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COVANTA
ROOKERY SOUTH ERF
SUPPORTING INFORMATION

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Table of Contents

1 Introduction

Covanta Rookery South Limited (Covanta) is proposing to build an Energy Recovery Facility (ERF) at Rookery Pit in Stewartby, Bedfordshire, referred to as the Rookery South ERF. The Installation will be arranged in a three stream format with the capacity to process 585,000 tonnes of mixed Municipal Solid Waste (MSW) and commercial, industrial and trade waste per annum. The facility will be designed to export 52.5 MWe and up to 40 MWth of heat.

This document and its annexes contain the supporting information for Covanta's application for an Environmental Permit (EP). They should be read in conjunction with the formal application form. Section 1 of this document provides an overview of the proposed Installation. Section 2 provides further information in response to specific questions in the application form.

1.1 The applicant

Covanta and Veolia UK Limited (Veolia) have joined forces, under a Project Development Agreement, to develop the Energy Recovery Facility at Rookery South Pit. The project team are currently working together to discharge the planning conditions and secure the EP for the operation of the facility. For the purposes of the EP application, and in accordance with the definitions of the 'legal operator' as stated in 'Guidance: Legal operator and competence requirements: environmental permits', Covanta Energy will be the Operator of the Facility and therefore the applicant for the purposes of the EP.

1.1.1 Covanta

Covanta, the parent company of Covanta Rookery South Limited, is an internationally recognised owner and operator of large-scale ERFs. The company delivers environmentally responsible and increasingly innovative solutions for the public, local government, industry and commerce, enabling its customers to reduce their impact on the environment. Covanta processes approximately 20 million tons of municipal solid waste each year which conserves over 25 million cubic yards of landfill space and generates 9 million megawatt hours of electricity - enough clean, renewable energy to power for one million homes. All of Covanta's EfW projects feature state-of-the-art emission control technology.

Covanta believes that recovering energy from the waste that remains after recycling is an important part of sustainable waste management and a key to reducing the hundreds of millions of tons of waste sent to landfills each year. Energy-from-Waste (EfW) takes non-hazardous waste destined for landfills, combusts it in specially designed boilers then recovers the heat to generate steam to use in energy generation or other industrial processes.

Covanta is proud of its environmental and safety performance having received a wide range of awards from US government bodies. These include OSHA VVP star award and various US State Environmental Awards.

Covanta is currently constructing the Dublin Energy from Waste facility in conformance with the waste incineration requirements of the Industrial Emissions Directive (IED) and understands how these requirements must be applied to the Rookery South Facility.

1.1.2 Veolia

The Veolia group is the global leader in optimized resource management. With over 174,000 employees worldwide, the Group designs and provides water, waste and energy management solutions that contribute to the sustainable development of communities and industries. Through its three complementary business activities, Veolia helps to develop access to resources, preserve available resources, and to replenish them.

1.2 The site

The application site ("the Site") comprises 17 hectares of land located at Rookery Pit, Stewartby, Bedfordshire (National Grid Reference 501290E 241040N), as illustrated in the location plan presented in Annex 1. The Site is located within the district of Central Bedfordshire Council and borders the Bedford Borough Council area of jurisdiction. The area beyond the Site is predominantly rural in nature.

Rookery Pit is an area of approximately 200 hectares comprising two former clay pits (referred to as Rookery North and Rookery South) associated with the former Stewartby Brickworks. The Site will be located in the north-western quadrant of Rookery South pit.

The Site is bounded to the east and west by two railway lines. The A507 is approximately 2.9 km to the south, and the A421 is approximately 1.8 km to the north-west.

To the immediate south of the Site is a line of trees and South Pillinge Farm, located approximately 250 m away. This is the closest residential receptor. To the immediate west of the Site is the Marston Vale Millennium Country Park. Approximately 0.5 km to the north-west is Stewartby Lake. Ampthill Park, a nationally important historic park, is located approximately 2.5 km to the south-east of the Site.

To the north of the Site, and just beyond Green Lane, are the former brickworks buildings. Approximately 1.1 km north is the settlement of Stewartby. Other neighbouring residential areas include Houghton Conquest approximately 2.7 km to the east and Marston Moretaine 1.2 km to the west.

1.3 Listed activities

The principal activities undertaken at the Installation will consist of a combination of Schedule 1 installation activities[1] and directly associated activities, as presented in Table 1.1.

Table 1.1: Environmental Permit Activities

Type of Activity	Schedule 1 Activity	Description of Activity
Installation	Section 5.1, Part A(1) (b)	The incineration of non-hazardous waste in an incineration plant with a capacity of 3 tonne or more per hour.
Directly Associated Activities		The processing of Incinerator Bottom Ash (IBA), to produce a material that can be recycled as a secondary aggregate.
		The export of power and heat from the installation.

The primary purpose of the activities at the Installation will be to burn waste in the waste incineration plant to recover energy in the form of steam and produce electricity for export to the National Grid.

1.4 The Installation

The Installation will consist of the following components:

- a waste reception area;
- a waste storage area and waste feed system;
- incineration grate and boilers;
- steam, water, fuel and air supply systems;

[1] As defined in the Environmental Permitting (England and Wales) Regulations 2010

- a flue gas treatment system and reagent injection systems;
- a turbine-generator and ancillaries;
- on-site facilities for storage of residues and waste water;
- a stack;
- devices and systems for controlling incineration operations, recording and monitoring conditions;
- an education/visitor centre and staff facilities; and
- an IBA facility.

A drawing presenting the Installation boundary is presented in Annex 1.

1.4.1 The waste incineration plant

The waste incineration plant will have a design capacity of 75 tonnes per hour of waste (i.e. 25 tonnes per stream), with a net calorific value (NCV) of approximately 9.3 MJ/kg. The plant is expected to process a nominal 585,000 tonnes per annum, based on an assumed annual operational availability of 7800 hours. The process is illustrated in the simple diagram (Figure 1) below. The design information contained herein reflects best engineering judgement at this time; final design details will be determined in the final design phase of the project following the vendor selection process.

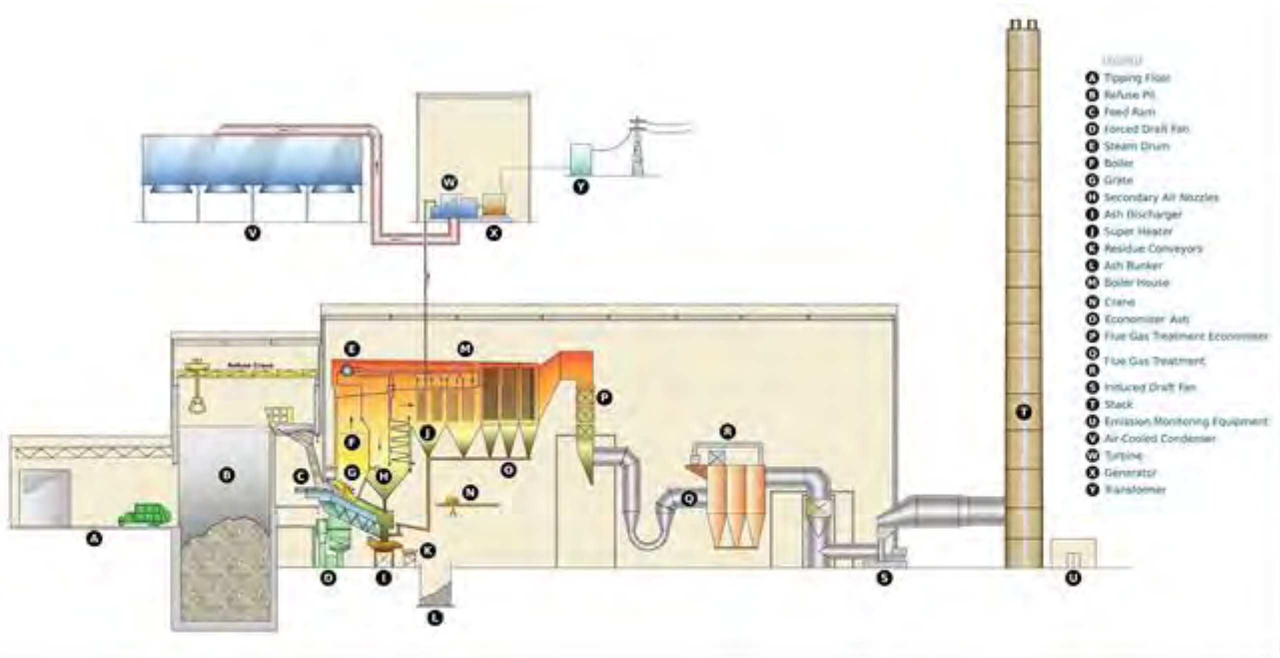


Figure 1 – Indicative Schematic of the Waste Incineration Plant

1.4.1.1 Raw materials

Waste will be delivered to the Installation in refuse collection and bulk transport vehicles. Deliveries will be weighed at the weighbridge prior to being directed to the tipping hall.

Combustion air for the boilers is drawn from the fully enclosed tipping hall which induces an air flow through the tipping hall to minimise the escape of the odours, dust or litter from the plant. Waste transport vehicles will tip waste onto the floor of the tipping hall and also directly into the waste bunker located within the tipping hall. The waste bunker has been designed for the storage of approximately 5 days of waste processing capacity. This will allow the operation of the Rookery South ERF, throughout seasonal variations in the supply of waste and interruptions to waste deliveries.

Gantry crane grabs will be used to homogenise the waste tipped into the storage pit and remove any unsuitable or non-combustible items. The grabs will transfer waste to one of the three feed hoppers which feed the three stream waste incineration process.

Hydrated lime for the flue gas cleaning process will be stored in silos. The lime will be delivered by bulk tanker and offloaded pneumatically into the silo with displaced air vented through a pulse jet filter.

Activated carbon for use within the flue gas cleaning process will be delivered by bulk tanker and offloaded into a silo with displaced air vented through a reverse pulse jet filter.

Aqueous ammonia will be delivered in sealed tankers and off-loaded via a standard hose connection into a tank within a suitable bund.

A demineralisation plant will be provided as part of the Rookery South ERF to supply demineralised water. The chemicals for demineralisation will be stored within a bunded area within the demineralisation plant. Caustic soda will be delivered by bulk tanker and offloaded into a bunded tank. Hydrochloric acid will also be delivered by tanker and stored in a bunded tank. Fugitive emissions from unloading of bulk chemicals will be vented back to the delivery vehicle. Various other water treatment chemicals will also be delivered in appropriate containers and stored in bunded areas.

A bunded above-ground gas oil tank will be situated within the building envelope. This will provide fuel for the combustion chamber secondary burners and site vehicles. Any spillages are retained within the fuelling containment systems.

All bunding will be able to contain 110% of the tank of largest storage vessels contents. Various maintenance materials (oils, greases, insulants, antifreezes, welding and firefighting gases etc.) will be stored in the appropriate and safe manner.

1.4.1.2 Combustion process

The combustion process for the waste incineration plant will be a mechanical moving grate design, to ensure continuous movement of the waste and resulting good combustion. As the waste moves onto the grate it passes through a drying zone, a combustion zone and a burnout zone. Primary combustion air is extracted from the tipping hall and waste bunker is fed through the grate bars to promote good waste combustion.

Secondary combustion air will be injected above the waste where it provides for good mixing and combustion control. Ammonia will be injected into the combustion chamber to react with the oxides of nitrogen, chemically reducing them to nitrogen and water.

Auxiliary low NOx burners operating on low sulphur gasoil will be fitted for start-up sequencing and when required to maintain temperatures above 850°C for 2 seconds. This ensures compliance with the IED. The oxygen concentration and temperature will be carefully controlled to ensure complete combustion and minimise dioxin emissions.

Combustion Bottom Ash and co-mingled metals, known as Incinerator Bottom Ash (IBA), will be discharged off the end of the incinerator grate into a water filled quench pit. The wet ash will then be transferred by conveyor to an ash storage bunker inside the waste incineration plant for safe and secure storage. The IBA will be approximately 60°C and have a moisture content of 15 to 25% when it leaves the quench bath. The composition of the IBA is expected to be similar to that from modern UK waste incineration facilities.

Periodic sampling of the IBA will be carried out to ensure effective burn out is being achieved by testing for the Total Organic Carbon (TOC) in the residual ash.

The IBA is expected to be transferred to the on-site IBA facility either by conveyor or truck for processing.

1.4.1.3 Energy recovery

Hot gases from the incineration of waste will pass through a series of heat exchangers and superheaters and finally through an economiser. The first stage of the economiser will be used to preheat feedwater before it is supplied to the boiler.

The design of the boilers, following a computerised fluid dynamics assessment, will ensure that such that the flue gas temperature is quickly reduced through the critical temperature range to minimise the risk of dioxin reformation.

The steam generated in the boilers will be fed to a steam turbine which will generate electricity. Water for steam generation will be sourced from the Towns Water supply and treated in a demineralisation plant prior to use in the boilers. Steam will be condensed in an air cooled condenser and recycled to the boiler.

There will be a heat extraction system to export generated heat to users, as discussed in Annex 7.

1.4.1.4 Gas cleaning

Flue gases will pass from the boiler to the gas cleaning, Air Pollution Control (APC) equipment. The flue gases will enter a reaction duct where dry hydrated lime will react with and neutralise the acid gases. The lime injection rate, dependent on vendor specific design, will be controlled by upstream measurement of hydrogen chloride (HCl) and or other parameters to optimise the efficiency of gas scrubbing and lime usage. Activated carbon will be injected into the duct to adsorb dioxins, volatile organic compounds reported as total organic carbon (TOC), mercury, and other trace metals.

Nitrogen oxides (NOx) abatement will be achieved through selective non-catalytic reduction (SNCR). The SNCR is based on the injection of ammonia into the combustion chamber.

Bag filters will be used to remove the fine ash, plus excess and spent lime and carbon, as the gases pass through the bag filter fabric. The build-up of the latter two enhances the performance of the system. Pulses of compressed air will be used to remove the accumulated particulate from the bags. The Air Pollution Control residues (APCr) will fall into a collection hopper and be conveyed to a storage silo. A proportion of APCr will be re-circulated to help improve acid gas capture and minimise lime consumption.

The cleaned gas will then discharge to atmosphere via a 105 metre high stack at an efflux velocity excess of 20 m/s at the design throughput.

The APCr will be removed from site in enclosed tankers. During the tanker filling operation, displaced air will vent back to the silo. The APCr will be transported off site by a licensed contractor for treatment and disposal at a landfill licensed to receive this type of waste.

1.4.1.5 Emissions monitoring

Emissions from the stack will be continuously monitored for:

- particulates;
- carbon monoxide (CO);
- ammonia (NH3);
- sulphur dioxide (SO2)
- hydrogen chloride (HCl);
- oxygen (O2);
- nitrogen oxides (NOx); and
- total organic carbon (TOC).

Temperature, water content and pressure shall also be measured to allow for correction of the raw emission data to the required reference conditions. There will be a duty Continuous Emissions Monitoring System (CEMS) for each line and one stand-by CEMS which can be switched to any of the three lines. This will ensure that there is continuous monitoring data available even if there is a problem with any of the duty CEMS systems. Measurements of sulphur dioxide and hydrogen chloride in the flue gases stream will provide a feed forward signal for adjustment of reagent feed rate, dependent on final vendor design.

Periodic sampling and measurement will be carried out for:

- hydrogen fluoride (HF);
- metals – cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), vanadium (V);
- dioxins and furans;
- and dioxin like PCBs.

Periodic measurements will be carried out four times in the first year and twice per year thereafter.

1.4.2 IBA

IBA will be collected and transferred from the waste incineration plant to the on-site IBA facility. Here the IBA will be manufactured into Incinerator Bottom Ash Aggregate (IBAA), a secondary aggregate for use in the construction industry. Recycling IBA has a number of benefits, but ultimately it further reduces the requirements for the need to landfill.

The IBA facility will be designed to process all generated IBA generated by the Rookery Plant.

1.4.2.1 Overview

The IBA facility will consist of a number of components:

- IBA processing building;
- oversize storage and processing area;
- unprocessed IBA stockpile area;
- IBAA storage stockpile areas (for different grades of IBAA);
- metal storage stockpile area.

Furthermore, dependent on the selected vendor design will also include:

- surface water run-off lagoon;
- silt catch pit;
- foul and surface drainage systems; and
- an oil interceptor.

1.4.2.2 Reception and drainage

IBA will be feed from the waste incineration plant ash pit either via a conveyor or trucked into the designated roofed IBA storage area. This area will have open sides to the north and the south for vehicle access, and an impermeable base with contained drainage system which discharges to a surface water run-off lagoon. The storage area has been designed for the storage of approximately 10,000 tonnes of IBA.

The IBA will be stored for a period of two to four weeks prior to processing for the following reasons:

(1) To reduce the water content of the IBA, as the material is allowed to dewater; and

(2) To allow the material time to undergo several naturally occurring chemical reactions. These reactions, including carbonisation and hydration, reducing its pH and thereby improves the material prior to processing.

Any unburnt, oversized or unsuitable materials that are found within the IBA will be removed and stored separately for further inspection. This material will either be sent back to the waste incineration plant waste bunker for further combustion or rejected and transported off-site to a suitably licensed disposal facility.

The IBA is expected to be classified as non-hazardous waste which can be recycled. The IBA will be sampled to ensure that only non-hazardous IBA is processed. The sampling and analysis will be undertaken in accordance with the Environment Agency (EA) guidance note M4.

1.4.2.3 IBA processing

IBA will be moved by a loading shovel from the IBA storage area to a hopper at the IBA Processing Building. During the transfer, the shovel driver will conduct a further inspection of the IBA. If any poor quality material is identified this will be quarantined for further inspection.

The acceptable material will be loaded into a hopper using a mobile front loading shovel. The hopper will contain a "grizzly" to prevent oversized items progressing further and handled as noted above.

A conveyor belt will feed the material (0-150 mm) under an overband magnet, which will remove ferrous material. The ferrous material will be collected in a storage bay. After the magnetic separator, the IBA will be fed into a drum screen which makes a split between 0–40 mm (80% of mass stream) and 40–150 mm (20% of the mass stream). Each split fraction is detailed below.

- 0–40 mm - this fraction will be collected on a conveyor belt underneath the drum screen. This material will be fed under a second overband magnet which is specially designed to separate the finer ferrous particles. The separated ferrous material will also be stored in a storage bay. The 0-40 mm fraction will be subject to a further separation, 0-8 mm and 8-40 mm.
  - 0-8 mm - this fraction will be collected on a conveyor belt which takes it to an eddy current separator. This specially designed machine is used to separate most non-ferrous particles such as aluminium, copper and brass from the IBA. The separated non-ferrous metals will be fed into skips, whereas the remaining IBAA will be stockpiled. A wheeled loading shovel will take the material to a product stockpile.
  - 8-40 mm - another conveyor belt will collect this size fraction and pass a windsifter. Any potentially combustible material will be blown out and collected in a fit for purpose container and sent back to the waste incineration plant. The separated IBA will then be fed into a second eddy current separator. The final product will be stockpiled.
- 40 – 150mm – this fraction will be stored on-site until a minimum of 1,500 tonnes is available. Metals will be recovered and large pieces of stone and concrete material will be crushed to below 40mm size. This material will then be put back through the IBA process. Unburnt organic material which has no commercial use will be collected and taken back by the waste incineration plant for re-processing.

Stockpiling of the IBAA will occur in two fractions (0-8mm and 8-40mm) within the uncovered IBAA storage area. This will have capacity to store six months (up to 55,000 tonnes) of IBAA. Whilst the IBAA is being stored it will continue to be weathered by the air and rainwater.

The quantities of IBAA being stored on site will be influenced by the market demand for IBAA material. Typically, the lowest demand occurs during the winter months and the highest during the summer months. IBAA will typically be held in the storage area for one month prior to shipment to the construction industry to allow for fluctuations in demand between seasons.

1.4.2.4 IBA Output

Approximately 86% of the IBA will be processed into IBAA, as identified in Table 1.2.

Table 1.2: Outputs from the IBA Materials Recovery Facility

Output	Percentage of the tonnage transferred to the MRF IBA Facility	Comments
Oversize	3-5	Separated by handpicking or by a grab. Oversized IBA will be removed for crushing. Combustible material will be reprocessed in the waste incineration plant.
Water	5-8	Moisture loss through drainage, evaporation and hydration.
Ferrous metal	7	Collected in a storage bay for recycling.
Non-ferrous metal	1.5	Aluminium, copper and brass. The material is stockpiled for recycling.
Unburnt material	<1	Small amounts of unburnt organic material recovered in the process. This will be returned to the adjacent waste incineration plant.
Aggregate (IBAA)	82-86	Material is screened into varying size fractions.

1.4.2.5 Flood risk

The site specific water management challenges from the Installation will be met by the establishment of an attenuation pond as part of the Rookery Low Level Restoration drainage scheme. This pond will be able to accommodate a 1 in 100 year rainfall event. This incorporates the effects of climate change and a pump station failure. As a result, flood risk within Rookery South, Rookery North and Stewartby Lake will not increase with the development and operation of the Installation.

In the case of an extreme flood event, there will be provision for a total pumping potential of 100 l/s from the attenuation pond to the water body in Rookery North pit. In addition, the bund which surrounds the entire Site will also provide protection during extreme local flood conditions. Facility buildings that are critical for safe operation (e.g. main electrical sub-station) will be elevated on plinths designed to prevent water damage.

2 Other Information for Application Form

2.1 Raw materials

2.1.1 Types and amounts of raw materials

Question 3c in part B3 of the application form requires information on the types and amounts of raw materials which will be used. The information requested is shown in Table 2.1 below. In addition, information on the potential environmental impact of these raw materials, as required by Getting the Basics Right, is included in Table 2.2.

Table 2.1: Types and Amounts of Raw Materials (indicative)

Schedule 1 Activity	Material	Maximum Amount (tonnes stored)	Annual Throughput (tonnes per annum)	Description including any hazard code
Waste incineration plant	Auxiliary fuel	200	550	Low sulphur gasoil
	Ammonia	70	4,700	25% aqueous solution
	Lime	200	9,000	Dry, hydrated
	Activated carbon	30	300	Powdered
	Sodium Hydroxide	15	160	32% aqueous solution; low mercury
	Hydrochloric acid	10	90	32 % aqueous solution
	Phosphate solution	1	20	Na_3PO_3, Na_2HPO_3 and sodium tripolyphosphate solution
	Other boiler treatment chemicals	<1	<5	Corrosion inhibitor, scale inhibitor, biocide, ion exchange resins

Table 2.2: Effect of Raw Materials on the Environment								
Product	Chemical Composition	Typical Quantity	Units	Environmental Medium			Impact Potential	Comments
				Air	Land	Water		
Gasoil	Low sulphur (<0.1%)	550	tonnes/yr	100			Low impact	Used for facility start-ups and to maintain good combustion conditions in the boiler. Facility combustion products released to atmosphere after passing through flue gas treatment facility.
Lime	$Ca(OH)_2$ >95%	9,000	tonnes / yr	0	100	0	Low impact	Injected lime is removed with the Flue Gas Treatment (FGT) residues at the bag filter and disposed of as hazardous waste at a suitable licensed facility.
Activated Carbon		300	tonnes/yr	0	100	0	Low impact	Injected carbon is removed with the APCr at the bag filter and disposed of as hazardous waste at a suitable licensed facility.
Ammonium hydroxide solution	NH_4.OH	4,700	tonnes / year	100	0	00	Low impact	Reacts with nitrogen oxides to form nitrogen, oxygen and water vapour. Any unreacted ammonia is released to atmosphere at low concentrations, and is continuously monitored.
Hydrochloric Acid	HCl 32% aqueous solution	160	litres / year	0	0	100	Low impact	Used for regeneration of water treatment facility. Bio-degradable, no bioaccumulation potential and negligible ecotoxicity.
Sodium Hydroxide	NaOH 32% aqueous solution, low mercury	90	litres / year	0	0	100	Low impact	Used for regeneration of water treatment facility. Bio-degradable, no bioaccumulation potential and negligible ecotoxicity.
Phosphate solution	Na_3PO_3, Na_2HPO_3 and sodium tripolyphosphate solution	20	tonnes / yr	0	0	0	Low impact	No process water discharge. Blowdown is reused in process water system.

Various other materials will be required for the operation and maintenance of the facility, including:

- hydraulic oils and silicone based oils;
- electrical switchgear;
- gas emptying and filling equipment;
- refrigerant gases for the air conditioning plant;
- oxyacetylene, TIG, MIG welding gases;
- glycol/anti-freeze for cooling;
- carbon dioxide (CO_2), or other firefighting foam agents; and
- test and calibration gases.

These will be supplied to standard specifications offered by main suppliers. All chemicals will be handled in accordance with Control of Substances Hazardous to Health (COSHH) Regulations as part of the quality assurance procedures and full product data sheets will be available on site.

Periodic reviews of all materials used will be made in the light of new products and developments. Any significant change of material, where it may have an impact on the environment, will not be made without firstly assessing the impact and seeking approval from the EA.

The Operator will maintain a detailed inventory of raw materials used on site and have procedures for the regular review of new developments in raw materials.

2.1.2 Raw materials selection

2.1.2.1 Acid gas abatement

There are several reagents available for acid gas abatement. Sodium Hydroxide (NaOH) or hydrated lime ($Ca(OH)_2$) can be used in a wet scrubbing system. Quicklime (CaO) can be used in a semidry FGT system. Sodium bicarbonate ($NaHCO_3$) or hydrated lime can be used in a dry FGT process.

The reagents for wet scrubbing and semi-dry abatement are not considered, since these abatement techniques have been eliminated by the Best Available Technology (BAT) assessment in Annex 5. The two alternative reagents for a dry system – lime and sodium bicarbonate are therefore assessed further.

The reagents have similar levels of abatement. However, the level of reagent use and therefore residue generation and disposal is different. This requires a full assessment following the Horizontal Guidance note H1 methodology. The assessment is detailed in Annex 5 and is summarised in Table 2.3 below.

Table 2.3: Acid Gas Abatement BAT Data

Item	Unit	$NaHCO_3$	$Ca(OH)_2$
Mass of reagent required	kg	109.0	67.0
Mass of residue generated	kg	84.0	85.0
Cost of reagent	£/tonne	155	94
Cost of residue disposal	£/tonne	150	125
Overall Cost	£/op. hr/kmol	29.5	16.9
Ratio of costs		1.74	

Note: data based on abatement of one kmol of Hydrogen Chloride

There is a small environmental benefit for using sodium bicarbonate, because the mass of residues produced is slightly smaller. However, there are a number of significant disadvantages:

- the residue has a higher leaching ability than lime-based residues, which will limit disposal options;
- the reaction temperature doesn't match as well with the optimum adsorption temperature for carbon;
- the sodium bicarbonate system has a slightly higher global warming potential due to the reaction chemistry (by around 1,000 tonnes of CO_2); and
- the costs are 74% higher.

Hence, the use of lime is considered to be BAT for this installation.

2.1.2.2 NOx abatement reagent

The SNCR system can be operated with dry urea, urea solution or aqueous ammonia solution. There are advantages and disadvantages with all options, as follows.

- Urea is easier to handle than ammonia. The handling and storage of ammonia can introduce an additional risk.
- Dry urea needs big-bags handling whereas urea solution can be stored in silos and delivered in tankers.
- Ammonia tends to generate lower nitrous oxide levels than urea. Nitrous oxide is a potent greenhouse gas.
- Ammonia emissions (or 'slip') can occur with both reagents, although good control will reduce the risk of this issue.

The Sector Guidance on Waste Incineration considers all options as suitable for NOx abatement. It is proposed to use aqueous ammonia for the SNCR system, because the climate change impacts of urea outweigh the handling and storage issues associated with ammonia solution. These issues can be overcome by good design of the ammonia tanks and pipework and the use of suitable procedures for the delivery of ammonia.

2.1.2.3 Auxiliary fuel

As stated in Article 50 (3) of the Industrial Emissions Directive (IED):

> *The auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil as defined in Article 2(2) of Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels (1) OJ L 121, 11.5.1999, p. 13., liquefied gas or natural gas.*

Therefore, as identified by the requirements of the IED, the only available fuels that can be used for auxiliary firing are:

(1) natural gas;

(2) liquefied gas (LPG); or

(3) gas oil.

Natural gas can be used for auxiliary firing and is safer to handle than LPG. As stated previously, auxiliary firing will only be required intermittently. When firing this requires large volumes of gas, which would be need to be supplied from a high-pressure gas main. The installation of a high-pressure gas main to supply gas for auxiliary firing to the Installation would be very expensive.

LPG is a flammable mixture of hydrocarbon gases. It is a readily available product, and can be used for auxiliary firing. As LPG turns gaseous under ambient temperature and pressure, it is required to be stored in purpose built pressure vessels. If there was a fire within the site, there would be a significant explosion risk from the combustion of flammable gases stored under pressure.

A gas oil tank can be easily installed at the Installation. Whilst it is acknowledged that gas oil is classed as flammable, it does not pose the same type of safety risks as those associated with the storage of LPG. The combustion of gas oil will lead to emissions of sulphur dioxide, but these emissions will be minimised as far as reasonably practicable through the use of low sulphur gas oil.

Therefore, low sulphur light gas oil will be used for auxiliary firing.

2.2 Incoming waste management

2.2.1 Waste to be burned

The proposed waste incineration plant will be used to recover energy from MSW and C&I waste with European Waste Catalogue Codes as presented in Table 2.4.

Table 2.4: Waste to be Processed

EWC Code	Description of Waste
Wastes from agriculture, horticulture, aquaculture, forestry, hunting, and fishing	
02 01 03	Plant tissue waste
02 06 01	Materials unsuitable for consumption or processing
Wastes from wood processing and the production of panels and furniture pulp, paper, and cardboard	
03 01 01	Waste bark and cork
03 01 05	Sawdust, shavings, cutting wood, particle board, and veneer other than mentioned in 03 01 04
03 03 01	Waste bark and wood
03 03 07	Mechanically separated reject from pulping of waste paper and cardboard
Wastes from the leather, fur, and textile industries	
04 02 10	Organic matter from natural products (e.g. grease, wax)
04 02 21	Waste from unprocessed textile fibres
04 02 22	Waste from processed textile fibres
Waste packaging	
15 01 01	Paper and cardboard packaging
15 01 02	Plastic packaging
15 01 03	Wooden packaging
15 01 05	Composite packaging
15 01 06	Mixed packaging
15 01 07	Glass packaging
15 01 09	Textile packaging
Wastes not otherwise specified in the list	

16 03 04	Off-specification batches – inorganic
16 03 06	Off specification batches – organic
Construction and demolition wastes	
17 02 01	Wood
17 02 03	Plastic
17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02, and 17 09 03
Wastes from human or animal health care and/or related research (except kitchen and restaurant wastes not arising from immediate health care)	
18 01 04	Wastes whose collection and disposal is not subject to special requirements in order to prevent infection
18 02 03	Wastes whose collection and disposal is not subject to special requirements in order to prevent infection
Waste from waste and water treatment	
19 02 03	Premixed wastes composed only of non-hazardous wastes
19 05 01	Non-composted fraction of municipal and similar wastes
19 05 02	Waste aerobic treatment of solid wastes from non-composted fraction of animal and vegetable waste
19 05 03	Off-specification compost
19 06 04	Digestate from aerobic treatment of municipal waste
19 06 06	Digestate from anaerobic treatment of animal and vegetable waste
19 12 01	Paper and cardboard
19 12 04	Plastic and rubber
19 12 07	Wood
19 12 08	Textiles
19 12 10	Combustible waste (refuse derived fuel)
19 12 12	Other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
Municipal wastes	
20 01 01	Paper and cardboard
20 01 08	Kitchen and canteen waste
20 01 10	Clothes
20 01 11	Textiles
20 01 38	Wood
20 01 39	Plastics
20 02 01	Biodegradable waste
20 03 01	Mixed municipal waste
20 03 02	Waste from markets
20 03 03	Street cleaning residues

20 03 04	Residual sludge from septic tanks and other similar installations for the treatment of sewage only (could also include sewage undertaker sludge disposal)
20 03 07	Bulky waste

The waste incineration plant is expected process a nominal 585,000 tonnes per year, is based on an NCV of 9.3 MJ/kg, with an assumed annual availability of 7,800 hours per annum.

Hours of operation will affect total fuel input capacity. On certain occasions waste throughput may be increased due to good facility performance and a reduction in planned shut-down frequency.

The waste will be delivered from the local area in Refuse Collection Vehicles (RCVs) and by Bulk Transfer Vehicles (BTVs). Checks will be made on the paperwork accompanying each delivery to ensure that only waste for which the waste incineration plant has been designed will be accepted at the Rookery South ERF.

It may not be practical to inspect compressed waste deliveries found within the RCVs or BTVs. The waste will be randomly inspected by the tipping hall operator as it is tipped followed by the crane driver and control room operator as it is mixed. Unacceptable waste will be removed from the bunker and quarantined for further inspection in a designated area within the tipping hall. Commercial and industrial waste will have spot check inspections prior to tipping into the bunker.

2.2.2 Waste handling

Covanta will develop pre-acceptance and acceptance procedures which comply with the Indicative BAT requirements in the Sector Guidance Note, including:

- A high standard of housekeeping will be maintained in all areas and provide and maintaining suitable equipment to clean up spilled materials.
- Loading and unloading of vehicles will take place in designated areas provided with impermeable hard standing. These areas will have appropriate falls to the process water drainage system.
- Fire fighting measures will be designed in accordance with the requirements of the Fire Prevention Plan (refer to Annex 8).
- Delivery and reception of waste will be controlled by a management system that will identify all risks associated with the reception of waste and shall comply with all legislative requirements, including statutory documentation.
- Incoming waste will be:
  - delivered in covered vehicles or containers; and
  - unloaded in the enclosed waste reception areas.
  - Design of equipment, buildings and handling procedures will ensure there is insignificant dispersal of litter.
- Inspection will take place by the plant operatives during vehicle tipping and waste unloading.

2.2.3 Waste minimisation (minimising the use of raw materials)

A number of specific techniques will be employed to minimise the production of residues, focussing on the following:

(1) Feedstock Homogeneity;

(2) Dioxin & Furan Reformation;

(3) Furnace Conditions;

(4) Flue Gas Treatment Control; and

(5) Waste Management.

All of these techniques meet the Indicative BAT requirements from the Sector Guidance Note on Waste Incineration.

2.2.3.1 Feedstock Homogeneity

Improving feedstock homogeneity can improve the operational stability of the plant, leading to reduced reagent use and reduced residue production. The incoming waste which is delivered into the waste bunker will be mixed by the cranes within the bunker. The mixing of the waste will improve the homogeneity of the fuel input to the waste incineration plant.

2.2.3.2 Dioxin & Furan Reformation

As identified within the sector guidance for the Incineration of Waste (EPR5.01), there are a number of BAT design considerations required for the boiler. The waste incineration boiler has been designed to minimise the formation of dioxins and furans as follows:

- Slow rates of combustion gas cooling will be avoided via boiler design to ensure the residence time is minimised in the critical cooling section and avoid slow rates of combustion gas cooling to minimise the potential for de-novo formation of dioxins and furans.
- The gas residence time in the critical temperature range will be minimised by ensuring high gas velocities exist in these sections. The residence time and temperature profile (between 450 and 200ºC) of flue gas will be considered during the detailed design phase to ensure that dioxin formation is minimised throughout the process.
- It is reported in the EA guidance note EPR5.01 that the injection of ammonia compounds into the furnace – an SNCR NOx abatement system – inhibits dioxin formation and promotes their destruction. SNCR is to be utilised in the waste incineration plant.
- Computerised Fluidised Dynamics (CFD) will be applied to the design, where considered appropriate, to ensure gas velocities are in a range that negates the formation of stagnant pockets / low velocities. A copy of the CFD model will be supplied to the EA following detailed design and prior to commencement of commissioning.
- Minimising the volume in the critical cooling sections will ensure high gas velocities.
- Boundary layers of slow moving gas along boiler surfaces will be prevented via design and a regular maintenance schedule to remove build-up of any deposits that may have occurred.

2.2.3.3 Furnace Conditions

Furnace conditions will be optimised in order to minimise the quantity of residues arising for further disposal. Burnout in the furnace will reduce the Total Organic Carbon (TOC) content of the bottom ash to less than 3% by optimising waste feed rate and combustion air flows utilising ASTM D 5468 Standard Test Method for Gross Calorific and Ash Value of Waste Materials.

2.2.3.4 Flue Gas Treatment Control

Close control of the flue gas treatment system will minimise the use of reagents and hence minimise the APCr produced. SNCR reagent dosing will be optimised to prevent ammonia slip.

Lime usage will be minimised by trimming reagent dosing to accurately match the acid load using fast response upstream acid gas monitoring. The plant preventative maintenance regime will include regular checks and calibration of the reagent dosing system to ensure optimum operation. Back-up feed systems will be provided to minimize interruption in lime dosing. The bag filter is designed to build up a filter cake of unreacted acid gas reagent, which acts as a buffer during any minor interruptions in dosing.

Activated carbon dosing will be based on demonstrated performance to achieve IED emission limits. Activated carbon will be controlled by a gravimetric feeder to ensure a dosing that has complied with IED emission limits. Maintaining a steady minimum concentration of activated carbon in the flue gas and consequently on the filter bags will maintain the adsorption rate for gaseous metals and dioxins.

Activated carbon and lime will be stored in separate silos. The feed rate for the activated carbon and lime dosing systems will be controlled separately.

2.2.3.5 Waste Charging

The waste incineration plant will meet the indicative BAT requirements outlined in the Incinerator Sector Guidance Note for fuel charging and the specific requirements of the IED:

- The combustion control and feeding system will be fully in line with the requirements of the IED. The conditions within the furnace will be continually monitored to ensure that optimal conditions are maintained and that the mandatory IED emission limits are not exceeded. Auxiliary burners fired with gas oil will be installed and will be used to maintain the temperature in the combustion chamber;
- The waste charging and feeding systems will be interlocked with furnace conditions so that charging cannot take place until combustion temperatures of 850°C are achieved, during start-up;
- The waste charging and feeding systems will also be interlocked with the continuous emissions monitoring system to prevent waste charging if the emissions to atmosphere are in excess of an emission limit value for more than four (4) consecutive hours, as allowable in accordance with the conditions relating to abnormal operation;
- Following loading into the feeding chutes by the grab, the waste will be transferred onto the grates by hydraulic powered feeding units;
- The backward flow of combustion gases and the premature ignition of waste will be prevented by keeping the chute full of waste and by keeping the furnace under negative pressure;
- A level detector will monitor the amount of waste in the feed chute and an alarm will be sounded if the fuel falls below the safe minimum level. Secondary air will be injected from nozzles in the wall of the furnace to control flame height and the direction of air and flame flow; and
- In a breakdown scenario, operations will be reduced or closed down as soon as practicable until normal operations can be restored.

The feed rate to the furnace will be controlled by the combustion control system.

2.3 Water use

It is anticipated that the Rookery South ERF will consume approximately 12 m^3/hr of towns water. The principal uses of water within the Rookery South ERF will be as boiler feedwater and the ash quench. The water system has been designed to minimise the consumption of potable water and ensure zero discharge of process water. Feedwater for the ash quench will be supplemented by process effluents generated from the Rookery South ERF.

An indicative water schematic for the Rookery South ERF is presented Figure 2. A larger version is presented in Annex 1.

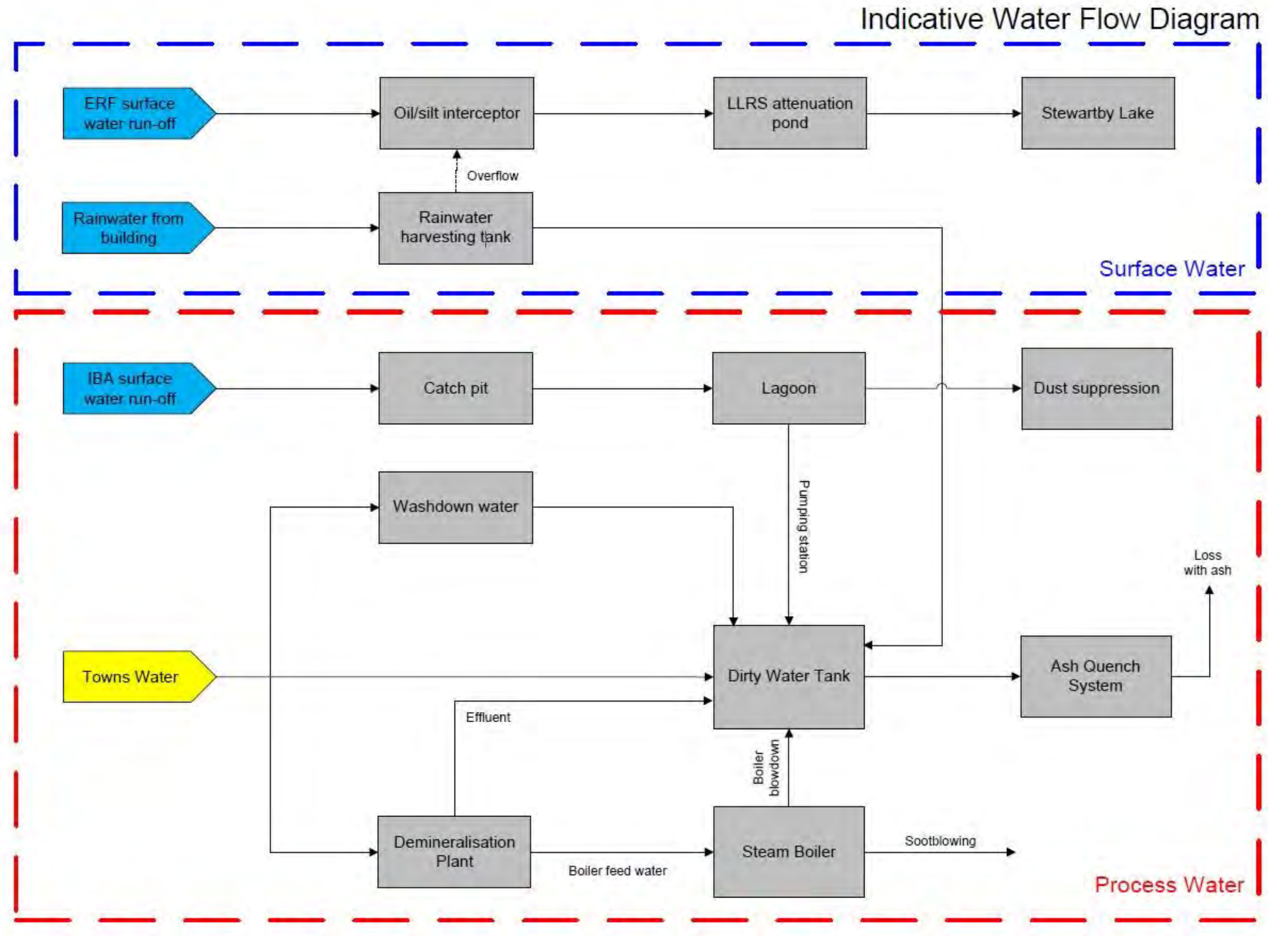


Figure 2 – Indicative Water Flow Diagram

2.3.1 Surface water

Surface water from the roofs of buildings at the Rookery South ERF will be collected in a rainwater storage tank for use within the IBA Quench System. In the event of imminent overflow of the storage tank, an outlet valve system will drain controlled quantities of water through an interceptor into the storm drains.

All other surface water (roadways and areas of hardstanding) shall be collected in drains with oily water interceptors which will incorporate an isolating penstock valve installed on the discharge pipe. This water will then be discharged via an interceptor channel into an attenuation pond to be constructed as part of the Rookery Low Level Restoration drainage scheme. This pond will be located adjacent to the Rookery South ERF, in the north-west corner of the Installation.

The discharge from the interceptors will be tested periodically to verify that it is not contaminated. The drainage system, interceptor and penstock valve will be subject to a planned maintenance regime.

2.3.2 Process water

2.3.2.1 Steam boiler

Towns Water will be treated using a package demineralisation plant to produce quality feed water for the boiler.

The majority of steam exiting the turbine will be condensed to water and returned to the boiler via an economiser.

The remaining steam lost from the boiler will be as blowdown to prevent the build-up of sludge and chemicals, in addition to system leaks and miscellaneous system vents (e.g., deaerator) and drains. Boiler blowdown water will be collected in the Dirty Water Tank. Lost steam cycle water will be replaced with demineralised Towns water.

2.3.2.2 Demineralisation plant

The demineralisation plant will be located at the waste incineration plant. The demineralisation plant is designed to remove contaminants from water through reverse osmosis Reject water will be used within the process..

The demineralisation plant will have two treatment streams which typically run in series but can also operate in parallel with sufficient storage capacity such that continuous operation is maintained whilst the other is re-generating..

2.3.2.3 Dirty Water Tank

Waste process water will be collected in the Dirty Water Tank and then pumped to the Ash Quench System.

Under normal operating conditions, waste water is generated from the following processes:

- process effluent collected in site drainage system (e.g. boiler blowdown);
- reject water from the demineralised water treatment plant;
- effluent generated through washdown and maintenance procedures;
- water run-off collected from the Ash Quench System which is re-used within the ash quench;
- rainwater from the roofs of waste incineration plant buildings; and
- surface water from the IBA MRF.

In the event of an overflow from any on-site tanks and equipment, the water will be directed via the process water drains to the Dirty Water Tank.

The control of the water level within the Dirty Water Tank will be automatic and continuous. The control system will ensure that Towns Water is only taken when the Dirty Water Tank level reaches a minimum and harvested rainwater is not available (i.e. when the rainwater tank is at minimum level).

The Dirty Water Tank will provide settlement of the re-circulated IBA quench water. Sludge tankers will periodically remove the settled ash and sludge from the Dirty Water Tank for transfer off-site for disposal.

2.3.2.4 Ash Quench System

To minimise the use of Towns Water, clean rainwater collected in the storage tank will be used in the Ash Quench System when possible.

2.3.2.5 IBA water use

Surface water run-off originating from the IBA facility will include rainwater and run-off from roadways, areas of hardstanding and stockpile areas. This surface water will be directed towards a run-off lagoon located along the northern boundary of the Rookery South ERF.

Surface water will pass through a catch pit before entering the lagoon. This will remove solids that may be present in the run-off. The lagoon will allow suspended solids to settle. There will be regular monitoring of settled solids levels within the catch pit and lagoon. When the catch pit reaches a high level of solids it will be dewatered to allow the solids to be emptied. The catch pit is designed to allow a front loading shovel to enter and remove the captured silt. When high levels of silt are found in the lagoon, these will be removed by a gulley sucker. Following removal of the silt, it will be transferred to the IBA MRF building. If this is not possible, the material will be removed from site using a licensed waste carrier and transported to a suitably licensed facility for disposal/recovery.

Under normal conditions the surface water collected in the run-off lagoon will be used for dust suppression at the IBA facility. Run-off from this process will be directed back to the lagoon.

Under unusual conditions (such as periods of high rainfall or shutdown of the waste incineration plant), the water within the lagoon will be collected in a tanker, and transferred off-site for disposal at a suitably licensed facility.

2.3.2.6 Other uses

Towns water will supply the office and mess facilities within the Rookery South ERF. Waste water from these facilities will be treated at the on-site effluent treatment plant prior to discharge into the Low Level Restoration Scheme.

Water for firefighting will be sourced from Towns Water and stored on-site in tanks with a dedicated pump set.

2.3.3 Site Drainage

The waste incineration plant buildings are designed with a sustainable drainage management scheme to collect and contain process water within buildings and ensure surface water is not contaminated. This will consist of a sloped floor gulley and piped drain system, connected to a centralised reuse water storage tank (Dirty Water Tank).

During the commissioning period for the ERF the drainage system will be subject to testing prior to commencing the operational phase. Records for commissioning of the drainage systems will be made available to the EA for inspection.

The drainage system will be designed and operated in accordance with:

- EA PPG1 - General guide to the prevention of pollution;
- EA PPG2 - Above Ground Oil Storage Tanks;
- EA PPG 21 - Incident Response Planning; and
- EA PPG 22 - Dealing with spills.

Construction Industry Research and Information Association (CIRIA) Report 164 “Design of Containment Systems for the Prevention of Water Pollution from Industrial Incidents”.

2.3.3.1 Spillage management

The Rookery South ERF has been designed to contain water used for firefighting or any chemicals/materials in the event of a spillage. All chemical and fuel storage vessels will be located in a bunded area to contain spillage or leaks. All process areas will be located on hard standing with no direct drainage connection to the surface water drainage systems. If there is a spillage, it will be contained either within the storage tank bund or the process water drainage network.

Good housekeeping practices will be in operation to ensure that any spillages are cleared up at the earliest opportunity. Spill kits will be available for the clean-up of all chemicals and oils stored and used within the Rookery South ERF. Spill kits will be located in close proximity to the relevant materials handling, loading/unloading and storage areas. The spill kits will be used to contain the spillage and prevent any release of pollution to the drainage system. Spillage control procedures developed prior to commencement of commissioning will detail those actions to be followed in the event of a spillage.

No material will be discharged on the internal road network which could potentially contaminate surface water run-off. Under normal operating conditions materials will be delivered to and from the waste incineration plant in dedicated transport vehicles by competent delivery drivers. Pollution prevention measures and strict operational controls will ensure that internal roadway rainwater run-off remains uncontaminated from process materials from the waste incineration plant. A trained member of Covanta's operational team will be in attendance during the delivery and off-loading of all chemicals and fuels.

In an emergency condition, such as a spillage or vehicle accident, the surface water discharge penstock valves will be closed. Any spillage or leak on the road network will be isolated, retained and remediated locally following the waste incineration plant spill procedure. The penstock valve will retain all surface water run-off within the drainage system to prevent its release to the environment. The retained surface water run-off will be tested and transferred off-site to an appropriately permitted waste management facility. If necessary, the drainage system and interceptor will be emptied and cleaned prior to the penstock valve being opened to allow the discharge of uncontaminated rain water.

2.4 Emissions

2.4.1 Emissions to air

The full list of proposed emission limits for atmospheric emissions is shown in Table 2.5. This includes the information requested in Table 2 of Application Form Part B3. This is based on the emission limits required by the IED.

Table 2.5: Proposed Emission Limits(1)

Parameter	Units	10 minute Average	Half Hour Average	Daily Average (4)	Periodic Limit
Particulate matter	mg/Nm^3	-	30	10	-
VOCs as Total Organic Carbon (TOC)	mg/Nm^3	-	20	10	-
Hydrogen chloride	mg/Nm^3	-	60	10	-
Hydrogen fluoride	mg/Nm^3	-	4	1	-
Carbon monoxide	mg/Nm^3	150(2)	-(3)-	50	-
Sulphur dioxide	mg/Nm^3	-	200	50	-
Oxides of nitrogen (NO and NO_2 expressed as NO_2)	mg/Nm^3	-	400	200	-
Cadmium & thallium and their compounds (total)	mg/Nm^3	-	-	-	0.05
Mercury and its compounds	mg/Nm^3	-	-	-	0.05

Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V and their compounds (total)	mg/Nm^3	-	-	-	0.5
Dioxins & furans ITEQ	ng/Nm^3	-	-	-	0.1

Note:

(1) all concentrations expressed at 11% oxygen, dry flue gas, at 0°C and 1 bar-a. Limitations are not applicable during startup, shutdown or abnormal operating conditions.

(2) Applies to a minimum of 95% of all measurements determined as a 10 minute average

(3) Alternate to the 10 minute CO standard which is applicable to all half hour averages on a daily basis

(4) Values of the 95% confidence interval for this averaging period shall not exceed the WID Annex III percentages for each respective emission limit

2.4.2 Odour

The storage and handling of waste is considered to have potential to give rise to odour. The facility will be designed in accordance with the requirements of EA Guidance Note H4: Odour.

Waste Storage

Waste storage areas will be designed such that there is air flow into the building, with air from the waste reception and bunker areas being utilised as combustion air within the ERF.

Fuel reception and storage areas will utilise a dust suppression system; this is a sprinkler type system, which will emit a very fine spray to suppress dust, if necessary.

Overall Design

The main access doors to the reception area will used for the waste delivery vehicles will be kept closed except during vehicles coming in and leaving to maintain odour control during delivery times.

As the waste incineration plant is a three stream facility, it will ensure that the waste storage areas will continuously be maintained at a negative pressure, even during shutdown of a single line.

Management Controls

The Rookery South ERF will include the following management controls for odour:

- during shutdown, doors will limit odour spread while still allowing vehicle access. Misting sprays may be used to reduce odour from the fuel bunker; and
- bunker management procedures and good mixing will be employed at the waste incineration plant to minimise the development of anaerobic conditions.

2.4.3 Emissions to water

There will be no process emissions to water. Wastewaters from the process will be collected and re-utilized.

All areas of hardstanding within the IBA will be profiled so that surface water run-off from areas subject to potential ash contamination is collected.

Clean water such as rainwater from roofs will be collected in a rainwater storage tank and utilised within the waste incineration plant or IBA facility or released through an interceptor into the storm drains. Surface water from roadways and areas of hardstanding will pass through an oil/silt interceptor prior to being discharged into the Low Level Restoration Scheme (LLRS) attenuation pond.

2.4.4 Contaminated water

All chemicals will be stored in a bunded environment supported by other measures (such as acid and alkali resistant coatings) to ensure appropriate containment. Operational control procedures and the bunding will reduce the potential for uncontrolled releases and associated environmental impacts.

Adequate quantities of spillage absorbent materials will be available onsite. These will be located at appropriate, accessible locations near to liquid storage areas. A site drainage plan which includes the locations of foul and surface water drains and interceptors will be made available onsite. Water interceptors will have penstock valves to prevent the discharge of contaminated surface water in case of an incident on site.

The off-loading of diesel and ammonia water will take place within contained areas. The storage tanks will be bunded at 110% of the tank capacity and the offloading location will be fully contained.

Any spillage, no matter how minor, will be reported and recorded in the Accident Log for further investigation. Site reviews will be followed in accordance with site inspection, audit and reporting procedures. Relevant authorities (EA/Health and Safety Executive) will be informed if spillages are over a certain volume threshold, as specified in the facility control procedures.

The effectiveness of the Emergency Response Procedures for spillages will be reviewed during planned drills and will be subject to Management Review.

2.4.5 Fugitive Emissions from IBA Storage

Good housekeeping practices will be implemented to ensure that any IBA spillage that does occur is cleaned up at the earliest opportunity. Spill kits will be available for the clean-up of IBA spills as procedures in the Quality and Environmental Management System (EMS) require ash spills to be cleaned up promptly.

Water released from the IBA will be also prevented from entering surface water drains through preventative maintenance, monitoring, housekeeping, and strict operational controls.

Any heavy metals within the IBA will be present as salts. These salts will be retained in solution when mixed with water and would not be expected to dissolve. Metals would be retained in solution form if there was an IBA spill on the internal roadways or other areas of hardstanding. If the IBA were to enter the surface water drainage system, it would collect within the interceptors in the surface water drainage systems for the waste incineration plant. The interceptors are designed to prevent the discharge of suspended solids and oils and grease.

2.5 Emissions monitoring

Sampling and analysis of all pollutants including dioxins and furans will be carried out to CEN or equivalent standards (e.g. ISO, national, or international standards). This ensures data provision of an equivalent scientific quality.

The facility will be equipped with modern monitoring and data logging devices which will enable the checking of process efficiency.

The purpose of emission monitoring has three main objectives, as follows.

(1) To provide the information necessary for efficient and safe facility operation.

(2) To warn the operator if emissions deviate from predefined ranges.

(3) To provide records of emissions and events to demonstrate regulatory compliance.

2.5.1 Monitoring emissions to air

The following substances will be monitored and recorded continuously at the stack (APC outlet) using a Continuous Emissions Monitoring System (CEMS):

- particulates;
- carbon monoxide (CO);
- ammonia (NH3);
- sulphur dioxide (SO2)
- hydrogen chloride (HCl);
- oxygen (O2);
- nitrogen oxides (NOx); and
- total organic carbon (TOC).

Temperature, water content and pressure shall also be measured to allow for correction of the raw emission data to the required reference conditions. There will be a duty Continuous Emissions Monitoring System (CEMS) for each line and one stand-by CEMS which can be switched to any of the three lines. This will ensure that there is continuous monitoring data available even if there is a problem with any of the duty CEMS systems.

The continuously monitored emissions concentrations will also be checked by an independent testing company at frequencies agreed with the EA.

The following parameters will also be monitored by means of spot sampling:

- hydrogen fluoride;
- metals – cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), vanadium (V);
- organic compounds;
- dioxins and furans; and
- dioxin like PCBs.

Periodic measurements will be carried out four times in the first year and twice per year thereafter.

The methods and standards used for emissions monitoring will be in compliance with guidance note EPR5.01 and IED. The CEMS equipment will be certified to the EA's Monitoring Certification Scheme (MCERTS) standard. It will have certified ranges which are no greater than 1.5 times the relevant daily average emission limit.

It is anticipated that:

- HCl, CO, SO_2, NOx (NO and NO_2) and NH_3 will be measured by an FTIR type multi-gas analyser;
- VOCs (reported as TOC) will be measured by a FID type analyser;
- particulate matter will be measured by an opacimeter; and
- O_2 will be monitored by a zirconium probe.

The periodic measurements will comply as a minimum with the requirements of the IED. Flue gas sampling techniques and sampling platforms will comply with EA Technical Guidance Notes M1 and M2.

2.5.1.1 Reliability

The IED allows a valid daily average to be obtained only if no more than 5 half-hourly averages during the day are discarded due to malfunction or maintenance of the continuous measurement system. The IED also requires that no more than 10 daily averages are discarded per year.

These reliability requirements will be met primarily by selecting MCERTS certified equipment.

Calibration will be carried out at intervals recommended by the manufacturer and by the requirements of BS EN14181. The CEMS will be supplied with remote access which will allow service engineers to provide remote diagnostics.

There will be a duty CEMS for each line and one stand-by CEMS which can be switched to any of the three lines. This will ensure that there is continuous monitoring data available even if there is a problem with the duty CEMS system.

2.5.1.2 Start-up and shutdown

The emission limit values under the IED do not apply during start-up and shutdown when the facility is incinerating waste. Therefore, under these conditions, a signal would be sent from the main facility control system to the CEMS package indicating that the facility is not operational and not burning waste. Averages for compliance with the IED would only be calculated when this signal is sent. Raw monitoring data would be retained for inspection.

Start-up ends when all of the following conditions are met:

- the feed chute damper open, feeder ram, grate and ash extractors are all running;
- exhaust gas O_2 is less than 15% (wet measurement); and
- the combustion grate is fully covered with waste.

Shutdown begins when all of the following conditions are met:

- the feed chute damper is closed;
- shutdown burner is in service; and
- exhaust gas O_2 is equal or above than 15% (wet measurement).

2.5.2 Monitoring emissions to land

Disposal of residues to land will comply with all relevant legislation. In particular the IBA will comply with the IED criterion of Total Organic Carbon (TOC) less than 3%. Compliance with the TOC criterion will be demonstrated during commissioning and checked at periodic intervals. These frequencies will be agreed with the EA throughout the life of the facility. Testing for TOC will be conducted by an independent accredited laboratory utilising ASTM D 5468 Standard Test Method for Gross Calorific and Ash Value of Waste Materials.

2.5.3 Monitoring emissions to water

As discussed in Section 2.4.3, there will be no process emissions to water and the only emissions to water will be of uncontaminated rainwater. Therefore, there will be no requirement to undertake monitoring of emissions to water.

2.5.4 Monitoring emissions from the IBA facility

Quantitative sampling analysis of perimeter dust will be carried out via sticky discs to monitor dusts emissions migrating from the IBA facility.

2.5.5 Waste Incineration Plant Process Monitoring

The waste incineration plant will be controlled from a dedicated control room. A modern control system, incorporating the latest advances in control and instrumentation technology, will be used to control operations, optimising the process relative to efficient heat release, good burn-out and minimum particle carry-over. The system will control and/or monitor the main features of the plant operation including, but not limited to the following:

- Combustion air;
- Fuel feed rate;
- SNCR system;
- Flue gas oxygen concentration at the boiler exit;
- Flue gas composition at the stack;

- Combustion process;
- Boiler feed pumps and feedwater control;
- Steam flow at the boiler outlet;
- Steam outlet temperature;
- Boiler drum level control;
- Flue gas control;
- Power generation; and
- Steam turbine exhaust pressure.

The response times for instrumentation and control devices will be designed to be fast enough to ensure efficient control.

The following process variables have particular potential to influence emissions:

(1) Fuel throughput will be recorded to enable comparison with the design throughput. As a minimum, monthly and annual throughput will be recorded; Steam generation rates will be recorded to enable comparison for short term design throughput.

(2) Combustion temperature will be monitored at a suitable position to demonstrate compliance with the requirement for a residence time of 2 seconds at a temperature of at least 850°C;

(3) The differential pressure across the bag filters will be measured, in order to optimise the performance of the cleaning system and to detect bag failures; and

(4) The concentration of HCl and SO_2 in the flue gases upstream of the flue gas treatment system and other emission and process parameters will be monitored, to optimise the performance of the emissions abatement equipment dependent on specific vendor design.

Water use will be monitored and recorded regularly at various points throughout the process to help highlight any abnormal usage. This will be achieved by monitoring the incoming water supplies and the boiler water makeup.

In addition, electricity and auxiliary fuel consumption will be monitored to highlight any abnormal usage.

Validation of Combustion Conditions

The waste incineration plant will be designed to provide a residence time, after the last injection of combustion air, of more than two seconds at a temperature of at least 850°C. This criterion will be demonstrated using Computational Fluid Dynamic (CFD) modelling during the design stage and confirmed by the recognized measurements and methodologies during commissioning in accordance with Guidance Note EPR5.01.

It will also be demonstrated during commissioning that the waste incineration plant can achieve complete combustion by measuring concentrations of carbon monoxide, VOCs and dioxins in the flue gases and TOC of the bottom ash.

During the operational phase, the temperature at the 2 seconds residence time point will be monitored to ensure that it remains above 850°C. The location of the temperature probes will be selected using the results of the CFD model. If it is not possible to locate the temperature probes at precisely the 2 seconds residence time point then a correction factor will be applied to the measured temperature. The CFD model for the design will be made available to the EA following detailed design of the boiler.

Ammonia solution will be injected into the flue gases at a temperature of between 850 and 1000°C. This narrow temperature range is needed to reduce NOx successfully and avoid unwanted secondary reactions. This means that multiple levels of injection points will be required in the radiation zone of the furnace.

Sufficient nozzles will be provided at each level to distribute the ammonia correctly across the entire cross section of the radiation zone. CFD modelling will be used to define the appropriate location and number of injection levels as well as number of nozzles to make sure the SNCR system achieves the required reduction efficiency for the whole range of operating conditions while maintaining the ammonia slip below the required emission level.

The CFD modelling will also be used to optimise the location of the secondary air inputs into the combustion chamber.

Measuring Oxygen Levels

The oxygen concentration at the boiler exit of the waste incineration plant will be monitored to ensure that there will always be adequate oxygen for complete combustion of combustible gases.

2.6 Technology selection

2.6.1 Combustion technology

It is proposed that the waste incineration plant combustion technology will be a modern moving grate and furnace/boiler.

This is the leading technology in the UK and Europe for the combustion of untreated Municipal Solid Waste (MSW). The moving grate comprises of fixed and moving bars that will move the waste from the feed inlet to the residue discharge. The grate movement turns and mixes the waste along the surface of the grate to ensure that all waste is exposed to the combustion process.

The Incinerator Sector Guidance Note discusses a number of alternative technologies for the combustion of waste.

Moving Grate Furnaces

As stated in the Sector Guidance Note, these are designed to handle large volumes of waste.

Fixed Hearth

These are not considered suitable for large volumes of waste. They are best suited to low volumes of consistent waste.

Pulsed Hearth

Pulsed hearth technology has been used for municipal waste in the past, as well as other solid wastes. However, there have been difficulties in achieving reliable and effective burnout of waste and it is considered that the burnout criteria required by WID would be difficult to achieve.

Rotary Kiln

Rotary Kilns have achieved good results with clinical waste, but they have not been used in the UK for municipal waste. The energy conversion efficiency of a rotary kiln is lower than that of a moving grate due to the large areas of refractory lined combustion chamber.

An oscillating kiln is used for municipal waste at two sites in England and a number of sites in France. The energy conversion efficiency is lower than that of a moving grate for the same reasons as for a rotary kiln. In addition, the capacity per unit is limited to 8 tonnes per hour and for this application it would need at least 9 furnaces to achieve the design throughput.

Pyrolysis/Gasification

Various suppliers are developing pyrolysis and gasification systems for the disposal of municipal waste. While pyrolysis and gasification systems which generate a syngas can theoretically take advantage of gas engines or gas turbines, which are more efficient that a standard steam turbine cycle, the losses associated with making the syngas and the additional electricity consumption of the site mean that the overall efficiency is no higher than for a combustion facility and is generally lower. This means that a combustion facility will have a more beneficial effect on climate change.

These systems are modular and are only available for small-scale facilities. The Rookery South ERF would require at least 11 modules in order to achieve the required capacity. This would significantly increase the capital cost of the facility, meaning that it is not viable in this configuration.

Therefore, pyrolysis and gasification are not considered to be a suitable alternative to the current facility design.

Fluidised Bed

These are designed for the combustion of relatively homogeneous waste. For residual MSW, the waste would need to be pre-treated before feeding to the fluidised bed. This would lead to additional energy consumption and require a larger building. The pre-treatment can also lead to higher quantities of rejected material. Where MSW is treated at a material recycling facility, the residues from the MRF may already be suitable for feeding to the fluidised bed. This does not apply to residues from kerbside collection schemes, which would need some pre-treatment, including shredding and metals removal as a minimum, before feeding to the fluidised bed.

While fluidised bed combustion can lead to slightly lower NOx generation, the injection of ammonia or urea is still required to achieve the WID emission limits.

Fixed hearth, pulsed hearth, rotary/oscillating kiln and pyrolysis/gasification are not considered suitable, but moving grate and fluidised bed technologies are considered in more detail in Annex 5 following the approach described in Horizontal Guidance Note EPR-H1. The conclusions are summarised in Table 2.6 below.

Table 2.6: Combustion Options Comparison

Parameter	Units	Grate	Fluidised Bed
Change in GWP	tpa CO_2 eq.	-176,000	-174,000
Ammonia solution	tpa	4,700	2,900
Total residues	tpa	147,000	153,400
Additional loss of exported power compared to Grate	£ p.a.		350,000
Total power, reagents and disposal annual cost	£ p.a.	6,500,000	6,130,000

Both the grate and fluidised bed will produce similar quantities of ash, although the fluidised bed produces a higher proportion of fly ash.

The lower annualised costs associated with a grate system outweighs the additional material costs and higher ammonia consumption. Furthermore, the grate system will be able to process the varying waste composition compared to a fluidised bed system which requires a consistent and homogenous fuel.

On this basis a grate system is considered to represent BAT for the Rookery South ERF.

2.6.2 NOx Reduction System

NOx levels will primarily be controlled by monitoring combustion conditions. Selective non-catalytic NOx reduction (SNCR) methods will also be installed, using urea or ammonia as a reagent.

The use of Selective Catalytic Reduction (SCR) has also been considered. In this technique, the reagent is injected into the flue gases immediately upstream of a reactor vessel containing layers of catalyst. The reaction is most efficient in the temperature range 200 to 350°C. The catalyst is expensive and to achieve a reasonable working life, it is necessary to install the SCR downstream of the flue gas treatment plant. This is because the flue gas treatment plant removes dust which would otherwise cause deterioration of the catalyst.

Since the other flue gas cleaning reactions take place at an optimum temperature of around 140°C, the flue gases have to be reheated before entering the SCR. This requires some thermal energy which would otherwise be converted to electrical power output, reducing the overall energy recovery efficiency of the facility. The catalytic reactor also creates additional pressure losses to be compensated by a bigger exhaust fan, further reducing the overall energy efficiency of the Installation.

2.6.2.1 Flue Gas Recirculation (FGR)

FGR is not a bolt-on abatement technique. FGR involves the recirculation of a proportion of the flue gases into the combustion chamber to replace some of the secondary air changes to effect the operation of the plant in various ways, such as by changing the temperature balance and increasing turbulence. This would require the boiler to be redesigned to ensure that the air distribution remains even.

Some suppliers of the furnace have designed their combustion systems to operate with FGR and these suppliers can gain benefits of reduced NOx generation from the use of FGR. Other suppliers have focussed on reducing NOx generation through the control of primary and secondary air and the furnace design, and these suppliers gain little if any benefit from the use of FGR.

It is also important to emphasise that, even where FGR does improve the performance of a combustion system, it does not reduce NOx emissions to the levels required by WID and so it would not alleviate the need for additional abatement.

The supplier of the combustion technology has not yet been selected, but it should be noted that most technology suppliers do not include FGR in their design. These suppliers can meet the required emission limits for NOx by using SNCR only.

At present, a technology provider has not been appointed for the Installation. If the selected technology supplier has an established track record of using this technique and can demonstrate the benefits, in terms of energy efficiency and environmental performance, of applying it to his technology FGR will be included within the design. We would propose that a Pre-operational Improvement condition is included within the EP to allow the Operator to confirm whether the design will include FGR prior to the commencement of commissioning.

A quantitative BAT assessment of the available technologies has been undertaken and is included in Annex 6. This assessment uses data obtained by Fichtner from a range of different projects using the technologies proposed in this application.

Table 2.7: BAT Assessment NOx Abatement

Parameter	Units	SNCR	SCR	SNCR + FGR
NOx emissions removed by abatement	tpa	900	1,380	740
POCP		-27,800	-9,500	-27,800
Global Warming Potential	tpa CO2 eq	1,900	6,700	2,600
Ammonia solution	tpa	4,700	3,910	3,060
Total Annualised Cost	£ p.a.	1,175,000	4,473,000	1,284,000

As can be seen from information presented in the table above, applying SCR to the Rookery South ERF when compared to using an SNCR system:

(4) increases the annualised costs by approximately £3.3 million;

(5) abates an additional 480 tonnes of NOx per annum;

(6) reduces the benefit of the facility in terms of the global warming potential by a minimum of 4,800 tonnes of CO_2; and

(7) reduces ammonia consumption by a minimum of approximately 790 tonnes per annum.

This gives an effective additional annual cost of approximately £6,900 per additional tonne of NOx abated or approximately £5,000 per additional tonne of NOx abated when compared to SNCR + FGR. The additional costs associated with an SCR system are not considered to represent BAT for the Rookery South ERF. Therefore, SNCR is considered to represent BAT for the Rookery South ERF.

The two SNCR options, with and without FGR, are very similar. FGR results in a reduction of reagent consumption, but requires more power to operate, and therefore it has a higher global warming potential and slightly higher total annualised costs.

2.6.3 Acid gas abatement system

There are currently three technologies widely available for acid gas treatment on similar plants in the UK.

(1) Wet scrubbing, involving the mixing of the flue gases with an alkaline solution of sodium hydroxide or hydrated lime. This has a good abatement performance, but it consumes large quantities of water, produces large quantities of liquid effluent which require treatment and has high capital and operating costs. It is mainly used in the UK for hazardous waste incineration plants where high and varying levels of acid gases in the flue gases require the buffering capacity and additional abatement performance of a wet scrubbing system.

(2) Semi-dry, involving the injection of quick lime as a slurry into the flue gases in the form of a spray of fine droplets. The acid gases are absorbed into the aqueous phase on the surface of the droplets and react with the quick lime. The fine droplets evaporate as the flue gases pass through the system, cooling the gas. This means that less energy can be extracted from the flue gases in the boiler, making the steam cycle less efficient. The quick lime and reaction products are collected on a bag filter, where further reaction can take place.

(3) Dry, involving the injection of solid hydrated lime or sodium bicarbonate into the flue gases as a powder. The reagent is collected on a bag filter to form a cake and most of the reaction between the acid gases and the reagent takes place as the flue gases pass through the filter cake. In its basic form, the dry system consumes more reagent than the semi-dry system. However, this can be improved by recirculating the flue gas treatment residues, which contain some unreacted hydrated lime and reinjecting this into the flue gases.

Wet scrubbing is not considered to be suitable, due to the production of a large volume of hazardous liquid effluent and a reduction in the power generating efficiency of the facility.

The dry and semi-dry systems can achieve the emission limits required by IED and both systems are in operation on plants throughout Europe. Both can be considered to represent BAT by Sector Guidance Note S5.01. The advantages and disadvantages of each technique are varied which makes assessment complex, therefore the assessment methodology described in Horizontal Guidance Note H1 has been used and is detailed in Annex 5 The conclusions are summarised in Table 2.8 below.

Table 2.8: Acid Gas Treatment Options Comparison

Parameter	Units	Dry	Semi-Dry
SO_2 abated	tpa	1,450	1,450
POCP	t-ethylene eq	860	860
Global Warming Potential	tpa CO2	6,700	11,400

Table 2.8: Acid Gas Treatment Options Comparison			
Parameter	Units	Dry	Semi-Dry
APC Residues, incl. fly ash	Tpa	22,000	22,000
Annualised Cost	£ p.a.	£12,039,000	£12,334,000

The performance of the options is very similar. The dry system only requires a small quantity of water for conditioning of the lime so that it is suitable for injection into the reaction chamber, whereas the semi-dry system requires the lime to be held in solution (lime slurry). This requires significantly more water than a dry system.

The dry system has a reduced global warming potential and a reduced annualised cost However, the semi-dry option benefits from medium reaction rates that mean that a shorter residence time is required in comparison with a dry system. In addition, within a semi-dry system recycling of reagent within the process is not proven, but it is proven in a dry system.

2.6.4 Control of particulate matter

The ERF will use a multi-compartment fabric filter for the control of particulates. There are a number of alternative technologies available, but none offer the performance of the fabric filter. Fabric filters represent BAT for this type of waste incineration plant for the following reasons:

(1) Fabric filters are a proven technology and are used in a wide range of applications. The use of fabric filters with multiple compartments, allows individual bag filters to be isolated in case of individual bag filter failure.

(2) Wet scrubbers are not capable of meeting the same emission limits as fabric filters.

(3) Electrostatic precipitators are also not capable of abating particulates to the same level as fabric filters. They could be used to reduce the particulate loading on the fabric filters and so increase the acid gas reaction efficiency and reduce lime residue production, but the benefit is marginal and would not justify the additional expenditure, the consequent increase in power consumption and significant increase in the carbon footprint of the Facility.

(4) Ceramic Filters have not been proven for this type of combustion plant, and are regarded as being more suited to high temperature filtration.

Fabric filters are considered to represent BAT for the removal of particulates for the waste incineration plant.

The bag filter will not require a flue gas bypass station, as the bag filters will be preheated allowing start-up without a bypass, which is considered to represent BAT for the Rookery South ERF.

For plants which include a bypass in their design, there is a risk that during normal operation, pollutant residues can build up in the inlet duct to a bypass station. If the bypass is then operated during start-up, as is common until the bag filter is at operating temperature, these residues will be emitted from the stack with no abatement.

2.6.5 Steam condenser

The facility will operate an Air Cooled Condenser (ACC) to condense the steam output from the turbine. This allows the return of the condensate to the boiler. The two main alternatives to an ACC are a water cooled condenser (WCC) or an evaporative condenser (EC). All are considered in Sector Guidance Note EPR5.01 as potential BAT solutions. The WCC uses a recirculating water supply to condense the steam and the EC uses water which is evaporated directly from the condenser surface and lost to the atmosphere to provide the required cooling.

The main advantage of both of these water based systems is that they provide improved cooling and are not susceptible to condenser efficiency fluctuation with changing air temperature. Air cooled condensers operating in high summer air temperatures can result in insufficient condensing power and subsequently reduce the efficiency of the generating turbine. Water cooled condensing system generate less noise in comparison to the noise generated by the fans in an air cooled condenser system.

However, water cooled condensers require significant volumes of make-up water. The absence of a local river of sufficient size would require the use of main town water supply. Chemical additives are also required. This generates effluent disposal is a problem for a water cooled condenser. In addition, during winter months there is a risk of freezing and maintenance costs are high due to the wet nature of the technology.

Evaporative condensers have significant potential for the release of water vapour plumes.

The ACC has been designed and guaranteed by the technology supplier with enough additional capacity to maintain turbine efficiency during the summer. The noise generated by the ACC has been considered in the noise assessment in Annex 3. The noise levels caused by the facility at nearby receptors will be below the existing background levels.

It is considered that the additional potable water use and the potential for visible plumes mean that water based condensers do not represent BAT for the Rookery South ERF.

2.6.6 IBA facility

There are three potential treatment techniques for IBA as follows:

- Wet Treatment (washing);
- Thermal Treatment (vitrification); and
- Dry Treatment (air maturation).

Wet treatment systems use water to wash soluble salts from the IBA. Wet treatment systems produce large quantities of effluent which require treatment either on-site or offsite and subsequent discharge to water/sewer. There is no on-site water treatment facility and no suitable receiving water which would have a suitable capacity to receive large quantities of treated effluent. Therefore, any effluent would require transport off-site to a suitably licensed recovery/disposal facility. Due to the large quantities of effluent produced by wet system these are not considered appropriate for the Rookery South ERF.

Thermal treatment systems have high destruction efficiency of organics and immobilization of environmental harmful elements. However, the high temperature processing required for vitrification of the IBA has a very high energy cost. Bottom ash from the incineration of MSW is a very inhomogeneous product and the results of vitrification have been known to vary. Therefore, the produced slag can differ in composition and the subsequent level of immobilization of pollutants can vary. Due to the high energy costs and the potential for varying levels of immobilization of pollutants from the IBA, the thermal treatment systems are not considered appropriate for the Rookery South ERF.

The dry treatment of IBA uses small quantities of water, and produces comparatively small quantities of effluent. The effluent can re-used on site, however when there is excess effluent this can be transported off-site to a suitably licensed recovery/disposal facility. The volume of effluent produced in a dry treatment system will be significantly smaller than a wet treatment system. The equipment used on dry treatment systems use significantly smaller quantities of power when compared to thermal treatment systems. Due to the small quantities of effluent and low power consumption associated with dry systems, they are considered to represent BAT.

In addition, there are no IBA treatment facilities in the UK which employ either wet treatment or thermal treatment techniques, therefore Covanta do not consider these techniques to be a proven technology. There are a number of facilities in the UK which employ the use of dry treatment systems.

Taking into consideration the above, Covanta consider that dry treatment of IBA through air maturation represents BAT for the treatment of IBA.

2.7 Specific requirements of the Industrial Emissions Directive (2010/75/EU)

This section presents information on how the waste incineration plant will comply with the Waste Incineration requirements of the Industrial Emissions Directive (IED).

Chapter IV of the IED includes 'Special Provisions for Waste Incineration Plants and Waste Co-incineration Plants'. Review of provisions for waste incineration as presented in the IED has identified that the following requirements could be applicable to the Rookery South ERF:

- Article 46 – Control of Emissions;
- Article 47 – Breakdown;
- Article 48 – Monitoring of Emissions;
- Article 49 – Compliance with Emission Limit Values;
- Article 50 – Operating Conditions;
- Article 52 – Delivery & Reception of Waste;
- Article 53 – Residues; and
- Article 55 – Reporting & public information on waste incineration plants and waste co-incineration plants.

As the Rookery South ERF will be constructed as a 'new' facility, the requirements of Articles 51 (Authorising to change operating conditions) and 54 (Substantial change) will not apply to the installation. In addition, the requirements of Article 55 (Reporting & public information on waste incineration plants and waste co-incineration plants) will apply to the competent authority (the EA), not the installation.

The following table identifies the relevant Articles of the IED and explains how the waste incineration plant will comply with them. Many of the articles in the IED impose requirements on regulatory bodies, in terms of the permit conditions which must be set, rather than on the operator. The table below only covers those requirements which the IED imposes on operators and either explains how this is achieved or refers to a section of the application where an explanation can be found.

Table 2.9 Summary Table for IED Compliance		
Article	Requirement	How met or reference
22(2)	Where the activity involves the use, production or release of relevant hazardous substances and having regard to the possibility of soil and groundwater contamination at the site of the installation, the operator shall prepare and submit to the competent authority a baseline report before starting operation of an installation or before a permit for an installation is updated for the first time after 7 January 2013. The baseline report shall contain the information necessary to determine the state of soil and groundwater contamination so as to make a quantified comparison with the state upon definitive cessation of activities provided for under paragraph 3. The baseline report shall contain at least the following information: (a) information on the present use and, where available, on past uses of the site; (b) where available, existing information on soil and groundwater measurements that reflect the state at the time the report is drawn up or, alternatively, new soil and groundwater measurements having regard to the possibility of soil and groundwater contamination by those hazardous substances to be used, produced or released by the installation concerned. Where information produced pursuant to other national or Union law fulfils the requirements of this paragraph that information may be included in, or attached to, the submitted baseline report.	Refer to Annex 2 – Site Condition Report.
44	An application for a permit for a waste incineration plant or waste co-incineration plant shall include a description of the measures which are envisaged to guarantee that the following requirements are met: (a) the plant is designed, equipped and will be maintained and operated in such a manner that the requirements of this Chapter are met taking into account the categories of waste to be incinerated or co-incinerated;	Refer to 2.2.3 of the Supporting Information.
	(b) the heat generated during the incineration and co-incineration process is recovered as far as practicable through the generation of heat, steam or power;	Refer to Section 2.8 of the Supporting Information.
	(c) the residues will be minimised in their amount and harmfulness and recycled where appropriate;	Refer to Section 2.9 of the Supporting Information

Table 2.9 Summary Table for IED Compliance		
Article	**Requirement**	**How met or reference**
	(d) the disposal of the residues which cannot be prevented, reduced or recycled will be carried out in conformity with national and Union law.	Refer to Section 2.9 of the Supporting Information
46 (1)	Waste gases from waste incineration plants and waste co-incineration plants shall be discharged in a controlled way by means of a stack the height of which is calculated in such a way as to safeguard human health and the environment.	Refer to Annex 4 – Air Quality Assessment.
46 (2)	Emissions into air from waste incineration plants and waste co-incineration plants shall not exceed the emission limit values set out in parts 3 and 4 of Annex VI or determined in accordance with Part 4 of that Annex.	Refer to Section 2.4.1 of the Supporting Information
46 (5)	Waste incineration plant sites and waste co-incineration plant sites, including associated storage areas for waste, shall be designed and operated in such a way as to prevent the unauthorised and accidental release of any polluting substances into soil, surface water and groundwater. Storage capacity shall be provided for contaminated rainwater run-off from the waste incineration plant site or waste co-incineration plant site or for contaminated water arising from spillage or fire-fighting operations. The storage capacity shall be adequate to ensure that such waters can be tested and treated before discharge where necessary.	Refer to Section 2.4.4 of the Supporting Information.
46 (6)	Without prejudice to Article 50(4)(c), the waste incineration plant or waste co-incineration plant or individual furnaces being part of a waste incineration plant or waste co-incineration plant shall under no circumstances continue to incinerate waste for a period of more than 4 hours uninterrupted where emission limit values are exceeded. The cumulative duration of operation in such conditions over 1 year shall not exceed 60 hours. The time limit set out in the second subparagraph shall apply to those furnaces which are linked to one single waste gas cleaning device.	Refer to Annex 4 – Abnormal Emissions Assessment
47	In the case of a breakdown, the operator shall reduce or close down operations as soon as practicable until normal operations can be restored.	Refer to Section 2.2.3.5 of the Supporting Information

Table 2.9 Summary Table for IED Compliance		
Article	Requirement	How met or reference
48 (2)	The installation and functioning of the automated measuring systems shall be subject to control and to annual surveillance tests as set out in point 1 of Part 6 of Annex VI.	Refer to Section 2.2.3.4 of the Supporting Information
48 (4)	All monitoring results shall be recorded, processed and presented in such a way as to enable the competent authority to verify compliance with the operating conditions and emission limit values which are included in the permit.	Refer to Section 2.5.1 of the Supporting Information
49	The emission limit values for air and water shall be regarded as being complied with if the conditions described in Part 8 of Annex VI are fulfilled.	Refer to Section 2.5 of the Supporting Information
50 (1)	Waste incineration plants shall be operated in such a way as to achieve a level of incineration such that the total organic carbon content of slag and bottom ashes is less than 3% or their loss on ignition is less than 5% of the dry weight of the material. If necessary, waste pre-treatment techniques shall be used.	Refer to Section 2.5.4 of the Supporting Information
50 (2)	Waste incineration plants shall be designed, equipped, built and operated in such a way that the gas resulting from the incineration of waste is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to a temperature of at least 850°C for at least two seconds.	Refer to Section 2.2.3.3 of the Supporting Information
50 (3)	Each combustion chamber of a waste incineration plant shall be equipped with at least one auxiliary burner. This burner shall be switched on automatically when the temperature of the combustion gases after the last injection of combustion air falls below the temperatures set out in paragraph 2. It shall also be used during plant start-up and shut-down operations in order to ensure that those temperatures are maintained at all times during these operations and as long as unburned waste is in the combustion chamber. The auxiliary burner shall not be fed with fuels which can cause higher emissions than those resulting from the burning of gas oil as defined in Article 2(2) of Council Directive 1999/32/EC of 26 April 1999 relating to a reduction in the sulphur content of certain liquid fuels (OJ L 121, 11.5.1999, p. 13.), liquefied gas or natural gas.	Refer to Section 1.4.1.2 of the Supporting Information

Table 2.9 Summary Table for IED Compliance		
Article	Requirement	How met or reference
50 (4)	Waste incineration plants and waste co-incineration plants shall operate an automatic system to prevent waste feed in the following situations: (a) at start-up, until the temperature set out in paragraph 2 of this Article or the temperature specified in accordance with Article 51(1) has been reached;	Refer to Section 2.2.3.5 of the Supporting Information
	(b) whenever the temperature set out in paragraph 2 of this Article or the temperature specified in accordance with Article 51(1) is not maintained;	Refer to Section 2.2.3.3 of the Supporting Information
	(c) whenever the continuous measurements show that any emission limit value is exceeded due to disturbances or failures of the waste gas cleaning devices.	Refer to Section 2.2.3.4 of the Supporting Information
50 (5)	Any heat generated by waste incineration plants or waste co-incineration plants shall be recovered as far as practicable.	Refer to Section 2.2.3.4 of the Supporting Information
50 (6)	Infectious clinical waste shall be placed straight in the furnace, without first being mixed with other categories of waste and without direct handling.	Not applicable.
52 (1)	The operator of the waste incineration plant or waste co-incineration plant shall take all necessary precautions concerning the delivery and reception of waste in order to prevent or to limit as far as practicable the pollution of air, soil, surface water and groundwater as well as other negative effects on the environment, odours and noise, and direct risks to human health	Refer to Section 2.2.2 of the Supporting Information
52 (2)	The operator shall determine the mass of each type of waste, if possible according to the European Waste List established by Decision 2000/532/EC, prior to accepting the waste at the waste incineration plant or waste co-incineration plant.	Refer to Section 2.2 of the Supporting Information
53 (1)	Residues shall be minimised in their amount and harmfulness. Residues shall be recycled, where appropriate, directly in the plant or outside.	Refer to Section 2.9 of the Supporting Information
53 (2)	Transport and intermediate storage of dry residues in the form of dust shall take place in such a way as to prevent dispersal of those residues in the environment.	Refer to Section 2.4.5 of the Supporting Information

Table 2.9 Summary Table for IED Compliance		
Article	Requirement	How met or reference
53 (3)	Prior to determining the routes for the disposal or recycling of the residues, appropriate tests shall be carried out to establish the physical and chemical characteristics and the polluting potential of the residues. Those tests shall concern the total soluble fraction and heavy metals soluble fraction.	Refer to Section 2.9 of the Supporting Information

2.8 Energy efficiency

The waste incineration plant will utilise a waste fired steam boiler. The generated steam will supply a steam turbine generator to generate electricity.

The Rookery South ERF will supply electricity to the local electricity grid via a power transformer which increases the voltage to the appropriate level.

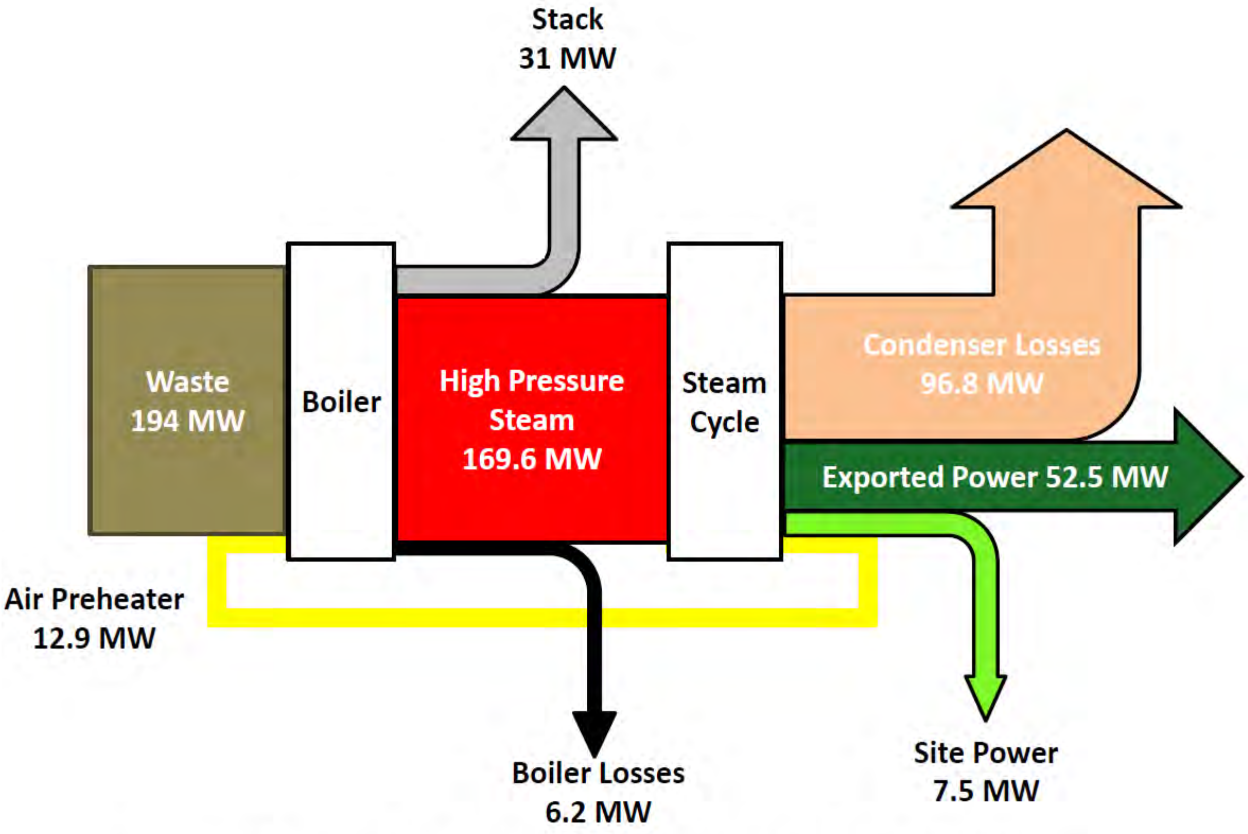
In case of failure of the electricity supply, an emergency diesel generator will be provided to safely shut down the facility and to provide an emergency supply to the rest of the facility. In addition, the waste incineration plant will be configured to operate with the turbine offline for short periods due to maintenance of the turbine that the turbine will be bypassed to the air cooled condensor. Due account has been taken of the requirements of EA Horizontal Guidance Note H2 on Energy Efficiency.

2.8.1 Basic energy requirements

It is estimated that the Rookery South ERF will generate approximately 60 MW of electricity. Approximately 7.5 MW of this electricity will be used within the Installation with the remaining approximately 52.5 MW being exported to the National Grid. The precise electrical consumption will be determined and supplied to the EA when the Rookery South ERF becomes operational. However, the most significant electrical consumers are anticipated to be the following:

- combustion air fans;
- induced draft fans;
- boiler feed water, condensate and cooling water pumps;
- air cooled condenser fans;
- air compressors;
- waste loading systems and ash and residue conveying systems; and
- offices and ancillary rooms.

An indicative Sankey Diagram for the waste incineration plant is presented in



Based on 75 tonnes per hour of waste with a net CV equal 9.3 MJ/kg

Figure 3.

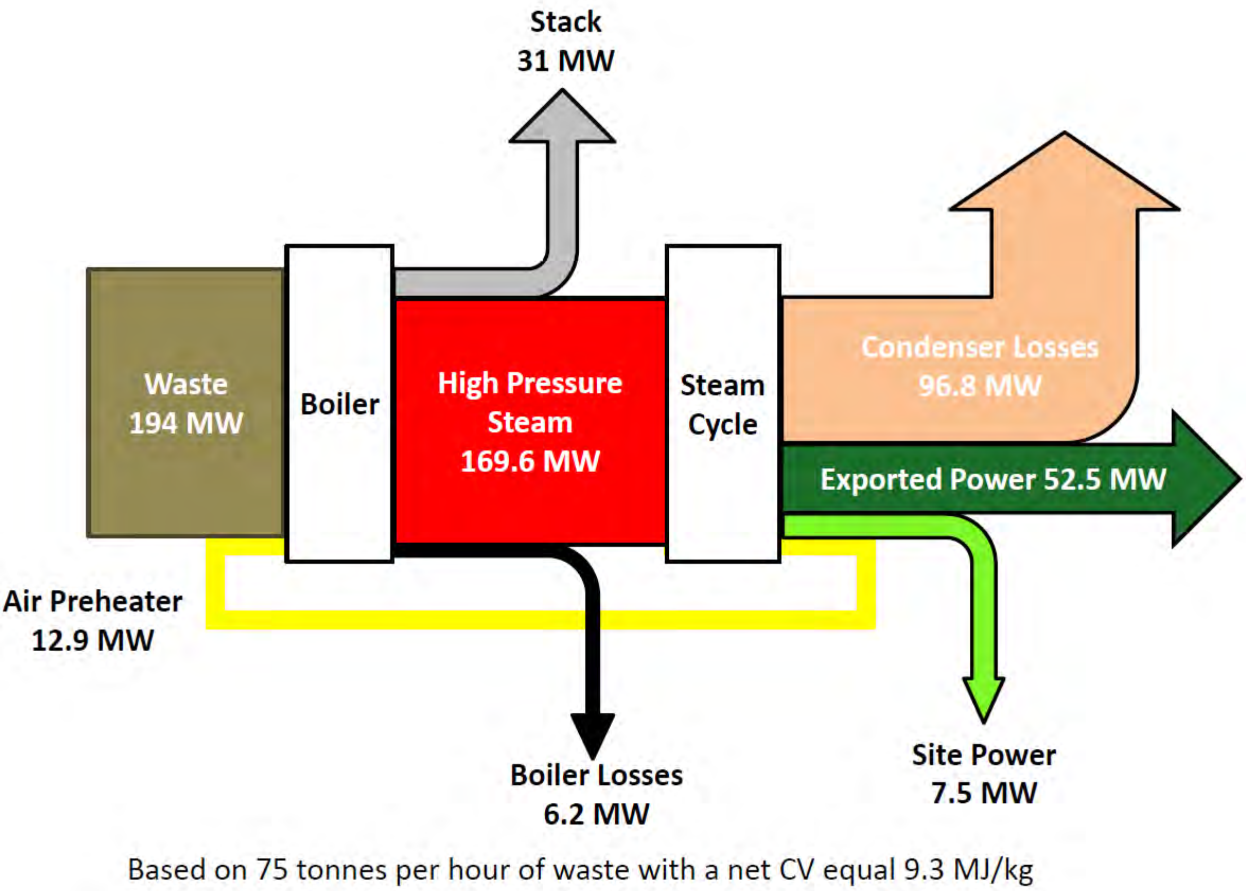


Figure 3 – Indicative Sankey Diagram

The Rookery South ERF will be designed with careful attention being paid to all normal energy efficiency design features, such as high efficiency motors, high standards of cladding and insulation. In addition, the waste incineration plant will be designed to achieve a high thermal efficiency, through the following measures.

- The boilers will be equipped with economisers and super-heaters to optimise thermal cycle efficiency without prejudicing boiler tube life, having regard for the nature of the waste that is being burnt.
- Unnecessary steam and hot water releases will be controlled to avoid the loss of boiler water treatment chemicals and heat contained within the steam and water.
- Low grade heat will be extracted from the turbine and used to preheat combustion air and condensate. This will improve the efficiency of the thermal cycle.
- Boiler heat exchange surfaces will be cleaned on a regular basis to ensure efficient heat recovery.

Due consideration will be given to the recommendations given in the Sector Guidance Note.

2.8.1.1 Operating and maintenance procedures

The O&M procedures will include the following aspects.

- Good maintenance and housekeeping techniques and regimes across the whole Installation
- Facility Condition Monitoring carried out on a regular basis. This ensures that motors are operating efficiently, insulation and cladding are not damaged and that there are no significant leaks.
- Operators will be trained in energy awareness and are encouraged to identify opportunities for energy efficiency improvements.

2.8.1.2 Energy efficiency benchmarks

The Rookery South ERF will generate up to 60 MWe. As stated within the EA Guidance Note – The Incineration of Waste (EPR5.01), the benchmark for the generation of electricity from municipal waste incineration is 5-9 MW per 100,000 tonnes. Applying the criteria stated within the EA guidance, the EfW will generate approximately 10.25 MW per 100,000 tonnes of waste. The efficiency of the Rookery South ERF therefore is in accordance with the benchmark efficiency figure.

At the design point of 75 tph and a net calorific value of 9.3 MJ/kg, the waste incineration plant will generate up to 60 MWe. Approximately 7.5 MWe of this electricity will be used within the Rookery South ERF The remaining 52.5 MW will be exported to the National Grid. This equates to 0.7 MWh/te waste, with 0.1 MWh/te waste used within the facility, with 0.7 MWh/te waste exported to the grid. This is based on a design waste Net Calorific Value of 2.83 MWh/te.

2.8.2 Further energy efficiency requirements

The Rookery South ERF will not be subject to a Climate Change Levy agreement, although the electricity generated will be partially exempt from the levy.

In accordance with the requirements of the IED and the Energy Efficiency Directive, heat should be recovered as far as practicable. A Heat Plan and CHP-R application for the facility is presented in Annex 7.

2.9 Waste recovery and disposal

The main residue streams which will arise from the operation of the Rookery South ERF are:

(1) IBA from the combustion process (Residue Type RT1); and

(2) APCr and fine ash particles (Residue Type RT2).

Waste recovery and disposal techniques will be in accordance with the indicative BAT requirements. The wastes generated are summarised in Table 2.11.

2.9.1 Metals separated from the received waste

Ferrous metals will be removed from the IBA by means of magnetic separators and discharged to a separate storage area in the IBA processing facility. Any ferrous material recovered will be recycled. Non-ferrous metals will be removed using an eddy current separator.

2.9.2 Incinerator bottom ash (IBA)

As can be seen in the process flow diagram in Annex 1, boiler ash will be mixed with bottom ash. The mixture of boiler ash and bottom ash is normally a non-hazardous waste which can be recycled. If the boiler ash were to be mixed with the APC residues, the mixture would be defined as hazardous waste and this would restrict the ability of the operator to recycle the boiler ash.

IBA has been used for at least 20 years in Europe as a substitute for valuable primary aggregate materials in the construction of roads and embankments. IBA processing will be sited adjacent to the waste incineration plant. The process will produce secondary aggregate of various grades for use in the construction industry. There will also be further ferrous and non-ferrous metal extraction for recycling within this process.

The composition of the IBA is expected to be similar to that from other waste incineration facilities in the UK. Table 2.10 shows the typical trace components found in IBA produced in the UK.

Table 2.10: Typical Composition of IBA				
Component	Unit	Average	Minimum	Maximum
Total Organic Carbon	%	1.4	0.00	3.2
Total cadmium	mg/kg	12.1	0.00	190.0
Total mercury	mg/kg	0.5	0.02	7.9
Total chromium	mg/kg	145.1	0.00	580.0
Total copper	mg/kg	1,356.6	4.00	5,700.0
Total lead	mg/kg	1,306.2	0.00	6,800.0
Total nickel	mg/kg	84.8	0.00	340.0
Thallium	mg/kg	27.0	10.00	63.0
Managanese	mg/kg	1,446.0	230.00	16,000.0
Arsenic	mg/kg	11.7	2.00	45.0
Antimony	mg/kg	81.2	0.00	760.0
Cobalt	mg/kg	17.0	6.00	41.0
Vanadium	mg/kg	45.1	10.00	120.0
Zinc	mg/kg	2,688.5	3.60	13,000.0
Tin	mg/kg	121.0	23.00	220.0
Dioxin/Furan (Total)	ng/kg	529.9	0.00	2,500.0
Dioxin/Furan (ITEQ)	ng/kg	9.4	0.00	55.0

2.9.3 Air pollution control residues

APCr are predominantly composed of calcium as hydroxide, carbonate, sulphate and chloride/hydroxide complexes. Typical major element concentration ranges for the UK residues are as follows:

- 30-36% w/w Calcium;
- 12-15% w/w Chlorine;
- 8-10% w/w Carbonate (as C); and
- 3-4% w/w Sulphate (as S).

Silicon, Aluminium, Iron, Magnesium and Fluorine are also present in addition to traces of dioxins and the following heavy metals: Zinc, Lead, Manganese, Copper, Chromium, Cadmium, Mercury, and Arsenic.

It may be possible to send the residue to an effluent treatment contractor, to be used to neutralise acids and similar materials. Using the residues in this way avoids the use of primary materials. If this option is not practicable then it will be sent to a secure landfill for disposal as a hazardous waste.

APCr will be removed from site in enclosed tankers which will minimise the chance of spillage and dust emissions. During the tanker filling operation, displaced air will vent back to the silo and any releases to atmosphere would pass through a fabric filter.

Table 2.11: Key Waste Streams					
Source / Material	Properties of Waste	Storage location / volume stored	Quantity of waste produced (annual estimate)	Disposal Route and Transport Method	Frequency
IBA	Grate ash, grate riddlings. This ash is relatively inert, classified as non-hazardous.	IBA storage bunker.	150,000 tonnes	Sent to the IBA recycling facility adjacent to the ERF for further processing into a secondary aggregate, referred to as Incinerator Bottom Ash Aggregate (IBAA). A small fraction may be unsuitable for reuse and will be transferred off-site for disposal. Transport occurs by road vehicles.	Daily
Fly Ash / APCr	Ash from boiler and dry flue gas treatment, may contain some unreacted lime	APCr residue silos.	25,000 tonnes	Recycled or disposed of in a licensed site for hazardous waste. Transport occurs by road vehicle.	Daily

2.10 Management

The Facility will be designed and constructed following the latest international and national regulations, standards and guidance. This will incorporate risk management techniques such as HazOp studies prior to construction and thorough commissioning and testing before facility takeover.

Covanta will ensure that continued Safety, Health and Environmental excellence will be ensured by employing the latest management best practice as outlined below.

2.10.1 Management systems

As part of its ongoing commitment to sustainable and responsible development and to regulatory compliance, Covanta has developed and implemented a documented EMS. Measures are undertaken to ensure that this is communicated, understood and effectively maintained throughout the organisation to meet the requirements of the BS EN ISO 14001:2004 Environmental Management System Standard.

Covanta will develop a management structure and a site specific EMS certified to ISO 14001. The EMS is part of the facility's integrated management system that establishes an organisational structure, responsibilities, practices, procedures and resources for achieving, reviewing and maintaining the company's commitment to environmental protection. Covanta regards the ISO 14001 certification to be of considerable importance and relevance to a waste treatment facility. It is an assurance to the local authority, regulator, neighbours, and others alike that the facility operation is undertaken in strict compliance with the regulations in force and with the management seeking continual improvements. It requires the company to work in a transparent way, to maintain and improve the confidence of regulators and neighbours, and to have a proactive approach to environmental improvement.

2.10.1.1 Scope and structure

The scope of Covanta's current certification to ISO 14001 is for Covanta Energy's current operations. The scope will be extended to cover the operational Rookery Pit facility.

2.10.1.2 General Requirements

The EMS objectives and scope will ensure that the EMS includes the following requirements:

(1) identifying potential environmental impacts;

(2) documenting and implementing standard procedures to mitigate and control these impacts;

(3) determining a procedural hierarchy that considers the interaction of the relevant processes;

(4) ensuring adequate responsibility, authority and resources to management necessary to support the EMS;

(5) establishing performance indicators to measure the effectiveness of the procedures;

(6) monitoring, measuring and analysing the procedures for effectiveness; and

(7) implementing actions as required based on the results of auditing to ensure continual improvements of the processes.

2.10.1.3 Personnel

Sufficient numbers of staff, in various grades, will be required to manage, operate and maintain the plant on a continuous basis, seven days per week throughout the year. The plant will be managed, operated and maintained by experienced managers, boiler operators and maintenance staff.

The key environmental management responsibilities will be allocated as described below.

(1) The General Manager will have overall responsibility for management of the ERF and compliance with the operating permit. The general manager will have extensive experience relevant to his responsibilities.

(2) The Operations Managers will have day-to-day responsibility for the operation of the plant, to ensure that the plant is operated in accordance with the permit and that the environmental impact of the plant's operations is minimised. In this context, he or she will be responsible for designing and implementing operating procedures which incorporate environmental aspects.

(3) The Maintenance Manager will be responsible for the management of maintenance activities, for maintenance planning and for ensuring that the plant continues to operate in accordance with its design.

2.10.1.4 Competence, Training and Awareness

Covanta aims to ensure that any persons performing tasks for it, or on its behalf, which have the potential to cause significant environmental impact are competent on the basis of appropriate education and training or experience.

Covanta's EMS will contain a training procedure to make employees aware of:

(1) the importance of conformity with the environment policies and procedures and with the requirements of the EMS;

(2) potentially significant environmental aspects associated with their work;

(3) their roles and responsibilities in achieving conformity with the requirements of the EMS, including emergency preparedness and response requirements;

(4) the relevance and importance of their activities and how they contribute to the achievement of the environmental and quality objectives; and

(5) the potential consequences of the departure from specified procedures.

Covanta will comply with industry standards or codes of practice for training (e.g. WAMITAB), where they exist. The EMS will contain an archiving procedure to ensure all training is recorded and all associated records are retained.

2.10.1.5 Competence

Covanta will identify the minimum competencies required for each role. These will then be applied to the recruitment process to ensure that key role responsibilities are satisfied. Covanta will pay particular attention to potential candidate's experience, qualifications, knowledge and skills.

2.10.1.6 Induction and Awareness

Staff induction programmes are location and job role specific and will include, as a minimum, the induction of:

(1) the Environmental Policy;

(2) the requirements of the Environmental Permit;

(3) the Health and Safety Policy and Procedures; and

(4) the EMS Awareness Training.

2.10.1.7 Training

Covanta will be required to train staff during commissioning of the Rookery South ERF and before the plant is operational. Line Managers will be required to identify and monitor staff training needs as part of the appraisal system.

Training records will be maintained onsite. Where applicable, will be required to comply with industry standards or codes of practice for training (e.g. WAMITAB), where they exist.

2.11 Closure

The planning permission for the Rookery South ERF has no finite date for the end of operations or closure. During operations there will be a continuous programme of preventative and life cycle maintenance that will ensure the replacement of key components at appropriate stages. In this way, the plant will continue to operate to the same standards required by the Environmental Permit for many years. When the ERF reaches the end of its operational life, for whatever reason, and is proposed to be closed, it may be adapted for an alternative use, or demolished as part of a redevelopment scheme and the site cleared and left in a fit-for-use condition. These proposals would be subject to a new planning permission.

2.12 General

Covanta recognises the need to ensure that the design, the operation and the maintenance procedures facilitate decommissioning in a safe manner without risk of pollution, contamination or excessive disturbance to noise, dust, odour, ground and water courses.

To achieve this aim, a site closure plan will be prepared at the appropriate time. It is anticipated that the closure plan will include the information listed below.

2.12.1 Site closure plan

The following is a summary of the measures to be considered within the closure plan to ensure the safe and clean decommissioning of the facility.

2.12.1.1 General requirements

- Underground tanks and pipework to be avoided except for supply and discharge utilities such as Towns Water, sewerage lines and grid connections.
- Safe removal of all chemical and hazardous materials.
- Adequate provision for drainage, vessel cleaning and dismantling of pipework.
- Disassembly and containment procedures for insulation, materials handling equipment, material extraction equipment, fabric filters and other filtration equipment without significant leakage, spillage, dust or hazard.
- The use of recyclable materials where possible.
- Methodology for the removal/decommissioning of components and structures to minimise the exposure of noise, disturbance, dust and odours and for the protection of surface and groundwater.
- Soil sampling and testing of sensitive areas to ensure the minimum disturbance (sensitive areas to be selected with reference to the Site Condition Report).

2.12.1.2 Specific details

- A list of recyclable materials/components and current potential outlet sources.
- A list of materials/components not suitable for recycle and potential outlet sources.
- A list of materials to go to landfill with current recognised analysis, where appropriate.
- A list of all chemicals and hazardous materials, location and current containment methods.
- A Bill of Materials detailing total known quantities of items throughout the site such as: steelwork; plastics; cables; concreate and civils materials; oils; chemicals; consumables; contained water and effluents; and IBA and FGT residues.

2.12.1.3 Disposal routes

Each of the items listed within the Bill of Materials will have a recognised or special route for disposal; e.g. Landfill by a licensed contractor, disposal by high sided, fully sheeted road vehicle or for sale to a recycling company, disposal by skip/fully enclosed container, recycling company to collect and disposal by container.

2.13 Improvement programme

Covanta are committed to continual environmental improvement and are therefore suggesting the following improvement conditions be incorporated into the Environmental Permit.

2.13.1 Pre-Commissioning

Prior to the commencement of commissioning Covanta will:

(1) provide a written commissioning plan, including timelines for completion, for approval by the EA. The commissioning plan will include the expected emissions to the environment during the different stages of commissioning, the expected durations of commissioning activities and the actions to be taken to protect the environment and report to the EA in the event that actual emissions exceed expected emissions. Commissioning will be carried out in accordance with the commissioning plan as approved.

(2) submit a written report to the EA detailing the waste acceptance procedure to be used at the site. The waste acceptance procedure will include the process and systems by which wastes unsuitable for incineration at the site will be controlled. The procedure will be implemented in accordance with the written approval from the EA.

(3) provide a report with detailed plans to the EA for site infrastructure, including details for underground structures and storage tanks.

(4) Submit a report which confirms to the EA, the NOx abatement techniques to be employed within the final design of the Installation. The report will confirm whether FGR has been included in the final design.

(5) The report will describe the performance of the Selective Non-Catalytic Reduction (SNCR) system design and combustion settings to minimise oxides of nitrogen (NOx) emissions within the IED emission limit values described in this permit with the minimisation of nitrous oxide emissions. after completion of furnace design and before any furnace operation, submit a written report to the EA of the details of the computerised fluid dynamic (CFD) modelling. The report will demonstrate whether the design combustion conditions comply with the residence time and temperature requirements as defined by the Waste Incineration Directive.

(6) send a summary of the site Environment Management System (EMS) to the EA and make available for inspection all documents and procedures which form part of the EMS. The EMS will be developed in line with the requirements of "How to comply with your Environmental Permit (EPR 1.00)", and will include a written accident management plan, and site closure plan. The documents and procedures set out in the EMS shall form the written management system referenced in condition 1.1.1 (a) of the permit.

(7) submit to the EA for approval a protocol for the sampling and testing of incinerator bottom ash for the purposes of assessing its hazard status. Sampling and testing will be carried out in accordance with the protocol as approved.

2.13.2 Post commissioning

Following the commissioning of the Rookery South ERF, Covanta will:

(1) within 12 months of the date on which waste is first burnt, submit a written report to the EA on the implementation of the EMS and the progress made in the accreditation of the system by an external body, or if appropriate submit a schedule by which the EMS will be subject to accreditation.

(2) within 6 months of the completion of commissioning, submit a written proposal to the EA to carry out tests to determine the size distribution of the particulate matter in the exhaust gas emissions to air from emission points A1 to A3, identifying the fractions within the PM_{10} and $PM_{2.5}$ ranges. The proposal will include a timetable for approval by the EA to carry out such tests and produce a report on the results. On receipt of written agreement by the EA to the proposal and the timetable, Covanta shall carry out the tests and submit to the EA a report on the results.

(3) within 4 months of the completion of commissioning, submit a written report to the EA summarising the environmental performance of the ERF as installed against the design parameters set out in the Application. The report shall also include a review of the performance of the ERF against the conditions of the Environmental Permit and details of procedures developed during commissioning for achieving and demonstrating compliance with permit conditions.

(4) within 4 months of the completion of commissioning, carry out checks to verify the residence time, minimum temperature and oxygen content of the exhaust gases in the furnace whilst operating under the anticipated most unfavourable operating conditions. The results will be submitted in writing to the EA.

(5) within 4 months of the completion of commissioning, submit a written report to the EA describing the performance of the Selective Non Catalytic Reduction (SNCR) system and combustion settings to minimise oxides of nitrogen (NOx) emissions within the emission limit values described in the Environmental Permit.

(6) within 15 months from commencement of operations, carry out an assessment of the impact of emissions to air for the following component metals subject to emission limit values: Cd, As, Cr(VI) and Ni. A report on the assessment will be submitted to the EA. Emissions monitoring data obtained during the first year of operation will be used to compare the actual emissions with those assumed in the impact assessment submitted with the Application. An assessment shall be made of the impact of each metal against the relevant EAL. In the event, the assessment shows that an EAL can be exceeded, the report shall include proposals for further investigative work.

(7) submit a written summary report to the EA to confirm by the results of calibration and verification testing that the performance of Continuous Emission Monitors for the parameters specified in the Environmental Permit complies with the requirements of BS EN 14181. The initial calibration report will be submitted to the EA within 3 months of completion of commissioning. The full summary evidence compliance report will be submitted within 18 months of commissioning.

(8) undertake a noise assessment during normal operations to validate the assessment provided within the Application. The assessment will be undertaken in accordance with the procedures given in BS4142: 1997 (Rating industrial noise affecting mixed residential and industrial areas) and BS7445: 2003 (Description and measurement of environmental noise), or other methodology as agreed with the EA. The assessment shall include, but not be limited to: a review of the noise sources from the facility; a review of noise levels from static plant; and considerations of on-site vehicle movements. A report shall be provided to the EA detailing the findings of the assessment.

Annex 1 – Plans and Drawings

Annex 2 – Site Condition Report

Annex 3 – Noise Assessment

Annex 4 – Air Quality Assessment

Annex 5 – BAT Assessment

Annex 6 – Environmental Risk Assessment

Annex 7 – Heat Study

Annex 8 – Fire Prevention Plan

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