Riverside Energy Park

Environmental Permit Appendices

APPENDIX:

I

ODOUR MANAGEMENT PLAN

December 2018 | Revision 0

CORY
RIVERSIDE ENERGY

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Executive Summary

1.1.1 Cory Environmental Holdings Limited (trading as Cory Riverside Energy) (Cory or the Applicant) is applying to the Environment Agency (EA) under The Environmental Permitting (England and Wales) Regulations 2016 (Environmental Permitting Regulations) for an Environmental Permit (EP) to operate an integrated Energy Park, to be known as Riverside Energy Park (REP or the Proposed Development). REP would comprise waste treatment facilities together with an associated Electrical Connection.

1.1.2 The aim of this report will be to detail the provisions which will be taken into account during the design phase of REP to manage the risk of the operation of the installation leading to an odour nuisance to the public.

1.1.3 As required by EA Guidance Note, titled '*How to Comply with your Environmental Permit*', an Odour Management Plan (OMP) will be mandatory when applying for a permit for an anaerobic digestion facility such as that proposed for REP. This report identifies the odour management controls proposed to be incorporated into the design of REP.

1.1.4 REP has been designed in accordance with the recommended best practice and UK odour management guidance, including the following:

- Sector Guidance Note IPPC S5.06: Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste, Environment Agency;
- EA Guidance Note H4: Odour Management - How to comply with your environmental permit;
- An industry guide for the prevention and control of odours at biowaste processing facilities, The Composting Association, 2007; and
- Odour Guidance for Local Authorities, DEFRA, March 2010[1].

1.1.5 The potential point source releases of odour from the REP are:

- the main stack which would emit combustion gases from the ERF;
- the stack for the biogas engine; and
- the biogas flare.

1.1.6 The potential sources of fugitive emissions of odour are:

- deliveries of waste for processing;
- the anaerobic digestion process, in three sections:

i. waste reception;

ii. anaerobic digestion process; and

iii. digestate storage area.

[1] The Odour Guidance for Local Authorities has been withdrawn. In the absence of an alternative the guidance will still be considered to be applicable.

- biogas storage;
- the ERF waste bunker; and
- the ash storage area.

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

1.1.8 There are a limited number of sensitive receptor locations within 1 km of the Installation Boundary, on the south side of the River Thames, refer to Appendix A.1. The closest residential receptors, on the north side of the River Thames, are located more than 1.5 km from the Installation Boundary.

1.1.9 Arrangements and responsibilities for monitoring of odour at the Installation Boundary have been identified.

1.1.10 Systems are proposed to be developed that would investigate reported odour complaints and set out actions to resolve the odour issues identified and implement actions to prevent re-occurrence of complaints.

1.1.11 A system for the periodic review of this OMP has been proposed following completion of detailed design. Any required changes to the requirements will need to be formally agreed with the Environment Agency prior to their implementation.

1 Introduction

1.1.1 Cory Environmental Holdings Limited (trading as Cory Riverside Energy) (Cory or the Applicant) is applying to the Environment Agency (EA) under The Environmental Permitting (England and Wales) Regulations 2016 (Environmental Permitting Regulations) for an Environmental Permit (EP) to operate an integrated Energy Park, to be known as Riverside Energy Park (REP or the Proposed Development). REP would comprise waste treatment facilities together with an associated Electrical Connection.

1.2 Project Description

1.2.1 A detailed description of REP is presented in Sections 2.2 to 2.4 of this report. REP would be constructed on land immediately adjacent to Cory's existing Riverside Resource Recovery Facility (RRRF), within the London Borough of Bexley and would complement the operation of the existing facility.

1.2.2 The main elements of REP would be as follows:

- Energy Recovery Facility (ERF): to provide thermal treatment of Commercial and Industrial (C&I) residual (non-recyclable) waste with the potential for treatment of (non-recyclable) Municipal Solid Waste (MSW);
- Anaerobic Digestion facility: to process food and green waste. Outputs from the Anaerobic Digestion facility would be transferred off-site for use in the agricultural sector as fertiliser or as an alternative, where appropriate, used as a fuel in the ERF to generate electricity;
- Solar Photovoltaic Installation: to generate electricity. Installed across a wide extent of the roof of the Main REP Building;
- Battery Storage: to store and supply additional power to the local distribution network at times of peak electrical demand. This facility would be integrated into the Main REP building; and
- On Site Combined Heat and Power (CHP) Infrastructure: to provide an opportunity for local district heating for nearby residential developments and businesses. REP would be CHP Enabled with necessary on site infrastructure included within the REP site.

1.3 Background

1.3.1 The purpose of this report will be to detail the provisions which will be taken into account during the design phase of REP to manage the risk of the operation of the installation leading to an odour nuisance to the public.

1.3.2 As required by EA Guidance Note: How to Comply with your Environmental Permit, this document provides an Odour Management Plan (OMP) to support the REP permit application. This report identifies the odour management controls proposed to be incorporated into the design of REP. However, REP will be subject to detailed design; therefore, this report will be subject to review following completion of detailed design. It will be proposed that a Pre-operational Improvement Condition will be included within the EP which requires a revised OMP to be submitted to and approved by the Environment Agency (EA) prior to commencement of operation.

1.3.3 REP has been designed in accordance with the recommended best practice and UK odour management guidance, including the following:

- EA Sector Guidance Note *'IPPC S5.06: Guidance for the Recovery and Disposal of Hazardous and Non Hazardous Waste'*;
- EA Guidance Note '*H4: Odour Management - How to comply with your environmental permit*';
- An industry guide for the prevention and control of odours at biowaste processing facilities, The Composting Association; and
- Odour Guidance for Local Authorities, DEFRA, March 2010[2].

1.4 Report Structure

1.4.1 In accordance with the EA Guidance Note '*H4: Odour Management - How to comply with your environmental permit*', this report has been developed using the following structure:

- Section 2, will be a detailed description of the site and the operations to be undertaken;
- Section 3, presents a review of potential odour sources, pathways and receptors;
- Section 4, details the proposed odour management and control measures;
- Section 5, details the requirements for odour monitoring;
- Section 6, considers abnormal events and appropriate response measures;
- Section 7, details the complaints and contingency procedures; and
- Section 8, the proposed timescales for review and update of this OMP have been set out.

[2] The Odour Guidance for Local Authorities has been withdrawn. In the absence of an alternative the guidance will still be considered to be applicable.

2 Site Location and Description

2.1 The Site

The Activities

2.1.1 Activities covered by this application include:

iv. Twin line waste combustion ERF, processing incoming waste which would predominantly be delivered to REP by river. The ERF would:

- generate power and export electricity to the local electricity distribution network and have the potential to export heat from the ERF;
- produce an inert bottom ash material (referred to as Incinerator Bottom Ash (IBA)) that would be transferred off-site to a suitably licensed waste treatment facility for recovery/disposal; and
- generate an Air Pollution Control Residue (APCR) that would be transferred to a suitably licensed hazardous waste facility for disposal or recovery.

v. The anaerobic digestion of organic waste to produce a biogas which will be preferably be upgraded to Compressed Natural Gas (CNG) (or otherwise used in a "CHP engine") and a digestate which will be suitable to be applied to land as a soil conditioner.

2.1.2 The following table lists the Schedule 1 activities, from the Environmental Permitting Regulations, and the directly associated activities.

Table 2-1: Permitted Activities

Type of Activity	Schedule 1 Activity	Description of Activity
Installation	Section 5.1 Part A1 (b)	The combustion of non-hazardous waste in a waste incineration plant with a nominal design capacity of greater than 3 tonnes per hour (Line 1).
Installation	Section 5.1 Part A1 (b)	The combustion of non-hazardous waste in a waste incineration plant with a nominal design capacity of greater than 3 tonnes per hour (Line 2).
Installation	Section 5.4 Part A1 (b)	Recovery or a mix of recovery and disposal of non-hazardous waste with a capacity exceeding 100 tonnes per day, as the waste treatment activity will be anaerobic digestion, involving biological treatment.
Directly Associated Activities		The receipt, storage and handling of municipal and commercial and industrial waste prior to incineration.
Directly Associated Activities		The receipt, storage and handling of organic waste prior to anaerobic digestion.

Directly Associated Activities		The handling, storage and transfer of residues (Incinerator Bottom Ash (IBA), Air Pollution Control Residue (APCR) and digestate for transfer off-site.
Directly Associated Activities		The export of electricity and potential export of heat from the Installation.

2.2 The Energy Recovery Facility (ERF)

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

2.2.2 The turbine would be designed to generate up to 67.6 megawatts (MWe) and up to 30 MWth of heat. The ERF would have an estimated parasitic load of 6.1 MWe. Therefore, the maximum export capacity of the ERF would be 61.5 MWe.

2.2.3 The ERF has been designed to thermally treat incoming waste with a range of net calorific values (NCV's). The nominal design capacity of the thermal treatment lines would be approximately 41 tonnes per hour of waste, with an average NCV of 9 MJ/kg. The ERF would have an assumed availability of approximately 8,000 hours per annum. On this basis, the ERF would have a nominal design capacity of approximately 655,000 tonnes per annum. However, allowing for an availability of 8,760 hours per annum and variability of incoming waste (NCV 7 – 13 MJ/kg), the maximum throughput of the ERF will be approximately 805,920 tonnes per annum.

2.2.4 An indicative process diagram for the ERF will be presented in Figure 1.

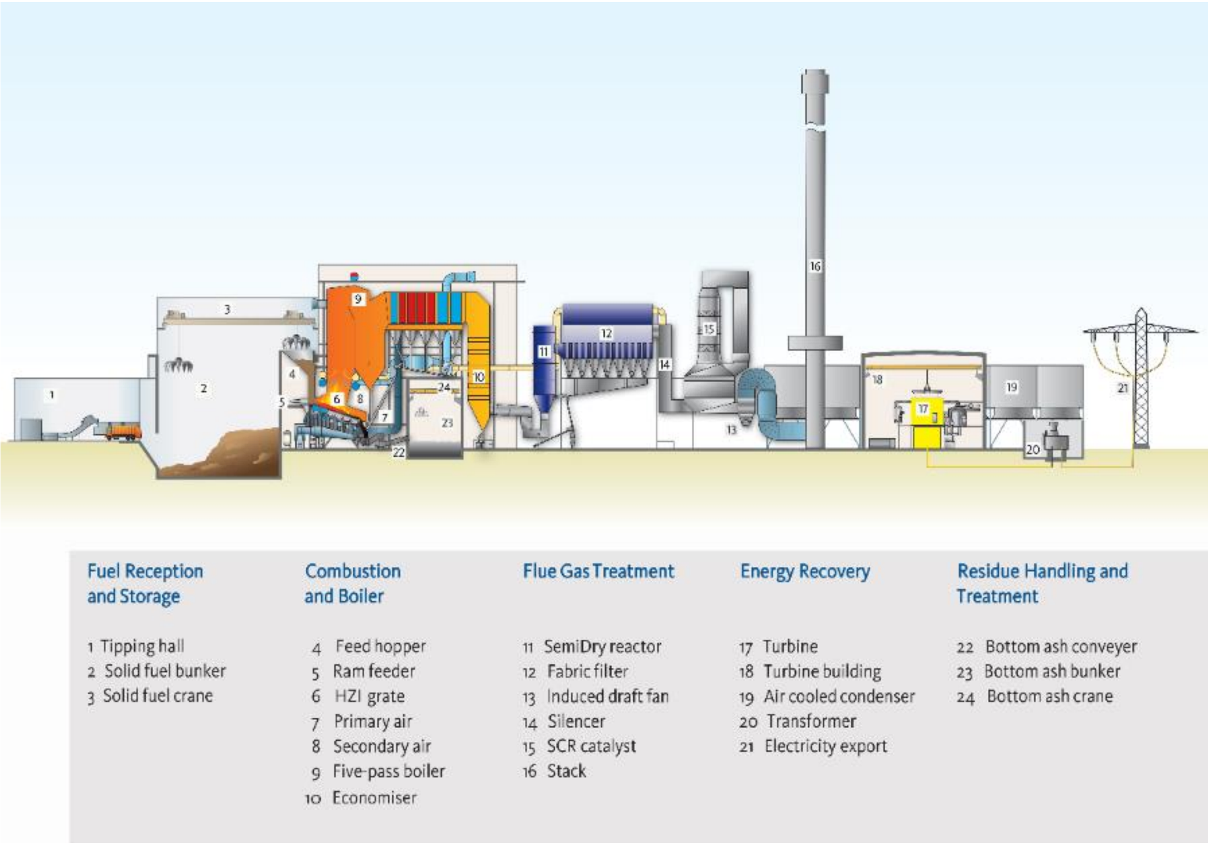


Figure 1 – Indicative Schematic of the ERF

Raw Materials

2.2.5 The preferred option will be for the majority of the incoming waste to REP to be delivered by barge with a smaller proportion being delivered by road. If delivered by barge the waste would be delivered to the existing jetty that currently serves the RRRF, using standard ISO containers. The containers would be lifted off the barges by the existing cranes. From the jetty the containers would be transferred into road vehicles for delivery to the waste reception area. All incoming waste delivery vehicles would be weighed in at the weighbridge, before being directed to the tipping hall.

2.2.6 The tipping hall would be a fully enclosed building, maintained under slight negative pressure to ensure that no odours, dust or litter can escape the building. The incoming waste delivery vehicles would tip into a refuse bunker. A grab would transfer the waste from the ERF bunker to the feed chute of the furnace. The grab would also be used to homogenise the incoming waste and to identify and remove any unsuitable or non-combustible items.

2.2.7 Hydrated lime would be used to react with the acid gases in the flue gas cleaning process. Lime will be stored in silos. The lime would be delivered by tanker and offloaded pneumatically by means of the on board truck compressor into the silo. The displaced air from the silo would be vented to atmosphere through a fabric filter located on the top of the silo.

2.2.8 Powdered activated carbon (PAC) used for the adsorption of volatile heavy metals and organic components would be added with the lime. PAC would be stored in silos. PAC would be pneumatically transferred from the delivery truck by means of an on board compressor. As with the lime, the exhaust air would be de-dusted using a fabric filter located on the top of the silo.

2.2.9 Ammonia solution (25% concentration) would be used as a reagent for NO_x abatement in the NOx abatement system. Ammonia would be delivered and stored in a tank in a designated storage area.

2.2.10 Demineralised water would be supplied from an onsite demineralisation plant. It would be used to supply the steam cycle.

2.2.11 Various maintenance materials (oils, greases, insulants, antifreezes, welding and fire-fighting gases etc.) would be stored in an appropriate manner.

Combustion Process

2.2.12 The combustion chamber would use a moving grate which would agitate the fuel bed to promote a good burnout of the waste and a uniform heat release. Primary combustion air would be drawn from the tipping hall to minimise odour issues from stored waste in the waste bunker and fed into the combustion chamber beneath the grate.

2.2.13 Secondary combustion air would be injected into the flame body above the grate to create turbulence and facilitate the complete combustion of waste on the grate.

2.2.14 The combustion chamber would be provided with auxiliary burners that burn fuel oil. Their purpose would be to raise the combustion chamber temperature to the minimum 850°C prior to the feeding of waste into the combustion chamber. There would be interlocks preventing the charging of waste until the temperature within the combustion chamber has reached a minimum 850°C. During normal operation, if the temperature falls below 850°C, the burners would again be initiated to maintain the temperature above this minimum. Air flow for combustion would be controlled by measuring excess oxygen content in the flue gas. This would be set to maximise the efficiency of the heat recovery process while maintaining the combustion efficiency.

2.2.15 Bottom ash would fall from the grate into the discharger which comprises a water bath followed by a chute inclined upwards that forms a water seal preventing uncontrolled air ingress to the combustion chamber from the boiler house. The water would serve as a quench and makes it possible to remove the cooled bottom ash without dust or odour issues. The bottom ash would be deposited into an enclosed IBA bunker within the REP building where it would be stored prior to being transferred offsite.

Energy Recovery

2.2.16 Heat would be recovered from the flue gases by means of a water tube boiler integral with the furnace. Heat would be transferred through a series of heat exchangers. The hot gases from the furnace would first pass through evaporators that generate the steam. The hot flue gases would then pass into the boiler. The boiler would consist of five passes containing evaporative tubes, primary and secondary superheaters and an economiser. At the boiler outlet the flue gases would pass through an external economiser which controls the flue gas temperature to approximately 160°C. The boiler economisers would be used to pre-heat the evaporator feedwater supply. The cooling medium in the external economiser would be condensate from the air-cooled condensers. The flue gas temperature would be reduced quickly through the critical range where dioxin reformation can occur.

2.2.17 Superheated steam at 73.5 bar-a and 439°C will would supplied to a high efficiency turbine which, through a connecting shaft, turns a generator to produce electricity. The turbine would have a series of extractions at different pressure that are used for preheating air and water in the steam cycle. The remainder of the steam would passe out of the final low pressure condensing stage. The exhaust steam would be condensed to water in the air-cooled condensers.

2.2.18 REP would be capable of exporting heat to nearby heat users. Depending on the requirements of the heat users either high pressure steam or hot water could be supplied. Steam exiting the turbine could be passed through an onsite heat exchanger to heat up water for use in a local heat network.

Gas Cleaning

2.2.19 After the heat recovery stage, the flue gas would pass to the flue gas treatment (FGT) plant. The method chosen is known as dry FGT and uses hydrated lime to reduce the concentrations of acid gases, such as SO_x and HCl, in the flue gas stream. This abatement technology has the benefit that it does not produce a liquid effluent. Energy recovery would be more efficient as additional heat in the boiler flue gas will not be required to evaporate water as in a semi-dry or conditioned FGT process.

2.2.20 PAC would be used as an adsorbent to remove volatile metals, dioxins and furans. Both PAC and lime would be held in dedicated storage silos and transported pneumatically and mixed in line and introduced to the flue gas stream through a common injection point. The flue gases containing the reagents pass through a reaction loop and into a fabric bag filter arrangement where reaction products and un-reacted solids are removed from the stream. The residues would cake the outside of the filter bags, with the units regularly cleaned by pulsing compressed air through the filter bags.

2.2.21 Residues collected by the bag filters would be transferred via an enclosed conveyor to a silo from where it would be recycled back into the flue gas stream at the top of the reaction loop. The acid gas reagent flow rate would be controlled by the upstream acid gas pollutant concentration measurements and proportioned to the volumetric flow rate of the flue gases. As fresh reagents are added an equivalent amount of residues collected from the bag filters would be removed.

2.2.22 There would be online monitoring of the pressure drop within bag filter compartments to identify if there has been bag filter failure. If a pressure drop is identified, bag filter compartments would be isolated to prevent uncontrolled emissions and repaired before being brought back on-line. If necessary, the ERF would be capable of operating at full capacity with one bag offline whilst maintenance was undertaken.

2.2.23 The abatement of oxides of nitrogen (NOx) would be achieved by a selective catalytic reduction (SCR) system. NOx will be formed at high temperatures within the boiler from nitrogen in the waste and in the combustion air. The SCR system would be located in the flue gas stream after the bag filter, as particulates within the flue gases will ‘spoil’ the catalyst. As the flue gases will be at a lower temperature than the optimum temperature for an SCR system, the flue gas must be heated before the SCR system, by means of steam extraction from the turbine or auxiliary fuelled burners. This will be subject to detailed design of the SCR system. The ammonia solution would be injected into the flue gases immediately upstream of a reactor vessel containing layers of catalyst.

2.2.24 The cleaned gas would be monitored for pollutants and discharged to atmosphere via a 90 m stack.

Emissions Monitoring

2.2.25 Emissions from the stack would be continuously monitored for:

- particulates;

- sulphur dioxide;
- hydrogen chloride;
- carbon monoxide;
- nitrogen oxides;
- hydrogen fluoride;
- ammonia; and
- Volatile Organic Compounds (VOCs), expressed as total organic carbon.

2.2.26 In addition, the oxygen content, water vapour content, temperature and pressure of the flue gases would be monitored so that the emission concentrations can be reported at the reference conditions required by the Industrial Emissions Directive (IED).

2.2.27 In addition, periodic sampling and measurement would be carried out for:

- Metals [cadmium (Cd), thallium (Tl), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni), vanadium (V)];
- nitrous oxide;
- dioxins and furans; and
- dioxin like PCBs.

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

2.2.29 The Continuous Emission Monitoring System (CEMS) would be accredited to the Environment Agency's MCERTS standard. There would be a back-up CEMS system available in the unlikely case of CEMS failure.

Emergency Generators

2.2.30 A Low Voltage (LV) standby diesel generator would be provided to support safe shut down of the ERF and associated critical loads in the event of a power failure or fault on the electricity supply network.

Process Effluents

2.2.31 Under 'normal operations' there would not be any process emissions to water from the ERF. Where practicable, waste waters generated from the process would be re-used/recycled within the process. Process effluents, and surface water/and wash down waters collected from internal process areas will be collected in a process effluent system. The process effluents would be collected within the sedimentation tank for re-use.

2.3 The Anaerobic Digestion Plant

2.3.1 The anaerobic digestion plant would operate a single anaerobic digestion line fed with organic material. The anaerobic digestion plant would have a design capacity of approximately 40,000 tonnes per annum. The biogas generated by the anaerobic digestion plant would be upgraded to a CNG and/or upgraded for injection into a local gas network. CNG would be the preferred option if feasible and viable. However, if a CNG option is not progressed then REP will incorporate a "CHP engine" which would use the biogas to generate electricity and heat, which could be used to support the anaerobic digestion process or added to energy available for export from REP. As the combustion of biogas in an engine on site would be part of the regulated anaerobic digestion activity, for the purpose of this application, biogas combustion has been detailed within the operating techniques within this application.

2.3.2 In addition, the digestate from the anaerobic digestion plant would be dried in a belt drier, and processed (through maturation) in the same storage and loading area until it achieves compliance to standards that would be required before use in agriculture or for onward transportation to a further maturation facility.

2.3.3 An indicative process schematic for the anaerobic digestion plant will be presented in Figure 2.

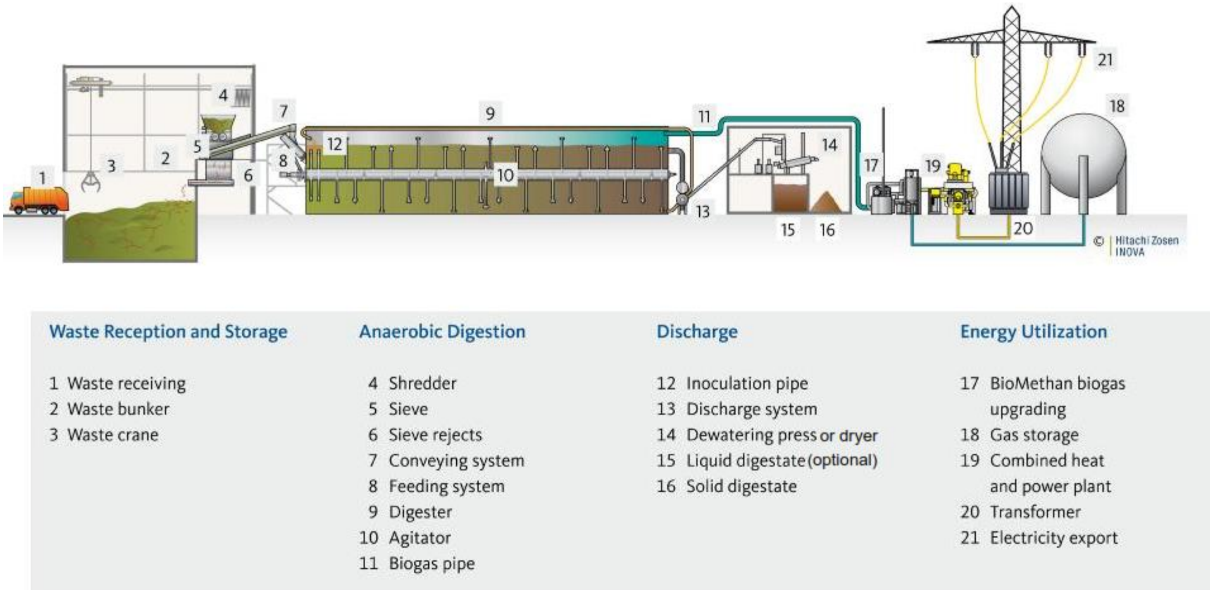


Figure 2 – Indicative schematic of the anaerobic digestion plant

Raw Materials

2.3.4 Organic waste would be delivered to REP by road. All incoming organic waste delivery vehicles would be weighed in at the weighbridge, before being directed to the tipping hall.

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

Anaerobic Digester

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

2.3.7 The anaerobic digestion process would take place at a dry solids content of 35 – 45% and an optimum temperature of 57°C. The digester will be a horizontal cylinder. The digester would be constructed of steel, and clad in a weather-proof housing which would be insulated to reduce heat losses from the digester. The digester would also comprise a central heat distribution system to reach and maintain the process temperature.

2.3.8 The biological process involves several steps, each requiring a different type of bacteria, but essentially the organic material will be broken down in the following way:

$$C_6H_{12}O_{6(s)} \rightarrow 3CO_{2(g)} + 3CH_{4(g)}$$

The digester would be installed with an agitator located inside the digester for mixing. The organic waste would move slowly horizontally across the digester, with the residue withdrawn from the digester at the digester outlet. The average retention time of organic material in the digester would be 14 days.

2.3.9 The residue would leave the digester through the outlet and some would be transported by extraction screw to the feeding pump, where it functions as inoculum and would be brought back into the digester in this way. The remaining residue would be diverted by screws towards the extraction pump, which transfers it to be dewatered. The biogas arising from the anaerobic degradation would accumulate above the residue in the digester and would be removed through the biogas outlets.

2.3.10 On-line measurements of temperature, biogas pressure, hydrogen sulphide and biogas flow rate would be recorded for process control, with high level indications linked to alarms in the system.

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

2.3.12 Whilst the anaerobic digestion plant will be subject to detailed design, it assumed that:

- any significant pressure variations would result in an alarm notifying the operator; and
- pressure release valves (for over and under pressure protection) would not be connected to the alarm system on anaerobic digestion facilities; and
- pressure release valves (for over and under pressure protection) would be manual ‘dumb’ systems (spring loaded, weighted disc or burst disc).

Digestate Dewatering

2.3.13 The digestate would be transferred in an enclosed conveying system from the digester to the digestate dewatering system. The digestate dewatering system would be an enclosed containerised system. The digestate would be transferred into a hopper. The digestate would fall from the hopper onto a belt drier. Hot air would be blown through the digestate pile on the belt drier to evaporate-off moisture from the digestate. The moisture from the drier would be ducted to the ERF to be combusted as combustion air.

2.3.14 The dried digestate would be processed (through maturation) in the digestate storage area until it achieves compliance to standards that would be required before use in agriculture, or for onward transportation to a further maturation facility.

Biogas storage

2.3.15 Due to the anaerobic digestion of organic material in the digester, biogas would be continuously produced. The biogas would accumulate in the digester above the residue and flows, through the difference in pressure, to gas storage.

2.3.16 Biogas would be stored in a double-membrane storage tank. The inner membrane would contain the gas and the outer membrane provides weather protection.

2.3.17 The volume of biogas within the inner membrane would vary depending on gas production and consumption rates. Air blowers and release valves would maintain the pressure between the two membranes such that the outer membrane retains a constant size and the gas within the inner membrane remains at a constant pressure. The pressure would be controlled at a lower pressure than the digester to ensure a constant flow of gas to the gas storage tank.

2.3.18 In periods of excess biogas generation or emergency situations, biogas would be diverted to a flare stack which will be controlled by pressure sensors in the gas storage tank. The flare would be designed to meet the requirements for landfill gas flares, which state that the flue gas must be maintained at or above 1000°C for at least 0.3 seconds. Therefore, emissions from the flare would not be required to be routinely monitored.

2.3.19 Ultimate overpressure protection for the gas storage tank would be provided by a pressure release valve.

2.3.20 The biogas storage tank would provide two functions; maintaining a minimum biogas amount, so that biogas can always flow back to the digester in case of under pressure; and levelling off of biogas peaks.

Outputs

2.3.21 The anaerobic digestion plant would produce approximately 460 Nm^3 per hour biogas with a net calorific value of 19.8 MJ/Nm^3. The biogas would typically contain an average minimum of 55% methane and 45% carbon dioxide. The biogas would also contain traces of hydrogen sulphide and water vapour. For the purpose of this application the controls associated with the combustion of the biogas in a biogas engine have been described.

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

Biogas Clean-up

2.3.23 Hydrogen sulphide (H2S) would be removed from the biogas produced, in order to avoid corrosion and to reduce sulphur concentrations within the biogas. This would ensure that the biogas will be suitable to be upgraded to a CNG or combusted in a biogas engine. Whilst the selection of reagents within the anaerobic digestion plant would be subject to detailed design, either ferric chloride or ferric hydroxide would be dosed into the digester to reduce H2S concentrations within the biogas. In addition, there would be a chiller and carbon filter system prior to combustion of the biogas.

2.3.24 Cory's preferred option, if feasible and viable, would be for the biogas to be upgraded to a CNG. Alternatively, it could be upgraded to be injected into the local gas network. The final decision on these options would be subject to REP securing development consent and an EP.

2.3.25 If the biogas is proposed to be upgraded, it will be compressed and sent through additional filters to further refine the biogas and remove other impurities which may foul the separation membranes. The temperature would be adjusted to ensure correct operating temperature for the membrane system. The biogas would then be separated into a product gas (methane rich) and a sour gas (mostly carbon dioxide) using membrane separation. The carbon dioxide would be released to atmosphere and the methane would be subject to calorific value adjustment by addition of propane, as required to convert to a CNG.

2.3.26 If the biogas is upgraded to CNG, following refining, it would be compressed to high pressure and stored in a dedicated pressurised storage vessel. A pressure reduction and dispensing system would be provided for fuelling CNG vehicles.

2.3.27 If the biogas is injected into the local gas network, an odorous chemical may then be added prior to injection into the local gas network using suitably pressurised gas pipeline infrastructure.

Biogas Combustion

2.3.28 If the biogas is combusted into a biogas engine, it would not be 'refined' as set out in the steps described in paragraphs 2.3.23 to 2.3.27, but would instead be passed to a biogas engine for combustion. The biogas engine would have an electrical output of approximately 1MWe. The capacity of the biogas engine(s) will be determined during detailed design.

2.3.29 The generated electrical power generated by the biogas engines would be added into the site network while the excess heat would be used for digester heating and for drying of the digestate, or as additional heat available for local district heating.

2.3.30 An external gas flaring system would ensure that any excess biogas would be combusted (e.g. when biogas utilisation will be stopped or in case of an emergency). This would be expected to occur approximately 10 times a year while the gas upgrading engine is out of service for maintenance and repairs. There would be a separate stack for the flare. It is assumed that the flare stack would be no taller than 14m.

Anaerobic Digestion Odour Abatement

2.3.31 The anaerobic digestion process area would be compartmentalised to limit the total volume of air that requires treatment. The compartments would separate areas of 'clean' or 'dirty' air (i.e. 'clean' being air that naturally circulates around contained anaerobic digestion operating systems within an internal environment that requires little or no treatment prior to ventilation; and 'dirty' being areas of the building where organic waste and digestate, requires air treatment to mitigate fugitive emissions). By controlling and containing the environment(s) within the anaerobic digestion process area, the volume of air requiring treatment / management would be minimised. The anaerobic digestion bunker and the air from the belt drier would be the only 'dirty' air from the anaerobic digestion process.

2.3.32 The anaerobic digestion bunker would be held under negative pressure. Air from the anaerobic digestion bunker would be ducted to the ERF to be used as combustion air. Doors to the anaerobic digestion plant area would remain closed except for those short periods of waste delivery or removal of the reject containers.

2.3.33 Odorous air from the dryer and digestate storage would be ducted to the ERF to be used as combustion air.

Emissions Monitoring

2.3.34 Emissions from the combustion of biogas would be periodically monitored on an annual basis. Periodic monitoring would be undertaken for the following parameters:

- Sulphur dioxide;
- Non methane volatile organic compounds;
- Carbon Monoxide; and
- Nitrogen oxides.

2.3.35 The oxygen, water vapour content, temperature and pressure of the flue gases would also be monitored.

2.4 Ancillary Operations

Surface Water Drainage and Domestic Effluents

2.4.1 Surface water run-off from buildings, roadways and vehicle movement areas would be collected in the surface water drainage system, which would be discharged into surface water attenuation tank. The attenuation tank would limit the flow of surface water run-off from REP. The water from the attenuation tanks would be pumped to interceptors to remove sediments and oils/grease. Having passed though the interceptor, the surface water would be discharged into the existing watercourse to the south east of the Installation Boundary.

2.4.2 Wastewater from domestic uses would be discharged to a package water treatment plant.

3 Review of Potential Sources, Pathways and Receptors

3.1 Odour Sources

3.1.1 An odour is the organoleptic attribute perceptible by the olfactory organ on sniffing certain volatile substances. It is a property of odorous substances that make them perceptible to our sense of smell. The term odour refers to the stimuli from a chemical compound that will be volatilised in air. Odour will be our perception of that sensation and we interpret what the odour means. Odours may be perceived as pleasant or unpleasant. The main concern with odour will be its ability to cause a response in individuals that will be considered to be objectionable or offensive. Odours have the potential to trigger strong reactions for good reason. Pleasant odours can provide enjoyment and prompt responses such as those associated with appetite. Equally, unpleasant odours can be useful indicators to protect us from harm such as the ingestion of rotten food. These protective mechanisms are learnt throughout our lives. Whilst there will be often agreement about what constitutes pleasant and unpleasant odours, there will be a wide variation between individuals as to what will be deemed unacceptable and what affects our quality of life.

3.1.2 An odorant will be a substance which stimulates a human olfactory system so that an odour will be perceived. Odorants may be a single chemical but more typically are a complex mixture of compounds and can also be associated with fine particulates. This complex mix often makes reliable “chemical” analysis or measurement at source difficult. Typically, odours are detected at very low concentrations of chemicals and compounds in air. The human nose will be very sensitive with on average over 5 million scent receptors. Humans can detect concentrations as low as a few parts per billion (ppb), or less in air.

3.1.3 The potential point source releases of odour from the REP would be:

- the main stack which would emit combustion gases from the ERF;
- the stack for the biogas engine; and
- the biogas flare.

3.1.4 The potential sources of fugitive emissions of odour would be:

- deliveries of waste for processing;
- the anaerobic digestion process, in three sections:

vi. waste reception;

vii. anaerobic digestion process; and

viii. digestate storage area.

- biogas storage;
- the ERF waste bunker; and
- the ash storage area.

3.2 Pathways

3.2.1 Odours emitted from the sources identified are emitted to air and have the potential to be conveyed to nearby receptors via transfer through the air. The extent to which odour would be detectable downwind and the intensity and character of such odours would be dependent upon the following factors, all of which can exhibit substantial variation over time:

- the nature and magnitude of odorous emissions released from the source;
- wind direction and wind speed; and
- atmospheric turbulence (vertical and horizontal) and the level of dilution and dispersion odours undergo as they travel downwind.

3.3 Receptors

3.3.1 The identification of potentially sensitive receptors has been conducted on the basis that the level of exposure to odours that will be likely to generate annoyance in residential premises (i.e. people’s homes) tends to be considerably lower than the levels which may generate annoyance at commercial premises, where higher tolerance to odour exposure can generally be expected. Some receptors are more sensitive than others, for example, domestic residences, or a pub with an outdoor area, will typically be more sensitive (referred to as highly sensitive receptor locations) than an industrial complex or a passer-by.

3.3.2 There are a limited number of highly sensitive receptor locations within 1 km of the Installation Boundary, refer to Appendix A.1, on the south side of the River Thames. The closest residential receptors, on the north side of the River Thames, are located more than 1.5 km from the Installation Boundary. At this distance odour impact on these receptors from waste processing operations at REP would be considered to be ‘*negligible*’.

3.3.3 The closest highly sensitive receptors locations to the Installation Boundary have also been identified and presented in Table 3-1. A Plan of the highly sensitive receptors locations will be presented in Appendix A.2.

Table 3-1: Highly Sensitive Odour Receptors

ID	Receptor Name	X	Y	Distance from Installation Boundary (m)
R1	Clydesdale Way	549730	179862	630
R2	Norman Road	549600	179666	824
R3	Aspen Green	548801	179386	1,334
R4	Kale Road	548191	179515	1,609
R5	St Brides Close	547982	179885	1,540
R6	Cherbury Close	548033	181071	1,418
R7	Iron Mountain	549739	180539	62

ID	Receptor Name	X	Y	Distance from Installation Boundary (m)
R9	Asda Distribution Centre	549739	180442	80
R10	Thames Path 1	549698	180748	83
R11	Thames Path 2	549578	180761	139
R12	Thames Path 3	549395	180771	20
R13	Crossness Footpath 1	549355	180674	15
R14	Crossness Footpath 2	549251	180395	41
R15	Crossness Footpath 3	549432	180360	212

4 Odour Management and Control Measures

4.1.1 REP will be subject to detailed design. Where design information will be available, it has been included within this plan. Following completion of detailed design, additional information in relation to the control measures to be implemented on-site will be incorporated into this plan.

4.1.2 Prior to commissioning of the ERF and anaerobic digestion plant, a Commissioning Plan will be submitted to the EA for approval. The Commissioning Plan will include the measures to be undertaken to prove performance of the abatement measures detailed in this section. The Commissioning Plan will include, but not be limited to the following:

- Confirmation of the management and contractual arrangements which will define the age of the waste materials imported into REP.
- Further details associated with:
  - the storage capacity of each waste reception bunker (ERF and anaerobic digestion bunker); and
  - the storage times associated with the storage of incoming waste within each waste reception bunker will be available following completion of detailed design.

4.1.3 The detailed design information will also be used to support the development of the final Odour Management Plan, and will include the following:

- the development of a waste acceptance criteria that limits the odour of waste received at REP, which will be supplemented by random monitoring of suppliers and odour monitoring of the waste to be transferred to REP;
- odour parameters, odour ranges, monitoring protocols and intervention trigger levels being established within the Commissioning Plan;
- design and management of ventilation systems;
- extent of building enclosure and management of the operation of access doors and locations of louvres; and
- management of emergency situations.

4.1 Monitoring

4.1.1 Routine olfactory inspection, refer to paragraph 5.1.5, of the site would be conducted during operational hours by trained operators. During the inspection a walk-around of the Installation Boundary, refer to Appendix A.1, would be conducted and observations made concerning the type and nature of any odours detected, including the likely source. The monitoring would be recorded and incorporated into the documented site management systems.

4.1.2 In the unlikely event odour would be detected at the Installation Boundary, the source of the odour would be investigated. Once the source and cause of the odour has been identified, appropriate mitigation measures to abate the odour would be implemented.

4.2 Control Measures

4.2.1 All waste handling, transfer and treatment activities undertaken at REP would be undertaken within environmentally controlled buildings which would maintain negative pressure within all waste reception and handling areas, thereby minimising the potential for odour from REP.

4.2.2 Where appropriate, documented pre-acceptance and acceptance procedures for incoming waste would be developed to ensure that 'unacceptable' odorous wastes are not delivered to REP. If they are, waste acceptance procedures would be in place to ensure that the waste delivery will be either rejected, or, quarantined within the REP process building before being transported off-site to a suitably licenced waste management facility.

ERF

Incoming Waste

4.2.3 Incoming waste for processing in the ERF would be transferred to the ERF bunker. Allowing for stacking within the ERF bunker, the waste storage capacity of the ERF bunker would be approximately 35,000 – 40,000 m^3. Following consultation with the EA for the minimum height above ground level for the key components of REP, including flood sensitive and of REP, the finished floor level would be set to at least 2.97 m AOD, including the Main REP Building. Allowing for this, the maximum capacity of the bunker would be approximately 12,000 tonnes, which would be equivalent to 6 days of waste processing capacity. If an extended unforeseen shutdown of the ERF occurs, a facility would be included into the design which will allow for waste to be back loaded from the ERF bunker and transferred off-site to a suitably licenced waste management facility.

4.2.4 All waste deliveries which are transported via river would be transported in enclosed containers. The containers would remain enclosed during transportation by on-site vehicles to the enclosed waste reception area. The waste delivery vehicles would not be opened until they are within the enclosed waste reception area which would be maintained at negative pressure. There would be no external storage of waste associated with the operation of the ERF.

4.2.5 All MSW for treatment within REP would be managed prior to delivery through waste transfer stations within London and surrounding areas. Waste delivered to REP would only be accepted if it will be in accordance with the documented waste acceptance procedures.

4.2.6 The waste reception area would have sufficient safe areas for the inspection of waste deliveries and for the potential quarantine of any non-compliant waste.

4.2.7 The ERF would have a dedicated waste bunkers for the storage of incoming waste for processing. The bunker would have a number of tipping bays to allow simultaneous tipping of waste and control over the location of deposition of waste into the ERF bunker. When delivering waste to the ERF, the waste delivery trucks would reverse into an assigned tipping bay and unload their waste into the ERF bunker.

4.2.8 The waste reception area would be maintained at negative pressure, by drawing air from this area and using it to supply combustion air to the ERF combustion process. The resulting negative pressure within the waste reception area would ensure that dust and odour are prevented from leaving the waste reception area.

4.2.9 Delivery/unloading of waste would be supervised by site operatives. If the waste is identified as being odorous/unacceptable it would be quarantined within a dedicated area and either returned to the waste producer or transferred off-site to a suitably licenced waste management facility. Investigations would be undertaken to identify the reason for malodourous materials being imported into the site with the waste supplier, and appropriate action taken to prevent a reoccurrence. The provenance and age of the waste supplied to REP would be monitored and managed by Cory at their waste transfer stations prior to transfer to REP to minimise the risk of malodourous materials being received at REP.

4.2.10 Anaerobic conditions can lead to the generation of odorous air within the ERF bunker if the waste will be not processed in a timely manner. Incoming waste delivered to REP would be stored in the ERF bunker for the minimum period of time to prevent the formation of anaerobic conditions. The length of time which waste would be stored will be dependent on the continuous operation of the ERF. To prevent the development of anaerobic conditions within the ERF bunker, bunker management procedures would be developed and implemented to ensure that the older wastes within the bunker are processed prior to newer deliveries of incoming waste.

4.2.11 Waste reception areas would be cleared and cleaned during normal night time operations, which are typically scheduled between 18:00pm and 06:00am.

4.2.12 Where appropriate, prior to periods of planned maintenance, the quantity of waste within the ERF bunker would be 'run-down' so that the bunker does not contain significant quantities of potentially odorous material during planned shutdown periods. It will be unlikely that both streams of the ERF will be shutdown simultaneously for planned maintenance purposes. Therefore, the periods when negative pressure would not be maintained within the ERF bunker would be kept to a minimum.

4.2.13 To allow for periods of extended unplanned shutdown, the incoming waste would be diverted from REP to the adjacent RRRF.

IBA

4.2.14 Due to the high temperatures, any organic substances within the waste would be destroyed within the waste combustion process. Therefore, the IBA would not be odorous and would be managed within the confines of the Main REP building within the IBA bunker.

4.2.15 The IBA Bunker would have capacity for the storage of approximately 1,900 m^3 of IBA (subject to detailed design), equivalent to 5 days production of IBA assuming continuous operation at full load.

APCR

4.2.16 Due to the high temperatures, any organic substances within the waste would be destroyed at the high temperatures within the ERF. Furthermore, the ammonia dosed in the NOx abatement system would not be dosed into the flue gas stream until after the bag filters. Therefore, the ammonia would not be present in the APCR and would not be odorous. APCR would be stored within sealed/enclosed silo(s).

4.2.17 The design of the silo(s) will be subject to detailed design; however, the capacity of the silo(s) would be approximately 600 m^3, which would be equivalent to 4 or 5 days storage assuming continuous operation at full load.

Anaerobic Digestion Plant

Incoming Organic Waste

4.2.18 All waste deliveries would be transported in enclosed road vehicles. The waste delivery vehicles would not be opened until they are within the enclosed waste reception area which would be maintained at negative pressure. There would be no external storage of waste associated with the operation of the anaerobic digestion process.

4.2.19 Waste which delivered to REP would only be accepted if it will be in accordance with the documented waste acceptance procedures.

4.2.20 The waste reception area would have sufficient safe areas for the inspection of waste deliveries and for the potential quarantine of any non-compliant waste.

4.2.21 The anaerobic digestion plant would have a dedicated waste bunker for the storage of incoming waste for processing. The bunker would have a number of tipping bays to allow simultaneous tipping of waste and control over the location of deposition of waste into each bunker. When delivering waste to anaerobic digestion plant, the waste delivery trucks would reverse into an assigned tipping bay and unload their waste into the anaerobic digestion bunker.

4.2.22 The anaerobic digestion waste reception area would be maintained at negative pressure, by drawing air from this area and using it to supply combustion air to the ERF combustion process. The resulting negative pressure within the waste reception area would ensure that dust and odour are prevented from leaving the waste reception area.

4.2.23 Delivery/unloading of waste would be supervised by site operatives. If the waste is identified as being unacceptable, i.e. not in accordance with the documented waste acceptance procedures, it would be quarantined within a dedicated area and either returned to the waste producer or transferred off-site to a suitably licenced waste management facility. Investigations would be undertaken, with the waste supplier, to identify the reason for the unacceptable waste being imported to REP. Appropriate actions would be taken to prevent a reoccurrence. The provenance and age of the waste supplied to REP would be monitored and managed by Cory at their waste transfer stations prior to transfer to REP to minimise the risk of malodourous materials being received at REP.

4.2.24 Anaerobic conditions can lead to the generation of odorous air within the anaerobic digestion bunker if the waste will be not processed in a timely manner. Incoming waste delivered to REP would be stored in the anaerobic digestion bunker for the minimum period of time to prevent the formation of anaerobic conditions. The length of time which waste would be stored will be dependent on the continuous operation of the anaerobic digestion plant. To prevent the development of anaerobic conditions within the anaerobic digestion bunker, bunker management procedures would be developed, prior to commencement of operations, and subsequently implemented to ensure that the older wastes within the bunker are processed prior to newer deliveries of incoming waste.

4.2.25 Reception areas would be cleared and cleaned during normal night time operations.

4.2.26 Where appropriate, prior to periods of planned maintenance, the quantity of waste within the anaerobic digestion bunker would be ‘run-down’ so that the bunker does not contain significant quantities of potentially odorous material during a planned shutdown period. Furthermore, planned shutdowns of the anaerobic digestion plant would not be planned to occur at the same time as the ERF. It will be unlikely that both streams of the ERF would be shutdown simultaneously for planned maintenance purposes. Therefore, when the anaerobic digestion plant would be shutdown, a negative pressure would be maintained within the anaerobic digestion waste reception area to prevent the release of odours.

4.2.27 To allow for periods of extended unplanned shutdown, arrangements would be in place to divert incoming wastes from REP to an alternative suitably licensed waste management facility for the treatment of organic waste.

4.2.28 The incoming waste delivery vehicles would tip into the anaerobic digestion bunker. The maximum waste storage capacity of the anaerobic digestion bunker would be approximately 1,000m^3.

4.2.29 A grab would transfer the waste from the anaerobic digestion bunker to the shredder. The grab would also be used to homogenise the incoming waste and to identify and remove any unsuitable items for anaerobic digestion.

4.2.30 Allowing for the processing capacity of the plant, the incoming organic waste would be stored in the anaerobic digestion bunker for a maximum period of 7 days.

Digestate

4.2.31 Digestate would be transferred in an enclosed conveying system from the digester to the digestate dewatering system. The digestate dewatering system would be an enclosed containerised system. The digestate would be transferred into a hopper. The digestate would fall from the hopper onto a belt drier. Hot air would be blown through the digestate pile on the belt drier to evaporate-off moisture from the digestate. The moisture from the drier would be extracted to the ERF to be used as combustion air within the ERF. The dried digestate would be conveyed from the belt drier to the digestate storage bays.

4.2.32 The digestate storage bays would have a capacity for the storage of approximately 500 tonnes of digestate. Digestate would be stored within the digestate storage bays, which would be equivalent to 7 days of storage within the digestate storage bays. Odorous air from the digestate storage area would be extracted to the ERF to be used as combustion air within the ERF.

4.2.33 The dried digestate would potentially be loaded from the digestate storage bays into sealed containers prior to transfer off-site.

4.3 Point Source Odorous Emissions

4.3.1 The potential point sources which have potential for the release of odorous emissions from REP would be as follows:

- the main stack which would emit combustion gases from the ERF;
- the stack for the biogas engine; and
- the biogas flare.

ERF

4.3.2 Emissions from the ERF would be released from flues located within the main stack. Odorous air from the waste reception and waste storage areas within the Main REP Building would be used as combustion air in the ERF. The Industrial Emissions Directive (IED) requires that any combustion gases passing through an ERF must experience a temperature of 850^{o}C or more for at least two seconds. Due to the high temperature experienced by the gases, most odorous chemicals would be destroyed. Any surviving odorous chemicals would likely be captured by the bag filters and filter cake (APCR). Any odorous chemicals that are not captured by the bag filters and APCR would be released via the stack at height and would not be in concentrations at ground level to be detectable.

4.3.3 The flue gases from the ERF would pass through the FGT system, which includes bag filters to reduce the particulate content of the flue gas.

4.3.4 Ammonia solution would be introduced into the furnace as part of the FGT process, which would convert into ammonia during the process, and there may be some occasional “ammonia slip” during operation. The impact of emissions of ammonia from the ERF have been assessed in a Dispersion Modelling Report submitted with the EP application. This has demonstrated the emissions of ammonia from the Facility would have an insignificant impact upon the environment.

4.3.5 The release of the flue gases from the main stack would assist with dispersion of the flue gases. Taking this into consideration, there would not be any malodorous air from the ERF that will be detectable at sensitive receptors.

Biogas Engine

4.3.6 Biogas produced by the anaerobic digestion process would be treated to produce biomethane, refer to paragraph 2.3.1. In the event that the biogas would be combusted in a biogas engine, the high temperatures experienced, typically approximately 400°C, would destroy odorous chemicals before the gases are released via the biogas engine stack.

Biogas Flare

4.3.7 In periods of excess biogas generation or emergency situations, biogas would be diverted to a flare stack which would be controlled by pressure sensors in the gas storage tank. The flare would be designed to meet the requirements for landfill gas flares, which state that the flue gas must be maintained at or above 1000°C for at least 0.3 seconds. The high temperatures would destroy any odours from the flare.

4.4 Fugitive Odorous Emissions

4.4.1 Identified possible sources of fugitive emissions of odour are:

- deliveries of waste for processing;
- the anaerobic digestion process, in three sections:

i. waste reception;

ii. anaerobic digestion process; and

iii. digestate storage area.

- biogas storage;
- the ERF waste bunker; and
- the ash storage area.

Deliveries of Waste for Processing

4.4.2 All waste would be delivered to REP in enclosed vehicles/containers, which would contain any fugitive emissions from the waste delivery vehicles/containers whilst being transferred to the waste reception areas. Wastes would not be unloaded from the waste delivery vehicles/ containers until the delivery vehicles are within the fully enclosed Main REP building, and the waste delivery vehicles/containers are in the dedicated waste reception areas.

Anaerobic Digestion Plant

Anaerobic Digestion Waste Reception

4.4.3 The waste delivery procedure for the anaerobic digestion process would be the same as for the ERF. Organic waste would be tipped into the anaerobic digestion bunker. An induced draught (ID) fan would be used to maintain the anaerobic digestion bunker at negative pressure. This would ensure odours are not able to escape the REP building. Air from the anaerobic digestion bunker would be drawn into the ERF combustion process and used as combustion air.

Anaerobic Digestion Main Process

4.4.4 All digester process steps would be fully enclosed ensuring that, notwithstanding emergency biogas release via overpressure protection systems, all emissions of odours would be kept to an absolute minimum and would be contained and eliminated.

Digestate Processing and Storage

4.4.5 Waste liquid digestate from the digester would be pumped to a belt dryer. The dryer would utilise steam from the ERF process. The dried digestate would be taken from the discharge point of the dryers by shovel loader and filled into boxes. The mixed steam / hot air exiting the dryer would be returned into the combustion process of the ERF. The exhaust air of the boxes and storage area would be collected and fed back to the dryer. This would ensure neutralisation of any potential odours.

Biogas Storage

4.4.6 Biogas would be stored in an air-tight gas bag, which prevents the biogas from being released during normal operations. This would prevent the fugitive release of biogas.

ERF Waste Bunker

4.4.7 An ID fan would be used to maintain the waste bunker at negative pressure. This would ensure odours are not able to escape the Main REP Building. Air from the ERF bunker would be combusted within the ERF as combustion air.

4.4.8 The ERF operators would employ bunker management procedures which would include for mixing of the waste, using the crane grab, to avoid the development of anaerobic conditions in the ERF bunker, which could generate further odorous emissions.

4.4.9 During periods of planned maintenance for the ERF, one stream would be shut down at a time. This would ensure that the waste bunker would be maintained at negative pressure and minimise the risk of odours being released from the ERF bunker.

4.4.10 If one stream is forced into an unplanned shutdown, the other stream would continue to process the incoming waste. The ID fan of a single stream would maintain a negative pressure within the ERF bunker to prevent the release of odour from the waste reception area.

4.4.11 It will be unlikely that both ERF streams would be shutdown simultaneously for extended periods. For short periods when both streams are shutdown, the doors to the waste reception areas would be closed to contain potential odour from the ERF bunker and waste would be diverted to an alternative treatment facility, such as the adjacent RRRF. In the unlikely event that both streams are offline for extended periods, facilities would be incorporated into the design which would allow waste to be backloaded from the bunker into vehicles so that it can be transferred off-site to a suitably licensed waste management facility, such as the adjacent RRRF.

IBA Bunker

4.4.12 IBA would be a product from the combustion of waste fuels. This means that it will have been combusted at a minimum temperature of 850ºC for at least two seconds, and that it will have a Loss on Ignition (LOI) of less than 5% or a Total Organic Carbon of less than 3%, as required by the IED. At this temperature, any organic or putrescible solid material which was presented within the waste would be destroyed and would not be present within the IBA. Consequently, there would be no odour from the IBA bunker and the handling of the IBA would be managed within the IBA bunker within the Main REP Building.

5 Odour Monitoring

5.1.1 A programme of odour monitoring would be undertaken at REP. This would include the following monitoring regime:

- sniff testing at the perimeter of REP; and
- wind direction and wind speed.

5.1 Olfactory Testing

5.1.1 Olfactory (sniff) testing would be undertaken around the perimeter of REP. Where odours at the perimeter are identified this would be reported to the site management team. An investigation on the source and root cause of the odours would be undertaken as detailed in Section 7.

Competent Individuals

5.1.2 In order to ensure repeatability of the results more than one competent odour assessors/staff would be on-site at all times. This would ensure that odour monitoring would continue in the event that one individual is away or unavailable. Furthermore, as colds, sinusitis or sore throats can affect the sense of smell, having more than one trained individual would allow the monitoring to continue in the event of illness. However, if all individuals are suffering from illness etc then this fact would be clearly recorded on the odour monitoring forms. The number of trained individuals available at any one time would not exceed four people in order to maintain the consistency of the results.

5.1.3 It will be important that these individuals do not spend or have not spent significant time in waste processing areas, as the testers sense of smell must not have become accustomed to the odours arising. The individuals undertaking the monitoring should avoid strong foods or drinks (including coffee) for at least half an hour before conducting the monitoring. Furthermore, strongly scented toiletries and the use of deodorisers within vehicles would be avoided.

Monitoring Locations

5.1.4 The proposed locations for odour monitoring are presented in Appendix A.3. The locations would be reviewed following detailed design to ensure that there are no accessibility constraints.

Monitoring Frequency

5.1.5 In order to generate a detailed odour record for REP, regular monitoring of boundary odour would be carried. This will ensure a detailed data set of data will be maintained throughout the year.

5.1.6 Monitoring would be undertaken upon receipt of a complaint in order to identify and record the odours present at the time of the complaint. Refer to Section 7.

5.1.7 The strategy would be flexible; therefore, monitoring would not be conducted at a set time of day. Instead the monitoring would be conducted when there will be a high risk of odour generation, i.e. during times where there are waste deliveries to the site or residues being transferred from the site, and not when there will be relatively little risk of odour generation, e.g. outside ‘typical’ delivery hours for the delivery of organic waste to the anaerobic digestion plant.

Data collection and recording

5.1.8 Before starting the odour monitoring the individual would record all pertinent details, such as date, time, weather conditions and activities being undertaken. This has been summarised within a proposed monitoring *template contained within Appendix B .

5.1.9 In order to quantify the odour at a specific level the Intensity and the Offensiveness are recorded. These are based on a scale of 1 to 5 for 'Intensity' and 1 to 4 for 'Offensiveness'. The levels for the two scales are shown below.

Table 5-1: Odour Intensity

Scale	Intensity Rating
1	No detectable odour
2	Faint Odour (barely detectable, need to stand still and inhale facing into the wind)
3	Moderate Odour (odour easily detectable while walking and breathing normally)
4	Strong Odour
5	Very Strong Odour (probably causing nausea)

Table 5-2: Odour Offensiveness

Scale	Offensiveness Rating
1	No detectable odour
2	Potentially Offensive
3	Moderately Offensive
4	Very Offensive

5.1.10 As well as recording the odour Intensity and Offensiveness, general comments on the odour would also be recorded, such as persistence, transience and potential source etc.

Action Limits

5.1.11 If a score of 1 is recorded for Odour Intensity and Odour Offensiveness at a monitoring location, odour from REP cannot be detected and no action would be required.

5.1.12 If monitoring locations score a 2 or higher for Odour Intensity or score a 2 or higher for Odour Offensiveness, then a more detailed investigation into the activities being undertaken and the root cause of the odour would be investigated, refer to section 7.1.1. This approach would attempt to identify the source of the odour and suggest possible ways to improve operations at REP to prevent odour being generated from on-site activities.

Wind Direction and Wind Speed

5.1.13 An anemometer would be used to record the wind direction and speed to provide data to inform investigations into any odour complaints which are received.

6 Abnormal Events

6.1.1 Table 6-1 shows possible abnormal events, and planned responses in the event of these occurrences.

Table 6-1: Abnormal Events and Response Measures

Event	Location	Likely Effect	Response Measures	Timescales for Response
Severely odorous wastes received	Anaerobic digestion bunker	Increased odours within waste reception areas while severely odorous waste will be present, any fugitive emissions would become more serious.	Processing of this waste within the anaerobic digestion process will be prioritised to minimise the period of time that it will be stored within the anaerobic digestion bunker. Direct transfer to the ERF for incineration will be considered. Additional deliveries of waste from the waste producer may be suspended. If appropriate, transfer the waste to a dedicated quarantine area, and reject odorous waste which does not comply with the waste acceptance procedures. Review whether the implemented measures have been successful	Immediate
Failure of an ID fan for a single line of the ERF	ERF	Increased odours within the Tipping Hall and reception areas.	Maintenance engineers sent to rectify the failure. One line will continue to operate maintaining the waste reception areas under negative pressure.	Immediate
Failure of both ID fans for the two ERF lines	ERF	Increased odours within the Tipping Hall and reception areas.	Maintenance engineers sent to rectify the failure.	Immediate
			ERF operations suspended until the problem will be rectified. Waste diverted to an alternative waste treatment facility.	One day
			Waste unloading operations from the bunker will commence.	One week
Development of anaerobic conditions in waste storage areas	ERF tipping area	Increase in odour within the ERF tipping area and reception areas.	Wastes are removed on a first-in, first-out principle and the waste will be regularly mixed to avoid the development of anaerobic conditions.	Ongoing

Event	Location	Likely Effect	Response Measures	Timescales for Response
	Anaerobic digestion tipping area	Increase in odour within the anaerobic digestion tipping area and reception areas.	Wastes are removed on a first-in, first-out principle and the waste will be regularly mixed to avoid the development of anaerobic conditions.	Ongoing
Plant breakdown	Any location	Risk of increased impact from any area of site where normal operations are affected during and after the breakdown	A supply of critical spares will be maintained on site. The site will employ maintenance engineers to enact any repairs.	Immediate
			If spares or engineers are not available, the relevant operations and their predecessors in the process will be suspended if necessary to prevent significant increase in odour emissions	Immediate

6.1.2 In all instances where waste processing will be required to be suspended, the receipt of waste at REP would be stopped and diverted to an alternative waste treatment facility, such as RRRF.

6.1 Emergency Planning

Abnormal Meteorological Conditions

6.1.1 Abnormal meteorological conditions such as low wind speed and high temperatures may promote elevated levels of odour either on the site or at nearby sensitive receptors. A wind direction towards sensitive receptors may increase odour levels. Conversely very low wind strength and temperature inversions may minimise dispersion and potentially create a build-up of odour. High temperatures may also increase emissions.

6.1.2 Contingency mitigation measures would be developed as part of the detailed design, construction and commissioning of REP. This would include an emergency plan for flooding and the procedures to be implemented in case of flooding.

Staffing Issues

6.1.3 Human error and accidents may cause elevated levels of odour to be created either through the stopping or breakdown of the process or the failure of control equipment. Contingency mitigation measures would be developed as part of the detailed design, construction and commissioning of REP. This would include procedures to be implemented in case of staffing issues at REP.

Planned Odorous Events

6.1.4 If at any time it will be necessary to undertake temporary actions that are likely to cause elevated levels of odour, Cory would contact the EA and any other relevant stakeholders in advance to inform them of the operations being undertaken and that the elevated levels of odour will be of a temporary nature. Where practicable, such actions would only proceed when the prevailing wind direction can be demonstrated to be away from sensitive receptors.

7 Odour Action Plans/Contingencies

7.1 Odour Complaint Investigation

7.1.1 The following actions would be taken on receipt of an external odour complaint or the identification of odour at the REP boundary:

- Any complaints received at the site would be logged in Cory's documented management systems. The EA would be informed as soon as possible after a complaint has been received.
- The site management would be given the details of the odour complaint as soon as possible, including the location, nature, time, and date of the complaint.
- If complaints are received, a "sniff test" would be conducted by suitably trained personnel in the area from which the complaint is received in order to assess the presence of any odours, and the odour characteristics and intensity. Where possible, the likely cause of the odour will be identified.
- For all complaints, reference would be made to the site activities at the time of the complaints, and further onsite investigations would be conducted to determine whether any abnormal operation are (or were) occurring. The following key potential causes of abnormal odour emissions would be investigated:

i. Is the waste arriving in appropriate vehicles/containers?

ii. Are there any unusual characteristics evident in the waste on site (composition, age, condition etc.)?

iii. Are operations in 'normal operation'?

iv. Are the extraction and ventilation systems (through the stack; the biogas flare; the ERF combustion air fans; and building ventilation) working properly?

v. Are there any unusual activities taking place off site?

- If the investigations identify that the source of the odour is an off-site source, feedback would be reported to the complainant, and an odour complaint would be logged with the source of the odorous emissions.
- Once the cause of the odour has been established, appropriate actions would be immediately implemented (see Section 6), and actions devised to prevent reoccurrence.
- Feedback would be given to all complainants on the findings of any investigations if they are known, and a summary would be provided of any remedial measures taken to rectify odour problems and ensure that the problem has been suitably resolved. The complainant would be asked if the perceived problem is still occurring to measure any improvement achieved.
- Cory would submit a short factual report to the Environment Agency detailing:

i. the complaint(s) received;

ii. the investigations conducted;

iii. the findings of those investigations;

iv. whether the complaint was substantiated;

v. any remedial measures implemented; and

vi. any ongoing improvement actions to be implemented.

- Records of all complaints, subsequent investigations, and remedial actions would be retained on site for a minimum of five years. The site management would ensure that records are readily retrievable, and maintained as fit for retention. As applicable, records would be stored in accordance with data protection legislation.

7.2 Action Plans

7.2.1 In the event that an odour complaint is proven to be justified and attributable to operations undertaken at the facility, or a 'non-conformance' occurs, a defined Action Plan would be implemented. The following potential odour 'non-conformances' have been identified:

- abnormal odour emissions occur;
- significant odour is detected onsite that will be believed to pose a risk of offsite odour impact; and
- significant site odour will be detected off-site during the "sniff testing" exercise.

7.2.2 In the event that any of the above occurs, the following actions would be taken:

- If not previously undertaken, a walk-around of the entire site and a review of the activities undertaken at REP would be conducted in order to identify the likely cause(s) of the odour.
- Upon identification of the likely odour source(s), appropriate corrective and preventative measures would be identified and implemented, depending on the outcome of the investigations. The measures would consider, but not be limited to the following:

i. Suspension of receipt of highly odorous waste in the relevant waste reception areas and the closure of all doors until excessively odorous wastes are processed or removed from site.

ii. Suspension of future receipt of the odorous waste stream until confirmed acceptable.

iii. Review of the effectiveness of waste acceptance, reception and handling procedures to avoid the formation of anaerobic conditions in waste storage areas.

iv. Review of all process parameters (temperature, moisture, oxygen availability) to ensure all maturation processes are under control. Implementation of corrective actions to restore parameters to desired levels.

7.2.3 Details of any odour 'non-conformances' including the nature of the incident, results of investigations, action taken and any required amendments to the OMP would be made available to the Environment Agency on request.

8 Document Review

8.1 Review Requirement and Timescale

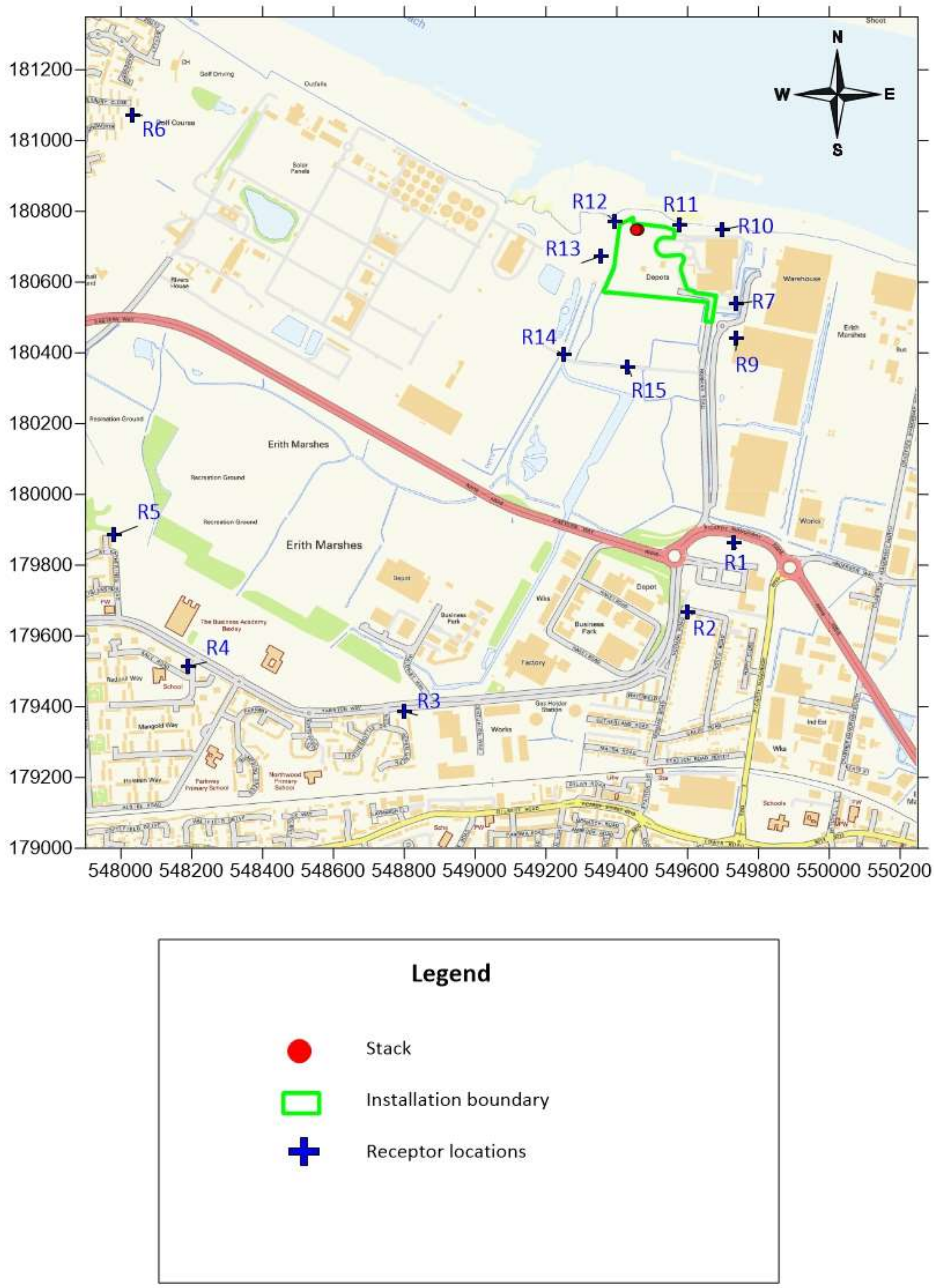
8.1.1 This OMP would be formally reviewed by Cory initially six months after the commencement of operations, and subsequently every twelve months to ensure that the controls described are effective and reflect best available techniques. In addition, the OMP would be reviewed following any relevant changes in site operations or procedures that are likely to have implications from an odour generation/impact perspective.

8.1.2 Any required changes to the conditions set out within this document would be formally agreed with the Environment Agency prior to their implementation.

Appendix A Drawings and Plans

A.1 Installation Boundary

A.2 Odour Sensitive Receptors



A.3 Odour Monitoring Locations

Appendix B Odour Assessment Report

1 Odour Assessment Report

Installation		**Date**	
Weather		**Wind (strength / direction)**	
Temperature (°C)		**Pressure (mbar if known)**	
Ground Conditions		**Cloud Cover**	
General Air Quality		**Time: Start**	
		Time: Finish	
Activity on Site			

Plan attached showing location & extent of odour

YES / NO

Complaint Received?
YES / NO

If **YES** complete the following:

Date & time complaint received		**Number of complaints which may relate to the same source**	
Location of complaint			
Grid Reference (if not a property)		**Time odour noticed and duration**	

Additional Comments:

Action Required:

Signed: ………………………………………… **Date:** ………………………………

Test Location & Time	Intensity (1 – 5)	Offensiveness (1 – 4)	“Dilution to Threshold” Ratio	Comments: (including persistence, transience, potential source)

Note: The “Dilution to Threshold” Ratio is obtained from the Nasal Ranger and is only required if an odour is detectable, i.e. a 2 or higher for Intensity.