6.2 Syngas Clean-up and end of waste

The purpose of the syngas clean-up is to produce a gas that will be cleaned so that it will no longer be a waste and can cause emissions no higher than those resulting from the burning of natural gas.

IED article 42(1) states:

This chapter shall not apply to gasification or pyrolysis plants, if the gases resulting from this thermal treatment of waste are purified to such extent that they are no longer a waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas.

The Applicant's proposed clean up system consists of the following measures:

- After exiting the pyrolysis chamber the syngas will be reheated to 850°C to 1150°C to crack tar materials.
- Inline eductor scrubber (rapid quench), venture and packed tower scrubbers
- .
- Activated carbon filter - providing a final polish of the gas.

Theses scrubbing processes will act to condense any moisture from the gas, remove acid gases (SO₂, HCl, HF and H₂S), remove any residual tars, and trap any residual particulate matter.

The Applicant provided a BAT justification as follows:

- Thermal cracking is described as having 100% removal efficiency for tar removal.
- Metals retained in char or condensed and retained in scrubber liquors.
- Water and alkaline scrubbing described as recognised sector BAT with 98% removal of NH₃, HCl, H₂S and HF

The applicant has demonstrated that emissions will be no higher than from combustion of natural gas at their sister plant in Huntingdon. *We have considered operational data from Huntingdon in support of this application. The Applicant stated that the Huntingdon site is of the same configuration as*

the proposed site in Greenwich. This data has been used to provide confidence that similar performance can be achieved using the technology at Greenwich. We are satisfied that this Installation can also achieve the same.

End of waste requires that the syngas to be of a quality which does not cause worse environmental effects than natural gas. From IED article 42, chapter IV will not apply if the gas is no longer a waste AND can cause emissions no higher than natural gas. The IED test is therefore tighter than the end of waste test.

The reasoning behind this is that if the compositions are comparable then the syngas could then not cause emissions higher than from combustion of natural gas.

As part of the data provided for Huntingdon, the Applicant analysed a sample of natural gas – providing data to compare to syngas samples. The Applicant also submitted data on emissions from natural gas plants (based on emissions factors) to further support their application.

Natural Gas analysis

Parameter	Units	Result	Reference period	Method
Cadmium & Thallium	mg/m ³	0.00016	420 minutes	BS EN 14385
Heavy Metals	mg/m ³	0.02656	420 minutes	BS EN 14385
Mercury	mg/m ³	0.000015	420 minutes	BS EN 13211 / MID 14385

The above table shows total heavy metals of 0.027 mg/m³ based on a CV of 37 MJ/m³ for natural gas.

The assessment also compared the metal content of the syngas produced at the Huntingdon site with emission factor data from the European Environment Agency (EEA) and with the composition of natural gas, a sample of which they had analysed.

EEA (European Environment Agency) combustion emission factors (2013)

The following emission factors (or coefficients) show emission parameter levels released during the combustion of gas (table 3-4 Tier 1 emission factors from document 1.A.4 Small Combustion GB2013).

Parameter	EEA emission factor data 2013	
	Emission factors (mg/GJ)	Concentration based on CV of 37 MJ/m ³ (mg/m ³)
Cd	0.00025	9.24898E-06
Tl		
Hg	0.68	0.025157233
As	0.12	0.004439512
Cr	0.00076	2.81169E-05
Cu	0.000076	2.81169E-06
Ni	0.00051	1.88679E-05
Se	0.011	0.000406955
Zn	0.0015	5.54939E-05
Sb		
Pb	0.0015	5.54939E-05
Co		
Mn		
V		
Total		0.030118239
Excluding ZN and Se (ZN and Se are not part of 'WID' suite		0.02965579

Analysis from the Huntingdon site
Syngas Testing Data

The Applicant carried out testing for heavy metals on syngas produced from each of the waste types that are expected to be received.

1. RDF
2. Mixed waste wood
3. Heavily laden oily waste and plastic

Full reports (including testing parameters) are available on the public register, Schedule 5 Response, App2.

Syngas from waste type 3 was also tested for total S, total aromatic hydrocarbons, total chlorinated hydrocarbons and hydrogen sulphide.

Syngas analysis Test 1: RDF

Parameter	Units	Result
Cadmium & Thallium	mg/m ³	0.00076
Other Heavy Metals	mg/m ³	0.02103
Mercury	mg/m ³	0.00010
Total metals	mg/m ³	0.02189

Syngas analysis Test 2: Mixed Waste Wood

Parameter	Units	Result
Cadmium & Thallium	mg/m ³	0.0002
Other Heavy Metals	mg/m ³	0.0111
Mercury	mg/m ³	0.00009
Total metals	mg/m ³	0.01139

Syngas analysis Test 3: Heavily laden oily waste & Plastics

Parameter	Units	Result
Cadmium & Thallium	mg/m ³	0.00013
Other Heavy Metals	mg/m ³	0.01380
Mercury	mg/m ³	0.00010
Total metals	mg/m ³	0.01403
Total Sulphur	mg/m ³	11.02
Total Aromatic hydrocarbons (expressed as Xylene)	mg/m ³	43.96
Halogenated hydrocarbons	mg/m ³	0.15
Hydrogen sulphide	mg/m ³	2.70

The tables above show analysis for individual waste types. The Applicant proposed to pyrolyse a blend of wastes (50% RDF, 30% wood, 20% oily waste and plastic with CV of 19-22 MJ/Kg. Based on this ratio with total metals would be ~ 0.016 mg/m³ at a CV of 19-22 MJ/Kg. When adjusted to a CV of 37 MJ/m³ (natural gas CV) this equates to or 0.03 mg/m³.

Comparison to natural gas.

Total S, total aromatic hydrocarbons, total chlorinated hydrocarbons and hydrogen sulphide are lower than the levels expected to be in natural gas, based on comparison with our natural gas specification.

	SynGas (adjusted to CV of 37 MJ/kg)	Natural Gas specification
Total Sulphur	≤ 27.1 mg/m ³	50 mg/m ³
Hydrogen Sulphide (H ₂ S)	≤ 2.7 mg/m ³	5 mg/m ³
Total Halogenated Hydrocarbons	≤ 0.8 mg/m ³	1.5 mg/m ³
Xylenes (all isomers)	≤ 54.2 mg/m ³	100 mg/m ³

Total heavy metals in the syngas is predicted to be ~0.03 mg/m³ when converted to the CV of natural gas. This is a similar to the total heavy metals in the natural gas analysis and also in the emissions factor data.

The results indicate that although the composition of individual metals varies in value, that the overall total level of metals in the syngas at Huntingdon is similar to values specified in natural gas analysis composition data from the EEA and also in the analysis sample of natural gas. Individual metal values within the syngas are all low in level.

Considering this information we are satisfied that the applicant will be able to provide similar data in order to justify the syngas can be classified as non waste.

Certainty of use

End of waste also requires that there is an end use for the proposed material. We asked the applicant to include a description of any end uses within the schedule 5 notice.

In response, the applicant provided the following :-

As the Greenwich site is primarily a gas production and export facility, there is a potential for the syngas to be enriched to 36.9MJ/m³ using propane prior to export, however the need for enrichment is entirely dependent on customer need and specific requirements.

As this question on end uses was not answered, we have included a pre-operational condition which will require the operator to provide this information prior to final commissioning – this must be approved in writing by the Environment Agency.

Summary

Based on the information submitted by the applicant we are satisfied that the syngas has the potential to meet the test that its combustion will cause emissions no higher than natural gas. 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 2.3.7.

We have set improvement conditions for the applicant to submit a report on syngas analysis, in order to confirm the application data with operational data. The applicant is also required to carry out further natural gas analysis to provide further assurance on the decision.

Based on this we have permitted the plant as a 1,2 activity. If the applicant cannot meet the limits set in the permit or if future analysis shows that the syngas is no longer comparable to natural gas then the operator would have to cease operation of the plant until the permit is varied, to accommodate additional gas clean up techniques, or to amend the activity where Chapter 4 of the IED applies (i.e. S5.1 Incineration of Waste).

Pre-operational condition PO2 requires the Operator to submit a commissioning plan to include a proposal for syngas monitoring during commissioning. IC3 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. This is covered in section 6.7 of this decision document.

The Applicant stated that the flare will only be used during start-up, shut down or for emergency reasons. Condition 2.3.7 will prevent waste feed to the unit where 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.

6.3 BAT and emissions control

The prime function of syngas gas treatment is produce a clean syngas which can cause emissions no higher than those resulting from natural gas combustion. The control measures below look at the main emissions from natural gas combustion - oxides of nitrogen and carbon monoxide.

6.3.1 Oxides of Nitrogen

Emissions of NO_x have not been shown to be insignificant with the PC at residential receptors just above the insignificance threshold of 1%. The maximum long term PC at an existing residential receptor was 2.0%. The Applicant also predicted impacts at possible future developments. A PC of 4.6% of the EQS was predicted in an area immediately to the south of the Installation. This area has been identified for residential development in the Greenwich Peninsula West Masterplan, but does not yet have planning permission.

Most of the syngas will be exported from site with on-site combustion limited to use in burners to heat the pyrolysis units. LPG burners will be used to heat the pyrolysis unit. Clean syngas will be used instead of LPG after start-up. Emissions will be minimised by using low NO_x burners.

Based on the limited on-site combustion, the PC at residential receptors being close to the insignificance criteria and the EQS not being breached, we are satisfied that the proposed measures are BAT.

6.3.2 Carbon monoxide and volatile organic compounds (VOCs)

The prevention and minimisation of emissions of carbon monoxide is through the optimisation of combustion controls. Emissions of carbon monoxide have

previously been shown as insignificant, we are therefore satisfied that the Applicant's proposals are BAT.

6.4 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 (CO₂) 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, CO₂ is clearly a pollutant for IED purposes.

The major source of greenhouse gas emissions from the installation will be CO₂ from the combustion of the syngas or LPG used to heat the pyrolysis unit. The main purpose of the plant will be to produce syngas for export with a minor part of the syngas burned. BAT for greenhouse gas emissions is to maximise energy recovery and efficiency.

Waste heat will be recovered from the syngas/LPG burned in the form of electricity and exported. The electricity that is generated by the Installation will displace emissions of CO₂ elsewhere in the UK, as virgin fossil fuels will not be burnt to create the same electricity. The Applicant included a measure of energy recovery in their BAT assessment.

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 CO₂ emissions from the Installation are:

On the debit side

- CO₂ emissions from the burning of the syngas/LPG
- CO₂ emissions associated with electrical energy used;

On the credit side

- CO₂ saved from the export of electricity to the public supply by displacement of burning of virgin fuels;

The Applicant considered energy efficiency in its BAT assessment. This is set out in sections 4.3.7 and 6.1.1 of this decision document.

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.

6.5 Other Emissions to the Environment

6.5.1 Emissions to water

There will be no emissions to water from the Installation.

6.5.2 Emissions to sewer

Aqueous residues from water treatment plant (blowdown) and surface water run-off (external storage areas) will be emitted to sewer.

All liquid effluent emissions from the plant will be treated within an onsite water treatment plant (lamella clarifier) prior to being released to sewer under the consent of Thames Water.

We asked for clarification on impact assessments (H1) for emissions to sewer in order to ensure that these included sight of any hazardous pollutants. Response was provided within the schedule 5 response.

H1 “water impacts – Trac Water Releases” was carried out for the following pollutants.

- Arsenic, Cadmium, Chromium III, Copper, Lead, Mercury, Nickel, PAH's and Zinc.

All pollutants passed ‘test1’ of the screening process – allowing these to be screened out as “insignificant”.

Based upon the information in the application we are satisfied that appropriate measures will be in place to prevent and /or minimise emissions to sewer. A trade effluent consent will also be in place.

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.

- Storage tanks will be within the main building or on concrete hardstanding. They will have secondary containment and be designed to comply with the Environment Protection Pollution Prevention Guideline Above Ground Oil Storage Tanks: PPG 2.
- The majority of the processing equipment will be inside the building
- All external plant is located on a sealed / impermeable concrete hardstanding.
- Electronic monitoring including level gauges for all vessels;
- All external delivery areas will be contained within a sealed drainage and containment system that incorporates bund walls, appropriate falls and drains;
- Tanks will be inspected daily

- Surface water run-off will be collected and discharged to sewer via an interceptor.

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

6.5.4 Odour

All feedstocks to the plant will be delivered in sealed / airtight bales and containers, and will remain sealed until inputted into the feed hopper. The main building will be operated with process doors closed.

In addition to these measures, combustion air (approximately 9,500Nm³/hour) will be drawn from inside the main building through the process, and thermally oxidised through the burner systems. This will ensure that air is continuously drawn in through the building fabric, thus minimising the potential for any odours to escape outside the building.

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

6.5.5 Noise and vibration

Since submission of the application, the applicant has made an amendment to the application by removing external waste processing (e.g. shredding) and replacing this with feedstock deliveries which are pre-prepared / sorted only. This change provides a reduction to noise impacts (by no longer requiring an onsite shredder), and hence revised noise assessment within the schedule 5 response.

The updated noise assessment (using BS4142:2014) establishes baseline noise climates at the site, and considers noise source information relating to each of the main components of the plant (e.g. reception, compressors etc) to assess likely effects on people living close by. The survey considers the three closest residential receptors (and proposed development).

The report concludes that during the operational phase, noise impacts are considered to have a negligible effect on existing residential receptors using appropriate design, mitigation measures, and intervening distances to the nearest residential development.

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.

We have included an improvement condition requiring the operator to validate the theoretical noise report provided by schedule 5 response.

6.6 Setting ELVs and other Permit conditions

6.6.1 Translating BAT into Permit conditions

IED 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.

The Applicant's modelling was based on emissions that they stated could be achieved. The impacts were shown to be not significant there is therefore no justification to reduce ELVs further.

(i) Global Warming

CO₂ is an inevitable product of the combustion of the syngas or LPG. The amount of CO₂ emitted will be essentially determined by the quantity and characteristics of the gas, which are already subject to conditions in the Permit. It is therefore inappropriate to set an emission limit value for CO₂, 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 CO₂. 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 syngas or LPG) that can be imposed that do not run counter to the primary purpose of the plant, which is the pyrolysis of waste and generation of syngas. 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 CO₂ emissions.

(ii) Commissioning

Pre-operational condition PO3 has been set for a commissioning programme to be agreed. IC2 requires a report on commissioning to be submitted.

6.7 Monitoring

6.7.1 Emissions monitoring

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.

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 Syngas process monitoring

We have set a requirement to monitor the syngas in table S3.3 of the permit. Permit conditions 3.5.5 and 3.5.6 set the monitoring frequency of the monitoring.

Section 6.2 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 natural gas combustion. The table below shows the monitoring that has been set in the permit.

Process monitoring requirements – syngas quality	
Parameter	Monitoring frequency
Total Sulphur	As specified in condition 3.5.5
Hydrogen Sulphide	As specified in condition 3.5.5
Total halogenated hydrocarbons	As specified in condition 3.5.5
Heavy metals Hg, Cd, Tl, Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	As specified in condition 3.5.5
Total aromatic hydrocarbons (expressed as xylene)	As specified in condition 3.5.5
Calorific Value	As specified in condition 3.5.5

Condition 3.5.5 will require daily sampling to start with for these components. Condition 3.5.5 allows the frequency to be relaxed if samples are shown to meet the limits. If samples fail then the required monitoring frequency will increase.

Condition 3.5.5 (d) allows quarterly sampling frequencies (maximum) whereby the sequence of daily, weekly and monthly monitoring have demonstrated full compliance.

In the event of a failure during quarterly sampling, the operator is required to revert back to 3.5.5 (c) – weekly, rather than 3.5.5 (d) - monthly. This is due to the fact that the point of use for the syngas will not be within the installation (as it will be exported), and thus increased controls are considered necessary in any such event.

Hydrogen sulphide is included because this installation will be exporting syngas as product, rather than combusting within the permitted installation. It was therefore considered that additional controls (monitoring) for H₂S are required.

Condition 3.5.6 ensures that if a sample fails another is taken within a week. Condition 2.3.7 will prevent waste feed if two consecutive samples fail the limits.

6.8 Reporting

We have specified the reporting requirements in Schedule 4 of the Permit to ensure data is reported to enable timely review by the Environment Agency to ensure compliance with permit conditions and to monitor the efficiency of material use and energy recovery at the installation.

7 Other legal requirements

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

7.1 The EPR 2010 and related Directives

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

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

We address the requirements of the IED in the body of this document above.

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

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

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

The local planning authority (Royal Borough of Greenwich) did not require an EIA. The development is permitted by a lawful development certificate.

7.1.2 Schedule 9 to the EPR 2010 – Waste Framework Directive

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

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

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

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

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

Article 23(1) requires the permit to specify:

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

These are all covered by permit conditions.

The permit does not allow the mixing of hazardous waste so Article 18(2) is not relevant. Waste will be received pre-bailed / bagged.

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

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

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

To the extent that it might lead to a discharge of pollutants to groundwater (a “groundwater activity” under the EPR 2010), the Permit is subject to the requirements of Schedule 22, which delivers the requirements of EU Directives relating to pollution of groundwater. The Permit will require the

taking of all necessary measures to prevent the input of any hazardous substances to groundwater, and to limit the input of non-hazardous pollutants into groundwater so as to ensure such pollutants do not cause pollution, and satisfies the requirements of Schedule 22.

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

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

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

This Application has been consulted upon in line with this statement. The Environment Agency has deemed that this site is not a Site of High Public Interest, which has been reflected by no public representations received following our advert / consultation on the application.

7.2 National primary legislation

7.2.1 **Environment Act 1995**

(i) Section 4 (Pursuit of Sustainable Development)

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

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

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

(ii) Section 7 (Pursuit of Conservation Objectives)

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

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

(iii) Section 81 (National Air Quality Strategy)

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

7.2.2 Human Rights Act 1998

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

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

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

7.2.4 Wildlife and Countryside Act 1981

Under section 28G of the Wildlife and Countryside Act 1981 the Environment Agency has a duty to take reasonable steps to further the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which a site is of special scientific interest. Under section 28I the Environment Agency has a duty to consult Natural England in relation to any permit that is likely to damage SSSIs.

We assessed the Application and concluded that the Installation will not damage the special features of any SSSI.

7.2.5 Natural Environment and Rural Communities Act 2006

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

7.3 National secondary legislation

7.3.1 The Conservation of Natural Habitats and Species Regulations 2010

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

We sent a summary of our conclusions on an Appendix 11 to natural England that the operation of the Installation would not have a likely significant effect on the interest features of protected sites.

The habitat assessment is summarised in greater detail in section 5.4 of this document.

7.3.2 Water Framework Directive Regulations 2003

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

7.3.3 The Persistent Organic Pollutants Regulations 2007

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

7.4 Other relevant legal requirements

7.4.1 Duty to Involve

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

The way in which the Environment Agency has consulted with the public and other interested parties is set out in section 2 of this document. The way in which we have taken account of the representations we have received is set out in Annex 3. 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: Pre-Operational Conditions

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

Reference	Pre-operational measures
PO1	Prior to the commencement of final commissioning, the Operator shall send a summary of the site Environment Management System (EMS) to the Environment Agency and make available for inspection all documents and procedures which form part of the EMS. The EMS shall be developed in line with the requirements set out in Section 1 of How to comply with your environmental permit – Getting the basics right. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.
PO2	At least three months before final commissioning, the operator shall submit proof of agreement for the export and sale of syngas, including evidence that no further processing to the syngas is required prior to use (or any other appropriate documentation demonstrating certainty of use of syngas) for approval in writing by the Environment Agency.
PO3	<p>Prior to the commencement of final commissioning; the Operator shall provide a written commissioning plan including timelines for completion, for approval by the Environment Agency. The commissioning plan shall include :-</p> <ul style="list-style-type: none"> • Specific operational parameters for the activities listed in Table S1.1 required to define “final commissioning”. • a written plan for sampling and analysis of the syngas against the parameters set out in table S3.3 of the permit, • the expected emissions to the environment during the different stages of commissioning and final 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. • details of emergency scenarios under which the flare will be used, and confirmation that this will meet the operational requirements of guidance LFTGN05. <p>Commissioning shall be carried out in accordance with the commissioning plan as approved.</p>
PO4	<p>Prior to final commissioning the operator shall submit for approval a Syngas Monitoring Methodology 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;</p> <ul style="list-style-type: none"> • 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 3.5.5 and 3.5.6, including details of sampling, courier, analysis and reporting responsibilities and timescales <p>The methodology shall be implemented in accordance with the Environment Agency’s written approval.</p>

Reference	Pre-operational measures
PO5	Prior to the commencement of final commissioning 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.
PO6	The Operator shall submit a 'Fire Prevention Plan' to the Environment Agency for approval in writing. The plan must satisfy the requirements of Environment Agency guidance 'Fire prevention plans, version 2, March 2015' and give detailed consideration for flammable and combustible materials (including syngas cylinders) used and stored within the Installation.
PO7	Prior to the commencement of final commissioning the operator shall submit procedures for the management of out of specification syngas. Procedures shall include details of syngas specification, how syngas recirculation processes operate and identify processes for the management of syngas where any limit in Schedule 3 Table 3.3 has been exceeded and/or the requirements of conditions 3.5.5 or 3.5.6 are being met..

ANNEX 2: 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.

Reference	Requirement	Date
IC1	The Operator shall submit a written report to the Environment Agency on the implementation of its Environmental Management System 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 date on which waste is first pyrolysed.
IC2	The Operator shall submit a written report to the Environment Agency on the commissioning of the installation. The report shall summarise the environmental and operational performance of the plant as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the facility against the conditions of this permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions.	Within 4 months of the completion of commissioning.
IC3	<p>The Operator shall carry out checks to verify the syngas composition is lower than the limits specified in Table 3.3 across a range of operating scenarios and waste feedstock mixes and meets the End of Waste criteria.</p> <p>The Operator shall also carry out analysis of at least 3 samples of natural gas for the parameters specified in table S3.3.</p> <p>A written report shall be submitted to the Environment Agency containing the results of syngas testing and natural gas analysis, and shall include but not be limited to:</p> <ul style="list-style-type: none"> • A comparison of data between syngas and natural gas for the parameters specified in table S3.3 • Details of the waste types that were pyrolysed 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 • Details of any other monitoring / analysis undertaken for quality control for the supply of compressed syngas • A statement of action (including timescales for implementation) to be taken should syngas levels be shown to have higher pollutant levels than detected within the natural gas analysis. 	Within 2 months of the completion of commissioning

IC4	<p>The Operator shall undertake a noise assessment during normal operations in accordance with the procedures given in BS4142: 2014 and BS7445: 2003 or other methodology as agreed with the Environment Agency - in order to validate the assessment provided within the schedule 5 response dated 26/05/2015.</p> <p>The assessment shall include, but not be limited to:</p> <ul style="list-style-type: none"> • A review of the noise sources from the facility. Where any noise source(s) are identified as exhibiting tonal contributions, they shall be quantified by means of frequency analysis. • A review of noise levels from static plant. • Considerations of on-site vehicle movements. <p>A report shall be provided to the Agency detailing the findings of the assessment.</p>	Within 6 months of the completion of commissioning
IC5	<p>The operator shall submit a report on the recovery of char produced from process. The report shall include analysis of the char as specified in Section 5.4 of the Application and confirmation of its suitability for available recovery outlets.</p>	6 months following commissioning
IC6	<p>The operator shall submit a report on the performance of syngas clean up techniques to demonstrate the removal of pollutants as detailed in the application. The report shall include analysis of representative samples of char, syngas and scrubber residues to demonstrate removal efficacy of the techniques, and that acid gases, dioxins and ammonia are not present in cleaned syngas.</p>	3 months following commissioning

ANNEX 3: 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 decision is summarised in this Annex. Copies of all consultation responses have been placed on the Environment Agency and Local Authority public registers.

The Application was advertised on the Environment Agency website. We made the Application and all other documents relevant to our determination (see below) available to view on our Public Register and also sent a copy to Royal Borough of Greenwich Council for its own Public Register. Anyone wishing to see these documents could do so and arrange for copies to be made.

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

- Royal Borough of Greenwich Council (Environmental Health and Planning Control);
- Public Health England;
- Director of Public Health
- Food Standards Agency;
- Local Fire Service;
- Health and Safety Executive
- Thames Water

1) Consultation Responses from Statutory and Non-Statutory Bodies

Responses received from Royal Borough of Greenwich Council	
<ul style="list-style-type: none"> • 6th November 2014 (original response) • 29th January 2015 (updated following further clarification) 	
Brief summary of issues raised:	Summary of action taken / how this has been covered
Planned developments adjacent or very close to the site need to be considered. <ul style="list-style-type: none"> • Greenwich Peninsula Masterplan • Plot M0318 and M0319, Millennium Way • Land at Enderby Wharf, Christchurch Way • Alcatel-Lucent, Christchurch Way • Peninsula West Masterplan SPD April 2012: 	An audit of the Air Quality modelling was undertaken by the EA's Air Quality Modelling and Assessment Unit (AQMAU) including checks at these proposed locations – as advised by the local authority. AQMAUs audit concludes that some locations (including Morden Wharf, Tunnel Avenue, Boord Street, Millenium Way, Enderby Wharf, Christchurch Way, Alcatel-Lucent and Peninsula Masterplan) predict impacts greater than 1% (thus cannot be considered insignificant). However, calculations show that headroom is present and thus no exceedences to Environmental

	<p>Quality Standards (EQSs) are likely as a result of the emissions proposed.</p> <p>The proposed installation is in an AQMA for PM10 and NO₂. The audit concludes that despite the site being located within this area, there is likely to be headroom that as a worst case will not lead to exceedence.</p> <p>No further action required. Appropriate ELVs and Monitoring requirements detailed within the permit.</p>
<p>The original consultation response raised concerns about Odour, Noise, Dust and Vermin in relation to the delivery of feedstock, unpacking, shredding and input.</p> <p>Since this time, the application has been amended so that only pre-prepared feedstock will be received at the Installation. In addition to this Royal Borough of Greenwich Council met with the applicant to discuss proposals comments. <i>The operator assured the council that no odours would be produced which would impact upon the local population. Explained that waste bales are not opened externally, and that the only operation in open air is the feed hopper to the chipper.</i></p>	<p>Application has been amended so that feedstock will arrive prepared – bagged and baled – as stated within the schedule 5 response:</p> <p><i>Following consultation with the London Borough of Greenwich Planning Team, Energy 10 have reviewed the need to carry out any external waste shredding and processing within the Greenwich Installation. A decision has been made that all waste feedstocks processed at the site will be delivered fully pre-treated, shredded and supplied in sealed bales or containers as necessary.</i></p> <p><i>Prior to use, the bales will all be transferred internally and fed directly into the inlet feed hopper of the pyrolysis feedstock blending plant and subsequently fed into the pyrolyser.</i></p> <p>The schedule 5 response has been incorporated into the application under table S1.2 operating techniques, and the operator will be required to operate in this manner.</p>
<p>We further request that the process building(s) be kept under negative pressure, or other odour/dust control measures which meet Best Available Technology (BAT).</p>	<p>All combustion air is drawn from the inside of the main building thus ensuring that air is continuously drawn in through the fabric building.</p> <p>In addition, we have included a pre-operational condition requiring the submission the odour control system – including design and maintenance of negative pressure in the reception building.</p>
<p>Air Quality Assessment – NO_x emissions. We are especially concerned about NO_x levels</p>	<p>See above. We have examined the applicants Air Quality report agree with conclusions that headroom is present and thus no exceedences to Environmental Quality Standards (EQSs) are likely as a result of the emissions proposed.</p>
<p>The original consultation response requested that the operator is required to meet the ‘Air Quality Neutral’ emissions benchmarks for buildings included in the London Mayor’s</p>	<p>No action required.</p>

<p>supplementary planning guidance on sustainable design and construction. This sets a Building Emission Benchmark (BEB) of 36.6 g/m²/annum for B2 class use, based on the gross floor area of the process building(s).</p> <p><i>Updated consultation response detailed that the above would not be relevant for this type of process, following clarity of the operation at a meeting with the operator.</i></p>	
<p>A Lawful Development Certificate (LDC) was granted in February 2013 on the basis that the primary purpose of the site would be as a processing plant for the production of biomass feedstock and that the clean gas generated from the advanced conversion process (gasification/pyrolysis) would be directly exported to the National Grid (Transco) Gas Distribution Network.</p> <p><i>Clarification later provided during meeting with applicant (as noted in updated response) that electricity generation would only utilise waste heat from the pyrolysis unit – and would not burn gas to generate electricity – which would be a fundamental change to the planning status.</i></p>	No action required
<p>Differing information contained in the Environmental Application and Planning application - strongly urges the applicant to contact the Planning Department to discuss the matter further.</p> <p><i>The applicant met with the council and provided further clarification.</i></p>	No action required
<p>Fully support that the site boundary should cover the whole site (including all materials preparation, storage etc).</p>	The site boundary supports this.
<p>Confirmed planning status</p>	No action required

Responses received from Public Health England	
Brief summary of issues raised:	Summary of action taken / how this has been covered
<p>Recommend that any permit issued for this site contains a) conditions relating to emissions, and b) appropriate measures to control fugitive emissions.</p> <p>Suggestion that demonstration (monitoring programme) is made to evidence that syngas production and proposed abatement equipment would mitigate against acid gases, trace metals or other thermal decomposition products and associated odours.</p>	<p>See section 6.2 of this document.</p> <p>[The Applicant provided a specification of their syngas (from sister plant) and compared this to natural gas based on National Grid standards and also on the Environment Agency biomethane quality protocol. This evidence showed that levels of xylenes, metals, total halogenated hydrocarbons, and total sulphur are no higher than in natural gas. The Environment Agency is satisfied that the syngas can cause emissions no higher than natural gas when burned, and</p>

	<p>have granted end of waste for this syngas.</p> <p>The permit requires monitoring of a) Oxides of Nitrogen and Carbon Monoxide [for emissions to air] - equivalent to monitoring required for Natural Gas plant, and in addition process monitoring requirements for syngas of total sulphur, halogenated hydrocarbons, heavy metals and aromatic hydrocarbons.</p> <p>Standard permit conditions relating to fugitive emissions control are also included within the permit.</p>
<p>Ensure that the accident management plan should adequately consider the hazards on site including the storage of fuel oil, chemicals and syngas product.</p>	<p>The operator is required to operate in accordance with conditions 1.1.1 – 1.1.3 of the permit – covering accident management. We have incorporated further information (received 15/07/2015) detailing storage quantities of syngas and other flammable materials on site. The site is not subject to COMAH regulations.</p>
<p>Based on information within the application, PHE has no significant concerns regarding risk to human health of the local population from this proposed activity, providing appropriate measures / best practice / industry standards are followed.</p>	<p>No further action.</p>

No other consultation comments were received.

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

No responses were received.

ANNEX 3: IED article 42(1) further information (Introduction)

IED article 42(1) states:

This Chapter shall not apply to gasification or pyrolysis plants, if the gases resulting from this thermal treatment of waste are purified to such an extent that they are no longer a waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas.

We have considered operational data from Energy 10's site in Huntingdon in support of this application. The Applicant stated that the Huntingdon site is of the same configuration as the proposed site in Greenwich. This data has been used to provide confidence that similar performance can be achieved using the technology at Greenwich.

Syngas Clean-up and end of waste

As stated within section 6.2 of this document, the purpose of syngas clean-up is to produce a gas that will be cleaned so that it will no longer be a waste. End of waste requires that the syngas to be of a quality which does not cause worse environmental effects than natural gas. From IED article 42, chapter IV will not apply if the gas is no longer a waste AND can cause emissions no higher than natural gas. The IED test is therefore tighter than the end of waste test.

In determining this application we required the Applicant to compare the composition of the syngas to the composition of natural gas. The reasoning behind this is that if the compositions are comparable then the syngas could then not cause emissions higher than from combustion of natural gas. To achieve this the Applicant analysed a sample of natural gas to compare to syngas samples. The Applicant also submitted data on emissions from natural gas plants (based on emissions factors) to further support their application.

Gas cleaning and conditioning

This site will include the following gas cleaning and conditioning technology, which is the same as that used at the Huntingdon Installation.

Two stage scrubbing :-

- Inline educator scrubber (rapid quench), and
- packed tower scrubber.

Theses scrubbing processes will act to condense any moisture from the gas, remove acid gases (SO₂, HCl, HF and H₂S), remove any residual tars, and trap any residual particulate matter.

Following this, the synthesis gas will then pass through an activated carbon column – providing a final polish of the gas.

Natural Gas analysis

Parameter	Units	Result	Reference period	Method
Cadmium & Thallium	mg/m ³	0.00016	420 minutes	BS EN 14385
Heavy Metals	mg/m ³	0.02656	420 minutes	BS EN 14385
Mercury	mg/m ³	0.000015	420 minutes	BS EN 13211 / MID 14385

The above table shows total heavy metals of 0.027 mg/m³ based on a CV of 37 MJ/m³ for natural gas.

EEA (European Environment Agency) combustion emission factors (2013)

The following emission factors (or coefficients) show emission parameter levels released during the combustion of gas (table 3-4 Tier 1 emission factors from document 1.A.4 Small Combustion GB2013).

Parameter	EEA emission factor data 2013	
	Emission factors (mg/GJ)	Concentration based on CV of 37 MJ/m ³ (mg/m ³)
Cd	0.00025	9.24898E-06
Tl		
Hg	0.68	0.025157233
As	0.12	0.004439512
Cr	0.00076	2.81169E-05
Cu	0.000076	2.81169E-06
Ni	0.00051	1.88679E-05
Se	0.011	0.000406955
Zn	0.0015	5.54939E-05
Sb		
Pb	0.0015	5.54939E-05
Co		
Mn		
V		
Total		0.030118239
Excluding ZN and Se (ZN and Se are not part of 'WID' suite)		0.02965579

Analysis from the Huntingdon site
Syngas Testing Data

The Applicant carried out testing for heavy metals on syngas produced from each of the waste types that are expected to be received.

4. RDF
5. Mixed waste wood
6. Heavily laden oily waste and plastic

Full reports (including testing parameters) are available on the public register, Schedule 5 Response, App2.

Syngas from waste type 3 was also tested for total S, total aromatic hydrocarbons, total chlorinated hydrocarbons and hydrogen sulphide.

Syngas analysis Test 1: RDF

Parameter	Units	Result
Cadmium & Thallium	mg/m ³	0.00076
Other Heavy Metals	mg/m ³	0.02103
Mercury	mg/m ³	0.00010
Total metals	mg/m ³	0.02189

Syngas analysis Test 2: Mixed Waste Wood

Parameter	Units	Result
Cadmium & Thallium	mg/m ³	0.0002
Other Heavy Metals	mg/m ³	0.0111
Mercury	mg/m ³	0.00009
Total metals	mg/m ³	0.01139

Syngas analysis Test 3: Heavily laden oily waste & Plastics

Parameter	Units	Result
Cadmium & Thallium	mg/m ³	0.00013
Other Heavy Metals	mg/m ³	0.01380
Mercury	mg/m ³	0.00010
Total metals	mg/m ³	0.01403
Total Sulphur	mg/m ³	11.02
Total Aromatic hydrocarbons (expressed as Xylene)	mg/m ³	43.96
Halogenated hydrocarbons	mg/m ³	0.15
Hydrogen sulphide	mg/m ³	2.70

The tables above show analysis for individual waste types. The Applicant proposed to pyrolyse a blend of wastes (50% RDF, 30% wood, 20% oily

waste and plastic with CV of 19-22 MJ/Kg. Based on this ratio with total metals would be ~ 0.016 mg/m³ at a CV of 19-22 MJ/Kg. When adjusted to a CV of 37 MJ/m³ (natural gas CV) this equates to or 0.03 mg/m³.

Comparison to natural gas.

Total S, total aromatic hydrocarbons, total chlorinated hydrocarbons and hydrogen sulphide are lower than the levels expected to be in natural gas, based on comparison with our natural gas specification.

	SynGas (adjusted to CV of 37 MJ/kg)	Natural Gas specification
Total Sulphur	≤ 27.1 mg/m ³	50 mg/m ³
Hydrogen Sulphide (H ₂ S)	≤ 2.7 mg/m ³	5 mg/m ³
Total Halogenated Hydrocarbons	≤ 0.8 mg/m ³	1.5 mg/m ³
Xylenes (all isomers)	≤ 54.2 mg/m ³	100 mg/m ³

Total heavy metals in the syngas is predicted to be ~0.03 mg/m³ when converted to the CV of natural gas. This is a similar to the total heavy metals in the natural gas analysis and also in the emissions factor data.

Certainty of use

End of waste also requires that there is an end use for the proposed material. We asked the applicant to include a description of any end uses within the schedule 5 notice.

In response, the applicant provided the following :-

As the Greenwich site is primarily a gas production and export facility, there is a potential for the syngas to be enriched to 36.9MJ/m³ using propane prior to export, however the need for enrichment is entirely dependent on customer need and specific requirements.

As this question on end uses was not answered, we have included a pre-operational condition which will require the operator to provide this information prior to final commissioning – this must be approved in writing by the Environment Agency.

Summary

Based on the information submitted by the applicant we are satisfied that the syngas has the potential to meet the test that its combustion will cause emissions no higher than natural gas.

We have set improvement conditions for the applicant to submit a report on syngas analysis, in order to confirm the application data with operational data. The applicant is also required to carry out further natural gas analysis to provide further assurance on the decision.

Based on this we have permitted the plant as a 1,2 activity. If the applicant cannot meet the limits set in the permit or if future analysis shows that the syngas is no longer comparable to natural gas then the operator would have to cease operation of the plant until the permit is varied, to accommodate additional gas clean up techniques, or to amend the activity where Chapter 4 of the IED applies (i.e. S5.1 Incineration of Waste).