DEVELOPMENT OF A SUSTAINABLE ENERGY PLANT.

KEMSLEY PAPER MILL, SITTINGBOURNE, KENT

ST REGIS PAPER COMPANY LIMITED & E.ON ENERGY FROM WASTE UK LIMITED

ENVIRONMENTAL STATEMENT

CHAPTER 4:

DESCRIPTION OF DEVELOPMENT

Prepared by:
Jonathan Standen

Checked by:
Andrew Stevenson

34 Lisbon Street
Leeds
LS1 4LX

Tel 0113 220 6190
Fax 0113 243 9161
Email rpsld@rpsgroup.com

Contents

4.1	Introduction	4-1
4.2	Site layout	4-2
4.3	SEP Description	4-3
4.4	Process Overview	4-9
4.5	Materials stored on Site	4-14
4.6	Water usage, Drainage treatment and Disposal	4-14
4.7	Other materials used and stored on Site	4-15
4.8	Hours of Operation	4-16
4.9	Site Staff	4-16
4.10	Monitoring	4-17
4.11	Hazard Prevention and Environmental Controls	4-18
4.12	Plant maintenance and shutdown	4-19
4.13	Operating Conditions	4-19
4.14	Construction	4-21

Tables, Figures & Appendices

Tables

Table 4.1: Waste Reception Area and Bunker
Table 4.2: Boiler House
Table 4.3: Flue Gas Treatment Building
Table 4.4 Steam Turbine
Table 4.5 Bottom Ash Treatment
Table 4.6 Air Cooler Condenser Structure
Table 4.7 Stack
Table 4.8 Bottom Ash Storage
Table 4.9 Gatehouse and Weighbridge
Table 4.10 Transformer and switchgear
Table 4.10 Process Diagram

Figures

Figure 4.1: Proposed Site Location Plan
Figure 4.2 Proposed Building Plan
Figure 4.3 Proposed Site Layout
Figure 4.4 South East Elevation
Figure 4.5 North East Elevation
Figure 4.6 South West Elevation
Figure 4.7 North West Elevation
Figure 4.8 Main Building Proposed South East Elevation
Figure 4.9 Main Building Proposed North East Elevation
Figure 4.10 Main Building Proposed South West Elevation
Figure 4.11 Main Building Proposed North West Elevation
Figure 4.12 Reference not used
Figure 4.13 Proposed Structure for Air Cooled Condenser Elevations
Figure 4.14 Proposed Structure for Bottom Ash Handling Elevations.
Figure 4.15 Proposed Bottom Ash Transport Elevations
Figure 4.16 Typical Switchgear Building Floor Plan
Figure 4.17 Reference not used
Figure 4.18 Typical Office and Staff amenity building
Figure 4.19 Reference not used

Figure 4.20 Gatehouse Section and Floor Plan
Figure 4.21 Reference not used
Figure 4.22 Site Perimeter and Boundary treatment
Figure 4.23 Main Car Park and Pedestrian Walkway
Figure 4.24 Site Sections
Figure 4.25 Proposed Drainage Layout
Figure 4.26 Proposed Levels/ Site Plan
Figure 4.27 Reference not used
Figure 4.28 Reference not used
Figure 4.29 3D Visualisation (1)
Figure 4.30 3D Visualisation (2)
Figure 4.31 3D Visualisation (3)
Figure 4.32 3D Visualisation (4)
Figure 4.33 3D Visualisation (5)
Figure 4.34 3D Visualisation (6)
Figure 4.35 3D Visualisation (7)
Figure 4.36 3D Visualisation (8)

Appendices

Appendix 4.1: Outline General Construction programme
Appendix 4.2: Environmental policies
Appendix 4.3 Drainage philosophy

4 Description of Development

4.1 Introduction

4.1.1 This Chapter of the Environmental Statement describes the proposed development. This is in accordance with Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 which provides that Environmental Statements should provide a description of the development. The scheme has been formulated through an iterative process of evaluation including assessment of likely significant effects from the scheme and incorporates mitigation measures.

4.1.2 The layout of the proposed sustainable energy plant together with a description of the power generation and waste management process to be undertaken within the plant is described. The scheme has been designed in accordance with the Construction (Design and Management) Regulations 2007.

4.1.3 In preparing the development proposals, consideration has been given to the following considerations:

- Design
- Ecological and Nature Conservation;
- Hydrology and Flood Risk
- Ground Conditions
- Air Quality and Noise Receptors
- Transport of Fuel feedstock, Raw Materials and Residues.
- Employees
- Visual and Landscape

4.1.4 In summary the development will comprise:

- The capability to generate in excess of 50MWth per hour of steam to the paper mill. Dependent upon its calorific value, the SEP will import as its feed stock approximately 500,000 to 550,000 tonnes per annum of pre treated waste comprising Solid Recovered Fuel waste, Commercial & Industrial waste and Municipal Solid Waste.
- The plant may accept up to approximately 25,000 tonnes per annum of waste plastics from the paper mill (included in the above).
- The plant is a recovery plant under the R1 calculation of the Waste Directive.
- The average net calorific value of 10.5 MJ/kg will fall within the range of 8 MJ/kg to 16 MJ/kg.
- Power generation capability of 48.5 MW of net electricity per hour.

- Grid connection cables to supply generated electricity to the public supply network.
- Two line moving grate with thermal combustion capacity of 100MW per line.
- Two stacks with a height of 90 metres from ground level.
- Waste reception hall and waste storage bunker.
- Waste handling systems and feed hoppers.
- Bottom ash handling.
- Bottom ash storage and maturation facility.
- Flue gas treatment.
- Boiler, steam turbine and air cooled condenser
- Heat extraction system and infrastructure providing connectivity to adjacent paper mill.
- Weighbridge and access arrangements.
- Control room and administration building.
- Transformers
- Site landscaping
- Importation of approximately 20,300m^3 of clean inert fill.

4.1.5 The construction period will be approximately 32 months in duration with an assumed start date in 2011.

4.2 Site Layout

Overview

4.2.1 The proposal site the general location of which is shown on Figure 1.1 extends to approximately 7.0 hectares exclusive of existing site access. The Development site and site plan is illustrated on Figure 4.1. Figure 4.2 illustrates the proposed Building Plan and sets out the proposal components. Figure 4.3 illustrates the proposed Site Layout. Figure 4.4 illustrates the proposed South East elevation of the plant, Figure 4.5 illustrates the proposed north east elevation of the plant, Figure 4.6 illustrates the proposed South west elevation of the plant and Figure 4.7 illustrates the proposed North west elevation of the plant. Figures 4.8 to Figure 4.22.set out the layout and elevations of particular components of the scheme. Figures 4.24 to 4.27 illustrate the drainage components of the scheme. Figures 4.29 to 4.36 show the 3D visualisations of the proposed plant.

In summary the primary features are:

Sustainable Energy Plant

4.2.2 The Sustainable Energy Plant (SEP) building footprint takes up a large part of the site and contains: Reception Hall and Bunker; Boiler House; turbine building; Stacks; Flue Gas

Treatment; Air Cooled Condensers; Bottom ash treatment building; Bottom Ash (BA) building; Offices; Disabled car parking; Landscaping; and Access. The Plant is orientated south west to north east.

Weighbridge

4.2.3 The weighbridge offices are located to the west of the main plant infrastructure.

Access

4.2.4 The proposal site is located on the eastern fringe of the existing Kemsley Paper Mill plant complex. It is proposed to utilise the existing paper mill access infrastructure which serves the site. Access for the SEP by road will be taken from the northern Kemsley Paper Mill access which is some 400 metres to the north. Within the proposal site, provision is made for vehicle circulation. Car parking for staff and visitors (with the exception of disabled parking) is located to the west within the existing arrangements which serve the Kemsley Paper Mill.

Landscaping

4.2.5 Landscaping is principally focused to the west and south west close to the weighbridge.

4.3 Sustainable Energy Plant

Building Description

4.3.1 The overall arrangements for the SEP are shown on Figures **4.2 and 4.3.** Principal Elevations are illustrated on Figure **4.4 to 4.11**. The SEP will be housed within the following principal structures:

- Fuel feedstock reception area and Bunker, Energy Building, Flue Gas Treatment
- Air Cooled Condenser
- Furnace Bottom Ash building
- Double Stack infrastructure to a height of 90 metres.

4.3.2 The waste feedstock reception area and bunker will be located within the east of the main structure. This structure will be fitted with roller shutter doors. The external dimensions will be **22.8m – 12** m in height **45.2** m in width and **35.8** m in length. This element of the building will have a pitched roof with a high level parapet. The bunker within the building envelope will have dimensions of **36.1** m in width **71.6** m and **36** m in depth. Table 4.1 summarises the dimensions.

Table 4.1 Waste Reception Area and Bunker

Component	Length (m)	Width (m)	Elevation (m)
Reception Area	35.8	44.5	22.8 -12
Bunker	32.1	71.6	36.1

4.3.3 The Boiler House Building contains the boiler and the energy building with electrical and utility infrastructure (switchgear building) and is to the west of and is continuous with the Fuel feedstock reception area and bunker. The external dimensions will be up to **50.4** m in height **45.0** m in width and **51.5** m in length. This element of the building will have a pitched roof with a high level parapet. Table 4.2 summarises the dimensions. To the south is the office and staff welfare accommodation, and associated disabled car parking. Within the north of the building is located the steam turbine building.

Table 4.2 Boiler House Building

Component	Length (m)	Width (m)	Elevation (m)
Boiler House	51.5	45.0	22.5 48.0 50.4 (staircase)

4.3.4 The Flue Gas Treatment building contains the flue gas cleaning infrastructure and is to the west of and is continuous with the Energy building. The external dimensions will be **45** m in height **34.7** m in width and **58.9** m in length. This element of the building will have a pitched roof with a high level parapet. Table 4.3 summarises the dimensions.

Table 4.3 Flue Gas Treatment

Component	Length (m)	Width (m)	Elevation (m)
Flue Gas Treatment	58.9	34.7	37 43 45 (staircase)

4.3.5 The Steam Turbine Building contains the turbine off steam condensing infrastructure and is within a separate structure located to the north of the flue gas treatment building. The steam turbine building has dimensions of **35.0** m x **30.0** m x **24** m. Table 4.4 summarises the dimensions.

Table 4.4 Steam Turbine

Component	Length (m)	Width (m)	Elevation (m)
Steam turbine	35	30	24

4.3.6 The Bottom Ash Treatment building is located to the west and adjacent to the bottom ash building and waste reception building. The external dimensions will be **21.7** m in height **20** m in width and **25** m in length. Table 4.5 summarises the dimensions.

Table 4.5 Bottom ash treatment

Component	Length (m)	Width (m)	Elevation (m)
Bottom Ash treatment	25	20	21.7

4.3.7 The external dimensions of the Air Cooled Condenser will be **23.4** m in height **28.4** m in width and **62.1** m in length. Table 4.6 summarises the dimensions.

.

Table 4.6 Air Cooled Condenser

Component	Length (m)	Width (m)	Elevation (m)
Air Cooled Condenser	62.1	28.4	23.4

Stacks

4.3.8 Each of the two processing lines will have a single stack with a proposed height of 90 metres from ground level. The stack height has been calculated based upon emission parameters to ensure optimum emission of flue gases and the successful operation of the plant. The stack will be located to the west of the principal plant infrastructure. The centres of the two stacks will be 5.00 metres apart.

4.3.9 Dispersion of pollutants is dependent on a number of factors including local land topography, neighbouring buildings, emission rates and pollutant concentrations, together with the height of the proposed structures. The air quality and plume dispersion modelling used to identify the stack height necessary for optimal dispersion is described in detail in Chapter 7. Table 4.7summarises the dimensions

Table 4.7 Stack

Component	Length (m)	Width (m)	Elevation (m)
Stack (x2)	N/A	3.1Ø	90 metres

Bottom Ash Building

4.3.10 Bottom Ash (BA) building is an independent structure located to the east of the principal plant infrastructure. The building will have a minimum storage capacity of 4 x 9,400m^3 The BA building will provide the necessary covered floor space to enable Incinerator Bottom ash to be laid out and stored to enable maturation of the ash to take place prior to its removal from site. The external dimensions will be **19.7** m in height **85.2** m in width and **84.2** m in length. This element of the building will have a pitched roof form. Figure 4.15 illustrates the building. Table 4.8 summarises the dimensions.

Table 4.8 BA Building

Component	Length (m)	Width (m)	Elevation (m)
BA building	84.2	85.2	19.7

Materials

4.3.9 The SEP side panels will be constructed from profiled steel sheeting in terracotta, merlin grey, hamlet, anthracite and albatross. The upper parts of the façade will be structured in light grey rectangular wirings. The roof will be constructed from steel. The bunker roof will be constructed from concrete. Visualisations of the plant and associated infrastructure are illustrated on Figures 4.29 to 4.36.

Gatehouse and Weighbridge

4.3.10 A gatehouse and weighbridge will be located at the site entrance to the west of the SEP infrastructure to weigh and direct incoming waste fuel carrying and outgoing vehicles. The accommodation will include seating, WC and comfort areas. The external dimensions will be 6.85 m in height 5.59 m in width. Table 4.9 summarises the dimensions of the gatehouse and weighbridge. Figure 4.20 illustrates the gatehouse.

Table 4.9 Gatehouse and Weighbridge

Component	Length (m)	Width (m)	Elevation (m)
Gatehouse	14.5	4.0	3.0
Weighbridge	20	3	0.0 Under floor
Roofing	15	12	5.5

4.3.11 Two twenty metre weighbridges will serve the plant. One dedicated to weighing incoming waste fuel and the other weighing outgoing vehicles. The weighbridges will be flush mounted level with the roadway and without raised kerbs. The layout will allow vehicles that do not

need to be weighed to by pass the weighbridges. Some 70 m of straight section of road is provided on access to allow for queuing of vehicles.

Transformer

4.3.12 A transformer is located to the west of the plant. The external dimensions of the compound will be **3.7** m in height **25** m in width and **43** m in length. Table 4.10 summarises the dimensions of the building. The transformer is illustrated within Figure 4.22.

Table 4.10 Transformer and switchgear area

Component	Length (m)	Width (m)	Elevation (m)
Transformer	43	25	3.7

Vehicle Parking

4.3.13 Vehicle parking spaces will be provided for 5 disabled vehicles. For reasons of overall pedestrian safety and security the main area of car parking provision is that of the Kemsley Paper Mill car park located to the south and west of the complex. The parking area can be seen in Figure 4.1. Here provision for 100 cars for staff and visitors at the SEP is made**.** A walkway between the St Regis car park and the SEP already exists. This walk way provides full separation between the car park and the SEP. Other than for disabled personnel there will be no staff parking on the site. Vehicle parking is only authorised where equipment has to be physically transported.

4.3.14 The proposed level of parking is based on staff numbers (including proposed shift arrangements) together with provision for unannounced regulatory authority visits and assumed visitor numbers.

External Lighting

4.3.15 Site lighting is proposed at all times during construction to ensure safety and security. The construction lighting design will include 32x 400W floodlights with the luminaires mounted at a height of 10m on temporary columns around the Site. Localised task lighting may be required after dark during the construction phase, particularly in the winter months. Lighting will be kept to a minimum with light trespass controlled by appropriate technology and directed away from sensitive receptors. The lighting design will be based on the use of appropriate lighting to provide safe working conditions in all areas of the site whilst minimising light pollution and visual impact on the local environment.

4.3.16 During operation of the proposed development external lighting will be provided to ensure the safety of manoeuvring vehicles and pedestrians about the site. Lighting will provided in the form of flood lighting to all main turning areas and road ways wherever possible fixed to buildings or structures or alternatively on columns.

4.3.17 The lighting will incorporate measures which:

- Minimise the potential for sky glow by reducing the potential for upward reflected light.
- Minimise light spread through directional lighting.
- Use shielding to prevent glare.

4.3.18 Lighting will be generally installed along the walkways and staircases around the process equipment to provide illumination for safe access and operational tasks.

Vehicle Wash Down Area

4.3.19 A vehicle wash down area (utilising a manually operated high pressure water jet unit) will be provided in the southern part of the site for the cleaning of vehicle wheels where necessary prior to leaving site. Effluent from the wash down area will be discharged to foul drainage.

Drainage

4.3.20 The proposed drainage scheme is shown on Figures 4.24 to 4.26 which sets out all the components which will form part of the scheme. These include connection to the public sewer and above and below ground rainwater harvesting and arrangements for surface water management.

Fencing and Security

4.3.21 The site will be fenced using a combination of new 3.0 metres high mesh weld and galvanised grey palisade security fencing. These measures are identified on Figure 4.22. Additional security will be provided by CCTV cameras and intruder alarms.

Landscaping

4.3.22 The SEP will be landscaped in accordance with the scheme set out on Figure 8.22. Landscape proposals comprising tree, scrub and grassland establishment have been incorporated as an integral part of the project. Landscape structure planting would be included along the north west and north east perimeters of the site and would incorporate a band of shrub planting with groups of trees. Native, locally typical species would form a robust mix to filter views of the development and add visual and ecological diversity to the townscape.

4.3.23 The perimeter landscape treatments to the north western and north eastern boundaries work in conjunction with the broad flood attenuation ponds which wrap around the development. Grassland would be established on the gently sloping sides of the ponds. The inner edge of the pond will be planted with scattered trees and shrubs along the top of the slope. Species will include silver birch (Betula pendula), hawthorn (Crataegus monogyna) and dog rose (Rosa canina) in an open mosaic habitat.

4.3.24 A broader continuous band of scrub with clumps of trees would be established on the outer edge of the attenuation pond. Species would include goat willow (Salix caprea), aspen (Populus tremula), field maple (Acer campestre), hazel (Corylus avellana), hawthorn (Crataegus monogyna) and blackthorn (Prunus spinosa). The two linear planting treatments would combine to form a visual screen of vegetation when viewed from surrounding receptors. The base of development, including site activities, will be concealed when the planting becomes established, whilst the upper portions of the development will remain visible. The planting will also add visual diversity to the attenuation ponds.

4.3.25 A wider area of land to the north east of the scheme will be planted with an open mosaic of scrub and rough grassland, with clumps of trees. Scrub will be established on the remaining two boundaries between the site and the landfill and the existing paper mill buildings.

4.3.26 Internal green spaces within the site will receive a simple treatment of grassland and flora with a network of mown paths. Seating areas would be defined by native fruiting trees arranged in geometric shapes to reference north Kent's heritage of orchards and fruit production.

4.4 Process Overview

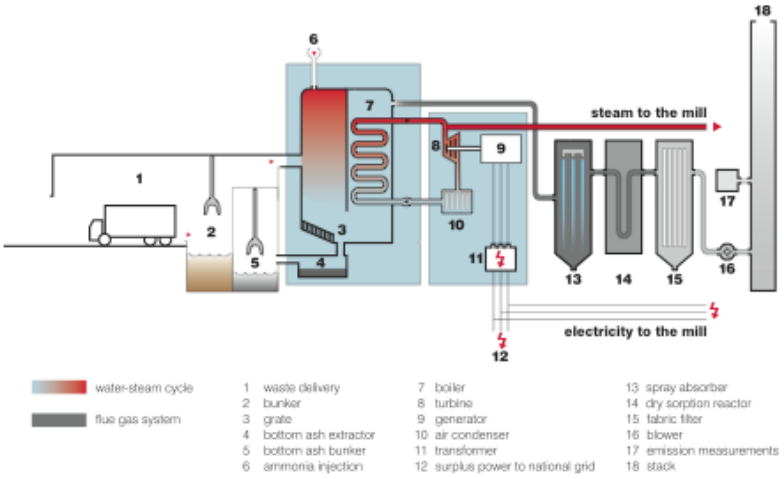
4.4.1 The proposed SEP will utilise proven and tested technology and has been designed to process pre treated waste, where all easily recoverable recyclates have been removed and would otherwise go to landfill, fuel using a two line process. It is assumed that each line will have 90% availability as a result of planned and unplanned downtime. A two line plant provides operational flexibility during periods of maintenance, enabling one line to be shut down whilst the second continues to operate. Down time will be for a period of about 3 weeks per line per year.

4.4.2 Assuming an average calorific value of 10.5 MJ/kg, the plant will generate up to 54 MW gross/ 48.5MW net of electricity (assuming minimum delivery of 50MWth per hour of steam this is 39.5 MWgross/ 34 MW net). The range of likely Calorific Value is the determinant of the quantity of pre treated waste to be imported to the SEP. The electrical energy is generated in

the synchronous generator at a voltage of 10.5kV. This is transformed to a voltage distribution of 400V and to 700V to supply the plant itself. That exported from the plant is fed to the grid via a transformer at 132kV. The plant will produce a minimum of 50MWth per hour of steam which will be fed to Kemsley Paper Mill as an integral part of its energy supply.

4.4.3 A flow diagram of the SEP process is provided in Table 4.11 below.

Table 4.11 Process Flow Diagram



4.4.4 The SEP process equipment will be wholly enclosed within a building. A separate enclosed building will contain the Bottom Ash maturation and storage area. The SEP building will be divided into a number of distinct operational areas all of which relate to function of the overall energy plant process. Elevations which show the location of the main components of the plant within the SEP building are set out within Figures 4.4 to 4.11**.**

Reception Hall and Waste Fuel Bunker

4.4.5 The waste fuel will be delivered to the plant within an enclosed container. The loads will be weighed upon entry to the site at the weighbridge located at the site entrance. The containers/ containerised vehicles will transport the waste fuel to the reception hall using the dedicated circulatory access roads within the site. All containers will be directed to the unloading bay where the waste fuel will be tipped into the bunker. The plant and therefore the bunker is designed to accept up to 3000 tonnes per day. The plant will process waste through the thermal treatment process at a rate of up to 2 x 37 tonnes per hour.

4.4.6 Access to and from the reception hall will be via entrances fitted with fast acting doors which will remain closed unless containerised vehicles are entering or exiting the hall. The floor area within the hall will be periodically washed down to ensure clean operation.

4.4.7 The fuel bunker is accessed from seven gates which are controlled by the crane driver or by a member of staff in the tipping hall to ensure they only open when discharge from a container is to take place. The bunker arrangement takes the form of a rectangular pit set down in to the floor of the reception area. It will have a depth of 7 metres below the general floor level of the plant. The bunker has two main areas. The first, the collection bunker into which the waste fuel will be tipped from the containerised vehicles will have a capacity of 3,456m^3. A permanent barrier provides separation from a larger adjacent stacking bunker which has a capacity of 18,221 m^3. Within the bunkers the waste fuel will be mixed to provide for a regular mix to the plant. Waste fuel is transferred from the collection bunker to the storage by the use of two hydraulic grabs. Here the waste is mixed to provide for a regular quality and is fed to the charging hoppers which in turn feed the grate stoker furnace located within the boiler house.

4.4.8 Operators will monitor the waste fuel flow via an automated weighing system and CCTV system in the control room.

4.4.9 The fuel bunker is ventilated under negative pressure by the primary air fan. During normal operation the exhaust air is fed into the incineration system. During downtime the extracted air is ventilated through a separate activated charcoal filter and discharged through a vent pipe on the roof of the bunker.

Combustion Grate

4.4.10 The combustion grate is where the combustion of the waste fuel takes place. The charging hopper passes into a shaft, the lower part of which is equipped with a double shell and is water cooled. The fuel in this shaft works as a gas tight seal between the combustion chamber and the bunker. Hydraulically driven ram feeders are used to evenly distribute the incinerator charge along its extent and transport it to the grate area. The grate is designed as a multi line sliding grate / feed stoker and longitudinally consists of four separate grate zones. The grate is longitudinally inclined. The grate bars of all zones are cooled by primary air.

4.4.11 The ash hoppers beneath the grate discharge into the water quench of the water based slag extractor. The burnt up slag at the end of the grate falls into the water quench via the bottom ash hopper. A slat conveyor carries ash and slag out of the water quench. The material is transported to the slag bunker via a belt conveyor.

4.4.12 Back up burners fuelled by light fuel oil are located above the grate. The burners allow for start up from a cold state and as a supplementary firing means to ensure a minimum operating temperature of 850 ^oC as necessary.

4.4.13 Primary combustion air will be fed into the furnace through the underside of the grates by a primary air fan. Secondary air will also be injected at high velocity through nozzles positioned in the walls of the combustion chamber above the level of the waste. This will create turbulence, which assists mix the secondary air and combustion gases to achieve complete combustion of the gases. The volume of both primary and secondary air will be regulated by an automatic combustion control system.

4.4.14 The steam generation system is located above the grate. The steam generating environment operates within a pressure of 48bara and 410^{o}C. This minimises chloride corrosion to the heating surfaces. The pipe walls of the first, second and third exhaust flue as well as those of the horizontal flue constitute the evaporator heating surfaces, where at first saturated steam is generated. The horizontal flue contains the convection heating surfaces suspended in the flue gas flow and super heater and feed water heater (Economiser). The flue gas is ventilated from the grate via the four passes in to the flue gas treatment system behind the horizontal flue.

Energy Recovery

4.4.15 Low pressure steam is extracted for use as process steam within the adjacent paper mill. The plant will have a reasonable sized steam turbine with steam inlet conditions of about 410^{o}C/48bara. The steam required in the mill will be used at c. 9bara or at c. 6bara. The steam is fed to the paper mill over a bridge which crosses the site internal road to the west of the proposal site.

Flue Gas Treatment

4.4.16 Combustion gases will be cleaned before they are released to the atmosphere. The flue gas treatment system is a dry conditioned flue gas treatment system. The final configuration and design of the abatement plant will be agreed with the Environment Agency as part of the Environmental Permitting authorisation process. The flue gas treatment system will be designed to be compliant with the EC Waste Incineration Directive, which will be enforced by the Environment Agency through conditions attached to the facilities Environmental Permit. The proposed flue gas treatment process is able to precipitate acid components to a minimum. The flue gas from the grate is denitrified by a process which turns nitrogen oxides (NOX) produced during combustion by non catalytic conversion to nitrogen and steam. The reducing agent used is ammonium hydroxide, which reacts with nitrogen dioxide of the flue gases within a temperature range of 850 - 950^{o}C. Approximately, 20% by weight of the total ash produced by the sustainable energy plant will be in the form of fly ash and reaction product FGT. Thus assuming a 90% load factor it is expected that approximately 28,000 tonnes of fly ash and reaction FGT residue will be produced per annum.

4.4.17 A major aspect of the dry conditioned flue gas treatment system is that it does not generate waste water. The plant consists of the following components.

- Spray absorber
- Dry sorption reactor
- Fabric filter
- Induced draught fan
- Stacks

4.4.18 Within the spray absorber, there is turbulent contact between flue gases and injected water slaked lime which enables pre separation of chloride and sulphur dioxide and the quenching of flue gas by injected water. The cooling down and the increase of the water content provides for an interim formation of a liquid phase at the surface of the dust and salt particles and enhances the performance of the absorption of pollutants in the process which follows.

4.4.19 The activated charcoal, a dry sorption reactor is introduced to the flue gas to separate heavy metals and dioxins and furans by adsorption. Dry hydrated lime is injected also. The solid reaction products leave the dry sorption reactor with the flue gas and are precipitated in the fabric filter downstream in the process. The filter bags are regularly cleaned. Most of the material precipitated in the fabric filter is initially moistened and then re-circulated using screws and mechanical conveyors. The remainder is transported by conveyors to the residue silo where the ash from the boiler flue is also collected. Once collected, the ash will be loaded into sealed containerised vehicles and transported from the site for disposal within a permitted facility.

4.4.20 Clean exhaust gas is directed to the stack by an induced draft fan. An exhaust silencer will control sound emissions at the stack outlet.

Stacks

4.4.21 Each processing line will be served by a stack with a height of 90 metres located at the south western end of the building. The height has been determined through extensive dispersion modelling of emissions and evaluation of the resulting dispersion plumes so that ground level concentrations of key pollutants are maintained within acceptable levels under all operating conditions.

4.4.22 Dispersion of pollutants is dependent upon a number of factors including local land topography, emission rates and pollutant concentrations at the height of the SEP buildings. The air quality and plume dispersion modelling used to identify the chimney height necessary for optimum dispersion is described in detail in Chapter 7: Air Quality. The stacks have been designed to meet all predicted climatic conditions.

Ash Management

4.4.23 Bottom ash (BA) is the cooled burnt-out residue from the combustion process. Around 20% to 25% of the fuel burnt is expected to be converted to bottom ash this equates to 80% of the total ash produced. This equates to up to 138,000 tonnes per annum of bottom ash. Ash from the slag bunker is transported to the slag treatment system using a crane and a belt conveyor. The ash is treated to precipitate iron, non iron metals and un-burnt fuel. The slag is crushed into a graded material. Ferrous and non ferrous metals are recovered with un- burnt matter returned to the fuel bunker. The ash is graded and stored in rows within an enclosed building for a period of three months during which time it maturates. This process enables the bottom ash to hydrate and age which improves its ability to be used for constructional purposes. All maturated bottom ash (slag) will be exported from the site.

Any ash that has not been sold will be treated as a waste product from the process. Bottom Ash, as with other wastes, will need to meet Waste Acceptance criteria testing thresholds before being accepted for landfill (Environment Agency, 2006).

4.5 Waste Types, Inputs Sources and Facility Options

4.5.1 The SEP is designed to process fuel in the form of pre treated waste from the commercial and industrial, and municipal solid waste streams, together with waste Solid Recovered Fuels. The mixed waste stream will have a predicted average net calorific value of 10.5 MJ/kg. The proposal site will seek to attract a wide range of local Commercial and Industrial Wastes.

4.5.2 The sources of treated waste fuel have yet to be determined, Subject to appropriate fuel supply agreements, It is anticipated that pre treated waste will be sourced from Kent with the balance from London, the South East and elsewhere in the UK subject to commercial viability. Waste will be brought to the site by HGV vehicles. There is the potential for waste fuel to be transported to the site by the use of both rail and water transportation utilising facilities at the local Ridham Sea Terminals.

4.6 Other materials used and stored on site

4.6.1 A range of chemical substances and hazardous materials will be stored on site associated with the SEP process including urea/ ammonia water (25%), calcium hydroxide and activated carbon, boiler water treatment chemicals, low sulphur fuel oil and oxygen and acetylene bottles. These materials will be stored in accordance with Environment Agency guidance.

4.6.2 The reagent and boiler water treatment chemicals will be stored in suitable storage tanks located within the building infrastructure (stored in the concrete building within the boiler house). Lime and activated carbon will be used within the Flue Gas Treatment process. Storage will be in dedicated steel silos with equipment for filling from a tanker through a sealed pipe work system. Delivery to site will be by bulk powder tanker.

4.6.3 Boiler water treatment chemicals will be used to control water hardness, pH and scaling and will be delivered in sealed containers and stored in the water treatment room. Fuel oil will be used on site for the auxiliary support burners and diesel fuel for mobile plant and equipment. The fuel oil will be stored within a bunded storage tank and the diesel tank is located underground. Portable bottles of oxygen and acetylene gas will be stored on site for welding purposes gas bottles will be kept secure.

4.7 Water Usage, Drainage Treatment and Disposal

4.7.1 The proposal site generally comprises land previously used for storage. The construction and operation of the new development will therefore significantly increase the impermeable area of the site and therefore the volume of the surface water run off from the site.

4.7.2 The overall philosophy for the design of the surface water drainage system for the site development is therefore to manage surface water discharge sustainably and at source and to ensure that discharged waters do not constitute a pollution risk. The drainage philosophy is set out at Appendix 4.3.

4.7.3 The surface water design is shown on Figure 4.25 and sections Figure 4.24 It is shown that all clean surface water from the site is discharged to receiving storage ponds constructed on the northern, eastern and southern perimeters of the site. The storage ponds discharge this water under gravity to the tidal Swale estuary to the north east. Site levels are shown on Figure 4.26. The provision of the constructed ponds will provide an effective and economic way of conveying water to the reed bed habitat from surface water run off. The drainage swale will also provide protection against flooding of the site during rainfall and tidal events.

4.7.4 The perimeter storage swale will be vegetated and will hold, slow down and contribute to treatment of the run off water. The drainage swale will prevent uncontrolled discharge water entering areas of land adjacent to the site. The surface water drainage network incorporates underground water harvesting tanks and pump arrangements to collect water from building roofs. This water will be used for fire water purposes, for toilet flushing, process water and landscape irrigation.

4.7.5 The SEP process is designed to be a net consumer of water and therefore there is no requirement for regular discharge of waste water from the combustion process. Waste waters are however generated from the process in the following areas.

- Water from the boiler drains
- Back flushing water from the de mineralisation plant
- Liquid run off from wash down operations
- Surface water on roads and hard standing
- Rainwater from roofs

4.7.6 The process requires the large scale storage of ash/ slag in a covered lay down area located to the north east of the site. The stored slag will be wet initially and will be moved by loading shovels entering from the adjacent external areas. A raised concrete upstand will be provided on the open sides of the covered laydown area. The run off water from the stockpiles will be collected in slot drains and discharged back to the slag extractor or recirculated on top of the slag stockpiles. Circulation and yard areas immediately adjacent to the laydown areas will be subject to the regular movement of loading shovel vehicles. The runoff from these external areas will be discharged to the surface water system following pre treatment such that it is of suitable quality for discharge to estuary waters. Full retention oil separators and catch and silt traps are included in the layout.

4.7.7 Foul drainage (production of domestic foul waste, process driven waste water, refuelling and vehicle wash down area run off) will discharge to the existing foul sewer located within Ridham Avenue. The remoteness of some of the areas requiring connection to the foul system will require that a pumping station and rising main are provided to discharge foul water to the receiving sewer at self cleansing velocities. The integral system of drainage to the foul drainage as shown on Figure **4.25**.

4.7.8 During construction of the bunker, the integrity of the walls and base will be verified. Further routine visual checks of the bunker will be undertaken following clearance of waste fuel to ensure its integrity is maintained.

4.8 Hours of Operation

4.8.1 Permission is being sought to enable the SEP to operate continuously 24 hours per day, seven days a week. It will operate continuously throughout the year with the exception of planned shut downs and unplanned maintenance. As far as practical, time booking arrangements for waste receipts will be put in place in order to minimise the impact at peak times on the local highways. In respect to the receipt of waste fuel by heavy traffic movements this will as far as possible take place between the following hours:

0700 and 1800 hours Mondays to Fridays
0700 and 1300 hours Saturdays.

4.9 Site Staff

4.9.1 The SEP will employ approximately 50 full time employees comprising operator shift staff, maintenance employees, weighbridge operators, clerical and administrative staff and plant management.

4.9.2 The plant will have 5 shift teams. Each day there will be 3 shifts, operating from 7am to 3pm, 3pm to 11pm and 11pm to 7am. A normal shift team member will work on 3 morning shifts then a day off. Then 3 (second cycle 4) afternoon then 4(second cycle 3) night shifts, then 6 day off. The cycle starts again after the days off.

4.9.3 In addition an average of 100 contractors will be employed for planned shutdowns.

4.9.4 During construction approximately 500 contractors will work at the site.

4.10 Monitoring

4.10.1 The proposed monitoring arrangements are summarised below. These will be agreed in detail through the Environmental Permit administered by the Environment Agency.

Flue Gases

4.10.2 The monitoring of exit flue gases will be achieved through the use of a Continuous Emissions Monitoring System (CEMS) which comprises a sample handling system, analyser unit and logging/reporting equipment. These systems use various analytical technologies to determine the gas composition on a continuous basis.

4.10.3 The components measured will as a minimum be those stipulated by current legislation, together with others required for process control purposes and will comprise particulate, HCI, SO2, NOx, NH3, CO, Hg and O2. The emissions components to be identified and monitored will be specified in the Environmental Permit and will be available to the Environment Agency. The CEMS will have an emergency electrical supply with sufficient capacity to maintain the system for at least 30 minutes in the event of power failure. All monitoring instruments will be regularly calibrated. A standby continuous monitoring system will also be provided that can be switched into operation on either line in the event of a problem with the duty system or whilst maintenance is taking place. Dioxin /Furan and heavy metal sampling will be undertaken in accordance with the Environmental Permit. The

sampling will be carried out by an independent company and is expected to be supplemented by tests carried out by the Environment Agency.

Process Control

4.10.4 The processes taking place throughout the plant will be monitored by an integral computer control system, typically comprising Programmable Logic controllers for the furnace and grate, fuel crane operation, gas cleaning system, bag filter, water treatment plant and turbine generator system.

4.11 Hazard Prevention & Environmental Controls

Fire

4.11.1 Comprehensive fire protection and detection systems will be installed within the facility to prevent fires occurring. In addition to these systems standard health and safety procedures will be put in place. Flammable liquids and chemicals will be kept in sealed containers / tanks within bunded storage areas.

Spillages of Additives

4.11.2 Additives and chemicals will be stored in sealed tanks within bunded storage areas with a capability of containing 110% of the capacity of each storage tank. Additives including lime and activated carbon will be fed into the process automatically and there should be no requirement for human intervention into this process.

Emissions to Air

4.11.3 The potential impacts of the facility's emissions to the atmosphere are discussed in detail in Chapter 7: Air and Climate.

Odour and Dust Suppression

4.11.4 Odour, dust and other potential environmental impacts from the plant will be controlled in accordance with the requirements of the Environment Agency Environmental Permit guidance. Air from the tipping hall has the potential to be odorous, however containment of dust and odour within this area will be achieved through the maintenance of negative pressure in the hall. Further odour suppression control will be introduced should circumstances require this.

4.11.5 Combustion air fans will draw feed air for the combustion process from the waste reception hall into the furnace to feed the combustion process. As a result, any dust or odour from the tipping, mixing, shredding and furnace loading operations will be retained within the waste fuel reception hall or drawn into the furnace where the odour carrying gases will be destroyed by combustion, virtually eliminating the possibility of odour detection outside the facility. Doors will be fitted with automatic door closures where required.

Vermin Control

4.11.6 The main area where vermin (such as rats and flies) could potentially be attracted is the tipping and bunker hall. Waste fuel will not be allowed to accumulate within the tipping hall and the floors will be kept clean through the use of loaders which will collect any spilled waste and deposit it into the waste bunker. In addition to these measures, standard pest control methods will be implemented as part of the Environment Agency permitting procedures.

Noise

Vehicles and reversing alarms

4.11.7 The layout of the facility has been designed such the majority of vehicle reversing actions will take place within the buildings thereby removing the impacts associated with reversing alarms.

Buildings and equipment

4.11.8 Buildings will be fully enclosed and will be insulated where appropriate in order to achieve acceptable noise levels at the closest sensitive receptor locations. Access and exit doors within the plant that are in continuous operation during week days will incorporate rapid closing doors. When not in use the doors will be closed at all times.

4.11.9 All plant and equipment will be located and operated within the confines of the proposed building environment with the exception of the air cooler and the transformer.

4.12 Plant Maintenance and Shutdown

4.12.1 The SEP is expected to operate continuously with both lines in operation throughout the year with the exception of maintenance periods. Typically there will be a three week planned shutdown each year for each line.

4.12.2 During this time there will be no need for any changes to the direct fuel waste delivery pattern to the SEP, as the facility will operate at half capacity, allowing it to process all of the delivered waste. In the unlikely event of an unplanned shutdown of both lines, waste materials would either be transferred or redirected to alternative treatment or disposal facilities elsewhere.

4.12.3 The SEP is carefully designed with sufficient duplicated equipment to ensure a high level of operational availability. All equipment within the SEP will be subjected to a planned and preventative maintenance programme to minimise the occurrence of unplanned shutdowns.

4.13 Operating Conditions

Start Up

4.13.1 This will take place during commissioning of the facility and after each maintenance shutdown period. Prior to start up, all systems and equipment will be checked to ensure they are ready for use. Prior to combustion, auxiliary burners using fuel oil will be used to ensure that the furnace temperature is at least 850ºC. Once the appropriate temperatures have been achieved, the feed hopper and grate are activated and waste fuel fed into the furnace.

4.13.2 Generation of electricity can only begin when sufficient steam at the correct pressure and temperature has been produced. There will be a period of delay between start up and the export of electricity to the local public electricity supply network. During this period the plant will import electrical power through the same cables that are used for export of generated power.

Fire Protection

4.13.3 The SEP will be equipped with a comprehensive fire protection and detection system and will conform to the required health and safety regulations including procedures in the event of a fire. In the bunker hall, remotely operated water cannons will be installed which are capable of covering the entire bunker and feed hoppers. Both an electrical fire pump and a reciprocating engine-driven fire pump will ensure that fire systems are available at all times. The operation of the fire pump will set off an audible alarm in the control room. The firewater tank will be sufficient to provide enough water for at least 2 hours capacity of the pump, giving time for the emergency services to respond.

4.13.4 Fire detection and protection systems will be installed in other areas of the plant, the type of which will be dependent on the nature of the process(es) taking place in any given location. Smoke extractors will also be fitted in all buildings and staircases. Fire detection and protection systems will be installed in all electrical and instrument rooms, and will be tested to current standards.

Failure of a Bag Filter

4.13.5 Failure of a filter bag is an irregular event, which would be detected by monitoring equipment, which sends a warning to the operators in the control room. The bag filters are then tested to locate the faulty bag and this section of the filter is isolated, shut down and the bag replaced. Individual bag failure will not result in an exceedance of the PPC permit limits.

Failure of FGT Equipment

4.13.6 There are various standby items (e.g. a standby atomiser) which can readily be installed to enable the plant to remain operational. If a lime injection system failure were to occur then unspent lime on the filer bags will ensure that the combustion conditions and emissions comply with the PPC permit during an emergency shutdown.

Failure of Other Equipment

4.13.7 The plant has been designed with stand-by systems and redundancy in equipment and this, together with a comprehensive planned maintenance programme to ensure the plant remains operational and in compliance with the Environmental Permit.

Grid Connection Failure

4.13.8 In the event of a failure of the power supply connection to the local public supply network, the facility will operate in island mode, during which the turbine generator will directly supply the required power to sustain operation of the SEP until the supply connection is restored. In the event that operation in island mode is not possible, the facility will switch to an uninterruptible power supply and import power from the power supply network/ CHP, allowing the facility to maintain all critical systems. Under these conditions, a controlled shut down of the facility will be initiated. During this period, all emissions will be monitored and kept within the permitted limits.

Emergency Shutdown

4.13.9 If any incident endangers or is likely to endanger personnel, or there is a risk of serious damage to the facility, an emergency shutdown will be necessary. Prior to the plant becoming operational, precise operating procedures for the various possible scenarios according to the likelihood of incidents in the facility, taking into account the safety of personnel and the equipment will be in place.

4.13.10 In order to rapidly extinguish combustion in an emergency, an emergency shutdown will be initiated and the induced draft fan will be switched off. This would result in the immediate stopping of the combustion air fans, the grate feed and the burner. Staff will ensure that the above actions have been completed, the air dampers under the grate are closed, and the burner fuel oil safety valves are closed.

4.14 Construction

Timescales

4.14.1 An outline general construction programme is provided at Appendix 4.1. Subject to planning permission, release of pre-commencement conditions and contractor mobilisation, it is estimated that the development timescales would likely to be as follows:

- Commence Construction: 2011
- Construction Completion: 2013
- Commissioning: 2013
- Run-in period: completed 2014

.

4.14.2 There are two main periods of construction works which will overlap to some degree. These are the civil engineering works associated with the plant construction and the process work involved in the mechanical and electrical equipment installation, fit out and commissioning of the plant.

4.14.3 In practice, some waste will be taken during the commissioning period on an intermittent basis. For the purpose of the EIA, December 2013 has been assumed as the commencement date for waste fuel imports to the site.

Hours

4.14.4 Construction operations will generally take place between the following hours:

- 07:00 – 19:00 Monday to Friday
- 07:00 – 16:00 Saturday and Sundays

4.14.5 However, it is envisaged that non-intrusive activities (such as electrical installations, pipework and similar activities) would be undertaken outside of these hours in order to minimise overall construction time. HGV movements associated with such activities would be insignificant. The construction of the bunker walls has to be a continuous process and will be of 12 -15 weeks in duration. The delivery of concrete and construction using it would be on 24 hours, 7 days per week.

4.14.6 Any intrusive work outside of these hours would be with the prior agreement of the Local Planning Authority, accept in the case of any emergency.

Access

4.14.7 Site access during construction works will be via the existing Ridham Road access which links to Barge Way

Plant

4.14.8 Plant to be used during the construction phase will typically include:

- Tracked Excavators (Excavation and loading)
- Articulated Dump Trucks
- Wheeled Back Hoe Loaders
- Wagons
- Telescopic handlers
- Rollers
- Water Pumps
- Concrete pump
- Generators
- Cement Mixer Truck
- Cranes
- Piling Rig(s)

Operational Practices

4.14.9 The following text sets out the operational practices that will be employed during the construction phase to minimise environmental impacts. In addition to the information presented below, the proposed contractors Common Environmental policies are included at Appendix 4.2.

Erection and Maintenance of Security Fencing (Including Construction Site Signage, where Appropriate)

4.14.10 The construction site boundary will be secured using 2m high fencing system with gated access points onto site at positions off the Ridham Road. There are no public rights of way across the site, therefore during the construction phase of the project there should be no areas that require a public interface.

4.14.11 Site personnel access routes will be segregated from construction vehicular traffic.

Storage of Construction Plant and Materials

4.14.12 During construction, the construction area will be segregated into stores, fuelling area, plant parking and materials. General construction materials and overnight parking of plant will occur within the development site boundary which will be provided with 24hour security. The proposal site itself will be used as a lay down area during construction.

4.14.13 Stores will be positioned to the forefront of the lay down area for easy access for small tools and plant, these will be organised so fire fighting equipment and spill kits are easily accessible.

4.14.14 The storage area will be constructed with a clean stone platform / existing concrete, and timbers/ pallets available for the off loading of materials to ensure that materials remain clean and fit for use.

4.14.15 Materials in need of added protection from the elements will be sheeted when required, this will be assessed as part of the build contractors quality procedures and a materials management plan will be produced for all major items.

4.14.16 Most materials will be transported to the work area as required but for major materials, for example structural steel, deliveries will be co-ordinated so they will be transported on site to the designated live work area and unloaded for immediate erection.

Site Operative and Visitor Parking

4.14.17 Directional signage for the building contractors will be placed in prominent positions off Barge Way directing construction/ visitor's traffic to the existing car park off the main site access road. Once entering the compound a defined route will be in place directing the personnel traffic into the site compound parking area catering for the 100 parking spaces.

4.14.18 Vehicular and pedestrian traffic will be separated using the existing site arrangements to mitigate risk of potential interface incidents. A defined route will be placed to direct the site personnel from the compound to the main construction site, this will be segregated to mitigate risk of collision between pedestrians and vehicles.

Loading and Unloading of Plant and Materials

4.14.19 Construction delivery and plant traffic will be directed by means of prominent signage into the site along the existing site haul road.

4.14.20 On entry to the site a check point, with gateman/security guard in attendance, will be placed with visible signage requesting delivery drivers to sign in and notify site personnel prior to entry into the construction work area.

4.14.21 All loads and tickets will be checked prior to the off loading of materials and plant on site, or within the designated materials laydown area. All off loading activities will be carried out under a permit to work procedure.

Wheel Wash Facilities

4.14.22 A wheel wash facility, located at the exit from the site, will be used during the earlier stages of construction. This is expected to be a bespoke system comprising a self contained unit, an integral pump house and internal settlement collection tank. The platform will be drive on, drive off, complete with a series of sensor controlled steel high pressure water hoses and a power washer hand lance.

Measures to Control the Emission of Dust and Dirt During Construction

4.14.23 Dust and dirt emissions will be monitored by the site engineer on a daily basis dependant on the weather conditions / elements and activities being carried out. To supplement the use of the wheel wash, which will prevent the majority of dust and dirt from being carried onto the public highway, the site access roads and existing approach road will be regularly swept by a mechanical road sweeper as and when required to maintain the roads to an acceptable standard. The prevention of inherent dust on site in dry conditions will be controlled by means of regularly damping down the site using water from a towed sprinkler unit.

4.14.24 Dust control during construction activities which effect workforce involved in specific activities will be risk managed by the building contractor's stringent permit to work risk assessment procedures.

Recycling of Waste

4.14.25 General site waste generated throughout construction will be segregated. This will include waste generated within the site compound and office set up which will be separated between general household type waste generated from the messing facilities and paper waste which will be disposed in designated paper recycling bins.

4.14.26 The waste generated from construction activities will be separated on site in general waste, timber waste and steel waste skips; this will be managed by the contractor and will be removed from site to an appropriate facility for processing. A detailed Waste Minimisation Statement will be submitted to the Waste Planning Authority for approval prior to the commencement of construction works.

Site Specific Procedures

4.14.27 The following site specific procedures will be in place during the construction period:

- all employees will attend a Site Induction (both for construction works and the St Regis site) carried out by the construction contractor on arrival to site. The induction will be project specific emphasising the contractors safety procedures and rules and site plans phasing;
- all employees will have signed onto the contractors Permit to Work/Risk Assessment and will have read and understood the method of work and safety procedures prior to commencing work on site;
- 'Take Time' risk assessments will be completed by each working gang or persons prior to commencing work;
- all plant operatives will be competent trained personnel and carry the required certification (CPCS) in line with the contractors approved list;
- site staff will carry out daily checks as part of safety and quality procedures; and,
- all operatives will be briefed at induction stage on the importance of waste segregation and recycling of materials generated on site.
- An example of the site rules proforma to be implemented is provided in Appendix 4.3

Foul Water

4.14.28 For construction work it is anticipated that the contractor will use a septic tank for sanitary and domestic drainage.

Decommissioning

4.14.29 Planning permission is sought for permanent development on the site and therefore it is not considered necessary to consider the impacts of the decommissioning phase within this Environmental Statement.

4.14.30 In the event that decommissioning becoming necessary, the techniques followed would be undertaken having regard to the following regulations (or their subsequent replacements):

- Building Control Regulations
- Construction (Design and Management) Regulations 2007.
- Integrated Pollution Prevention and Control (IPPC) Regulations.