BARRY ENERGY RECOVERY LTD

BARRY ENERGY RECOVERY FACILITY

ENVIRONMENTAL STATEMENT

December 2008

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GLOSSARY

Acoustic Cladding	**Cladding placed around a source of noise to lower the levels of noise detected by a receptor.**
Alternatives	**In EIA, an examination of alternative locations, methods, design, processes and techniques for a particular project including the alternative of not proceeding.**
Appropriate Assessment	**An Appropriate Assessment needs to be undertaken in respect of any plan or project which:** • **either alone or in combination with other plans or projects would be likely to have a significant effect on an European Site, and** • **is not directly connected with the management of the site for nature conservation.**
Baseline Studies or Surveys	**Collection of information about the current socio-economic status, against which to measure any effects of the project.**
Biodiversity	**Diversity of biological life, the number of species present.**
Controlled Waste	**A waste type composed of either domestic, commercial and/or industrial waste.**
Cumulative Effects/Impacts	**Progressive environmental degradation over time arising from a range of activities throughout an area or region, each activity considered in isolation being possibly not a significant contributor.**
Developer	**The initiator of a project; also called the proponent or applicant, for development consent.**
Development Advice Map	**Series of Maps produced by the Environment Agency containing information relating to zones of flood risk**
Ecology	**The study of plants and animals in relation to their environment.**
Environment	**A concept that includes all aspects of the surroundings of humanity affecting individuals and social groupings. The environment can be defined as 'the combination of elements whose complex inter-relationships make up the settings, the surroundings and the conditions of life of the individual and of society, as they are or as they are felt'.**
Environmental Assessment / Environmental Impact Assessment	**Processes intended to ensure that environmental impacts of schemes are identified prior to the work being carried out so adverse environmental impacts are avoided or minimised.**
Environmental Impact	**The total effect of any operation on the environment**
Environmental Statement	**Document produced at the completion of a formal Environmental Assessment that accompanies a Planning Application. In the**

	context of this Project, this is the document that will report the EIA process of the preferred design.
Ferrous	**Iron containing metals that are attracted to magnets.**
Fluvial Floodplain	**River floodplain.**
Greenfield Runoff	**Greenfield run-off is the surface water drainage regime from a site prior to development, or the existing conditions for brownfield redevelopment sites.**
Habitat	**The customary and characteristic dwelling place of a species or community.**
Herptiles	**Collective name for reptiles and amphibians**
Hydrogeology	**The study of the occurrence and movement of groundwater and its interaction with geology.**
Hydrology	**The study of water.**
Invertebrate fauna	**Animals which lack a vertebral column used for biological classification. Especially macro-invertebrates (animals of sufficient size to be retained in a net with a specified mesh size).**
Magnitude	**The size or physical extent of an impact.**
Megawatt	**A unit of energy equivalent to one million watts.**
Mitigation Measures	**Steps which may be taken to minimise or eliminate the adverse effects or impacts of a development.**
Municipal Solid Waste	**A waste type that includes predominantly household waste (domestic waste) with sometimes the addition of commercial wastes collected by a municipality within a given area. They are in either solid or semisolid form and generally exclude industrial hazardous wastes. There are five broad categories of MSW: Biodegradable waste: food and kitchen waste, green waste, paper (can also be recycled). Recyclable material: paper, glass, bottles, cans, metals, certain plastics, etc. Inert waste: construction and demolition waste, dirt, rocks, debris. Composite wastes: waste clothing, Tetra Paks, waste plastics such as toys. Domestic hazardous waste (also called "household hazardous waste") & toxic waste: medication, e-waste, paints, chemicals, light bulbs, fluorescent tubes, spray cans, fertilizer and pesticide containers, batteries, shoe polish.**
National Nature Reserves	**Sites either owned or controlled by the Countryside Council for Wales or held by approved bodies such as Wildlife Trusts, established to protect the most important areas of wildlife habitat and geological formations in Britain, and as places for scientific research.**
Nitrogen Dioxide (NO_2)	**Reddish brown gas derived from the**

	combustion of fossil fuels. Often contributes to summer smog giving it a characteristic brownish colour.
Nitrogen Oxides	**A mixture of nitric oxide (NO) and nitrogen dioxide. Derived from the combustion of fossil fuels in motor vehicles and power / heat generation.**
Non-aquifer	**A strata of rock generally regarded as containing insignificant quantities of groundwater with imperceptible flow.**
Non-Technical Summary	**A document accompanying the Environmental Statement, which summarises it using non-technical language.**
Particulates (PM10)	**Particulates are particles of solid matter of different sizes found in the atmosphere. Particulate matter of less than 10µm, referred to as PM10 is of concern, as it can penetrate the human respiratory system.**
Permeability	**a measure of the ability of a material (such as rocks or soils) to transmit fluids**
Pyrolysis	**The chemical decomposition of organic materials by heating in the absence of oxygen.**
Riparian	**River bank**
Scoping	**The process that seeks to identify at an early stage of the EIA process, from all the project's possible impacts, those that are the significant issues requiring further assessment.**
Screening	**The process of deciding whether or not a certain project requires an EIA or not.**
Significance	**There is not a statutory definition of significance however there are a number of accepted approaches that define significance or significant effects. For the purpose of this document two of the most frequently used approaches in environmental assessment studies are considered:** **An effect which either in isolation or in combination with others should be regarded as a 'material consideration' during the decision making process (this term is used as it is in a planning context);** **A significant effect will be identified by considering the following criteria:** **extent and magnitude** **short-term/long-term** **reversibility/irreversibility** **performance against environmental quality standards** **sensitivity of the receptor** **compatibility with environmental policies**
Site of Importance for Nature Conservation	**An area designated as being of local conservation interest by the Local Planning Authority.**
Site of Special Scientific Importance (SSSI)	**A site given statutory designation by the Countryside Council for Wales because it is**

	particularly important, on account of its nature conservation value.
Special Area of Conservation (SAC)	**SACs are areas of land and sea that are considered important for threatened European habitats and species.**
Special Protection Area (SPAs)	**SPAs are strictly protected sites classified in accordance with Article 4 of the EC Directive on the conservation of wild birds (79/409/EEC), also known as the Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds, listed in Annex I to the Birds Directive, and for regularly occurring migratory species.**
Stakeholder	**Any one with any personal interest in the Project, for example local residents, B&NES, consultees, any receptor of any effects of the Project.**
Surface Water	**Water collecting on and running off the surface of the ground.**
Sustainable Development	**Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.**
Terrestrial	**Land based**
Topography	**Physical features of a geographical area.**
Unitary Development Plan	**Authorities produce unitary development plans, which combine the functions of structure and local plans and include minerals and waste policies, in London and the metropolitan areas, and in a few non-metropolitan unitary areas.**
Watercourse	**A stream, river, canal or channel along which water flows.**
Water Resource	**The naturally replenished flow of recharge of water in rivers or aquifers.**

ABP	**Associated British Ports**
AOD	**Above Ordnance Datum**
AONB	**Area of Outstanding Natural Beauty**
APIS	**Air Pollution Information System**
AQMA	**Air Quality Management Area**
AQS	**Air Quality Strategy**
ATC	**Automated Traffic Counts**
AURN	**UK Automatic Urban and Rural Network**
BAP	**Biodiversity Action Plan**
BERL	**Barry Energy Recovery Ltd**
CAMS	**Catchment Area Management Strategy**
CCW	**Countryside Council for Wales**
CEMP	**Construction Environmental Management Plan**
COMAH	**Control of Major Accident Hazard Regulations**
cSAC	**Candidate Special Area of Conservation**
cSINC	**Candidate Site of Importance for Nature Conservation**
CSM	**Conceptual Site Model**
DAM	**Development Advice Map**
DCWW	**Dwr Cymru Welsh Water**
DMRB	**Design Manual for Roads and Bridges**
EA	**Environment Agency**
EAL	**Environmental Assessment Level**
EIA	**Environmental Impact Assessment**
ELVs	**Emission Limit Values**
ES	**Environmental Statement**
FCA	**Flood Consequences Assessment**
Ha	**Hectare**
HMIP	**Her Majesty's Inspectorate of Pollution**
IDB	**Internal Drainage Board**
IEEM	**Institute of Ecology and Environmental Management**
IEMA	**Institute of Environmental Management and Assessment**
IHT	**Institution of Highways and Transportation**
IPPC	**Integrated Pollution Prevention and Control**
km	**Kilometre**
LA	**Local Authority**
LAQM	**Local Air Quality Management**
LBAP	**Local Biodiversity Action Plan**
LDP	**Local Development Plan**
LI	**Landscape Institute**
LNR	**Local Nature Reserve**
LPA	**Local Planning Authority**
MCERTS	**The Environment Agency's Monitoring Certification Scheme**
MSW	**Municipal Solid Waste**
NAQIS	**National Air Quality Information Service**
NCC	**Newport City Council**
NGR	**National Grid Reference**
NIHHS	**Notification of Installations Handling Hazardous Substances**
NNR	**National Nature Reserve**
NSCA	**National Society for Clean Air**

NSR's	**Noise Sensitive Receptors**
NTS	**Non Technical Summary**
PB	**Parsons Brinckerhoff Ltd**
PPC	**Pollution Prevention and Control**
PPG	**Planning Policy Guidance**
PPS	**Planning Policy Statement**
SAC	**Special Area of Conservation**
SDR	**Southern Distributor Road**
SEWBReC	**South East Wales Biodiversity Records Centre**
SINC	**Site of Importance for Nature Conservation**
SPA	**Special Protection Area**
SPZ	**Source Protection Zone**
SSSI	**Site of Special Scientific Interest**
TAN	**Technical Advice Note**
TDI	**Tolerable Daily Intake**
UDP	**Unitary Development Plan**
UK	**United Kingdom**
UKBAP	**United Kingdom Biodiversity Action Plan**
UXO	**Unexploded Ordnance**
VER	**Valued Ecological Receptor**
WAG	**Welsh Assembly Government**
WDA	**Welsh Development Agency**
WID	**Waste Incineration Directive**
WEL	**Workplace Exposure Level**
WMF	**Waste Management Facility**
WRH	**Waste Reception Hall**
ZTV	**Zone of Theoretical Visibility**
ZVS	**Zone of Visual Significance**

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Background to the Facility

1.1.1 Barry Energy Recovery Ltd (BERL), part of the BioGen Power Ltd (BioGen Power) group of companies, propose to build and operate an Energy Recovery Facility at Barry Docks in the Vale of Glamorgan (see figure 1.1). The Facility will process approximately 80,000 tonnes of residual waste per annum to create approximately 7.5 MWe renewable energy for transfer to the National Grid system.

1.1.2 Parsons Brinckerhoff Ltd (PB) has been commissioned by BERL, the proponent, to undertake an Environmental Impact Assessment (EIA) to accompany the detailed Planning Application for the Facility in Barry Docks, (NGR: 312810, 167260). The site location is illustrated in Figure 1.1.

1.2 Background to the Development

1.2.1 The Site extends to approximately 1.6ha and is located in an existing industrial environment. Historic and existing land use in the vicinity of the Site includes other waste management activities. At present the Site is covered by scrub vegetation, all of which will be removed as a consequence of the proposed development.

1.2.2 The Site is located in an existing industrial environment. Historic and existing land use in the vicinity of the Site includes waste management activities (scrap yards, waste segregation, and landfill) and bulk materials storage and handling (including stockpiles of sand and other aggregates) and other small industrial units. At present the site is covered by scrub vegetation, all of which will be removed as a consequence of the proposed Development.

1.2.3 The applicant proposes to construct and operate an Energos Energy Recovery Facility. The Energos technology was developed in Norway between 1990 and 1997 at the SINTEF in Trondheim. The SINTEF Group is the largest independent research organisation in Scandinavia. Every year, SINTEF supports the development of 2000 or so Norwegian and overseas companies via research and development activity. Their design brief was to develop a small scale Energy from Waste Plant which could provide small communities with a cost effective alternative to mass burn incineration with minimum emissions to atmosphere and a high flexibility in handling different waste types and calorific values.

1.2.4 The technology developed is a two stage thermal process that eliminates the need for sophisticated and expensive flue gas treatment. The first stage heats the waste in a reduced oxygen environment converting the material into a synthetic gas fuel (i.e. gasification). The gas is then burned as an efficient fuel in an oxygen rich environment and the energy (in the form of steam) from the combustion is used to drive a turbine. The gasification process is classed as Advanced Thermal Treatment under the UK's Renewable Obligations Order.

1.2.5 In 1997 the first pilot plant was commissioned in Ranheim Norway. Today there are seven operational Energos facilities in Europe – five in Norway, one in Germany and one, the most recent to be commissioned, is on the Isle of Wight. Unlike many emerging thermal treatment technologies the Energos gasification plant has a proven operational and environmental track record. In December 2001 Juniper Consultants carried out an independent due diligence review of the Energos gasification process and stated:

"The claim by Energos that the process is environmentally friendly is backed up by very low pollutant levels as measured by Hurum and Averoy. These emissions are probably the lowest measured anywhere for this type of process, particularly the NOx figures which can only be achieved by competing technologies with the application of de-NOx systems".

1.2.6 Annual operating efficiencies range between 89% - 91% with downtime due to planned routine maintenance. However as the technology is modular, maintenance is staggered in order to provide a continuous waste disposal service.

1.2.7 With seven operating plants and collectively in excess of over 400,000 operating hours, the plant demonstrates excellent reliability and emissions track record.

1.2.8 The proposed Facility at Barry would be a disposal facility with energy recovery. Once waste has been deposited at the plant it is converted to energy, bottom and fly ash and a flue gas. The renewable electrical energy produced can be supplied to the National Grid or directly to businesses, the steam can be used in district heating networks or supplied directly to local industry and the ash residues can be recycled for use in the construction industry. The Facility is therefore a sustainable waste disposal solution operating at very high efficiency. Based on a design life of 25 yrs the Facility would provide the equivalent landfill disposal capacity of 2 million m^3. The small scale nature of the Facility means recycling/recovery initiatives will not be discouraged. This enables the Facility to form a final disposal solution as part of a integrated and sustainable waste management strategy.

1.2.9 The Facility will process waste materials and generate renewable energy on a 24 hour basis. However, particular activities, including waste reception will be restricted to normal operating hours of between 7am and 7pm Monday to Friday and 7am and 5pm on Saturdays. The process is described in greater detail in Section 2.5.

1.2.10 The use of a modular system allows:

- An appropriately sized building designed to reduce visual impact;
- Transport of waste to be minimised;
- Fast construction time;
- Reduced impacts on the local environment; and
- Integration into regional recycling strategies.

1.3 Requirement for an Environmental Impact Assessment

1.3.1 The proposed Energy Recovery Facility falls under Schedule 1 Part 10 of the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended) (hereafter referred to as the EIA Regulations) therefore an Environmental Impact Assessment is mandatory.

1.4 Environmental Impact Assessment Team

1.4.1 PB was appointed by BERL to undertake the EIA. PB was responsible for coordinating the preparation of the EIA and for undertaking the specialist surveys and assessments.

1.4.2 The project proponent has supplied all aspects of the process design.

1.4.3 Site investigation information has been provided by Capita Symonds Structures. Gas monitoring data has been supplied by ENCIA Environmental Limited.

1.5 Status and Purpose of this Document

1.5.1 This Environmental Statement (ES) reports the findings of the Environmental Impact Assessment (EIA) for the proposed Energy Recovery Facility in Barry Docks. The ES:

- Summarises the scope and approach of the EIA;
- Describes the proposed Facility for which for which Planning Permission will be sought;
- Describes the baseline environment;
- Describes the main environmental effects of the proposed Facility identified to date, both beneficial and adverse; and
- Identifies the environmental mitigation measures that would minimise the environmental impact.

1.5.2 This ES follows the production of a Scoping Letter issued to the Vale of Glamorgan, the Local Planning Authority and has been prepared has been prepared in accordance with the EIA Regulations.

1.6 Structure of this Environmental Statement

1.6.1 This document follows the guidance for an ES as detailed in the Environmental Impact Assessment: A Guide to Good Practice and Procedures (Department for Communities and Local Government (DCLG), 2006). This ES accompanies the Planning Application and comprises the following documents:

- A Non Technical Summary, summarising the findings of this ES in non-technical language; and
- A Main ES, (this document), which includes all figures and technical appendices.

1.6.2 Following this Introduction chapter of the Main Report, the subsequent chapters describe:

- Chapter 2 – the Proposed Facility (including the need for the development and alternatives considered);
- Chapter 3 – the Environmental Impact Assessment approach;

- Chapter 4 – the relevant policies and plans and land use;
- Chapter 5 to 11 – the methodology and assessment, baseline, effects, mitigation and planning and policy assessment for each specific environmental topic;
- Chapter 12 – the cumulative impacts of the proposed Facility; and,
- Chapter 13 – a summary of the potential impacts.

SECTION 2

PROPOSED DEVELOPMENT

2 PROPOSED DEVELOPMENT

2.1 Introduction

2.1.1 This section provides a discussion on the need for the proposed development, a description of the proposed project in terms of the Energy Recovery Facility and associated infrastructure, the alternatives considered and issues surrounding the construction phase of the development.

2.1.2 The proposed development includes the following:

- an Energy Recovery Facility; and
- associated infrastructure.

The site boundary is shown on Figure 2.1 and an aerial photo of the site is provided as Figure 2.2.

2.2 Need for the Development

2.2.1 In the UK there exist two pressing environmental and social issues that require resolution in the near future before circumstances limit action. These issues are:

- waste management; and,
- energy security.

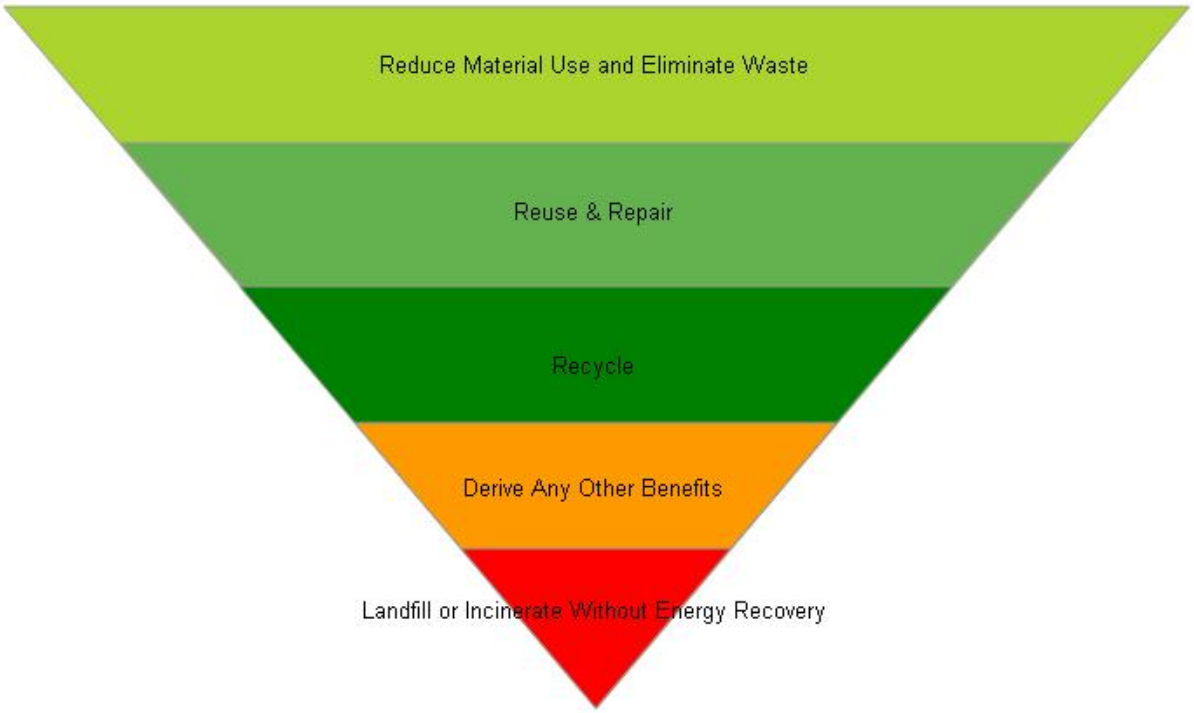
Waste Management in the UK

2.2.2 In the UK, it is estimated that the quantity of Industrial and Commercial and Construction and Demolition Wastes continue to grow at a rate of between 1.5 - 3%. Household waste generated each year continues to grow at a rate of approximately 3%[(1)]. These growth rates are unsustainable and measures need to be taken to reverse these trends. To this end, action is being taken, driven in part by implementation of the European Landfill Directive and the introduction of targets to reduce the quantity of waste disposed to landfill and to increase the quantity of waste that is reused, recycled, and recovered. Fiscal measures such as the landfill tax escalator are also driving the move towards alternative waste management activities, including the recovery of the energy inherent within waste materials.

2.2.3 The UK currently produces approximately 434 million tonnes of waste annually of which 73% is landfilled, resulting in approximately 317 million tonnes of waste annually disposed to landfill[(2)]. The UK continues to lag behind its European neighbours on recycling rates yet the available void space across the UK's landfills continues to decrease. Consequently, there is a very real need for alternative solutions to be found that will process the residual waste remaining following recycling/composting.

2.2.4 The Environment Strategy for Wales 2006[(3)] defines the waste management hierarchy, a concept that describes the preference of available waste management approaches. The hierarchy is presented in Figure 2.3.

Figure 2.3 - Waste Management Hierarchy



2.2.5 The waste hierarchy emphasises that waste minimisation is the preferred approach to managing waste. Waste minimisation reduces demands upon resources and upon waste management facilities. The least preferred waste management option is disposal of waste to landfill or incineration without energy recovery; at present waste generated in the Vale of Glamorgan is disposed to landfill, therefore placing it in the least preferred waste management approach.

2.2.6 The proposed gasification process allows energy to be recovered from the waste and is therefore located higher up the waste management hierarchy than the current strategy of landfilling without energy recovery. In addition it can be used to provide an integrated approach to waste management when combined with recycling. The proposals represent an improvement over the current situation.

Waste Management in Wales

2.2.7 Wise about Waste is the National Waste Strategy for Wales (The Strategy) that replaces the Waste Strategy 2000 (England and Wales). The Strategy has been developed to address Wales' over reliance on landfill as a final disposal solution. The Strategy implements the UK's targets as detailed in relevant European Council (EC) waste directives.

2.2.8 In relation to the amount of commercial and industrial waste (CIW) sent to landfill, the UK targets are:

- To reduce the amount of CIW sent to landfill to less than 85% of that landfilled in 1998;

- By 2010 to reduce the amount of CIW going to landfill to less than 80% of that landfilled in 1998.

2.2.9 To divert biodegradable waste from Landfill:

- By 2005 to reduce the amount of bio-degradable CIW sent to landfill to 85% of that landfilled in 1998; and
- By 2010 to reduce the amount of biodegradable CIW going to landfill to 80% of that landfilled in 1998.

2.2.10 And in relation to Construction and Demolition waste (C&D) - To reuse and recycle C&D waste

- By 2005 to re use or recycle at least 75% of C&D waste produced; and
- By 2010 to reuse or recycle at least 85% of C&D waste produced.

2.2.11 Targets in relation to Municipal Solid Waste (MSW) are as follows:

- By 2010 no more than 75% of the Biodegradable Municipal waste produced in 1995 can be landfilled;
- By 2013 no more than 50% of the Biodegradable Municipal waste produced in 1995 can be landfilled; and
- By 2020 no more than 35% of the Biodegradable Municipal waste produced in 1995 can be landfilled.

2.2.12 In relation to recycling and composting of MSW the targets set by the WAG are

- By 2006/07 achieve at least 25% recycling/composting of municipal waste with a minimum of 10% composting (with only compost derived from source segregated materials counting) and 10% recycling; and
- By 2009/10 achieve at least 40% recycling/composting of municipal waste with a minimum of 10% composting (with only compost derived from source segregated materials counting) and 10% recycling.

2.2.13 According to The Environment Agency Wales (EA) waste return data from licensed sites in 1989/99, 4,143,000 tonnes of CIW, C&D and MSW were landfilled, although a further 1 Million tonnes were sent to transfer stations where the final disposal option is likely to have been landfill. The figures indicate that in 1998/99 Wales landfilled 77% of all waste arisings, demonstrating the over reliance on landfill as a final waste disposal solution.

Sub Regional Context

2.2.14 The proposed Facility will be able to receive a range of wastes not just from the Vale of Glamorgan but from a wider sub region, including the following Local Authority Areas:

- Vale of Glamorgan;

- West Cardiff
- Rhondda Cynon Taff; and
- Bridgend

Commercial and Industrial and Construction and Demolition Waste Arisings

2.2.15 In 1998/999, a survey of businesses indicated that the South East Region (the Region) generated approximately 3 million tonnes of CIW. However the SE Wales Regional Waste Strategy (SE Strategy) states:

- *"the sample size does not support high levels of precision for local estimates"* and that
- *"It must be repeated that the forecast figures give a broad indication of possible trends at regional level but at LA level the figures must be considered as less than robust."*

2.2.16 The South East Regional Waste Group – Annual Monitoring Report 2007 (the 2007 Report) forecasts Regional CIW airings to be 1.15M tonnes by 2010 and 1.12M tonnes by 2014.

2.2.17 Very little data are available for predicted C&D waste arising within the Sub Region. It is assumed that in excess of 1 Million tonnes of C&D is generated and that 80% of this is recycled. The remaining 20%, or 200,000 tonnes, is landfilled.

2.2.18 Assuming that 40% of CIW and 80% of C&D waste arisings in the Sub Region are either reused or recycled, by 2010 the Sub Region will require disposal capacity for approx. 600,000 tonnes of residual CIW and C&D waste. The proposed Facility would provide approx 13% of the disposal capacity required.

2.2.19 There are no landfill facilities (other than small inert landfill sites) within the VofG. The nearest landfill facilities are located in Merthyr Tydfil (Trecatti Landfill site) and Aberdare (Bryn Pica Landfill Site). The continued transportation of waste from the VofG to these remote disposal facilities is not sustainable and does not accord with the principles of Wise about Waste, particularly the Proximity Principle. Alternative disposal capacity to deal with the residual CIW and C&D waste within the area is urgently required.

2.2.20 Whilst the Facility is able to accept a wide range of waste types including Commercial and Industrial Waste (CIW), Construction and Demolition (C & D), Municipal Solid Waste (MSW), Refuse Derived Fuel (RDF) and Agricultural Waste the applicant has targeted the the CIW and C&D sector based upon the need for recovery capacity in the Sub Region.

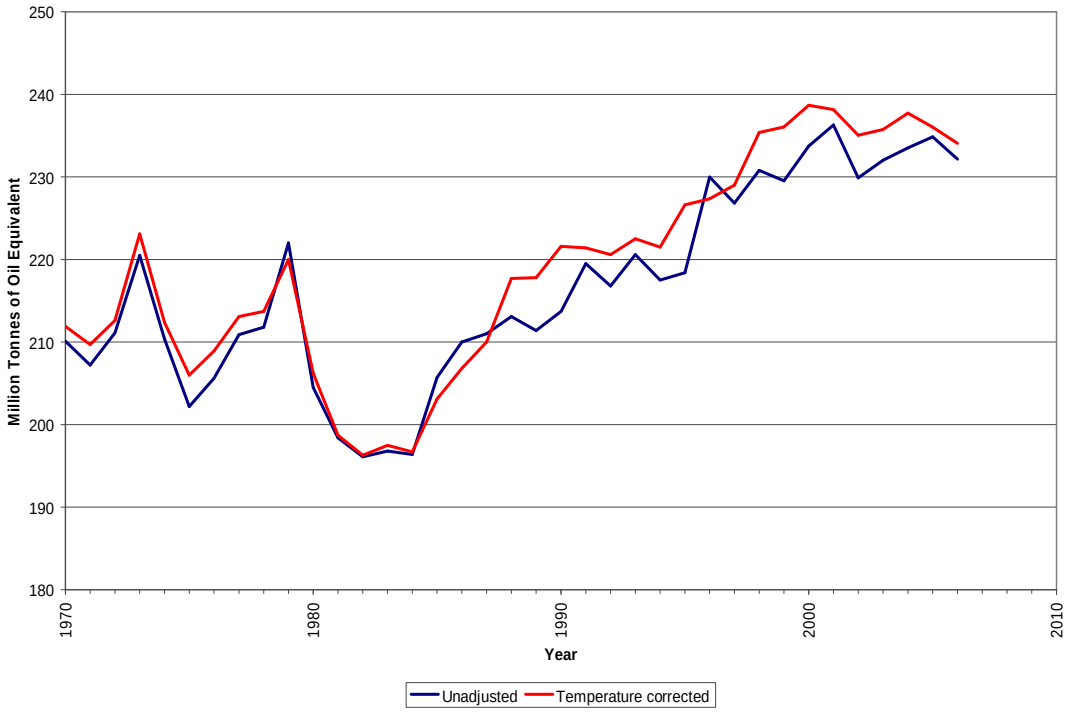
Energy Security in the UK

2.2.21 Over the past 25 years in the UK there has been a steady increase in consumption of energy with the UK consuming approximately 20% more energy in 2006 than it did in 1982[4] as illustrated in Figure 2.4. Over this period, The UK has continued to utilise gas and oil reserves in the North Sea. These reserves are now become less efficient and extraction is becoming increasingly more costly. As a consequence, the UK is

becoming increasing reliant on alternative sources of energy particularly fossil fuels including gas supplied from eastern Europe and in particular Russia.

2.2.22 Supply and demand pressures for fossil fuels have resulted in a marked increase in energy prices between 2007 and 2008. The emerging economies of India and China continue to demand energy to fuel their economic growth pushing prices higher. For example, the futures price of crude oil doubled between May 2007 and May 2008 increasing from approximately $60 per barrel to $130 per barrel respectively[5]. Wholesale gas prices in the Europe have forced domestic gas supply prices to increase over 2007 to 2008 by approximately 20% and are forecast to increase by a similar amount by 2009, depending on the supplier and tariff[6].

Figure 2.4 Total primary energy consumption by fuel, unadjusted and temperature corrected, 1970 to 2006



2.2.23 On the back of these energy cost increases, the media and charities such as Age Concern continue to report the growth of fuel poverty, particularly amongst the old.

2.2.24 Consequently, there is a real demand in the UK to implement effective solutions to continue to provide consumers with the energy that they require. The proposed facility provides one such solution which draws together the need to provide alternative waste management solutions whilst also providing a source of energy for local consumers. In Barry average domestic energy consumption in 2006 was 4,222kWh.[7]. It is estimated that the proposed facility will generate enough electricity to power approximately 11 000 properties in Barry.

2.3 Site Description

2.3.1 The site is situated on a level plot, approximately 1.6 ha in size, at National Grid Reference 312810, 167260 on Atlantic Way, within Barry Docks. The site is

approximately 100m south east of eastern dock wharf, approximately 450m east of the main dock gates and approximately 370m to the north of the Severn Estuary.

2.3.2 The site is currently disused and appears to comprise made ground. There is evidence of fly tipping of materials including inert waste. There are currently no buildings on site and there is no evidence of any previous buildings. The site is vegetated with a mixture of grasses, scrub, ruderal species and immature trees. The site is considered to be of low ecological value. Japanese knotweed has been identified on site.

2.3.3 Surrounding land use comprise mixed industrial activities, including waste management activities (scrap yards, waste segregation, and landfill) and bulk materials storage and handling (including stockpiles of sand and other aggregates) and other small industrial units.

2.3.4 Existing, industrial buildings in the surrounding area range in size from single story industrial units through to large warehouses, some of which exceed 10m in height such as the Atlantic Mills (Rank Hovis) building. Tall structures near to the site are limited to lighting towers for other sites, although approximately 1.1km north east of the site a chemical plant includes a number of tall structures estimated to be approximately 70m high.

2.3.5 During the Phase II ground investigation work undertaken by Capita Symonds, Made Ground was encountered in all of the boreholes and comprised ash, clinker, brick and concrete. Low levels of soil and groundwater contamination were identified by the Capita Symonds investigations and are indicative of the sites previous uses as a landfill and railway sidings with some contaminants above the screening criteria applied. Asbestos was also identified in one of the excavated boreholes. Further detail is presented in Section 7 of the ES.

2.3.6 There is a low risk that other areas of significant contamination could be present on the site in areas not covered by investigations completed to date.

2.4 Alternatives

2.4.1 A number of alternative solutions are available to deal with commercial and industrial, construction and demolition and MSW currently produced in the Vale of Glamorgan. These are considered in the following paragraphs. In addition the Facility proponent considered a number of alternative sites (detailed below) prior to progressing the site under consideration in this ES. It should be noted that the negative features identified for each site do not necessarily represent the reason for discounting the site option.

Do nothing scenario - Current Waste Management

2.4.2 At present, the majority of waste that is generated in Barry is transported first to Cardiff where it is subject to a degree of processing to remove recoverable materials. The residual waste from this sorting process is then transported in bulk by road for disposal at a landfill site in Merthyr Tydfil, some 30 miles north of the Site. Maintaining this approach to waste management in the Barry area represents the “Do-Nothing” alternative.

Alternative Technology Option 1 - Mass Burn

2.4.3 This is the most common and simplest for of incineration where the waste is burnt as received with virtually no pre-treatment. The waste is fed via a hopper onto a sloping moving grate that agitates and moves the waste down through the combustion

chamber so that by the time it is discharged into the ash pit at the end of the process all combustible materials have been burnt. The hot gases are directed to a boiler where the heat is extracted to generate steam that drives a turbine connected to an electricity generator. The flue gases then pass through a gas cleaning process to remove ash and pollutants before being discharged to the atmosphere via a chimney stack.

2.4.4 One tonne of waste produces a nominal 550 – 650 kilowatt hours of electricity or expressed another way a 100,000tpa incinerator will produce 7MWe of electricity. Mass burn technology is less efficient at generating electricity than gasification techniques and therefore mass burn has been ruled out.

Alternative Technology Option 2 – Gasification

2.4.5 The proposed Energy Recovery Facility will use a gasification process. This represents Alternative Technology Option 2. Further details of the process are provided in Section 2.5. This option is lower down the waste hierarchy than recycling, but still represents a more desirable waste management strategy then landfill or incineration without energy recovery. The Gasification process is more efficient than mass burn technology and can be used in conjunction with recycling.

2.4.6 The proposed Energy Recovery Facility makes use of modular technology which provides a flexible solution to reducing volumes of waste as waste management options higher up the waste hierarchy increase in use. Two lines each with a 40,000 tpa capacity are proposed.

Alternative Location 1 – Atlantic Trading Estate

2.4.7 The proposed brownfield site on land on Atlantic Trading Estate is between 5 and 6 acres. Much of the site is covered in scrub and there is evidence of fly tipping. Access is via Hayes Road and Wimbourne Road.

2.4.8 Surrounding land uses include residential properties, the closest being Bendrick Road 150m to the North, Hayes point is some 750m away. The shore line is 50m away.

2.4.9 In this location the Facility would have a very prominent position on the shoreline and be clearly visible from Barry Island.

2.4.10 The EA Wales Flood Map indicates the site is immediately adjacent to the Flood Line and could be at risk from flooding from seas or rivers without flood defences.

Alternative Location 2 – Vale Enterprise Centre

2.4.11 This site is on brownfield land within Vale Enterprise Centre on Hayes Road and is between 4 and 5 acres in size. The site is a level site with predominantly concrete hard standing. The site is fenced and secure and has a number of disused buildings still standing.

2.4.12 Within 100m of the site is the Zeon and Hexion chemical works with associated stack, pipe-work and holding tanks. . Surrounding land uses include residential properties, a metal engravers and High Tech Services. Agricultural land lies to the North, South and West. Residential Properties off South Road (Cog Road, Meadow View Court and The Halt) and Beechwood College have elevated positions relative to the site and would therefore have direct views of the facility.

2.4.13 The EA Wales Flood Map indicates the site is at risk from flooding from seas or rivers without flood defences.

Alternative Location 3 – Hayes Road

2.4.14 The proposed brownfield site off of Hayes Road is between 5 and 6 acres. The site is fenced and secure.

2.4.15 Within 100m of the site is the Zeon and Hexion chemical works with associated stack, pipe-work and holding tanks. Beechwood College is approximately 150m to the east. Surrounding land uses include residential properties, a metal engravers and High Tech Services. Agricultural land lies to the North, South and West. Residential Properties off South road (Cog Road, Meadow View Court and the Halt) and Beechwood College have elevated positions relative to the site and would therefore have direct views of the facility.

2.4.16 The EA Wales Flood Map indicates the site is at risk from flooding from seas or rivers without flood defences

Alternative Location 4 – Barry Docks

2.4.17 The proposed brownfield site extends to 10 acres to the north of the No. 2 dock. Access is via David Davies Road and Viaduct Road. The site is fenced.

2.4.18 Surrounding land uses include residential properties and the main railway line from Cardiff to Barry Island. Residential properties on Docks View Road would overlook the facility.

2.4.19 The EA Wales Flood Map indicates that a proportion of the site is at risk from flooding from seas or rivers without flood defences.

2.5 General Arrangement

2.5.1 The proposed Facility will process approximately 80,000 tpa of waste including, commercial, industrial, and construction and demolition wastes and could process municipal solid waste (MSW) and Refuse Derived Fuels (RDF). The proposed development will utilise proven gasification technology that has been operational in Europe for 10 years. Gasification technology is more efficient that conventional combustion technology enabling a higher proportion of the energy contained within a waste mass to be recovered. This process results in cleaner combustion and lower atmospheric emissions than conventional mass burn waste incinerators. The process will generate approximately 7.5MWe (NET) electricity for distribution to the local grid network.

2.5.2 The proposed Facility will operate two process lines, each of which will be operational for approximately 90% of the year (allowing for routine maintenance). Since maintenance will be staggered for the two process lines, the plant will operate near continuously throughout the year. The proposed development will have a design life of 25 years, although with routine preventative maintenance it is possible that this would be extended.

General Process Description

2.5.3 The following paragraphs provide a description of the process from waste reception through to outputs from the process including emissions. A schematic of the process is presented in Figure 2.5. The layout and elevations of the building are shown in Drawings Nos. 08-1353-P01, 08-1353-P02, 08-1353-P03, 08-1351-P04 and 08-1353-P05 which accompany the planning application.

Waste Reception

2.5.4 On arrival, waste vehicles will report to the weighbridge where waste documentation, waste carrier certificates and transfer notes will be checked to ensure compliance with the Duty of Care Regulations and the sites Environmental Permit. Vehicles containing any non-conforming waste will be quarantined and managed in accordance with the sites Environmental Permit. The quantity of waste the vehicles carry will then be assessed by passing them over the weighbridge.

Fuel Bunker and Transport System

2.5.5 Once the waste has been unloaded in the Waste silo it will be transferred by an overhead crane grab into the re-cycling area for removal of any ferrous components and for shredding. Once the material has been processed this fuel material is then discharged into a fuel silo. Fuel in the fuel silo will be mixed by an automated grab to improve homogeneity of the fuel, thereby increasing the efficiency of the gasification process.

2.5.6 Fuel is transferred from the fuel silo to the fuel feed hopper via an automated crane grab.

Energy Recovery

2.5.7 Gasification of the fuel is carried out in the gasification unit, forming a synthetic gas. The fuel then passes through a high temperature oxidation unit where air, waste reception hall air and recycled flue-gas are injected to enrich the oxygen environment still further. Introduction of these gases creates an environment suitable for combustion. At the end of this stage the waste has been converted to a hot flue gas and to bottom ash. The bottom ash passes through a quench pit before being transferred to a bunker for storage prior to removal from site. Similar facilities currently in operation in Norway produce approximately 18% bottom ash by weight however the quantity is dependant upon the composition of the waste entering the process. Possibilities to recycle the bottom ash are currently being explored by BERL. The remaining flue gases will then pass through an Air Pollution Control System (APC) (see Paragraph 2.5.10).

2.5.8 Typically the quench pits in a gasification facility are supplied with blow down water from the condensers but there is usually a shortage. This is therefore supplemented by surface water intercepted from either site roads or roof surfaces. At the proposed facility the condenser units are located some distance from the main building so at the detailed design stage consideration will be given to use of surface water from the roof and from site roads (once past the interceptor). Any surface water not required for quenching will be transferred (via an interceptor in the case of car park/hard standing drainage) to surface water storage pond at the northern end of the site, prior to discharge at Greenfield rate.

2.5.9 Heat from the oxidation unit will be transferred to the heat recovery steam generator. The steam produced, is transferred to a steam turbine to drive an electricity generating unit. On passing through the steam turbine significant energy is lost from the steam which is further cooled by passing through the air cooled condenser. The flue gases pass through an APC which will control the concentration of pollutants released to the atmosphere. This will include the addition of a reagent (lime and carbon) into the flue gas. The reagent and flue gas combine to form APC residue (known as fly ash). The fly ash will be removed from the air flow by a bag filter and collected and stored in the APC silo. Fly ash currently produced at similar facilities in operation in Norway account for approximately 4% by weight however the amount of fly ash produced is dependant upon the composition of the waste entering the system. APC residues require disposal at a licensed special waste landfill. The applicant is currently investigating emerging technologies capable of treating fly ash to produce reusable building/aggregate materials.

Opportunities for Waste Heat Usage

2.5.10 Potential uses for the steam are being sought, including as district heating for the nearby proposed developments at East Quay and South Quay. A copy of correspondence with the Developers of East Quay and South Quay is included in Appendix A. This indicates the intention of both parties to pursue the option of provision of a district heating system. BERL is also in discussions with Dow Corning Chemicals with regard to the possibility of supply electricity and heat to their plant nearby. Opportunities for provision of CHP are also being explored with ABP.

Remnants

2.5.11 Bottom ash will be assigned an appropriate European Waste Code by the developer in accordance with the Landfill Regulations (England and Wales) 2002. Bottom ash is suitable for re-use as an aggregate material in construction. Local markets for the use of the bottom ash will be investigated.

2.5.12 The applicant is investigating recycling opportunities for the fly ash; however should this not prove possible the fly ash will be disposed of at a suitably licensed waste management facility.

Facility Appearance

2.5.13 The development will comprise 4 buildings with a maximum height of 23.58m ,(excluding fins) these being the main process building, the air cooled condenser building, the turbine hall and a security/office building. The process will require an emissions stack, which will comprise the emission flue from each process line, as well as a standby flue. The height of the stack was determined through detailed atmospheric dispersion modelling and will be 45 m in height.

2.5.14 The buildings have been designed to respond to the language of its industrial park setting. The mass of the building has been broken to achieve a “layering” effect to lighten its appearance. A materials palette of predominantly natural green rainscreen cladding with grey coloured accent framework seeks to blend the building with adjacent grassed and planted landscaped areas (see figure 08-1353-P06).

2.5.15 On site there will be a fully structured landscape planting scheme with feature trees and shrubs to L.A approvals. This planting will screen the services and circulation activities proposed. The introduction of a pond at the Atlantic Way/ Atlantic Crescent corner of the site provides a reference point to the surrounding wetland, whilst giving

a quality visual amenity focal point when viewed from both inside the site boundaries and the surrounding area.

2.5.16 The chimney has been branded by the company logo, creating a local landmark from vistas where the height of the chimney is seen, advertising the sustainable agenda of the proponent.

2.5.17 The facility, with the exception of the waste/fuel silo, will be raised above ground. The waste/fuel silos will be excavated to a depth of 8 m to allow vehicles to reverse up to the waste silo without the need for access ramps.

2.5.18 There will also be requirement for intrusive ground works to be undertaken for construction of appropriate foundations and drainage runs.

2.5.19 The findings of the Phase II ground investigation undertaken by CS conclude that the Made Ground and natural soils arising from excavations will require off site disposal as they will be unsuitable for use as engineered fill materials.

2.5.20 No environmental issues were raised during CS discussion of foundations, ground floor slabs, road pavement construction, buried concrete, drainage and mining/subsidence risk potential. Buried concrete design is recommended by CS to be undertaken in accordance with BRE Special Digest 1:2005 (Concrete in Aggressive Ground). The history of the site is considered to be one which may contain pyrite (i.e. sulphide).

2.5.21 During operation an Environmental Management System will be put in place to ensure the Facility maintains and improves its environmental performance.

2.6 Construction Phase

2.6.1 Construction of the site will take approximately 18 months. Levels of employment will vary through out the construction period however it is likely that employees will range between 40 and 80 per day during the first 52 weeks of construction and 20 employees per day during the remaining 26 weeks. Peak levels of employment are likely to be associated with concreting works and building of the superstructure and internal works.

2.6.2 Whilst the construction programme and precise methods are to be determined by the contractor, activities will be scheduled to minimise the potential environmental impact (for example site clearance will take place outside of breeding bird season). All waste material will be taken off site by licensed carriers in accordance with Section 34 of the Environmental Protection Act. A Site Waste Management Plan will be prepared by the contractor to ensure that opportunities for reusing and recycling waste, both on and offsite are maximised. The plan will also allow recording of where the waste is taken to and the permit or exemption details of the waste carriers and disposal sites.

2.6.3 In order to minimise risks to groundwater the Environment Agency's Pollution Prevention Guidelines appropriate to the Facility will be followed.

2.6.4 Where possible, contractors will be sourced from the local community. Construction will involve the use of crane/cranes, concrete batching plant and piled foundations.

2.6.5 The site will be registered with the Considerate Constructors Scheme (CCS) and will be monitored by an experienced industry professional to assess performance against the eight point Code of Considerate practice. Categories included for monitoring include:

- Considerate,
- Environment
- Good Neighbour
- Respectful
- Safe
- Responsible and
- Accountable.

2.6.6 The Contractor will address the three main areas of the scheme as follows:

- The Environment: The Contractors will do all they can to reduce negative effects on the environment. They will work in an environmentally conscious, sustainable manner.
- The Workforce: The Contractors will provide clean, appropriate facilities for those who work or visit on site. Facilities will be comparable to any other working environment.
- The General Public: The Contractors will do all they can to reduce any negative impact they many have on the area in which they are working and aim to leave a positive impression on those they affect.

2.7 References

1. Department for Business Enterprise & Regulatory Reform (formerly the Department for Trade and Industry 2002 (data updated 2007), Energy Consumption in the United Kingdom, www.berr.gov.uk/files/file11250.pdf
2. WTRG Economics www.wtrg.com/daily/crudeoilprice.html
3. uSwitch.com, 'Price rises' from npower 30 April 2008 www.uswitch.com/news/energy/20080430/price-rises-from-npower.cmsx
4. Environmental Services Association www.esauk.org/waste/facts/
5. Welsh Assembly Government, 2006, Environment Strategy for Wales
6. http://www.berr.gov.uk/files/file45726.xls

SECTION 3

EIA PROCESS

3 EIA PROCESS

3.1 Introduction

3.1.1 Several guideline documents have been used to inform the EIA. In addition to observing the formal requirements of the EIA Directive 97/11/EC, further formal guidance which has informed the EIA include (although have not been limited to) the following:

- Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, as amended (EIA Regulations);
- Environmental Impact Assessment: A Guide to Procedures (DCLG, 2000);
- Department of the Environment, Transport and the Regions (DETR) Circular 02/99: Environmental Impact Assessment;
- Environmental Impact Assessment: A Guide to Good Practice and Procedures (DCLG, 2006);
- Amended Circular on Environmental Impact Assessment: A Consultation paper (DCLG, 2006);
- Design Manual for Roads and Bridges (DMRB), Volume 11 and 12 (Highways Agency (HA));
- Web Transport Analysis Guidance (WebTAG) (Department for Transport (DfT), 2003);
- Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs); and
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment (IEMA), 2004).

3.1.2 This chapter describes the main features of the approach to EIA. The methodologies applied to the assessment for each environmental topic are addressed in more depth in the specific environmental topic chapters (Chapters 5 – 11) and associated appendices.

3.2 The EIA Process

3.2.1 Techniques of EIA are well developed and a brief overview is provided in this section. The assessment process for each environmental topic has followed a common framework as summarised in Table 3.1 below.

Table 3.1 Stages of the Environmental Impact Assessment

Stage	Main Activities
Scoping	Definition and description of works to be assessed Determination of EIA scope and method of assessment
Baseline Assessment	Collection of available baseline data, identification of relevant resources and receptors; Field surveys e.g. ecology surveys, noise measurements, air quality

Stage	Main Activities
	measurements; Appraisal of current baseline conditions from data collected and surveys undertaken; Prediction and appraisal of how the baseline would be expected to change in future
Prediction of Impacts and Effects	Use of predictive techniques such as models or change indicators to identify likely impacts and to derive their potential effects
Effects	Allocation of significance and severity levels using defined thresholds and criteria
Mitigation	Identification of measures to mitigate adverse effects, and assessment of their effectiveness
Evaluation of Residual Effects	Allocation of significance and severity levels (with mitigation in place) using defined thresholds and criteria

3.2.2 The EIA process is principally a decision making tool but, it also facilitates the inclusion of environmental constraints and opportunities in the design development process. In this respect it is also a tool for optimising a development's environmental performance.

3.2.3 If a development is likely to have significant effects on the environment then an Environmental Impact Assessment (EIA) is normally required under the terms of European Community Directive 97/11/EC, amending Directive 85/337/EEC on 'the assessment of the effects of certain public and private projects on the environment'.

3.2.4 The European legislation makes provision for certain categories of project that require an EIA in every case and for other categories that require an EIA only if the project in question is likely to give rise to significant environmental effects. For projects falling within the scope of the Directive and requiring planning permission within England and Wales, the Directive is given legal effect through The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended) (the EIA Regulations).

3.3 Screening

3.3.1 The EIA Regulations allow applicants, under the provisions of Regulation 5(1), to request a 'Screening Opinion' from the Local Planning Authority. This is an opinion determining whether or not a formal EIA is required. BioGen did not request a screening opinion as it was considered that the process will require an EIA to be undertaken under Schedule I Part 10 of the EIA Regulations:

Waste disposal installations for the incineration or chemical treatment (as defined in Annex IIA to Council Directive 75/442/EEC under heading D9) of non-hazardous waste with a capacity exceeding 100 tonnes per day.

3.4 Scoping

3.4.1 Having established that an EIA is required, the next stage is to identify the topics and issues that will be subject to detailed assessment and to eliminate any topics and issues that require no further consideration. There is no statutory requirement to undertake a "scoping" exercise however it is considered best practice and a critical early activity that sets the context for a detailed assessment. Scoping aims to:

- Identify the topics and issues that are proposed to be the focus of the EIA;
- Eliminate any topics and issues not requiring further consideration and which would therefore not be taken further in the EIA;
- Define the technical, spatial and temporal scope of the study for each of the topics and issues to be considered;
- Define the approach to and methodologies for conducting baseline' studies;
- Define the approach to and methodologies for predicting environmental effects and for evaluating the severity and significance of environmental effects;
- Identify the methods to be adopted for incorporating mitigation and other environmentally driven modifications into the design, as it develops; and
- Define the consultation strategy to be applied to the EIA process.

3.4.2 In April 2008, the Local Planning Authority (LPA) was sent a request by PB to provide a formal Scoping Opinion for the proposed Energy Recovery Facility. The LPA was issued with background information on the project, the location of the facility, the proposed technology, and an appraisal of the potential environmental impacts associated with the development that warrant further investigation as part of the EIA so that effective consultation could be undertaken with statutory consultees.

3.4.3 A formal Scoping Opinion was received from the LPA on 2 June 2008 identifying the issues that the LPA and the statutory consultees expected to see addressed in the ES. The issues raised are presented in Table 3.2 and are supported with a cross reference to where this issue has been addressed in the ES.

Table 3.2 Summary of Scoping Opinion and Cross Reference to Where Issue Addressed

Issue Identified in Scoping Opinion	Reference Where Issue Addressed
Flood Risk - a Flood Consequence Assessment is required	Section 11
Proximity of site to designated sites (Hayes Point to Bendrick Rock SSSI, Barry Island SSSI and Severn Estuary cSAC and SPA)	Section 6
Details of surveys and an assessment of ecological impacts is required	Section 6
Detailed site investigation for contaminated land is required consideration should be given to the potential for piled foundations to create a migration pathway for contaminants.	Section 7
Hazardous waste associated with former landfill to be disposed of in accordance with Section 34 of the Environmental Protection Act	Section 7
An investigation of the possibility of gas migration from the adjacent landfill should be undertaken	Section 7
ES is to include details of site investigations, mitigation proposals and an assessment of the gas migration issues	Section 7

If water is required for the process the Thaw and Cadoxton CAMS document should be consulted	Section 11
The site must be drained by separate foul and surface water systems.	Section 11
Surface water drainage from parking areas and hard standings are to pass through an oil interceptor. Roof water should not pass through the interceptor.	Section 11
The development will require a permit under the Environmental Permitting (England & Wales) Regulations 2007	Section 2
The impact of noise associated with the proposals upon the proposed residential developments at East Quay and South Quay is to be taken account of.	Section 9
Impacts upon ambient air quality need to be modelled. The ES should include a scheme to control dust during remediation and construction phases	Section 5

3.4.4 A copy of the Scoping Opinion is included in Appendix B.

3.4.5 Further correspondence with the LPA determined that as previous uses of the site were only industrial in nature further consideration of cultural heritage would not be required within the ES. Appendix C contains correspondence from the LPA confirming this view.

3.5 EIA General Methodology

3.5.1 The ES addresses the environmental topic areas identified by the scoping process. The report addresses the primary, secondary, direct, indirect and cumulative environmental impacts associated with the proposed Facility during construction and operation.

3.5.2 The construction effects are impacts arising from the construction activities of the proposed Facility. These include impacts arsing from temporary land take and changes in road traffic and pedestrian movements.

3.5.3 The operational effects are those arising from the introduction of the proposed infrastructure as well as impacts arising from the operation of the proposed Facility.

3.5.4 Each of the sections dealing with the environmental topics generally follow the structure set out below;

- Introduction;
- Assessment methodology;
- Baseline conditions;
- Assessment of predicted impacts;
- Proposed mitigation measures;

- Conclusions; and
- References.

3.5.5 This approach allows a clear analysis of the predicted impacts of the proposed Facility relative to the existing conditions (baseline) and the significance of these impacts following implementation of any proposed mitigation measures, including those that are integral to the Facility design.

3.5.6 The establishment of the baseline has been largely based on consultation, visits to the site and surveys undertaken during the second quarter of 2008. However reference has also been made to earlier surveys where data were available. These are referred to in the relevant topic sections as applicable.

3.5.7 The beneficial and adverse, short-term and long-term impacts are assessed for each environmental component during construction and operation.

3.5.8 Any other plans or projects adjacent to the study area and which could have cumulative effects in combination with the proposed Facility have been identified and the resultant impacts considered in Section 12, Cumulative Impacts.

3.6 Prediction and Evaluation of Impacts and Effects

3.6.1 The EIA Directive 97/11/EC requires an ES to describe:

"...the likely significant effects which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development …"[3]

3.6.2 This section summarises the approach adopted to comply with this requirement. A distinction has been made in the assessment between impacts and effects, where:

- **Impacts** are defined as the predicted change to the baseline environment as a result of the proposed Facility (e.g. areas of land take, levels of noise, degree of visual intrusion, etc); and
- **Effects** are the consequence of impacts on environmental resources or receptors of particular value or sensitivity (e.g. loss of ecological area due to land take, sleep disturbance due to noise, loss of amenity due to visual intrusion, etc).

3.6.3 The primary objective of the assessment, as stated in the EIA Directive 97/11/EC is to identify 'significant' effects. This is achieved by assessing the magnitude of an impact and then by reviewing the extent (both temporal and spatial) to which it affects receptors. The determination of whether the result is deemed to be significant is described below.

3.6.4 Impacts and effects are usually associated with a specific source, receptor or resource, where:

- Sources are the construction or operation activities that give rise to impacts, which in turn would have effects on specific receptors or resources;
- Receptors comprise human beings, either individually or collectively, and the socio-economic systems on which they depend, for example, residents, employees, communities and local or regional economies; and

- Resources are defined as a biophysical feature or item of 'environmental capital' and include flora, fauna, aquifers, townscape or landscape, archaeological sites, the transport network, community facilities.

3.6.5 The assessment has considered the following impacts:

- Beneficial impacts that have a positive influence;
- Adverse impacts that have a negative influence;
- Temporary impacts that persist for a limited period only, due for example to particular construction activities (e.g. noise from construction plant);
- Permanent impacts that result from an irreversible change to the baseline environment (e.g. land take) or which persist for the foreseeable future (e.g. noise from operation);
- Direct impacts that arise from activities that form an integral part of the proposed Facility (e.g. new infrastructure);
- Indirect impacts that arise from activities not explicitly forming part of the proposed Facility (e.g. noise changes due to changes in road traffic flows on existing roads resulting from the operation of the Facility and
- Secondary impacts that arise as a result of an initial effect of the proposed Facility.

Interpretation of Effects

3.6.6 Table 3.3 below describes how various types of effects raised by the EIA Directive 97/11/EC have been interpreted.

Table 3.3 Interpretation of Effects

Effect	Interpretation
Permanent	Effects that result from an irreversible change to the baseline environment or which persist for the foreseeable future.
Temporary	Effects that persist for a limited period only; for example, those associated with particular construction activities or which may disappear due to natural recovery of the environment or their assimilation into it.
Direct	Effects that arise from the impact of activities that form an integral part of the proposed Facility (e.g. land take and new infrastructure).
Indirect	Effects that arise from the impact of activities that do not form part of the proposed Facility, but which are a consequence (e.g. increased road traffic due to other projects within the proposed Facility's area).
Primary	The first or only effects that arise from an impact (e.g. loss of ecologically valuable areas due to land take).
Secondary	Effects that arise as a consequence of a primary effect (e.g.

	effect on businesses if there is a change in the number of bus stops, footpaths and cycleways in the vicinity).
Beneficial (Positive)	Effects that have a beneficial influence on receptors and resources (e.g. creation of wildlife habitats through planting works).
Adverse (Negative)	Effects that have an adverse influence on receptors or resources.
Cumulative	Effects that result from multiple different types of effect on a particular resource or receptor from the proposed Facility subject to the current EIA (e.g. where construction activities result in effects on local residents due to noise, dust and traffic, the combined effect on local residents may well be greater than the sum of the individual effects).

3.7 Consultation

3.7.1 The following organisations were consulted as part of the preparation of this ES:

- Vale of Glamorgan Council;
- Environment Agency Wales (EA));
- Countryside Council for Wales (CCW);
- Associated British Ports (ABP);
- Glamorgan Gwent Archaeological Trust (GGAT) and
- Dwr Cymru Welsh Water (DCWW).

SECTION 4

PLANNING AND POLICY

4 PLANNING AND POLICY

4.1 Introduction

4.1.1 This chapter provides an overview of the statutory policies and guidance relevant to the proposed Facility. A more detailed assessment of European, national and local planning policy, particularly in relation to waste development is included in the Planning Supporting Statement, which accompanies the planning application. Policies and guidance relating to specific environmental impacts are reviewed within the relevant chapters in the ES.

4.1.2 The key planning and policy documents reviewed are as follows:

National Policy and Guidance

- Waste Strategy for England and Wales (2007)
- The Landfill (England and Wales) (Amendment) Regulations 2005
- Wales Spatial Plan Update (2008)
- The Waste Incineration (England and Wales) Regulations 2002
- Planning Policy Wales (2002)
- National Waste Strategy for Wales (2002)
- Environmental Protection Act 1990
- The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Act 1999

Welsh Assembly Technical Advice Notes

- TAN 5 – Nature and Conservation (1996)
- TAN 11 – Noise (1997)
- TAN 12 – Design (2002)
- TAN 15 – Flood Risk (2004)
- TAN 18 – Transport (2006)
- TAN 21 – Waste (2001)

Regional Policy and Guidance

- South East Wales Regional Waste Plan (2004)

- South East Wales Regional Waste Plan 1st Review Recommended Draft (2008)

Local Policy and Guidance

- Vale of Glamorgan Adopted Unitary Development Plan 1996 – 2011 (2005)
- Municipal Waste Management Strategy for Vale of Glamorgan Council (2004)
- Vale of Glamorgan Local Biodiversity Action Plan (2002) (LBAP)

4.2 Local Planning Policy

4.2.1 The current development plan for the proposed site is the Vale of Glamorgan Unitary Development Plan (UDP) 1996-2011, adopted 18 April 2005. The UDP provides the strategic and detailed policy framework for the Vale of Glamorgan.

4.2.2 On 1st February 2006, the Vale of Glamorgan Council resolved to commence work on the preparation of a Local Development Plan (LDP) for the Vale of Glamorgan, in accordance with Part 6 of the *Planning and Compulsory Purchase Act 2004*. It is intended that the LDP will be adopted in 2011 and will supersede the current UDP.

4.2.3 Table 4.1 summarises the Vale of Glamorgan UDP policies that are relevant to the proposed Facility. Some relate to specific Vale of Glamorgan UDP Proposals Map designations on the proposed site and its surrounding area, other policies address planning issues by topic and those that apply to this type of development are outlined.

4.2.4 The table also confirms whether the proposed Facility supports, fails to support or has neutral effect on the policy objectives.

Table 4.1: Policies identified from the Vale of Glamorgan UDP and Proposals Map

Planning Designation/Topic and Source Document	Applicable Policies	Applies to site	Applies to surrounding area/ General policy	Relevant policy objectives	Implications	Assessment
Developed Coast	ENV 6	Yes	Yes	In areas of existing or allocated development within the coastal zone, a new proposal should be designed with respect to its local context and sensitive to its coastal setting.	Development must be designed with respect to its coastal setting and context.	Supports policy aim.
Employment Allocated Site	EMP 1 (3: Barry Docks and Chemical Complex)	No	Yes	The employment land allocation is based on sites already with planning permission together with an assessment of employment opportunities both in the Vale of Glamorgan and in neighbouring areas. Suitable uses include: B1 (Light Industry/Offices), B2 (General Industry) and B8 (Warehousing and Distribution).	Need to consider future land allocations when designing the plant.	Supports policy aim.
Existing Employment Site	EMP 4	No	Yes	Developments that are not contained in B1, B2 or B8 (as in EMP 1), will not be permitted.	The proposed Facility should not affect the Existing Employment Site as it is located approximately 200m east of the designation.	Neutral.

Planning Designation/Topic and Source Document	Applicable Policies	Applies to site	Applies to surrounding area/ General policy	Relevant policy objectives	Implications	Assessment
Waste Management	Waste Hierarchy	Topic based policy	Topic based policy	Development proposals which encourage sustainable principles for waste disposal are judged on a hierarchical approach of: Waste minimisation; • Re-use; • Recycling/recovery (including Energy from Waste); and • Waste to Landfill.	The development falls into category "iii" of this Waste Hierarchy and, as such, is considered preferable to landfill and will thus provide a further waste management option in the Vale of Glamorgan area.	Supports policy aim.
	WAST 1 – Provision of WMFs	Topic based policy	Topic based policy	Proposals for the provision of Waste Management Facilities (WMFs) will be permitted on existing waste site, existing and allocated sites for B2 and B8 employment uses, within operational mineral working sites and, for green waste, land within or adjacent to farm building complexes.	The site is part of the Atlantic Trading Estate, which is identified as a suitable location for B2 and B8 uses, accordingly this is considered to be a suitable site for a WMF (albeit not a traditional WMF such as land fill).	Supports policy aim.

Planning Designation/Topic and Source Document	Applicable Policies	Applies to site	Applies to surrounding area/ General policy	Relevant policy objectives	Implications	Assessment
	WAST 2 – Criteria for assessing WMFs	Topic based policy	Topic based policy	Subject to WAST 1, WMF will be permitted if the proposal conforms to (inter alia) the principles of the waste hierarchy; doesn't have an unacceptable effect on residences, public health, ground/surface water, ecology, geology, agriculture; and has adequate links to the highway network and is of a high standard of design.	The proposed Facility is assessed against these environmental policy objectives in the relevant ES chapters. In summary, the proposed Facility is consistent with the policy objectives.	Supports policy aim.
Safeguarding of water resources	ENV 7	Topic based policy	Topic based policy	Inland and underground waters will be safeguarded. Development is permitted where it would not have an unacceptable effect on water quality or quantity of water resources, nature, heritage, recreation or amenity interests relating to such water. Development will be permitted if it would not be potentially at risk from flooding, nor increase the risk of flooding to an unacceptable level.	The proposed Facility is assessed against these environmental policy objectives in the relevant ES chapters. In summary, the proposed Facility is consistent with the policy objectives.	Supports policy aim.

Planning Designation/Topic and Source Document	Applicable Policies	Applies to site	Applies to surrounding area/ General policy	Relevant policy objectives	Implications	Assessment
New business and industrial development	EMP 2	Topic based policy	Topic based policy	Proposals for new business and industrial development will be permitted if the proposal lies within a suitable area for the proposed land use does not significantly impact areas of sensitive landscape, archaeology or ecology, is appropriately sized for its setting, access and parking accord with the Council's standards, adequate landscaping is provided, doesn't have unacceptable environmental effects on residential properties, has adequate infrastructure available, and does not present an undue health and safety risk and does not unacceptably effect surrounding land uses from pollution.	The proposed plant is classified as sui generis (non-conforming use) however it has some similarities with industrial and business use classes. This is considered to a suitable site for such as use. The proposed Facility is assessed against these environmental policy objectives in the relevant ES chapters. In summary, the proposed Facility is consistent with the policy objectives.	Supports policy aim.

Planning Designation/Topic and Source Document	Applicable Policies	Applies to site	Applies to surrounding area/ General policy	Relevant policy objectives	Implications	Assessment
General Industry	EMP 3	Topic based policy	Topic based policy	Development will be permitted for B2 use (general industry) where the proposal is compatible with existing uses, will not cause detriment to the amenities of nearby residential areas, the nature and scale of the development does not unacceptably affect surrounding uses, does not unacceptably pollute land, air or water, and does not pose undue health and safety risks and does not unacceptably effect surrounding land uses from pollution.	The proposed Facility is assessed against these environmental policy objectives in the relevant ES chapters. In summary, the proposed Facility is consistent with the policy objectives.	Supports policy aim.
Development involving hazardous substances	EMP 5	Topic based policy	Topic based policy	Developments involving hazardous substances will be permitted if the proposal does not pose undue health and safety risks, does not unacceptably pollute land, air or water, does not unacceptably effect surrounding land uses from pollution, not have an unacceptable effect on water quality or quantity of water resources, does not unacceptably affect the amenity and character of neighbouring land, does not unacceptably affect areas of sensitive landscape, archaeology or ecology, and provides satisfactory arguments for the after treatment and future use of site.	The proposed Facility is assessed against these environmental policy objectives in the relevant ES chapters. In summary, the proposed Facility is consistent with the policy objectives.	Supports policy aim.

Planning Designation/Topic and Source Document	Applicable Policies	Applies to site	Applies to surrounding area/ General policy	Relevant policy objectives	Implications	Assessment
Non-conforming business & industrial uses	EMP 9	No	Yes	Part of the Atlantic Trading Estate is allocated for suitable non-conforming business and industrial uses	The proposed plant is a sui generis (non-conforming use). Although this particular designation EMP9 is approximately 200m north east, the site is part of the Atlantic Trading Estate and as such its land use may be deemed suitable.	Neutral/Supports policy aim.
Undeveloped Coast	ENV 6	No	Yes	Development within the Undeveloped Coast Zone will be permitted if a coastal location is necessary for the development, the proposal would not have unacceptable environmental effects (i.e. noise intrusion, landscape impacts, air, land, water impacts, exacerbation of flooding and erosion risk, hazardous impacts and/or impacts on ecology or sites of geological interest) Proposals should be designed with respect to its local context and sensitive to its coastal setting.	The Undeveloped Coast is located approximately 230m south east. This limits direct implications for the proposed Facility.	Neutral.

4.3 Land Use

Existing Land Use

4.3.2 The proposed site is located in the Atlantic Trading Estate in Barry Docks. At present the site is disused and derelict with widespread vegetation. The surrounding land uses are largely commercial and industrial. Close to the south of the site there have been some earthworks undertaken. There are no residential properties within 250m of the site. Some 100m north west of the site is a body of water associated with Barry Docks. The coastline is located some 280m south of the site.

Effect on Land Use

4.3.3 As a result of the proposed Facility the use of land will change from vacant land to a site developed with an Energy Recovery Facility. While the use of the land will change it is not considered this change will have an adverse effect on land use at the site, or in the surrounding uses. The proposed Facility is considered to be consistent with the intended use of the site as identified in the Local Planning Policy designations and is commensurate with the surrounding industrial uses and businesses.

SECTION 5

AIR QUALITY

5 AIR QUALITY

5.1 Introduction

5.1.1 This chapter of the ES summarises the results of the air quality assessment undertaken for the proposed Energy Recovery Facility. The detailed assessment can be found in Appendix D.

5.1.2 The assessment considers potential changes to local air quality, associated with construction and operation of the plant, compared against the UK National Air Quality Objectives[1] for the protection of human health and ecological resources and the production of nuisance dust and odour in relation to Part III of the Environmental Protection Act (1990)[2].

5.1.3 A number of pollutants emitted from the gasification of waste are not included in the UK Air Quality Strategy (AQS) objectives. For this assessment emissions of such pollutants have been compared against the Waste Incineration Directive (WID) emission limit values and the Workplace Exposure Levels (WELs) designed for the protection of human health. The assessment will determine an appropriate stack height which will ensure all emissions are dispersed effectively.

5.1.4 During construction, there is the potential to generate temporary adverse effects on local air quality, primarily from dust nuisance.

5.1.5 During operation of the plant adverse effects could result from process stack emissions as well as changes in traffic on the surrounding road network.

5.2 Assessment Methodology

5.2.1 The air quality assessment methodology follows a risk based approach. Activities with a low potential to impact on sensitive receptors and resources have been assessed qualitatively and those with higher potential are assessed in detail. Specifically:

Construction phase

- a qualitative assessment of construction activities has been undertaken based on professional judgement, with consideration of the best practice guidance for control of dust and emissions from construction and demolition[3];
- nuisance dust and emissions from vehicle and plant exhausts are assessed qualitatively; and
- emissions from earthworks and material handling (stockpiling) are assessed qualitatively.

Operation phase

- impacts of emissions from the stack and determination of a stack height are assessed using detailed dispersion modelling following EA guidance[4]. This is considered to be an example of best practice in dispersion modelling.

- Dioxin and Furan exposure was modelled using a Health Risk Assessment developed for Her Majesty's Inspectorate of Pollution (HMIP)[5].

- The assessment of dust and odour is undertaken qualitatively and considers the identification of sensitive receptors and their distance from operations with a dust or odour generating potential.

Pollutants

5.2.2 A number of air quality regulations and non-statutory guidelines have been used in this assessment for direct comparison against potential changes in air quality arising from the proposed plant. In general, for waste incineration sources, the most significant emissions to air, in terms of local air quality impacts, are likely to be oxides of nitrogen (NOx), fine particulate matter (PM_{10}), sulphur dioxide (SO_2), and carbon monoxide (CO). Waste incineration also has the potential to release harmful pollutants such as lead, mercury, arsenic, nickel, chromium and cadmium as well as dioxins, furans and acid gases.

5.2.3 Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen and together are referred to as NOx. In ambient air, NO is oxidised to form NO_2, and it is NO_2 which has the more significant human health impacts.

5.2.4 This assessment considers the impacts of emissions of these pollutants on ambient concentrations and compares these with statutory and suggested guidelines described in Appendix D and summarised in Table 5.1, Table 5.2 and Table 5.3. Nitrogen deposition has been assessed against the critical loads in Table 5.4.

Baseline Conditions

5.2.5 The assessment covered a 6km square grid centred on the proposed site. The town of Barry is approximately 800m to the north-west. Barry Island is approximately 1km to the south west and Bendrick Rock 300m to the east. The assessment will focus on receptors and resources identified in TG (03)[6] as being the most sensitive to changes in air quality.

5.2.6 Existing pollutant concentrations were obtained from a desk top review of air quality assessments carried out by the Local Authority[7] under the requirements of the Local Air Quality Management (LAQM) regime, the Welsh Air Quality Forum[8] and the National Air Quality Archive[9].

Table 5.1 Air quality objectives and EU limit values for the protection of human health relevant to the assessment of the Barry Energy Recovery Facility

Pollutant	AQS Objective	EU Limit Value	Measured as	To be Achieved by
Carbon Monoxide	10 mg/m^3	-	Max daily running 8hr mean	31/12/2003
	-	10 mg/m^3	Max daily running 8hr mean	01/01/2005
Nitrogen Dioxide	200 µg/m^3	-	1 hr mean; not to be exceeded more than 18 times per year	31/12/2005
	40 µg/m^3	-	Annual mean	31/12/2005
		200 µg/m^3	1 hr mean; not to be exceeded more than 18 times per year	01/01/2010
	-	40 µg/m^3	Annual mean	01/01/2010
Particulate Matter (PM_{10})	50 µg/m^3	-	24 hr mean not to be exceeded more than 35 times per year	31/12/2004
	40 µg/m^3	-	Annual mean	31/12/2004
	-	50 µg/m^3	24 hr mean not to be exceeded more than 35 times per year	01/01/2005
	-	40 µg/m^3	Annual mean	01/01/2005
Sulphur Dioxide	266 µg/m^3	-	15 minute mean	31/12/2005
	350 µg/m^3	-	1 hr mean; not to be exceeded more than 24 times a year	31/12/2004
	125 µg/m^3	-	24 hr mean; not to be exceeded more than 3 times a year	31/12/2004
	-	350 µg/m^3	1 hr mean; not to be exceeded more than 24 times a year	01/01/2005
	-	125 µg/m^3	24 hr mean; not to be exceeded more than 3 times a year	01/01/2005

Table 5.2 Air quality objectives and EU limit values for the protection of vegetation and ecosystems relevant to the assessment of the Barry Energy Recovery Facility

Pollutant	AQS Objective	EU Limit Value	Measured as	To be Achieved by
Nitrogen Oxides	30 µg/m^3	-	Annual mean	31/12/2000
	-	30 µg/m^3	Annual mean	19/07/2001
Sulphur Dioxide	20 µg/m^3	-	Annual mean	31/12/2000
	20 µg/m^3	-	Winter average	31/12/2000
	-	20 µg/m^3	Annual mean	19/07/2001
	-	20 µg/m^3	Winter average	19/07/2001

Table 5.3 Workplace Exposure Levels (WELs) for pollutants not covered by the National Air Quality Strategy (AQS)

Pollutant	Annual Mean (ug/m3)	1 hour Maximum (ug/m3)
HCL	20	800
HF	-	250
Cadmium	0.005	1.5
Thallium	1	30
Mercury	0.25	7.5
Antimony	5	150
Arsenic	0.006	15
Chromium	0.1	3
Cobalt	0.2	6
Copper	2	60
Manganese	1 (24 hour max)	1500
Nickel	0.02	30
Vanadium	5	1 (24 hour max)
Dioxins and Furans	None	None

Table 5.4 Critical loads for nitrogen associated with sensitive ecosystems and resources within the study area

Ecosystem type found within study area	Name of site featuring ecosystem	Critical load kg N ha-1 year-1
Shingle rocks and cliffs	Barry Island, Hays Point to Bendrick Rock	10-15

Assessment of Significance

5.2.7 There are no universally accepted criteria for assessing the significance of air quality impacts. In general, a comparison is simply made between the predicted concentration and the relevant Air Quality Objective or EU Limit Value. In this assessment it is considered appropriate to specify significance criteria.

5.2.8 Environmental Protection UK (formerly the National Society for Clean Air, NSCA) has proposed the significance criteria given in Table 5.5

Table 5.5 NSCA Significance Criteria

Change / Concentration	<1%	1-5%	5-10%	10-15%	15-25%	>25%
Above objective without scheme	Minor adverse	Minor adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below objective without scheme, above with scheme	Minor adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below objective with scheme	Negligible	Minor adverse	Minor adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well below objective with scheme	Negligible	Negligible	Minor adverse	Minor adverse	Minor adverse	Moderate adverse

5.3 Baseline Conditions

Receptors

5.3.2 Table 5.6 details the closest specific receptors that have been assessed for potential impacts from the proposed plant. The closest residential receptor, a property on Bendrick Road, is located approximately 700m north of the site. The closest ecological receptor is approximately 944m away to the west.

Table 5.6 Sensitive receptors in the vicinity of the proposed facility

Receptor	Type	Location	Height (m)	Distance to proposed facility (m)
Bendrick Road	Residential	313410,167478	1.5	695
Dyfrig Street	Residential	312109,166908	1.5	725
Dock View Road	Residential	312397,167944	1.5	839
Hayes Lane	Residential	313724,167300	1.5	955
Hayes Road	Residential	313638,167674	1.5	987
Hayes Point hospital	Residential	314004,167398	1.5	1246
Children's hospice	Residential	314331,167685	1.5	1631
Southleigh home	Residential	314905,168078	1.5	2306

Receptor	Type	Location	Height (m)	Distance to proposed facility (m)
Bendrick Rock SSSI	Geological	313076, 167166	0	302
Barry Island SSSI	Ecological	312226, 166870	0	944

Existing Conditions

5.3.3 Under the requirements of LAQM Vale of Glamorgan Council have carried out air quality monitoring and reported on conditions in accordance with the timetable set out in the Environment Act 1995. To date, the council have not declared any Air Quality Management Areas (AQMAs) within 10km of the site.

5.3.4 Table 5.7 shows the nitrogen dioxide diffusion tube results for locations nearest to the proposed site. The results are well below the AQS objective at both roadside and background locations. Given that even the roadside monitoring location has obtained concentrations of nitrogen dioxide that are well below the objective, it is reasonable to assume that, since there are no significant traffic flows close to the site, background concentrations of nitrogen dioxide will also be well below the objective on site.

Table 5.7 Barry NO_2 diffusion tube data (bias adjusted)

Location	Easting	Northing	Type	Distance from site (m)	Annual Mean (ug/m^3)		
					2004	2005	2006
Gladstone Road	311797	168503	Roadside	1604	28	29	30
St Teilo Avenue	311464	168852	Background	2085	14	14	13
Gwenog Court	310475	168457	Background	2624	14	14	14
Port Road	310813	169691	Roadside	3146	21	21	23

5.3.5 Background concentrations for several pollutants were obtained from the National Air Quality Information Archive (NAQIA). Table 5.8 provides pollutant concentrations from mapped data on a 1km grid. The nitrogen dioxide concentrations are at a level consistent with the urban background and suburban diffusion tube results.

Table 5.8 Estimated background concentrations

Year	NOx (ug/m^3)	NO_2 (ug/m^3)	PM_{10} (ug/m^3)	CO (ug/m^3)
2004	25.8	19.2	18.8	0.125
2007	23.43	18.07	18.03	0.097
2010	20.8	17.1	17.4	0.085

5.3.6 SO_2 background concentrations have been obtained from the nearest Automatic Urban and Rural Network (AURN) site at Cardiff Centre and are given in Table 5.9

Table 5.9 Background concentrations of SO_2 obtained from the AURN

Location	Easting	Northing	Distance from site (m)	Annual mean (µg/m^3)
Cardiff Centre	318415	176503	15600	2.79

5.3.7 The background concentrations for metals assessed in this study have been taken as the 2007 annual average over the UK monitoring network (16 sites). Table 5.10 shows these concentrations.

Table 5.10 Background concentrations for metals

Pollutant	2007 (ng/m3)
Arsenic	0.93
Cadmium	0.40
Chromium	4.87
Copper	17.51
Manganese	8.09
Nickel	3.78
Vanadium	2.25
Mercury	0.44

5.3.8 Background nitrogen deposition was derived from data provided by the Air Pollution Information System (APIS). The data represent the average total deposition within a 5km square and include an area averaged contribution from roads. Deposition close to roads will be higher than this average, whereas at distances more than 200m from major roads, the deposition rate may be lower.

5.3.9 The APIS data were extracted from the region 313000, 167000 to 318000, 172000 as the average of 2003 to 2005, assumed to be representative of conditions in the year 2004. Following the advice in DMRB, the deposition was reduced by 2% (straight line reduction) per year for extrapolation to 2007.

5.3.10 The background deposition rate was calculated following the methodology set out in the Design Manual for Roads and Bridges (DMRB). Table 5.11 shows the background deposition rate used in the assessment for the sensitive ecosystems.

Table 5.11 Background nitrogen deposition (kg N/ha/yr) used in the assessment of impacts.

Year	Sensitive Ecosystem	5km average Nitrogen Deposition (from APIS)
2004	Barry Island and Bendrick Rock	12.9

2007	Barry Island and Bendrick Rock	12.1

5.3.11 Following the guidance in IPPC H1 and LAQM TG(03), the background concentration used in assessing short term effects is assumed to be twice the annual mean concentration.

5.3.12 Background pollutant concentrations are not available for some of the pollutants assessed in this study. However, since background concentrations for those pollutants which are available are well below the objectives and there are no other significant sources of pollution close by, it is assumed that background concentrations for all pollutants are well below the relevant objectives and EALs.

5.4 Assessment of Predicted Impacts

Construction Phase

5.4.2 In general, the potential air quality impacts during construction would arise from:

- Increased traffic emissions from construction traffic, and
- Dust generating construction activities

5.4.3 Dust nuisance is also dependant upon a wide range of localised factors including; prevailing wind direction, nature of material (ground), type and duration of activities and the location of sensitive receptors.

5.4.4 The impacts of emissions from construction traffic have not been assessed in detail. The development is not expected to result in a large number of vehicle movements, and with the temporary nature of construction, the impact of construction traffic emissions is negligible.

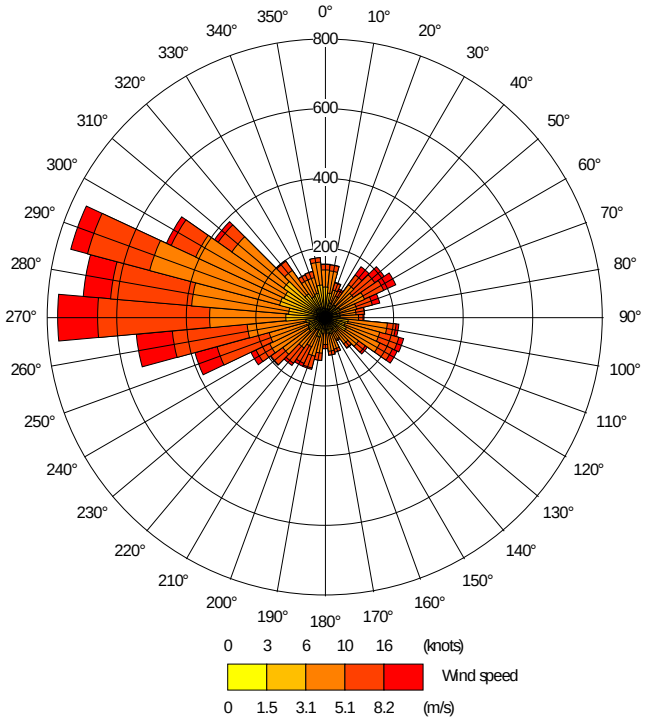
5.4.5 Construction activities associated with the greatest potential for dust generation are primarily:

- earthworks including excavation of topsoil, handling onsite and deposition;
- handling and storage of materials (including loading and unloading);
- re-suspension of dust on haulage roads;
- wind blown dust across disturbed site surfaces and materials; and
- Mechanical operations such as crushing, drilling, concrete mixing and cutting.

5.4.6 The site is currently disused. There will be a need to to excavate soil during pile construction, development of the waste/fuel silos and drainage runs. There may also be a need for excavation for a wheel wash during the construction phase. Vegetation clearance is required across much of the site. The site is located in Barry Docks with the surrounding land use comprised of mixed industrial units. The closest residential receptor is approximately 700m north east of the site.

5.4.7 Figure 5.1 shows the wind rose for Cardiff Airport from which meteorological data have been used.

Figure 5.1: Wind Rose for Cardiff Airport 2004



5.4.8 With prevailing winds from a westerly direction and the closest residential receptor approximately 700m north east of the site, the impact of construction dust on residential receptors is predicted to be low. The closest ecological receptor is located approximately 300m east of the site, with prevailing wind from the west; the potential for dust soiling on ecological receptors exists.

5.4.9 With a potential for dust soiling the implementation of best practice measures to minimise dust generation will be carried out onsite. Suitable mitigation measures are outlined in Section 5.5.

Operational Phase

Operational Traffic

5.4.10 It has been estimated that there will be approximately 27 HGV vehicle movements a day associated with the proposed plant. .

5.4.11 Pollutants from vehicle emissions have been shown to become negligible beyond 200m from a road. Such a small quantity of vehicles is predicted to have a very minor impact on the local road network. With the closest residential receptor located nearer to roads not used by waste delivery vehicles, any increase in traffic as a result of the plant would be lost in the overall traffic flows in the Barry area. Therefore, the impacts of operational traffic are considered to be negligible.

Odour

5.4.12 The proximity of sensitive receptors has been detailed previously. Therefore, the impact associated with odour from the plant is dependant upon the potential for the generation of odorous emissions.

5.4.13 The primary source of odour from the proposed facility is from the Waste/Fuel silos . When waste is allowed to decompose in anaerobic conditions odorous emissions are likely to arise. The proposed plant is expected to receive approximately 80,000 tonnes of residual waste per year. Therefore, the potential exists for odorous emissions from waste retained in the waste/fuel silos. . However, in a similar way to construction dust impacts, the westerly prevailing winds would carry any odour away from residential receptors.

5.4.14 The use of roller shutters, to be kept closed at all times unless receiving waste, negative pressures at the waste reception bays and regular cleaning of the site would mean that potential odour is negligible. Negative pressures will be achieved through removal of a small volume of air from the WRH. The extracted air will be used to aid the oxidation of the synthetic gas during the 2nd stage of the two stage energy recovery process.

Process Contribution (PC) to pollutant concentrations at specific receptors

5.4.15 Ground level concentrations have been modelled using the worst case meteorological year. Nitrogen dioxide concentrations, over both short and long term averaging periods, were determined using meteorological data from 2003 to 2005 and are given in Table 5.12. The 2004 meteorological data resulted in the worst ground level concentrations for both short and long term averaging times. Therefore, the pollutant concentrations given in this report have been modelled using 2004 meteorological data to represent a worst case scenario. This is a conservative approach.

Table 5.12: Maximum Process Contribution (PC) to ground level concentrations (µg/m^3)

Year	Maximum annual mean NO_2	99.79th percentile of 1 hour mean NO_2
2003	4.1	19
2004	5.1	19.2
2005	4.5	17.8
2006	4.8	19.5
2007	4.5	18.9

5.4.16 Ground level concentrations have been modelled in this assessment using the parameters set out in the assessment methodology given in Appendix D. Figures 3.1 to 3.7 in Appendix D show the predicted ground level concentrations for the key pollutants set out in the Air Quality Strategy. Table 5.13 to Table 5.22 below give concentrations of modelled pollutants at the specified receptors.

Table 5.13 Modelled Process Contribution (PC) to annual mean and 1 Hour mean nitrogen dioxide concentrations at the specific receptors

Receptor	Annual mean NO_2 ($\mu g/m^3$)	% of AQS objective ($40\mu g/m^3$)	99.79th percentile of 1 hour mean NO_2 ($\mu g/m^3$)	% of AQS objective ($200\mu g/m^3$)
Bendrick Road	1.19	2.96	7.55	3.77
Dyfrig Street	0.48	1.20	7.22	3.61
Dock View Rd	0.27	0.67	5.88	2.94
Hayes Lane	1.21	3.02	5.39	2.69
Hayes Road	0.61	1.53	5.19	2.60
Hayes Hospital	0.76	1.90	4.06	2.03
Childrens hospice	0.40	0.99	2.88	1.44
Southleigh home	0.19	0.48	2.02	1.01

Table 5.14 Modelled Process Contribution (PC) to annual mean and 24 hour mean Particulate Matter (PM_{10}) concentrations at the specific receptors

Receptor	Annual mean PM_{10} ($\mu g/m^3$)	% of AQS objective ($40\mu g/m^3$)	90.41st percentile of 24 hour mean PM_{10} ($\mu g/m^3$)	% of AQS objective ($50\mu g/m^3$)
Bendrick Road	0.06	0.15	0.17	0.35
Dyfrig Street	0.02	0.06	0.08	0.15
Dock View Rd	0.01	0.03	0.05	0.09
Hayes Lane	0.06	0.15	0.16	0.32
Hayes Road	0.03	0.08	0.09	0.17
Hayes Hospital	0.04	0.09	0.10	0.20
Children's hospice	0.02	0.05	0.06	0.11
Southleigh home	0.01	0.02	0.03	0.06

Table 5.15 Modelled Process Contribution (PC) to short term Sulphur Dioxide (SO_2) concentrations at the specified receptors

Receptor	99.9th percentile of 15 minute mean SO_2 (µg/m^3)	% of AQS objective (266µg/m^3)	99.73rd percentile of 1 hour mean SO_2 (µg/m^3)	% of AQS objective (350µg/m^3)	99.2nd percentile of 24 hour mean SO_2 (µg/m^3)	% of AQS objective (125µg/m^3)
Bendrick Road	5.06	1.90	3.64	1.04	1.48	1.18
Dyfrig Street	4.84	1.82	3.55	1.01	1.47	1.17
Dock View Rd	3.94	1.48	2.79	0.80	0.81	0.65
Hayes Lane	3.61	1.36	2.65	0.76	1.29	1.03
Hayes Road	3.48	1.31	2.60	0.74	0.87	0.70
Hayes Hospital	2.72	1.02	1.94	0.55	0.88	0.70
Children's hospice	1.93	0.73	1.33	0.38	0.48	0.38
Southleigh home	1.35	0.51	0.90	0.26	0.26	0.21

Table 5.16 Modelled Process Contribution (PC) to long term (annual) averaged Sulphur Dioxide (SO_2) concentrations at the specified receptors

Receptor	Annual mean SO_2 (µg/m^3)	% of AQS objective (20µg/m^3)
Bendrick Road	0.30	1.48
Dyfrig Street	0.12	0.60
Dock View Rd	0.07	0.33
Hayes Lane	0.30	1.51
Hayes Road	0.15	0.76
Hayes Hospital	0.19	0.95
Children's hospice	0.10	0.50
Southleigh home	0.05	0.24

Table 5.17 Modelled Process Contribution to Carbon Monoxide (CO) concentrations at the specific receptors

Receptor	8 hour running mean CO (µg/m^3)	% of AQS objective (10mg/m^3)
Bendrick Road	0.30	0.0030
Dyfrig Street	0.12	0.0012
Dock View Rd	0.07	0.0007
Hayes Lane	0.30	0.0030
Hayes Road	0.15	0.0015
Hayes Hospital	0.19	0.0019
Children's hospice	0.10	0.0010
Southleigh home	0.05	0.0005

Table 5.18 Modelled Process Contribution (PC) to Hydrogen Chloride (HCL) concentrations at the specific receptors

Receptor	Annual mean HCL (µg/m^3)	% of Long Term EAL (20µg/m^3)	100th percentile of 1 hour mean HCL (µg/m^3)	% of hourly EAL (800µg/m^3)
Bendrick Road	3.3E-04	0.0016	0.85	0.11
Dyfrig Street	1.3E-04	0.0007	0.84	0.11
Dock View Rd	7.4E-05	0.0004	0.67	0.08
Hayes Lane	3.4E-04	0.0017	0.62	0.08
Hayes Road	1.7E-04	0.0008	0.63	0.08
Hayes Hospital	2.1E-04	0.0011	0.49	0.06
Children's hospice	1.1E-04	0.0006	0.37	0.05
Southleigh home	5.4E-05	0.0003	0.28	0.03

Table 5.19 Modelled Process Contribution (PC) to Hydrogen Fluoride (HF) concentrations at the specific receptors

Receptor	Annual mean HF (µg/m^3)	100th percentile of 1 hour mean HF (µg/m^3)	% of hourly EAL (250µg/m^3)
Bendrick Road	3.3E-04	0.08	0.03
Dyfrig Street	1.3E-04	0.08	0.03
Dock View Rd	7.4E-05	0.07	0.03
Hayes Lane	3.4E-04	0.06	0.02
Hayes Road	1.7E-04	0.06	0.03
Hayes Hospital	2.1E-04	0.05	0.02
Children's hospice	1.1E-04	0.04	0.01
Southleigh home	5.4E-05	0.03	0.01

Table 5.20 Modelled Process Contribution (PC) to annual mean concentrations of non-AQS metals at the specified receptors

Receptor	Cadmium (µg/m^3)	Thallium (µg/m^3)	Mercury (µg/m^3)	Antimony (µg/m^3)	Arsenic (µg/m^3)	Chromium (µg/m^3)	Cobalt (µg/m^3)	Copper (µg/m^3)	Nickel (µg/m^3)	Vanadium (µg/m^3)
Bendrick Road	1.5E-04	1.5E-04	3.0E-04	3.3E-04	3.3E-04	3.3E-04	3.3E-04	3.3E-04	3.3E-04	3.3E-04
Dyfrig Street	6.0E-05	6.0E-05	1.2E-04	1.3E-04	1.3E-04	1.3E-04	1.3E-04	1.3E-04	1.3E-04	1.3E-04
Dock View Rd	3.3E-05	3.3E-05	6.7E-05	7.4E-05	7.4E-05	7.4E-05	7.4E-05	7.4E-05	7.4E-05	7.4E-05
Hayes Lane	1.5E-04	1.5E-04	3.0E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04	3.4E-04
Hayes Road	7.6E-05	7.6E-05	1.5E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04	1.7E-04
Hayes Hospital	9.5E-05	9.5E-05	1.9E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04	2.1E-04
Children's hospice	5.0E-05	5.0E-05	9.9E-05	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04	1.1E-04
Southleigh home	2.4E-05	2.4E-05	4.8E-05	5.4E-05	5.4E-05	5.4E-05	5.4E-05	5.4E-05	5.4E-05	5.4E-05

Table 5.21 Modelled Process Contribution (PC) to 100th percentile of 1 hour mean concentrations of non-AQS metals at the specified receptors

Receptor	Cadmium (µg/m^3)	Thallium (µg/m^3)	Mercury (µg/m^3)	Antimony (µg/m^3)	Arsenic (µg/m^3)	Chromium (µg/m^3)	Cobalt (µg/m^3)	Copper (µg/m^3)	Manganese (µg/m^3)	Nickel (µg/m^3)
Bendrick Road	2.1E-03	2.1E-03	4.2E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03
Dyfrig Street	2.1E-03	2.1E-03	4.2E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03	4.7E-03
Dock View Rd	1.7E-03	1.7E-03	3.3E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03	3.7E-03
Hayes Lane	1.6E-03	1.6E-03	3.1E-03	3.4E-03	3.4E-03	3.4E-03	3.4E-03	3.4E-03	3.4E-03	3.4E-03
Hayes Road	1.6E-03	1.6E-03	3.2E-03	3.5E-03	3.5E-03	3.5E-03	3.5E-03	3.5E-03	3.5E-03	3.5E-03
Hayes Hospital	1.2E-03	1.2E-03	2.4E-03	2.7E-03	2.7E-03	2.7E-03	2.7E-03	2.7E-03	2.7E-03	2.7E-03
Children's hospice	9.3E-04	9.3E-04	1.9E-03	2.1E-03	2.1E-03	2.1E-03	2.1E-03	2.1E-03	2.1E-03	2.1E-03
Southleigh home	6.9E-04	6.9E-04	1.4E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03	1.5E-03

Table 5.22 Modelled Process Contribution (PC) to 100th percentile of 24 hour mean concentrations of non-AQS metals at the specified receptors

Receptor	Manganese (µg/m^3)	Vanadium (µg/m^3)
Bendrick Road	2.6E-03	2.6E-03
Dyfrig Street	2.3E-03	2.3E-03
Dock View Rd	1.3E-03	1.3E-03
Hayes Lane	1.6E-03	1.6E-03
Hayes Road	1.4E-03	1.4E-03
Hayes Hospital	1.1E-03	1.1E-03
Children's Hospice	7.1E-04	7.1E-04
Southleigh home	4.8E-04	4.8E-04

5.4.17 The modelling results show that the process contribution to concentrations of all pollutants over all averaging periods does not exceed 4% of the relevant EAL at any of the sensitive receptors.

Health Risk Assessment

5.4.18 The EU Waste Incineration Directive (WID) requires new incinerators to meet certain standards for emissions to air. These limits are primarily set for the protection of human health. This assessment has used the WID Emissions Limit Values (ELVs) for dioxin emissions from the proposed Facility and dispersion modelling to derive a concentration of dioxins in air. This represents a worst case scenario, where the emissions from the Energy Recovery Facility are set to the ELV. In reality, the Facility will fully comply with the ELVs and so emissions would be less than this and the true concentrations would also be smaller. Concentrations were calculated on a regular grid as well as at the receptors given in Table 5.6.

5.4.19 The methodology outlined in the HMIP (Her Majesty's Inspectorate of Pollution) commissioned document on health risk from dioxins[10] has been used to calculate a total daily intake of dioxins for a range of human receptors; adult residents, child residents, infants, subsistence farmers and children of subsistence farmers via numerous pathways.

5.4.20 Dioxins accumulate in fatty foods due to their lipophilic properties and therefore over 90% of human background exposure to dioxins is estimated to come from the diet with animal products being the dominant source[11]. Direct inhalation and ingestion of soil, water and plants provide a relatively smaller contribution to total intake of dioxins. Although there are no drinking water supplies nearby and no subsistence fishermen living in the area, the fish and drinking water pathways were still included in the assessment to provide a worst case scenario.

5.4.21 The results at the specific receptors (Table 5.23) show that for the worst case exposure scenario of a subsistence farmer and child of subsistence farmer, the total intake of dioxins does not exceed the World Health Organization (WHO) recommended Tolerable Daily Intake (TDI) of 1-4 pg/kg-bw/day. The total daily intake for an infant is expected to be 1-2 orders of magnitude greater than that of an adult[10], based on a 'per kilogramme' amount. This is, however, only sustained for a very short period of the individuals' life.

Table 5.23: Modelled concentrations and resulting total daily intake of dioxins (Process Contribution) for receptors close to the proposed facility

Receptor	Concentration ($\mu g/m^3$)	Total Daily Intake (pg/kg-bw/day)				
		Adult	Child	Infant	Subsistence farmer	Child of subsistence farmer
Bendrick Road	5.9E-09	1.1E-01	2.2E-01	7.6E+00	7.8E-01	1.5E+00
Hayes Lane	6.0E-09	1.1E-01	2.2E-01	7.8E+00	7.9E-01	1.5E+00
Hayes hospital	3.8E-09	7.1E-02	1.4E-01	4.9E+00	5.0E-01	9.5E-01
Hayes Road	3.1E-09	5.7E-02	1.1E-01	3.9E+00	4.0E-01	7.7E-01
Southleigh	9.7E-10	1.8E-02	3.5E-02	1.2E+00	1.3E-01	2.4E-01
Dock View	1.3E-09	2.51E-02	4.86E-02	1.72E+00	1.76E-01	3.37E-01
Dyfrig St	2.4E-09	4.5E-02	8.7E-02	3.1E+00	3.1E-01	6.0E-01
Hospice	2.0E-09	3.7E-02	7.2E-02	2.5E+00	2.6E-01	5.0E-01

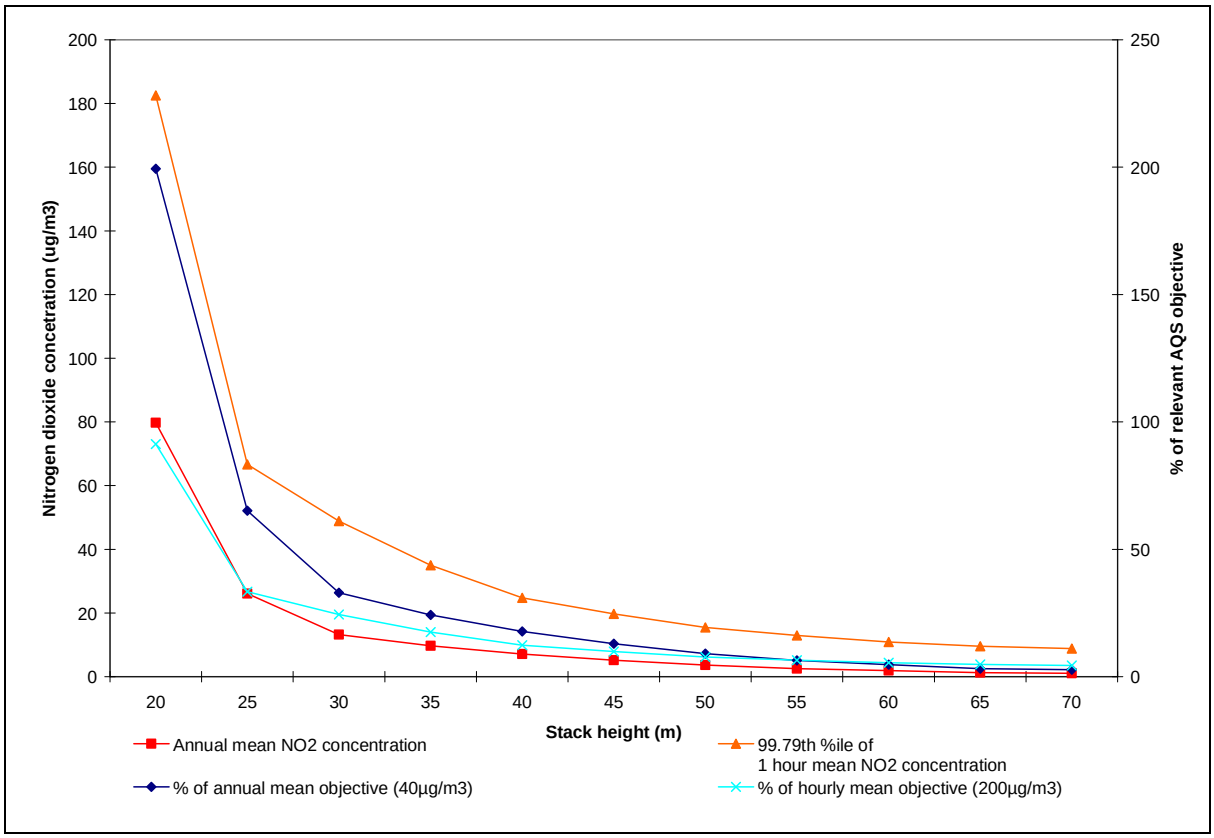
5.4.22 The maximum on site total intake for the gridded receptors was found to be above the WHO recommended TDI. However, this intake is based on the maximum concentration close to the Facility where no human receptors would be living or farming the land. It is therefore not a realistic result for human exposure.

Stack Height Determination

5.4.23 The determination of a recommended stack height was carried out by modelling nitrogen dioxide concentrations over a regular grid for stack heights ranging from 20m to 70m. The maximum concentrations were taken from the gridded receptors and it should therefore be noted that these concentrations do not necessarily occur at locations where sensitive receptors are present.

5.4.24 It can be seen that ground level concentrations are inversely related to stack height (Chart 5.1). There is an initial rapid decrease in concentrations when increasing the stack height from 20m to 25m but as stack height increases further, there is a reduction in the rate at which concentrations decrease. Overall it is recommended that the stack height should be at least 45m.

Chart 5.1 Stack height determination



Nitrogen deposition and NOx concentrations

5.4.25 A prediction of nitrogen deposition on sensitive ecosystems has been carried out using relevant HA draft guidance (Table 5.24). Barry Island is the nearest site designated for ecological importance.

Table 5.24 Concentrations of nitrogen oxides (NOx) and nitrogen deposition for nearby sensitive ecosystems

Receptor	NOx concentration (µg/m^3)	% of AQS objective (30µg/m^3)	Nitrogen deposition (kg N /ha /yr)	% of critical load
Barry Island	0.36	1.2	0.04	0.3-0.4

5.4.26 The process contribution to NOx concentrations and nitrogen deposition levels over the sensitive ecosystem is less than the AQS objective and critical load respectively. Since background concentrations of NOx are well below the objective, the process contribution is considered Negligible at Barry Island.

5.5 Proposed Mitigation Measures

5.5.1 The assessment of construction dust effects identified that there were no significant offsite dust impacts due to the distance of relevant receptors. However, a Construction Environmental Management Plan (CEMP) will be prepared and implemented by the Contractor to minimise emissions.

5.5.2 There is potential for odour emissions from the reception of waste at the site. The use of roller shutters, maintenance of a negative pressure within the building and regular cleaning would ensure no significant odour impacts on the closest sensitive receptors.

5.5.3 The stack height has been designed to take account of recommendations made following modelling of the air quality data.

5.6 Conclusions

5.6.1 The air quality assessment has considered the potential impacts of construction and operation of the proposed Energy Recovery Facility at Barry Docks. The emissions of pollutants outlined in the WID have been assessed by estimating the impact of emissions on relevant receptors and resources.

5.6.2 During construction the development is not expected to result in a large number of vehicle movements, and with the temporary nature of construction, the impact of construction traffic emissions is negligible. Dust soiling at the nearest residential and ecological receptors is predicted to be low however, potential exists for dust soiling of the Geological SSSI at Bendrick Rock. Mitigation measures have been identified to minimise this impact. Construction impacts associated with the Facility are predicted to be Negligible.

5.6.3 With the stack height set to 45m, predicted concentrations of all pollutants are less than 5% of the relevant objectives and EALs. Since background concentrations in the area are well below the objectives and EALs, based on NSCA significance criteria, this is deemed to be a Negligible Impact.

5.6.4 For dioxin emissions, the HMIP risk assessment methodology was used. The worst case Total Daily Intake of dioxins for the modelled receptors was found to be consistent with the WHO recommended intake of 1-4 pg/kg-bw/day. The total daily intake for an infant is expected to be 1-2 orders of magnitude greater than that of an adult[10], based on a 'per kilogramme' amount. This is, however, only sustained for a very short period of the individuals' life.

5.6.5 Nitrogen deposition on the nearest sensitive ecological receptor at Barry Island as a result of the process contribution to NOx concentrations has been determined to be a Negligible impact.

5.6.6 A detailed assessment of the air quality impacts of the proposed facility has been carried out and will form part of the application for a permit to operate the process under Environmental Permitting Regulations 2008.

5.6.7 Impacts on air quality during construction are considered to be Negligible with the incorporation of mitigation measures. Operational impacts on air quality at residential

receptors are Negligible. At ecological receptors operational impacts are also Negligible. .

5.7 References

1. Department for the Environment Food and Rural Affairs (2007) in partnership with the Scottish Executive, the National Assembly for Wales, and the Department for Environment for Northern Ireland, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

2. HMSO (1990) Environmental Protection Act, Part III

3. London Councils (2006) Control of Dust and Emissions from Construction and Demolition – Best Practice Guidance

4. Environment Agency (2003) Integrated Pollution Prevention and Control (IPPC) Horizontal guidance note H1

5. ERM, 1996, Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes, HMIP/CPR2/41/1/181

6. DEFRA, 2003, Local Air Quality Management Technical Guidance (TG 03).

7. Vale of Glamorgan, 2007, Update on Forth Round Review and Assessment

8. AEA Energy and Environment on behalf of the National Assembly for Wales and the Welsh Air Quality Forum, 2007, www.airquality.co.uk

9. AEA Energy and Environment on behalf of the UK Department for Environment Food and Rural Affairs and the Devolved Administrations. 2006., www.airquality.co.uk

10. ERM, 1996, Risk Assessment of Dioxin Releases from Municipal Waste Incineration Processes, HMIP/CPR2/41/1/181.

11. World Health Organization, 1998, Assessment of the health risk of dioxins: re-evaluation of the Tolerable Daily Intake (TDI), WHO Consultation, May 25-29, Geneva, Switzerland, http://www.who.int/ipcs/publications/en/exe-sum-final.pdf.

SECTION 6

ECOLOGY

6 ECOLOGY

6.1 Introduction

6.1.1 This section of the ES reviews and assesses the baseline ecological status of the development site and relevant surrounding area and identifies those features of conservation interest/importance that require consideration in the assessment with regards to potential impacts resulting from the development.

6.1.2 Section 4 of the ES (Planning Policy Framework) discusses the local planning background against which the proposed development will be considered, including relevant nature conservation plans and policies. The following legislation, policy and guidance documents have been used to underpin the ecological impact assessment (EcIA) reported in this Section:

- Conservation (Natural Habitats and c.) Regulations 1994;
- Wildlife & Countryside Act 1981 (and subsequent amendments);
- Countryside and Rights of Way Act 2000;
- Technical Advice Note (TAN) 5: Nature Conservation and Planning (1996);
- Natural Environment and Rural Communities (NERC) Act 2006;
- Protection of Badgers Act 1992;
- The UK Biodiversity Action Plan (UKBAP) 1994;
- Vale of Glamorgan Local BAP (2002); and
- Vale of Glamorgan Unitary Development Plan (UDP) 1996-2011, adopted 18 April 2005.

6.2 Assessment Methodology

6.2.1 The methodology for this ecological assessment is based on guidance issued by the Institute of Ecology and Environmental Management (IEEM) (2006) and involves the following stages:

- Consultations;
- Baseline studies and evaluation of ecological receptors;
- Identification of Valued Ecological Receptors;
- Identification and characterisation of potential impacts; and,
- Assessment of impact significance.

Consultation

6.2.2 The following statutory consultees were consulted in relation to ecology;

- Countryside Council for Wales (CCW);
- Environment Agency (EA);
- Vale of Glamorgan Council.

Baseline

6.2.3 Baseline information about ecological features including sites of importance for nature conservation, species populations, species assemblages and habitats was obtained from the following sources:

- A desk study carried out to collate and analyse data on the proximity of any statutory and non-statutory designated sites of nature conservation interest and existing records of notable and protected species within the past five years held by CCW, the local council and the South East Wales Biological Records Centre (SEWBReC); within at least 2km of the proposed development site. Aerial photographs of the site and surrounding area were reviewed to assess the context of the site in relation to neighbouring habitats.
- An ecological site assessment was undertaken by suitably experienced ecologists on 3 April 2008. The survey was carried out to identify habitat types and identify the presence or potential presence of ecological constraints to the proposed development. The survey focussed on the site of proposed development as described in Section 2 and relevant surrounding area (at least 30m), the combination of which is hereafter referred to as the 'survey area'.

Identification of Valued Ecological Receptors (VER)

6.2.4 The valuation of sites makes use of established value systems (e.g. Sites of Special Scientific Interest (SSSIs) are all of national importance, County Wildlife Sites are of county importance), although judgement is required for the valuation of sites of less than district value.

6.2.5 The valuation of species populations, assemblages of species and habitats uses accepted criteria e.g. published lists of species of conservation concern, presence on National or local Biodiversity Action Plans (BAP) and legal protection status.

Identification and characterisation of potential impacts

6.2.6 The likely effects of the proposed development during construction and operation, and the potential ecological impacts arising from them are identified and characterised, taking into consideration the following parameters:

- Positive or negative – whether the effect will result in net loss or degradation of a VER or whether it will enhance or improve it;

- Magnitude – the size or intensity of the effect measured in relevant terms, e.g. number of individuals lost or gained, area of habitat lost of created or the degree of change to existing conditions (e.g. noise or lighting levels);

- Extent – the spatial scope of the effect, for example the physical area affected or the geographical pattern of the effect;

- Duration – the length of time over which the effect occurs;

- Reversibility – the extent to which effects are reversible either spontaneously or through active mitigation; and,

- Timing and frequency – consideration of the timing of events in relation to ecological change, some effects may be of greater significance if they take place at certain times of year (e.g. breeding season). The extent to which an effect is repeated may also be of importance.

Assessment of impact significance

6.2.7 The significance of the predicted impacts on VER arising from the identified effects of the proposed development, including designed-in and additional mitigation measures, is assessed. Significance is assessed as Negative, Positive or Not Significant.

6.3 Baseline Conditions

Statutory Designated Sites

6.3.2 The desk study identified three statutory designated sites of conservation interest within 2km of the study area. These sites, by order of proximity, are;

- Hayes Point to Bendrick Road Site of Special Scientific Interest (SSSI),

- Barry Island SSSI

- Barry Woodland SSSI

6.3.3 Summary information of the statutory designations awarded to these sites is presented in Table 6.1 with full details of the citations and notifications included in Appendix E.

Table 6.1 Statutory designated sites located within 2km of the study area

Designation Name and Approximate Distance from Proposed Development	Designation	Reasons for Designation and Description
Hayes Point to Bendrick Road ~ 240m	SSSI - National	The site is designated for its geological value.

Barry Island ~1000m	SSSI - National	The site is designated for its geological value.
Barry Woodlands ~2100m	SSSI – National	Barry Woodlands is of special interest for its semi-natural broadleaved woodland. The site comprises a series of fourteen separate woodland blocks, and is the best example of this habitat in Wales. The ground flora of these woodlands is of particular interest as it is especially rich, even in areas replanted with non-native trees. Flushes, streams and small humid ravines add to the ecological diversity of the woodlands. There are also two areas of wooded swamp, associated with up-welling of lime-rich water.

6.3.4 Hayes Point to Bendrick Road and Barry Island SSSI are both designated as a result of their geological interest and have no notable biological conservation interest. As such they are not considered further in this section.

Non-statutory Designated Sites

6.3.5 An area of ancient woodland is located approximately 1km from the proposed development site. Ancient Woodland has intrinsic nature conservation value and represents a locally valuable habitat which is difficult to replace or recreate. Areas of Ancient Woodland may also have the potential to contain significant features in terms of cultural heritage and landscape character as well as ecology and nature conservation.

6.3.6 A request was made to the Vale of Glamorgan Council to identify any Sites of Importance for Nature Conservation (SINC) within 2km of the survey area. However due to legal restrictions regarding the status of the local SINCs the details of such sites were unobtainable.

Notes regarding the Desk Study

6.3.7 The desk study search produced a large number of records of protected and/or notable species within a 2km radius of the survey area. Many of these records are in excess of 5 years old and/or occur in association with the statutory and non-statutory sites that are located within the same search area.

6.3.8 None of the records occurred within the boundaries of the development site itself and the majority of records occur in excess of 500m of the site boundary. Summary details of these records are presented in Figure 6.1.

6.3.9 It should be noted that the records generally do not provide sufficient details of species in order to ascertain certain information. For example, in the case of plants whether the record represents an individual or a larger population; or, in the case of badger (*Meles meles)* whether the record represents the location of a sett or an individual or, for birds whether the record represents a nest site. It is likely that records represent both individual sightings and the location of nest sites, setts etc. On this basis a precautionary approach has been adopted in identifying the value of these records in terms of their value/sensitivity and it is likely that for some features

the value assigned for the purpose of this assessment is somewhat greater than the actual value.

Habitat Types and Associated Flora

6.3.10 No protected and/or notable plant species were identified from the desk study within 2km of the survey area.

6.3.11 The ecological appraisal identified that the survey area was disused and appeared to comprise made ground. There was evidence of fly tipping of materials including inert waste. There were no buildings on site and no evidence of any having been previously present. Surrounding land use comprised mixed industrial activities, including waste management activities (scrap yards, waste segregation, and landfill) and bulk materials storage and handling (including stockpiles of sand and other aggregates) and small industrial units.

6.3.12 The habitats predominantly comprised scrub and ruderal vegetation including bramble (*Rubus fruticosus* agg.), buddleia *(Buddleja davidii),* teasel (*Dipsacus fullonum*) nettle (*Urtica dioica,)* Umbellifer sp., gorse (*Ulex europaeus)* and Japanese knotweed (*Fallopia japonica).* Japanese knotweed is listed in Schedule 9, Part II of the Wildlife and Countryside Act (1981 as amended). As such it is an offence to plant or otherwise cause this species to grow in the wild (e.g. by spread of rhizome or seed).

6.3.13 The remainder of the survey area comprised a mixture of bare ground including rubble piles, semi-improved grassland and immature trees. No aquatic habitats were recorded on site or in the immediate surrounds.

6.3.14 Based on the findings of the desk study and site appraisal no specially protected or notable species are recorded in the surrounding area and all the floral species and habitats present within the application area have been identified as being very common in a local, regional and national context with low diversity and negligible conservation interest. It is considered that the habitats and flora are of no greater than neighbourhood value and as such are not considered further in this assessment, with the exception of Japanese knotweed the presence of which is addressed Section 6.5.

Protected and/or Notable Fauna

Invertebrates

6.3.15 The desk study identified nine species of invertebrate that are protected and/or of nature conservation interest within 2km of the survey area; the nearest of which occurred 740m from the survey area. The majority of the remaining records were in association with a private property located approximately 1500m away on Barry Island.

6.3.16 The survey area supported neither niche habitats for the invertebrate recorded in the desk study nor habitat of particular importance for other populations/species of invertebrates of conservation interest. It is therefore considered that the site is of no more than neighbourhood value for invertebrate species and as such invertebrates are not considered further in this assessment.

Herpetiles

6.3.17 The desk study did not identify any records of amphibians or reptiles within 2km of the survey area. Consultation with Vale of Glamorgan Council Biodiversity Officer confirmed an absence of any known great crested newt *(Triturus cristatus)* records in the vicinity of the site although identified that they are thought to be present in garden ponds in Barry (R May 5 June 2008 *Pers com*).

6.3.18 The terrestrial habitats of the survey area were of limited suitability for herpetiles. The survey area is effectively fragmented from other habitats by surrounding roads, which are considered likely to function as a physical barrier to recruiting these species. Furthermore the survey area itself offers limited potential for foraging or breeding, which could support remnant populations. There were only a limited number of suitable refugia present and there was no evidence of reptiles present, despite favourable weather conditions during the site visit.

6.3.19 There are no water bodies present in the survey area or immediate surrounds that could provide suitable breeding habitat for amphibians.

6.3.20 Based on the findings of the desk study and site appraisal the proposed development area is considered highly unlikely to support herpetiles and it is considered that the site does not offer habitat of particular value for these species and as such herpetiles are not considered further in this assessment.

Birds

6.3.21 The desk study identified a number of bird records the nearest of which was located 540m from the survey area and the remainder of which were located in excess of 1km from the survey area.

6.3.22 The survey area supported suitable breeding bird habitat for a range of common species that utilise scrubland environments. However given the size of the survey area and fragmented nature of the location it is considered highly unlikely that the survey area would support individual specially protected breeding bird species or a breeding bird assemblage that would be considered to be of particular notable conservation importance.

6.3.23 Based on the findings of the desk study and site appraisal the proposed development area is considered unlikely to support specially protected breeding bird species or a breeding bird assemblage of conservation interest. For the purpose of the assessment a precautionary approach has been taken to allow for the more occasional support of common species of breeding bird, and as such the breeding bird assemblage has been considered to be of local value. Furthermore all breeding birds receive protection under the Wildlife & Countryside Act 1981 (as amended) and due consideration of this legal protection will be taken.

Bats

6.3.24 The desk study did not identify bat species within the 2km study area.

6.3.25 The proposed development area does not support any features that could be utilised by roosting bats. The site has some limited foraging potential, however the exposed location combined with fragmentation due to an absence of suitable commuting

corridors to and from the site, results in the site being considered unlikely to support bats on anything but a very occasional basis.

6.3.26 Based on the findings of the desk study and site appraisal the proposed development area is considered highly unlikely to support roosting or foraging bats and does not offer habitat of particular value for these species and as such bats are not considered further in this assessment.

Terrestrial and Riparian Mammals

6.3.27 The desk study did not identify the presence of any terrestrial mammals within 2km of the proposed development site.

6.3.28 The proposed development site is considered to be unlikely to support terrestrial mammals of conservation importance.

6.3.29 There are no water bodies present to provide habitat for otter (*Lutra lutra)* or water vole (*Arvicola terrestris)*. The site has very limited potential to support badger due to it being fragmented and largely absent of suitable foraging habitat, no field signs of badger were observed during the site visit. The small size of the site and extensive scrub present is not suitable for brown hare (*Lepus europaeus.*)

6.3.30 Based on the findings of the desk study and site appraisal the proposed development area is considered highly unlikely to support terrestrial or riparian mammals of conservation importance and the site offers no habitats of particular value for these species and as such terrestrial or riparian mammals are not considered further in this assessment.

Assessment of Valued Ecological Receptors

6.3.31 As documented above each habitat and species or species assemblage recorded has been assigned an ecological value according to the geographical scale at which it is important in accordance with the IEEM guidelines. Where sites have designations at different levels (International, National and Regional/County/Local) the highest value has been assigned.

Table 6.2 Summary of Valued Ecological Receptors (VERs)

Site/Habitat/Species	Value	Evaluation Rationale
Barry Woodlands	National	SSSI
Ancient woodland	Local	Intrinsic value and potential to support species of conservation interest.
Birds	Local	All breeding birds receive protection under the Wildlife & Countryside Act 1981 (as amended). There is potential for a limited range of breeding species within development site boundary. A precautionary value has been applied.

6.4 Assessment of Predicted Impacts

6.4.1 The EIA assessment baseline entails the following known changes to the existing situation within the proposed project's phases of construction, operation and decommissioning.

6.4.2 The development will be operational for a period of 25 years, though this may be extended with appropriate maintenance. Currently the habitat consists of predominantly bare ground and scrub, which will be replaced by the proposed development.

6.4.3 The development will comprise a number of buildings with a maximum height of 23.58m (excluding fins). In addition there will be an emissions stack which will be 45m above existing ground level.

6.4.4 Significant changes in baseline conditions for the VER identified above, during the period of the development, are considered unlikely.

6.4.5 The methodology used to identify and characterize potential impacts, and assess the significance of these impacts is described in detail above. In summary, this section identifies the likely effects on VERs as a result of the proposed development during construction, operation and decommissioning and characterizes the potential ecological impacts that are likely to arise, taking into consideration the following parameters: positive/negative effect, magnitude, extent, duration, reversibility, and timing/frequency.

6.4.6 The impacts are assessed on the basis of the details of construction, operation and eventual decommissioning of the proposed development outlined in Section 2. For the purpose of this assessment the effects of decommissioning the development are considered to be as per those of construction and of no greater significance.

6.4.7 The potential impacts of the proposed development proposals on VERs are identified as follows.

Construction

6.4.8 Clearance of vegetation prior to earthworks and construction would remove habitats and could harm, kill or displace the resident fauna. In addition the removal of habitats could have indirect effects on species in adjacent habitats. For example habitat fragmentation could impact the viability of local populations of species and/or impede with the dispersal patterns of some species. In relation to the proposed development the construction impacts may involve:

- Direct loss of habitat and associated impacts on species that utilize them;
- Direct mortality during site clearance and construction;
- Direct and indirect disturbance from construction activities including dust, visual, noise, and lighting; and
- Pollution caused by use of hazardous materials and release of waste materials.

Designated Sites

6.4.9 No loss of habitat to any statutory sites will occur as a result of the development proposals. It is considered that the statutory sites are located sufficiently far away (the nearest site being 1km away) from the proposed development to be unaffected by any potential negative impact from changes in air quality predominately due to dust

deposition during the construction period. It is considered that the magnitude of these impacts will result in no change to any statutory sites and the Facility is therefore considered to have a Not Significant impact.

6.4.10 Species associated with the designated sites described above (Table 6.2) are not considered to be affected VERs due to the distance they are located from the site. Accordingly, other disturbance effects that may arise as a result of increased noise and visual changes are considered to be Not Significant.

Breeding Birds

6.4.11 All breeding birds receive protection under the Wildlife & Countryside Act 1981 (as amended) and therefore the removal of any nesting habitat (scrub) will need to take place outside of the breeding season (late March – August inclusive) unless surveys confirming breeding bird absence are undertaken. The development site habitats are considered to be of low conservation value and highly unlikely to support a bird assemblage of conservation importance.

6.4.12 Many species of bird, in comparison with other taxa, are relatively tolerant of disturbance effects and it is considered that there is extensive comparable habitat in the surrounding area to support any breeding birds that might be displaced as a result of the loss of potential breeding habitat arising from the development proposals. The magnitude of this impact is likely to result in negligible change to the local bird population and as such considered Not Significant.

Operation

6.4.13 During the operation of the proposed development there are potential impacts on VERs that are a result of the operation processes. These potential impacts can include:

- Air quality effects resulting from operational emissions (presented separately and in part summarised below);
- Habitat fragmentation due to increased road traffic;
- Disturbance from increased road traffic and operational activities;
- Water pollution from surface water drainage from roads, buildings and hard standing areas. Further information on the impacts associated with water quality is included in Section 11 of this ES; and
- Other forms of disturbance and pollution including noise and light from the operational processes.

Designated Sites

6.4.14 With the exception of air quality effects it is considered that the statutory sites are located sufficiently far away (the nearest site being 1km away) from the proposed development so as to be unaffected by any potential negative impacts associated with the operational phase. It is considered that the magnitude of these impacts will result in no change to any statutory sites and are therefore considered to be Not Significant.

6.4.15 The Air Quality assessment (Section 5) considered the effects arising from air pollution deposition to the designated sites. The findings of the assessment concluded that potential exists for dust soiling of the Geological SSSI at Bendricks Rock. Mitigation measures have been identified to minimise this impact.

6.4.16 As such the potential impacts to designated sites as a result of air pollution are predicted to be Negligible.

Breeding Birds

6.4.17 The landscaping that will be implemented across the development site will include new planting that will result in a positive effect and offer potential breeding bird habitat.

6.4.18 Potentially negative effects upon bird species in the wider area from noise and disturbance impacts as a result of the operational processes will be temporary in nature and are unlikely to be considerably greater than disturbance already occurring in the vicinity. The magnitude of these impacts is likely to result in negligible change to the local bird population and as such is considered Not Significant.

6.5 Proposed Mitigation Measures

6.5.1 Within the context of Ecological Impact Assessment, mitigation is one of a hierarchy of measures that are undertaken to prevent or reduce adverse impacts:

- Avoidance/prevention: measures taken to avoid or prevent adverse impacts, e.g. layout, timing of site works.
- Reduction/mitigation: measures taken to reduce adverse impacts, e.g. retaining walls, pollution interceptors.
- Compensation/offsetting: measures taken to offset significant residual adverse impacts, i.e. those that cannot be entirely avoided or mitigated to the point that they become insignificant: for example, habitat creation or enhancement.

6.5.2 In this section, specific mitigation measures are proposed for all significant ecological impacts on the habitats and species previously identified. Generic mitigation measures are also proposed that include best practice methods and general principles that can be applied to the development as a whole, and are relevant to all habitats and species.

Generic mitigation to avoid impacts

6.5.3 A Construction Environmental Management Plan (CEMP) will be implemented by the appointed Contractor and a Works Method Statement(s) produced to manage impacts on ecology. Construction site best practice will be implemented and will be controlled and monitored through the CEMP. Measures will be implemented to avoid/minimise pollution incidents such as fuel and other chemical spills. A Pollution Incident Response Plan will be included as part of the CEMP to ensure that impacts from any potential accidental spills can be reduced to a minimum. In addition, the following measures will be included in the CEMP:

- ensure that work compounds and access tracks etc are not located in, or adjacent to, areas that maintain habitat value;
- establish site fencing to prevent access to areas outside working areas, particularly in areas adjacent to features of interest/value;
- implement procedures to cover site safety issues, including storage of potentially dangerous materials;
- provide briefings and instruction to contractors regarding the biodiversity issues present on the site; and
- follow Pollution Prevention Guidelines provided by the Environment Agency (including but not limited to PPG01, PPG02, PPG03, PPG05 and PPG06) to prevent pollution of water courses from silt or chemicals.

6.5.4 Japanese knotweed was recorded within the redline boundary of the site. It is listed under the Wildlife and Countryside Act 1981 (as amended) as an invasive plant and it is an offence to plant, encourage or otherwise cause this species to spread. It is classed as controlled waste under the Environmental Protection Act (1990) and cuttings must be taken to a licensed waste management facility for disposal.

6.5.5 The Japanese knotweed present on site will require treatment to prevent spread and ideally to eradicate it as if left untreated it may result in damage to the development. Appropriate remediation measures will be identified and implemented in accordance with EA guidance at the earliest opportunity in order to minimise impacts upon the construction programme. Eradicating Japanese knotweed can be a lengthy process that can require treatment for up to three growing seasons. Should treatment on site not prove possible knotweed contaminated material will be removed to a suitably licensed landfill facility under the appropriate duty of care procedures.

Generic mitigation to reduce impacts

- the workforce will be restricted to working areas through the erection of fencing, to prevent additional damage;
- best practice working methods will be followed throughout construction; and
- protocols and contingency plans will be established for dealing with incidents should they arise.

Mitigation of Impacts to VERs

6.5.6 Given the very limited nature of the impacts associated with the proposed development it is considered that, with the exception of timing the site clearance to avoid the breeding bird season, there are no mitigation activities required to reduce the magnitude and significance of the identified potential impacts.

6.5.7 There is some potential to incorporate biodiversity enhancements to the development site through the use of appropriate landscaping which has the potential to provide habitat for invertebrates and birds (see Figure 8.6). Opportunities for incorporating

features such as nest boxes within the new structures for birds such as house martin (*Delichon urbicum)* and/or swift (*Apus apus*) will be considered during detailed design.

6.5.8 Table 6.3 summarises the residual effects of the proposed development.

Table 6.3 Summary of Residual Effects to Valued Ecological Receptors

VER	Value	Type of Impact	Phase	Mitigation	Significance of impact
Statutory Sites	National	Not significant			
Non-statutory Sites	Local	Not significant			
Terrestrial Birds	Local	Habitat loss and displacement. Disturbance	Construction and operation	Clearance of habitat outside breeding season. Post development landscaping	Not significant

6.6 Conclusions

6.6.1 The ecology and nature conservation features of interest in the development site have been determined through a combination of desk study and site appraisal. The study area was found to be of very limited conservation value and biodiversity interest.

6.6.2 The proposed development is assessed as being unlikely to result in any significant ecological impacts on the ecological features identified by the EIA. Some mitigation measures have been identified in line with legislative requirements and good practice, and enhancement measures are proposed to provide opportunities for net ecological gain. A landscape plan has been prepared as illustrated in Figure 8.6 utilising native species and creating both scrub and wetland habitats to increase biodiversity at the site. Further opportunities for enhancement, such as the provision of nest boxes will be considered during detailed design.

6.7 References

Institute for Ecological and Environmental Management (2006) Guidelines for Ecological Impact Assessment.

SECTION 7

GROUND CONDITIONS

7 GROUND CONDITIONS

7.1 Introduction

7.1.1 Ground conditions at the Site have been examined in terms of the potential for contaminated land associated with the soil and underlying geology. Consideration has been given to the area within the Site boundaries and proximal area. Potential key receptors to be considered are Site users, construction workers, groundwater, surface water bodies, future building foundations and protected ecosystems.

7.1.2 No detailed consideration has been given to the geotechnical ground conditions at the Site. These will be addressed by the proponent as part of the detailed design for the Facility

.

7.2 Assessment Methodology

7.2.1 Existing conditions at the Site have been established through the undertaking of a desk study using information provided from the following sources;

- British Geological Survey (BGS) 1:50,000 Series, Solid & Drift Editions, Sheet 263, Cardiff;
- Ordnance Survey Map, Landranger 171, Cardiff, Newport and Surrounding Area, 1:50,000;
- Landmark Envirocheck® Report Number 25314547_1_1 including historical plans which are provided in a CD in Appendix F;
- Environment Agency Groundwater Vulnerability Map, 1:100,000 Series, Sheet 36, Gwent, South & Mid Glamorgan;
- Correspondence with the Vale of Glamorgan Council (see Appendix C);
- Environment Agency Website (http://www.environment-agency.gov.uk/);
- Web-based war archives and UXO Risk Assessment;
- Department for the Environment Industry Profiles; and
- A site walkover survey undertaken by PB staff on 16 May 2008.

7.2.2 The existing conditions at the Site have been described through the identification of the following aspects:

- Geological, hydrogeological and hydrological information;
- Recorded pollution incidents;

- Waste management/disposal facilities; and
- Historical development and potentially contaminative land uses.

7.2.3 The following site investigation report and gas monitoring data was provided:

- Phase II Intrusive Investigation and Assessment, Atlantic Way Barry by Capita Symonds Structures SS/016890/P2SI-1. September 2008.
- Ground Gas and Water Monitoring Results, Atlantic Way Barry. By ENCIA Environmental (summary table only).

7.3 Baseline Conditions

Geological and Hydrogeological Information

7.3.2 The geology and hydrogeology of the Site is summarised in Table 7.1.

Table 7.1 Geology and Hydrogeology

Formation	Aquifer Classification
Made Ground comprising waste material	NA
Mud/Sand	Non-Aquifer
Mercia Mudstone Group	Minor Aquifer

7.3.3 Based on geological maps of the Barry area, the ground conditions beneath the Site are likely to comprise the following:

- Made Ground – Information provided by the Envirocheck® Report and the Vale of Glamorgan Council indicates that the Site and proximal area has been registered as a landfill site permitting deposition of inert, industrial, commercial and household wastes. Disposal of Special Waste and liquid sludge were also permitted, including deposition of asbestos insulation, PVC powder, PVC compound, nitrile rubber, latex PVC, latex nitrile and sludge. A Waste Management Licence (WML) exemption has also permitted further tipping of construction and demolition waste in order to increase the height of the land. The waste material is likely to be overlain by topsoil containing various anthropogenic components. The Site is densely vegetated with a mixture of grasses, brambles, ruderal plants and immature trees. There is also evidence of fly tipping.
- Mud/Sand – Prior to the tipping of waste material on to the Site, surface cover was recorded as mudflats/sand.
- Mercia Mudstone Group – Solid geology underlying the Site consists of structureless red mudstones and siltstones with scattered evaporate nodules. Strata beneath the Site are inclined to the north at a dip of 37°.

7.3.4 Geological hazards identified in the Envirocheck® Report are detailed within Table 7.2.

Table 7.2 Geological Hazards

Hazard Identification		Description of Hazard
Stability	Collapsible ground	No hazard
	Compressible ground	Very Low
	Ground dissolution	No hazard
	Landslide	Very low
	Running sand	Very low
	Shrinking or swelling clay	Very low
Mining hazards		The Site does not lie in an area that may be affected by Coal Mining. No hazard exists from previous shallow mining activity.
Radon hazards		The Enviro**check**® Report indicates that the Site is located in an area where between 5% and 10% of homes are above the action level of 200 Bq/m^3 (bequerels per cubic metre) of radon. Basic radon protective measures are necessary in the construction of new dwellings or extensions.

7.3.5 The Envirocheck® Report has identified that no BGS Boreholes are located within the Site. A total of 3 No. BGS boreholes are located within 250m of the Site, referenced as follows:

- Crane Beam, Barry Docks, No.3 (NGR 312730, 167410);
- Barry Docks and Railway (NGR 312600, 167100); and
- Crane Beam, Barry Docks, No.2 (NGR 312850, 167570).

Hydrogeology

7.3.6 The Groundwater Vulnerability Map of the area indicates that the Site is underlain by a minor aquifer (variably permeable). Minor aquifers can be fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers.

7.3.7 Review of the data held on the Environment Agency website (www.environment-agency.gov.uk/) and within the Envirocheck® Report indicates that the Site is not situated within a groundwater Source Protection Zone (SPZ), Nitrate Vulnerable Zone or Nitrate Sensitive Area.

7.3.8 There are no discharge consents to groundwater or groundwater abstractions registered to the Site or the surrounding area within 1km.

7.3.9 Further details concerning the hydrogeology of the Site are provided within Section 11 (Water Resources).

Hydrological and Drainage Information

7.3.10 There are no surface water features located within the Site boundaries.

7.3.11 Surface water features in the surrounding area are as follows:

- The River Cadoxton located approximately 280m to the east of the Site flowing in a south westerly direction towards the Severn Estuary;
- East Breakwater Stream located approximately 250m to the southeast of the Site;
- Cross Breakwater Stream located approximately 300m to the southwest of the Site;
- Barry Dock No.2 located approximately 100m to the west of the Site;
- Barry Dock No.1 located approximately 450m to the west of the Site;
- Barry Dock No.3 located approximately 350m to the southwest of the Site; and
- The Severn Estuary located approximately 370m to the south of the Site.

7.3.12 A review of the quality of surface water features surrounding the Site has been undertaken through examination of data held on the Environment Agency website (www.environment-agency.gov.uk/) and within the Envirocheck® Report. There is one classified watercourse within 1km of the Site as follows:

- The River Cadoxton, located 250m southeast of the Site has a General Quality Assessment (GQA) classification Grade C (Fairly Good).

7.3.13 An additional two classified water courses are located 1.6km upstream (confluence of Cadoxton River with Cold Brook) and 2.1km upstream (confluence of Cadoxton River with Dinas Powys). The water qualities at these locations are recorded as Grade C (Fairly Good) and Grade B (Good), respectively.

7.3.14 The Site is located within an area that is subject to flooding from rivers or sea without defences.

7.3.15 Further details concerning the hydrology of the Site are provided within Section 11 (Water Resources).

Surface Water Discharge Consents

7.3.16 There are no active or inactive discharge consents to surface water registered to the Site.

7.3.17 Within 1km of the Site, there are eight active discharge consents to surface water. The closest is located 283m to the west of the Site and is operated by MDH Tanker

Cleaning Services Ltd. The consent allows for the release of combined sewage and trade discharge to Barry Dock No.3.

7.3.18 The other active discharge consents in the area permit the release of final/treated sewage effluent, sewage effluent from a pumping station, trade effluent, storm sewage overflow, and unspecified waste to the Bristol Channel, River Cadoxton, Barry Docks and Barry Outer Harbour.

Surface Water Abstractions

7.3.19 There are no surface water abstraction licenses currently or historically associated with the Site. In the surrounding area within 1km, there are nine operational licenses as follows:

- Three water abstraction licenses are registered to Evans & Reid Coal Company Ltd (coal depot) located 298m to the east of the Site. The licences permit the abstraction of water from the River Cadoxton for dust suppression, top-up water and mineral washing activities;
- Three water abstraction licenses are registered to Apex Coal Ltd (coal depot) located 298m to the east of the Site. The licences permit the abstraction of water from the River Cadoxton for dust suppression, top-up water and mineral washing activities; and
- Three water abstraction licenses are registered to W Baker and Sons Ltd (flour mill) located 299m to the east of the Site. The licences permit the abstraction of water from the River Cadoxton for dust suppression, top-up water and mineral washing activities.

Recorded Pollution Incidents

7.3.20 There are no recorded pollution incidents to controlled waters sourced to the Site.

7.3.21 Information provided by the Envirocheck® Report has identified 13 No. pollution incidents to controlled waters within 500m of the Site.

7.3.22 The two nearest pollution incidents occurred 325m east of the Site. The first incident involved the release of an unknown pollutant to an unknown receiving water in 1992 and was classified as Category 3 (Minor Incident). The second involved the release of industrial solid waste to an unknown receiving water in 1991 and was classified as Category 2 (Significant Incident).

Waste Management Facilities

7.3.23 There are five areas of landfill recorded within 1km.

7.3.24 The closest landfill is registered to BP Chemicals Ltd which covers the Site and the proximal area to the east and southeast, however, the exact boundary of the landfill is currently unknown. The landfill site was registered to receive waste from 31 December 1945 until 31 December 1994. Registered waste included inert, industrial, commercial and household wastes. Special Waste and liquid sludge were also

permitted for deposition. Information provided by the Vale of Glamorgan Council indicates that the Special Waste consisted of asbestos insulation, PVC powder, PVC compound, nitrile rubber, latex PVC, latex nitrile and sludge. The licence is no longer operational. It is known that this landfill does not have any engineering containment or monitoring infrastructure.

7.3.25 In recent times, the on-Site landfill and surrounding area have been subject to further tipping of construction and demolition waste in order to increase the height of the land. This has been carried out under an exemption from the WML Regulations, however, information provided by the Vale of Glamorgan Council (Appendix C) indicates that the current height of the land is in breach of the existing permission. The Environment Agency are undertaking investigations in order to assess the exact nature of the materials deposited in the area under the WML exemption.

7.3.26 A second landfill is recorded 368m to the northwest of the Site registered to Associated British Ports. The landfill was authorised to receive wastes including industrial and household wastes and Special Waste (including asbestos and contaminated soil) from 11 October 1994 until 6 January 2006.

7.3.27 A third landfill is recorded 488m to the northeast of the Site registered to FJH Bracket. The landfill was authorised to receive wastes including inert, industrial (building hardcore) and household waste from 31 December 1944 until 31 July 1981. From 1 March 1979, Penarth Commercial Properties Ltd was also permitted to dispose of glass, office rubbish, packing materials, rubble, hardcore, concrete, soil and timber waste into this landfill. A separate licence was issued for this landfill between 31 December 1993 and 30 April 1996 during which time Special Waste was also permitted for deposition. In addition, from 29 September 2006, this landfill was licensed to receive end of life vehicles. The current status of this landfill is unknown.

7.3.28 A Local Authority landfill is recorded 564m to the east of the Site on Atlantic Trading Estate. Details of the type of waste, volumes and landfill engineering properties are not available. However, it is noted that the landfill appears to be relative small and potentially associated with industrial activities undertaken presently and historically in this area which relate to garage services, general engineers, road haulage services, sand, gravel and other aggregate suppliers and blast cleaning.

7.3.29 A fifth landfill is located 853m to the northeast of the Site, registered to Dow Corning Ltd. The license was issued on 31 December 1972 for the deposition of inert, industrial and household waste, Special Waste and liquid sludge. The current status of this landfill is unknown.

7.3.30 There are no Registered Waste Treatment or Registered Waste Transfer sites located within 1km of the Site.

COMAH

7.3.31 No COMAH (Control of Major Accident Hazards) sites have been identified on or within 1km of the Site.

Explosive Sites

7.3.32 The Site is not registered as an Explosive Site (a site licensed under the Manufacture and Storage of Explosives Regulations (MRES) 2005). There are no Explosive Sites located within 1km of the Site.

Notification of Installations Handling Hazardous Substances

7.3.33 The Site is not registered with a Notification of Installations Handling Hazardous Substances (NIHHS). There are no other sites with a NIHHS within 1km of the Site.

Sensitive Land Use

7.3.34 The ecological importance of the Site and surrounding area has been detailed within Section 6. A summary of sensitive land use is provided within Table 7.3.

Table 7.3 Sensitive Land Use Within 1km of the Site

Area	Approximate Distance from Site	Designations
The Site	-	None
Hayes Point to Bendrick Rocks	240m to the southeast	SSSI
Barry Island	1000m to the southwest	SSSI

Historical Development of the Site and Surrounding Area

7.3.35 The development of the Site and surrounding area has been reviewed by reference to historical County Series and Ordnance Survey plans provided by the Envirocheck® Report. A detailed review has been provided within appended Table G.1 and a summary given below.

7.3.36 The earliest available mapping from 1878 indicated that the Site was undeveloped mudflats and shingle. The surrounding area was also undeveloped consisting of mudflats, agricultural fields and moors.

7.3.37 Barry Docks were established in 1884 consisting of three basins referred to as Dock No.1, Dock No.2 and Dock No.3. These docks were located 450m to the west, 100m to the north and 350m to the southwest of the Site, respectively. Materials excavated in order to create the basins were potentially deposited on the Site and adjacent land in order to aid in the reclamation of the land.

7.3.38 By 1900, breakwaters had been constructed 400m to the southwest and 250m to the southeast of the Site and the land was no longer referenced as mudflats. The docklands were served by abundant railway lines and sidings, with associated coal tips. The railway sidings surrounding the Site had extended within the north western Site boundary by 1920. These sidings remained on-Site until 1975 when a number had been removed, with just two sidings remaining by 1984, and all sidings removed by 1987.

7.3.39 Landfill activity was noted on the Site between 1945 and 1994, including permission for the deposition of Special Waste. This activity is also believed to have aided the reclamation of land.

7.3.40 It is additionally noted that during 1940 to 1942 there were several air raids over the town of Barry including the dockland area.

7.3.41 There was abundant commercial/industrial activity within 1km of the Site historically associated with the docklands. Activities included saw mills, timber ponds and timber yards, transit sheds for dock cargo, an old quarry, a wagon works, a coal yard, various mills, factories, depots and warehouses, a tanker cleaning depot, a large oil terminal and further landfills.

7.3.42 Although the Site currently remains undeveloped, land use in the surrounding area is primarily industrial including road haulage services, garage services, timber product production, scrap metal merchants and concrete product manufacture. In addition there are large areas devoted to landfilling on-site and to the south and east of the Site.

Potentially Contaminative Land Uses

7.3.43 Based upon a review of the current and historical land use of the Site and surrounding area, a detailed review of associated potential contaminants has been provided within Appendix G, Table G.2. This information has been summarised below.

7.3.44 Potentially contaminative land uses currently and historically located on-site:

- landfill site;
- dredgings used for reclaimed land; and
- railway lines/sidings.

7.3.45 Potentially contaminative land uses currently and historically located off-site within 500m of the Site boundaries:

- timber yards;
- landfill sites;
- docklands (including cargo handling – coal and timber);
- railway lines/sidings;
- coal yard;
- road haulage;
- garage services;
- concrete product manufacture; and
- scrap metal merchants.

7.4 Site Investigation and Monitor Data.

7.4.1 A Phase two intrusive investigation and assessment was undertaken by Capita Symonds Structures (CS) in September 2008. The intrusive works took place between 4th and 7th August 2008 and comprised the following:

- The formation of 7no. trial pits (TP101 to TP107) using a JCB backhoe type excavator, and
- The formation of 4no. boreholes (BH101 to BH104) by cable percussion technique.

7.4.2 The trial pits were advanced to depths of between 3.9m bgl and 4.1m bgl with two of the pits elongated to try and establish the edge of the landfill.

7.4.3 CS report that three of the boreholes were formed in the area of the landfill to 8m bgl and the fourth was formed outside the landfill to 12m bgl. Monitoring wells were installed in each of the boreholes and soil samples were collected for chemical and geotechnical testing from all boreholes at regular intervals. Groundwater samples were obtained from each borehole for testing.

Chemical Testing

7.4.4 17no. soil samples were submitted by CS to ALcontrol laboratories and, based upon visual inspection of the ground and available background information, the following schedule was recommended by CS:

- 14no for metals;
- 11no for inorganic determinants;
- 5no for Total Petroleum Hydrocarbons (TPH);
- 12no for asbestos screen;
- 11no for Speciated (16) Poly Aromatic Hydrocarbons (PAH);
- 2no for tributyltin compounds;
- 5no for Volatile Organic Compounds (VOCs) including organolead compounds;
- 3no for pesticides.

7.4.5 4no groundwater samples were submitted by CS to ALcontrol Laboratories for testing with all 4 samples scheduled for the above testing with the exception of the asbestos screen.

7.4.6 Soil property samples were submitted by CS to Professional Soil Laboratory, Doncaster for the following tests:

- 6no for moisture content determination;

- 3no for plasticity;
- 5no for particle size distribution assessment;
- 6no for soil organic matter;
- 10no for pH;
- 10no for soluble sulphate.

7.4.7 One event of gas and groundwater was carried out by CS on the 7th of August and the results are discussed in 7.4.27.

Encountered Ground Conditions

7.4.8 The ground conditions encountered by CS during the investigation confirmed the expected geological succession of Made Ground overlying Estuarine Deposits; however the Mercia Mudstone was not encountered. Table 7.4 below shows the geological succession encountered during the investigations.

Table 7.4 Geological Succession Across the Site

Lithology	Depths to base of unit (mbgl)	Thickness Range (m)
Made Ground	0.8 – 6.2	0.8 – 6.2
Estuarine Deposits	>12	>9.5
Mercia Mudstone	Not encountered at 12mbgl.	

Made Ground

7.4.9 Made Ground is a British Standard term for ground that has been or is suspected to have been previously tipped, engineered or reworked

7.4.10 Made Ground was encountered by CS in all of the boreholes and comprised ash, clinker, brick and concrete. Polythene was encountered in BH102 and BH104, railway sleepers in TP105 and a pocket of white granular material in TP107.

7.4.11 The thickness of Made Ground was considered by CS to be consistent with the landfill history as it is shallowest near Atlantic Way and becoming deeper towards the south. In the trial excavations that were at the edge of the landfill, the 'slope' of the base of the landfill was observed to fall to the south east.

7.4.12 With the exception of TP107, the fill materials comprised materials considered by CS to be typical of demolition waste. TP107 encountered a PVC type substance and asbestos fibres. TP107 was classified by CS to represents a potential landfill hotspot.

Estuarine Deposits

7.4.13 The Estuarine Deposits were considered by CS to be heterogeneous but generally cohesive in nature with shallow deposits described as silt. There are also beds of gravel and clay within the unit.

Groundwater

7.4.14 Groundwater was encountered by CS during formation of the boreholes at depth between 3m and 7.5m below ground level. Rest levels were between 0.63m and 3.26m below ground level generally within the Estuarine Deposits.

Visual/olfactory evidence of contamination

7.4.15 CS identified no visual or olfactory signs of contamination during exploratory hole formation.

Capita Symonds General Conclusions

7.4.16 Japanese knotweed was identified in several areas of the site and as such any strip needs to be controlled to take account of this invasive weed which would become controlled waste if dug up.

7.4.17 CS recommend that Made Ground and natural soils arising from excavations will require off site disposal as they will be unsuitable for use as engineered fill materials.

7.4.18 No environmental issues were raised during CS discussion of foundations, ground floor slabs, road pavement construction, buried concrete, drainage and mining/subsidence risk potential. Buried concrete design is recommended by CS to be undertaken in accordance with BRE Special Digest 1:2005 (Concrete in Aggressive Ground). The history of the site is considered to be one which may contain pyrite (i.e. sulphide).

Capita Symonds Generic Qualitative Rick Assessment of Soils and Groundwater.

7.4.19 CS report that they undertook a generic quantitative risk assessment in line with CLR 11 (DEFRA & EA 2004) together with in house methods to derive screening criteria for commercial / industrial site use. The CS screening criteria for liquid concentrations (i.e. Groundwater) comprised environmental quality standards protective of nearby surface water receptors. Relevant statistical techniques in line with CLR 7 (DEFRA & EA 2004) documentation was also reported to be implemented to derive the screening criteria discussed as follows:

Soil Analysis

7.4.20 None of the laboratory tests exceeded the CS screening criteria with the exception of one concentration of copper. CS proposed no further action. Pesticides, organotins and a range of additional VOC (volatile organic compounds) did not exceed the laboratory detection limit.

7.4.21 CS report that every sample was tested for asbestos and, with the exception of TP107, no asbestos fibres were found. Asbestos fibres which were found at TP107 comprised chrysotile, amosite and crocidolite typical of asbestos lagging. It is recommended that a specialist asbestos contractor be appointed to determine the significance of the asbestos identified.

Groundwater Analysis

7.4.22 CS report that, of the laboratory testing carried out the majority of the recorded concentrations were below the CS screening criteria.. The exceptions to this were reported as follows:

- Chromium, copper and zinc, all of which constitute marginal screening exceedances and considered by CS to not warrant further consideration; and
- Tetrachloroethanes, which only fail due to a laboratory detection limit above the very low drinking water standard selected for this substance and it is proposed by CS that no further action is required.

Ground Gas Results

7.4.23 Standpipes installed by CS during the investigation were monitored on one occasion in the scope of their report: 7th August 2008. CS report that no methane gas was encountered with carbon dioxide concentrations up to 6.9% volume with no flow measurement.

7.4.24 CS report that they used current British Standard 8485 guidance for the assessment of risks associated with the presence of ground gases, (principally methane and carbon dioxide, other potential landfill soil gases were not measured). Based on the single round of monitoring, CS considered there is a low potential hazard in accordance with the hazard assessment guidelines provided in the British Standard and recommended that structures incorporate protective measures:

- Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints.
- Taped and sealed membrane.

Unexploded Ordnance

7.4.25 Examination of web-based archives have indicated that the docklands at Barry were bombed during Word War II. An unexploded ordnance (UXO) risk assessment has therefore been carried out by BAE Systems Environmental (August 2008). The risk assessment was undertaken to provide a quantitative estimate of the probability of encountering German air-dropped UXO during a site investigation comprising boreholes and trial pits. The report concluded that the probability of encountering UXO during these activities was relatively low and furthermore, the probability of initiating a device and causing an explosion was substantially lower. It was determined that risk mitigation measures such as down-hole geophysics and safety supervision would not be justified for the ground investigation. However, a record that

UXO has been identified as a hazard should be included in the health and safety documentation and communicated to all personnel.

7.4.26 No unexploded ordnance were reported to be encountered during the Site investigation carried out by CS.

7.5 Further Gas Monitoring

7.5.1 Two rounds of Ground Gas Monitoring have been undertaken on the 21st November and 25th November 2008. A summary table has been provided for this EIA from Encia Environmental but no background data or description of methodology provided. The instrument that was used was a GA2000PLUS Infra Red Gas Analyser.

7.5.2 The summary table for the first round of ENCIA monitoring indicates no methane was recorded and carbon dioxide 1.9% to 9.2% volume. Oxygen levels were reported between 3.2% and 19.9% volume, Carbon Monoxide 2ppm (parts per million) and 'low' levels of Hydrogen (H2) ppm.

7.5.3 The second round ENCIA monitoring summary table indicates similar ground gas conditions found during the first round. Namely: 0% methane, 3% to 9.7% (volume) carbon dioxide, 6% to 18.3% (volume) oxygen, .1 to 2 ppm carbon monoxide and low (ppm) H2.

7.5.4 No interpretation of the above results by ENCA has been provided. It is unclear if the supplementary analysis will change the CS recommendations. It is also understood that further gas monitoring will be provided in the future.

7.6 Land Condition Summary.

7.6.1 The CS report concludes that, based on the laboratory assessments conducted thus far and on the basis of CS interpretation, no further action is required with respect to soil and groundwater contamination. Notwithstanding this conclusion, CS state that conditions may vary away from the CS exploratory hole locations. Therefore during development good working practices, including appropriate personal protective equipment for construction workers and dust control measures, should be implemented as necessary throughout the construction period. CS consider of particular potential concern is the identification of asbestos in trial pit 107. Any excavations proposed in this area will need careful consideration of the potential hazards associated with this substance.

7.6.2 Levels of soil and groundwater contamination has been identified by CS investigations indicative of the site landfill and railway past use. As discussed above, some contaminants are also above CS screening criteria. There is a low risk that other areas of significant contamination could be present on the site in areas not covered by investigations completed to date.

7.6.3 CS consider that gas protection measures will likely be required in line with BS8485:2007.

7.6.4 CS report that an assessment of chemical analysis data indicates that soils would likely to be classified as Non-Hazardous should off-site disposal be required although this would need to be confirmed by appropriate classification testing of the soil destined for disposal.

7.7 Assessment of Predicted Impacts

7.7.1 The information collected to date concerning current and historical use of the Site and surrounding area indicates that contaminants are present beneath the Site generally below CS screening criteria. On this basis, a preliminary conceptual site model (CSM) has been developed which is fundamental to the overall process of understanding the risks and drivers of a potentially contaminated site. The CSM has been devised giving consideration to the potential "pollutant linkages" during the various phases of the works including the current use, construction phase and proposed future use and is detailed within Appendix G Table G.3 and summarised below in Table 7.5.

Table 7.5: Summary Conceptual Site Model

Contaminant(s)	Pathway(s)	Receptor(s)
Contaminants within Made Ground and groundwater	Ingestion, inhalation and dermal contact with contaminated soil, windblown dust and vapours.	Future Site users. Current Site users (trespassers). Neighbouring Site users. Construction workers.
	Ingestion, inhalation and dermal contact with contaminated groundwater/ landfill leachate.	Construction workers.
	Phytotoxic metals	Plants, vegetation.
	Lateral migration of aqueous, free-phase, suspended and dissolved contaminants. Surface run-off of aqueous, free-phase, suspended and dissolved contaminants.	Controlled waters (including River Cadoxton, East Breakwater Stream, Cross Breakwater Stream, Barry Docks and the Severn Estuary). Protected ecosystems (Hayes Point to Bendrick Rocks and Barry Island).
	Vertical migration of aqueous, free-phase, suspended and dissolved contaminants (including preferential pathway created by future piling activity).	Controlled Waters (underlying minor aquifer).
	Migration of contaminants to water supply pipes leading to permeation and accelerated deterioration of pipe material and loss of water quality.	Future water supply pipes. Future site users.
Components of ground gas	Accumulation of carbon dioxide within basements, buildings and confined spaces. Inhalation of gas flux.	Future Site users. Neighbouring Site users. Construction workers.
Sulphates, sulphide	Direct contact with building foundations.	Future building foundations on-Site.

7.7.2 A CSM identifies potential contaminants, receptors (both on and off-site) and exposure pathways that may be present. The identification of such potential "pollutant linkages" is a key aspect of the evaluation of potentially contaminated land.

7.7.3 A detailed examination of how the proposed development will alter ground conditions and subsequently create or remove potential "pollutant linkages" has been carried out This information has been used to form judgement on the overall impact that the development will have during the construction and operational phases. This assessment has been based upon the following:

- No significant impact/no impact: No change in current ground conditions or minor change with no notable implications;
- Slight impact: Current ground conditions altered by the proposed development with implications of low importance;
- Moderate impact: Current ground conditions altered by the proposed development with implications of considerable importance; and
- Major impact: Current ground conditions altered by the proposed development with implications of high importance.

Design Phase

7.7.4 Soil and groundwater underlying the site contain concentrations of contaminants which are potentially corrosive to concrete (e.g. sulphates) associated with previous uses of the Site. This has the potential to impact upon foundation design.

7.7.5 CS report that some organic contaminants may damage or penetrate pipes, resulting in the need for pipe protection such as a resistant sheath or special material.

7.7.6 CS also recommend that structures incorporate landfill gas protective measures in accordance with BS8485:2007:

Construction Phase

7.7.7 During construction it will be necessary to disturb the ground (e.g. laying services, piling, excavating the waste/fuel silos. . In the process of carrying out these excavations, construction workers may be exposed to potentially contaminated soil, dust and groundwater through ingestion, inhalation and dermal contact. Contaminated dust may also be transported off-site and have adverse affects upon neighbouring Site users.

7.7.8 There is a risk that unidentified areas of soil and groundwater contamination could be present on the site out with the investigations completed to date. The development contractor must provide a contingency for such eventualities:

- To provide additional workforce health and safety risk assessments; and
- Advise the designers of potential design issues.

7.7.9 Where possible, excavated material will be re-used on site to create landscaping features and to raise ground levels. Prior to re-use an assessment will be made to ensure that the material will not pose an unacceptable risk to human health or controlled waters. Should the soil to be excavated contain Japanese knotweed the mitigation measures described in Section 6.5 would be put in place. Should the soil

be unsuitable for re-use, it will be classified in accordance with European Waste Codes and disposed of to an appropriate landfill facility via a registered waste carrier.

7.7.10 Within excavations, there is the potential for hazardous ground gases and vapours to accumulate which may be inhaled by construction workers, should they be required to work within excavations. The installation of piles may also create preferential pathways for deep sourced hazardous gases and vapours to migrate to the ground surface.

7.7.11 Construction machinery has the potential to leak fuel and oils to soil and groundwater. The movement of these construction vehicles may lead to the entrainment of dusts which could lead to inhalation and adverse effects on construction workers and neighbouring Site users. Best practice techniques would be employed through out construction in order to minimise such risks.

7.7.12 The movement of construction machinery may also result in compaction of the ground which could lead to water logging, anaerobic conditions and alterations to soil geochemistry.

7.7.13 In light of the above, it is considered that the overall impacts of the proposed development will result in a moderate negative impact during the construction phase.

Operational Phase

7.7.14 It is proposed that the ground surface will be covered with hardstanding. This will have a major positive impact on human health as it will eliminate pathways preventing ingestion, inhalation and dermal contact with contaminated soil and wind blown dust. The presence of hardstanding across the Site will also reduce leaching of contaminants to the underlying groundwater.

7.7.15 The mitigation for landfill gases encountered on the site may require maintenance of venting systems, or ongoing monitoring to confirm the mitigation design.

7.7.16 Waste delivery vehicles use fuel and oils which have the potential to leak. The likelihood of this occurrence is however considered to be low. In addition, the movement of these waste delivery vehicles may lead to the entrainment of dusts which could lead to inhalation and adverse effects on Site users and neighbouring Site users.

7.7.17 Accounting for the above, it is considered that the overall impacts of the proposed development will result in a slight positive impact during the operational phase.

7.8 Mitigation Measures

7.8.1 A preliminary review of environmental information associated with the Site and the surrounding area indicates that the proposed development will have impacts upon ground conditions at the Site and subsequently create or remove potential “pollutant linkages” identified in the CSM. In order to confirm the nature of contaminants at the Site further investigative work will be undertaken as part of the detailed design stage of the Facility. This work will be carried out following key national and international legislation and guidance, including the following;

- Control of Substances Hazardous to Health Regulations, 1999;
- Construction (Design and Management) Regulations, 1995;
- Construction (Health, Safety and Welfare) Regulations, 1996;
- Environmental Act, 1995 – Section 57;
- Environmental Protection Act, 1999 – Part 2A;
- Health and Safety at Work etc. Act, 1974;
- Management of Health and Safety at Work Regulations, 1999;
- Planning Act, 1990 – Section 55;
- Planning (Hazardous Substances) Act, 1990;
- Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations, 1999;
- Model Procedures for the Management of Land Contamination (CLR11);
- BS5930 British Standard Code of Practice for Site Investigations, 1999; and
- BS10175 British Standard Code of Practice for the Investigation of Potentially Contaminated Sites, 2001.

7.8.2 Discrete patches of Japanese knotweed were observed on-Site. Current best practice will be followed by all Site staff during any further intrusive works. This includes a requirement for all Site staff to have the ability to identify Japanese knotweed, to record any areas that are contaminated, to isolate them with fencing and to put up restricted access signs. No exploratory excavations will be undertaken within 7m of a growth of the plant. During construction all site staff will be made aware of the presence of Japanese knotweed, the areas will be appropriately fenced and current best practice followed to allow treatment or removal of the contaminated material as appropriate.

7.8.3 CS recommend that structures incorporate landfill gas protective measures in accordance with BS8485:2007:

- Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and joints;
- Taped and sealed membrane to reasonable levels of workmanship in line with current good practice with validation; and
- All of the above points should be followed with due consideration of all guides and footnotes given in the standard

7.8.4 The gas monitoring undertaken subsequent to the CS report may change the above conclusions.

7.8.5 The CS site investigations identified soil and groundwater contamination above the screening criteria adopted by CS. These levels of contamination will probably require further quantitative risk assessment / investigation to identify the appropriate level of mitigation for the commercial / industrial end use.

7.8.6 A record that UXO has been identified as a hazard will be recorded in health and safety documentation and communicated to all personnel during both site investigation and construction works.

7.8.7 A CEMP will be created for the site which will include appropriate actions in relation to the ground conditions present at the site. Actions will include those related to contamination, Japanese knotweed and UXO.

7.9 Conclusions

7.9.1 A review of desk-based environmental information associated with the Site and the surrounding area has been undertaken. This indicates that there were a number of historical site uses, including railway sidings and landfill activity, which may have left behind a range of contaminants, some of which are potentially harmful to human health and / or the environment. A range of mitigation measures have been identified for the Facility which will be implemented during the design and construction phases of the project. Based on the available information the Facility is considered to have a moderate negative impact during the construction phase and a slight positive impact during the operational phase.

7.9.2 The CS site investigations identified low levels of soil and groundwater contamination above the screening criteria adopted by CS. These levels of contamination will probably require further quantitative risk assessment / investigation to identify the appropriate level of mitigation for the commercial / industrial end use.

SECTION 8

LANDSCAPE

8 LANDSCAPE

8.1 Introduction

General

8.1.2 The purpose of this section of the ES is to assess the potentially significant landscape and visual impacts of the proposed Energy Recovery Facility.

8.1.3 The location of the proposed development is shown on Figure 1.1, the planning application boundary on Figure 2.1, and the proposed development is described in detail in Section 2.

8.1.4 This section sets out:

- A brief description of the proposals and study area;
- The methodology adopted for establishing the landscape and visual baseline and assessing predicted impacts on landscape character and visual amenity;
- A description of the study area landscape and views, including the zone of theoretical visibility (ZTV) i.e. the area of land from which there may be views of the proposed development;
- A description of the proposed mitigation;
- An assessment of impacts on landscape character and visual amenity; and

8.1.5 The term 'landscape' denotes landscape and townscape where both terms apply.

8.1.6 Limitations of this report are as follows:

- At the time of writing this section, the design proposals are at a preliminary stage and final construction methods have not been determined. This is not expected to affect significantly the assessment of the pattern or scale of visual impacts arising from the proposed development.
- Field Survey was undertaken during the summer when the screening effect of vegetation was greater than is likely during winter months.

8.1.7 In order to follow the standard landscape and visual assessment process the structure of this section differs from the other specific environmental topics within this ES. The process is described in 8.2 and is summarised in Table 8.1

The Proposals

8.1.8 The proposed development, which includes an Energy Recovery Facility and associated renewable electricity generation and distribution infrastructure, is described in Section 2. The proposals are illustrated in Planning Application Drawing 08-1353-P02, 08-1353-P03, 08-1353-P04 and 08-1353-P05 and the site layout is

shown on Planning Application Drawing 08-1353-01. A set of photomontages of the site from different locations are shown on 08-1353-P07.

8.1.9 The Facility will comprise buildings up to a maximum height of approximately 23.58m, (excluding fins), and an emission stack approximately 45m in height above existing ground levels. The buildings will be predominantly large scale structures finished with pale green/grey metal cladding. The site will be enclosed by metal security fencing 2.4 metres high with a cranked return, and the inner perimeter will be planted with native species trees and shrubs to screen the lower part of the development.

The Development Site and Surrounding Area

8.1.10 The site of the proposed development is located within the industrial/docklands area on the south eastern edge of Barry, as shown on Fig 8.1. The maritime town increased in size around the turn of the century when the Docks were built and they continue to be an important part of the town in both economic and townscape terms. The older areas of Barry are characterised by a range of Victorian and Edwardian residential terraces built on a steep hillside (up to 90 metres AOD) from where there are wide views of the dockland area, Barry Island and the Bristol Channel.

8.1.11 Figure 8.2 shows an aerial view of the site and surrounding areas. It lies in the dockland area adjacent to Atlantic Way, less than 0.5km from the Bristol Channel. It is situated on the western edge of the Atlantic Trading Estate, an extensive industrial development, and is physically separated from the town by the docks and main railway line. The character of the landscape surrounding the site is distinctive and varied: the docks mark the transition between extensive new urban development on Barry Waterfront and industrial development dominated by chemical plants in the Atlantic Trading Estate. In this dockland/coastal location the site is visible from the town which occupies rising ground to the north and from Barry Island to the west.

8.1.12 The site covers an area of approximately 1.6ha and is part of a greater area of land owned by Associated British Ports (ABP) to which public access is restricted. It is vacant brown-field land comprising made-up, level ground. There are no buildings on the site and it is colonised by a mixture of grass species, self-set herbaceous plants and scrub. It is not enclosed and there are small areas of tipped materials.

8.1.13 Surrounding land uses include the docks, mixed industrial activities, waste management (scrap yards, waste segregation, and landfill), bulk materials storage and handling (including stockpiles of sand and other aggregates) and other small industrial units.

8.1.14 Nearby industrial buildings range in size from single storey industrial units through to large warehouses >10m high including Atlantic Mills, which is owned by Rank Hovis Ltd and is a distinctive landmark. Tall structures adjacent to the site are limited to lighting towers and cranes, although further north east there are several taller structures (up to 70m high) associated with the various chemical plants at Cadoxton and Sully. By contrast there are several built features of historic interest within the docks area including the former Barry Dock Office and its distinctive clock tower, the dock walls, lock gates etc.

Landscape Planning Context

8.1.15 Section 4 of this ES sets out the relevant national, regional and local planning policy and guidance of particular relevance to the development. The following landscape planning policy is relevant to this assessment:

8.1.16 The Vale of Glamorgan Unitary Development Plan 1996 - 2011 (adopted 2005)[1] (UDP) sets out policies for the protection and enhancement of urban townscapes as well as policies for new development including:

- Policy ENV 17 relates to the importance of the local natural and built environment in providing a context for new development citing Supplementary Planning Guidance including the Barry Development Guidelines, Trees and Development and Amenity Standards;

- Policy ENV 25 seeks to guide the regeneration of urban areas and states that *'measures to improve environmental quality of the urban fabric with priority given to older urban areas and housing estates. Particular attention will be given to the regeneration of derelict or downgraded land especially within the former dockland of Barry and Penarth'*; and

- Policy ENV 27 seeks to establish a framework to achieve appropriate sensitive development that promotes creative and imaginative design within the Vale of Glamorgan.

8.1.17 UDP Supplementary Planning Guidance, Barry Development Guidelines, provide design guidance for Areas of Special Identity that are of relevance to the proposed development.

8.1.18 There are no statutory or non-statutory designated landscapes within 5km of the site.

8.1.19 High Street, Barry is a designated Conservation Area.

8.2 Assessment Methodology

8.2.1 The methodology used for the assessment is based on the standard approach set out in 'Guidelines for Landscape and Visual Impact Assessment'[1] (GLVIA).

8.2.2 There is currently no specific standard guidance produced by national government or the relevant statutory agencies on the characterisation of townscape within urban areas. The overall approach for undertaking this assessment is based on the principles of landscape character assessment provided by the GLVIA.

8.2.3 In order to provide an objective and robust approach, the study will go through a number of stages at which assessments will be made using established criteria from the GLVIA, the sequence of which is described briefly in Table 8.1 and in more detail in 8.2.4 – 8.2.14.

Table 8.1: Landscape and Visual Impact Assessment Process

SEQUENCE	CRITERIA	FIGURE	SUB-SECTION / NOTES
Baseline Assessment			**8.3**
Define study area		Fig 8.1	
Describe existing landscape character		Fig 8.2 & 8.3	
Assess landscape quality	Table 8.2		
Assess landscape value	Table 8.3		
Assess capacity to accommodate change	Table 8.4		
Assess existing views of site and sensitivity of receptors	Table 8.5	Figs 8.4 & 8.5	Table 8.10
Mitigation			**8.4**
Assess mitigation measures		Fig 8.6	Outline landscape proposals
Assessment of Predicted Impacts			**8.5**
Assess magnitude of landscape impact with mitigation	Table 8.6		
Combine magnitude of impact with capacity to accommodate change (Tables 8.5 x 8.3) to define significance of impact	Table 8.7		
Assess significance of landscape impact	Table 8.8		
Produce visual impact schedule		Fig 8.7	Table 8.11
Assess significance of visual impact	Table 8.9		
Assess compliance with planning policy			
Conclusions			**8.6**

Baseline Assessment

8.2.4 The baseline assessment includes a description of the existing landscape character and the features that contribute to its distinctiveness, and key views into the site.

Landscape / Townscape

8.2.5 The quality and value of the baseline landscape is assessed and categorised in accordance with Tables 8.2 and 8.3 respectively. Quality relates to the physical state of the landscape and its intactness from visual, functional and ecological perspectives. It also reflects the state of repair of individual features and elements that make up the character in any one place. Quality is determined in accordance with a six point scale ranging from those of exceptional quality through to damaged landscapes. Landscape value is the relative value or importance attached to a landscape (often as a basis for landscape designation or recognition) which expresses national or local consensus, because of its quality, special qualities including perceptual aspects such as scenic beauty, tranquillity or wildness, cultural

associations or other conservation issues. Value is categorised according to three main grades – high, medium and low with intermediate categories in each grade.

Table 8.2: Determination of Quality

Category	Criteria	Typical example
High	- Strong landscape structure, characteristic patterns and balanced combination of landform and landcover; - Appropriate management for land use and land cover but potentially scope to improve; - Sense of place; - Occasional detracting features	Nationally recognised e.g. parts of National Park, AONB, all or great majority of AGLV
Good	- Recognisable landscape structure, characteristic patterns and combinations of landform and landcover are still evident; - Scope to improve management for land use and land; - Some features worthy of conservation; - Sense of place; - Some detracting features	Nationally, Regionally recognised e.g. localised areas within National Park, AONB, AGLV. Locally recognised e.g. all or great majority of Area of Local Landscape Importance
Ordinary	- Distinguishable landscape structure, characteristic patterns of landform and land cover often masked by land use; - Scope to improve management of vegetation; - Some features worthy of conservation; - Some detracting features	
Poor	- Weak landscape structure, characteristic patterns of landform and land cover are often masked by land use; - Mixed land use evident; - Lack of management and intervention has resulted in degradation; - Frequent detracting features	
Very poor	- Degraded landscape structure, characteristic patterns and combinations of landform and land cover are masked by land use; - Mixed land use dominates; - Lack of management / intervention has resulted in degradation; - Extensive detracting features	
Damaged landscape	- Damaged landscape structure; - Single land use dominates; - Disturbed or derelict land requires treatment; - Detracting features dominate.	

Table 8.3: Determination of Value

Value		Typical Criteria	Typical scale	Typical example
High	**Exceptional**	High importance (or Quality) and rarity. No or limited potential for substitution	International, National	World Heritage Site, National Park, AONB
	High	High importance (or Quality) and rarity. Limited potential for substitution	National, Regional , Local	National Park, AONB, AGLV, LCI, ALLI
Medium	**Medium**	Medium importance (or Quality) and rarity. Limited potential for substitution	Regional , Local	Undesignated but value perhaps expressed through non-official publications or demonstrable use.
Low	**Poor**	Medium importance (or Quality) and rarity.	Local	Areas identified as having some redeeming features or features identified for improvement
	Very poor	Medium importance (or Quality) and rarity.	Local	Areas identified for recovery

8.2.6 The capacity of the landscape to accept development is reflected in the degree to which it is able to accommodate change (due to a particular development or land use change) without adverse effects on its character. Landscapes that have the highest sensitivity to change have the lowest capacity to accept change. Sensitivity will vary according to the character of the existing landscape and the extent and nature of the development proposed. Table 8.4 sets out criteria for low, medium and high capacity of the landscape to accept change.

Table 8.4: Capacity of Landscape to Accept Change

Capacity	Typical Evaluation Criteria
Low	A landscape that would be unlikely to tolerate the change(s) envisaged and effective mitigation would be difficult to achieve, would be unlikely to enhance and the proposals would be out of scale.
Medium	A landscape that would be reasonably tolerant of the change(s) envisaged and effective mitigation would be possible, but results may take time to become effective and could give rise to an element of enhancement.
High	A landscape that would be likely to be tolerant of the change(s) envisaged and effective, mitigation would be readily achievable and may lead to an element of enhancement.

Baseline Views

8.2.7 Visual receptors, such as users of buildings, recreational spaces, footpaths and transport routes, have differing sensitivities to their visual environment. Generally, this is dependent upon their interest in the visual environment, their viewing opportunity and duration, and the context of the views. The sensitivity of receptors is

set out in Table 8.5. For the purpose of this assessment views have been sub-divided by distance:

- Near distance: 0 – 0.5 kilometre from visual receptor
- Middle distance: 0.5 – 1.0 kilometre from visual receptor
- Long distance: Greater than1.0 kilometre from visual receptor

Table 8.5: Sensitivity of Visual Receptors

Sensitivity	Receptors
High	Viewers with proprietary/high interest in their everyday visual environment and/or with prolonged and regular viewing opportunities. Such receptors would include: • Residents. • Users of outdoor recreational facilities whose attention or interest is focused on the landscape i.e. Non Motorised Users (NMUs) such as walkers and equestrians on rural public rights of way.
Medium	Viewers with moderate interest in their environment, and discontinuous and/or irregular viewing periods. Such receptors would include: • Users engaged in outdoor sport or recreation other than appreciation of the landscape (i.e., hunting, shooting, golf, water based activities) and NMUs on rural lanes or some roads or on rural paths that may be already impacted by intrusive features.
Low	Viewers with a passing interest in their surroundings and momentary viewing periods. Such receptors include: • Drivers/travelers and/or passengers of moving vehicles including trains. • People at their place of work, including agricultural workers and NMUs on most roads or those already impacted by intrusive features.

Assessment of Predicted Impacts

8.2.8 Consideration is given to the potential impacts of the proposed development on the landscape character and visual amenity during the construction and operation phases and how these processes would alter the character and quality of the receiving landscape and visual amenity. Recommendations are made for mitigation to prevent or reduce predicted significant adverse impacts.

8.2.9 The second stage of the assessment involves the identification of landscape and visual impacts associated with the proposed development. They can be direct, indirect, cumulative, adverse or beneficial, permanent (i.e. operational) or temporary (often associated with the construction phase) and are defined below. The assessment distinguishes between impacts on landscape character and those associated with visual amenity and views across the site.

- **Direct** impacts are those imposed on landscape elements on the site as a direct result of development, such as the loss of existing trees or other vegetation.

- **Indirect** impacts may occur some distance from the site, e.g. change to stream flows off-site by de-watering on site.

- **Secondary** impacts are those that follow on from the interaction of the above categories, such as a change in bird nesting patterns due to the loss of nest sites.

- **Cumulative** impacts occur when additional developments of similar type appear in an area (e.g. wind farms), or when a development might impose several different impacts on the same resource or receptor.

- **Short Medium** or **Long Term** describes the duration of an impact.

- **Permanent** or **Temporary** relates for example to additional impacts during construction compared to the permanent change caused by the new development.

- **Adverse** effects are those that cause detriment to the pre-development situation, **beneficial** effects are those that restore or improve the landscape, and **neutral** effects might change the existing situation, but on balance make the situation neither better nor worse.

Assessment of Landscape Impacts

8.2.10 The magnitude of landscape change is generally considered to be the degree, nature and duration of change to the landscape brought about by the development.

8.2.11 In assessing the magnitude of any landscape impact due regard is given to the scale, nature and duration of the impact. For example, a subtle change in pattern of the landscape confined to a limited area for only a short period is likely to be considered low in magnitude. Definitions of magnitude of landscape impact are outlined below in Table 8.6 below.

Table 8.6: Magnitude of Landscape Impact

Magnitude	Definition
Major	Total loss of or major change to elements, features or characteristics of the landscape baseline. *i.e.* introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape
Intermediate	Partial loss of or change to elements, features or characteristics of the landscape. *i.e.* introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape
Minor	Minor loss of or change to elements, features or characteristics of the landscape. *i.e.* introduction of elements that may be prominent but may not be uncharacteristic when set within the attributes of the receiving landscape.
Negligible	Very minor loss or change to elements, features or characteristics of the landscape. *i.e.* introduction of elements that are not uncharacteristic with the surrounding – approximating to the 'no change' situation.

8.2.12 The two principal criteria determining significance are the capacity of the receptor to accept change and the magnitude of the impact or effect. This assessment combines the capacity for change of the various receptors with the assessment of the magnitude of the impact in question in order to predict the significance of the landscape impacts to give an overall assessment score as shown in Table 8.7.

Table 8.7: Significance of Landscape Impact

		Landscape Capacity		
		Low	**Medium**	**High**
Magnitude of Change	**Major**	Large	Large or Moderate	Moderate or Slight
	Intermediate	Large or Moderate	Moderate or Slight	Slight
	Minor	Moderate or Slight	Slight	Slight or Neutral
	Negligible	Slight or Neutral	Neutral	Neutral

8.2.13 The significance of an effect may be beneficial but more usually it will be adverse, at least initially. Significance is determined using informed and well-reasoned professional judgment. In Table 8.7 where, for example, the magnitude of change is assessed as "minor" and in an area of "low" landscape capacity, the standard entry shows "moderate or slight" effect. In use this allows there to be two different effects of "slight" or "moderate" to be selected as judged appropriate to the circumstances and each could be either adverse or beneficial. This allows the assessment to be somewhat more subtle and by this means small differences can be highlighted. It is also recognition of the fact that there is inevitably an overlap between each box in the table. These criteria are described in Table 8.8 below.

Table 8.8: Definition of Landscape Significance

Significance	Criteria
Large adverse	The proposed Facility would result in effects that: • Cannot be fully mitigated and may cumulatively amount to a severe adverse effect; • Are at a considerable variance to the landscape thus degrading the integrity of the landscape; • Will be substantially damaging to a high quality landscape
Moderate adverse	The proposed Facility would: • Be out of scale with the landscape or at odds with the local pattern and landform; • Will leave an adverse impact on a landscape of recognised quality
Slight adverse	The proposed Facility would: • Not quite fit into the landform and scale of the landscape; • And affect an area of recognised landscape character
Neutral effect	The proposed Facility would: • Complement the scale, landform and pattern of the landscape; • Maintain existing landscape quality

Significance	Criteria
Slight beneficial	The proposed Facility has the potential to: • Improve the landscape quality and character; • Fit in with the scale, landform and pattern of the landscape; • Enable the restoration of valued characteristic features partially lost through other land uses;
Moderate beneficial	The proposed Facility would have the potential to: • Fit very well with the landscape character; • Improve the quality of the landscape through removal of damage caused by existing land uses;

Assessment of Visual Impacts

8.2.14 Having identified all predicted visual impacts, their significance is assessed using the criteria described in Table 8.9 below.

Table 8.9: Significance Criteria for Visual Impact

Significance	Definition
Large adverse impact	The Facility would cause a significant deterioration in the existing view
Moderate adverse impact	The Facility would cause a noticeable deterioration in the existing view
Slight adverse impact	The Facility would cause a barely perceptible deterioration in the existing view
Slight beneficial impact	The Facility would cause a barely perceptible improvement in the existing view
Moderate beneficial impact	The Facility would cause a noticeable improvement in the existing view
Large beneficial impact	The Facility would cause a significant improvement in the existing view
No change	No discernible deterioration or improvement in the existing view

Residual Impacts

8.2.15 The proposals are assessed with mitigation measures described in Section 8.4. The purpose of the mitigation measures is to avoid, reduce and where possible remedy any significantly adverse impacts. Residual impacts i.e. those that can not be mitigated, are identified at the end of the assessment.

8.2.16 The Assessment is an iterative process and, in order to inform the decision making process, the Impact Assessment reports on the environmental effects that are considered to be significant. For the purpose of this assessment, impacts that have been assessed as being either moderately adverse or beneficial or above are considered to be significant in terms of the Environmental Impact Assessment (England & Wales) Regulations 1999. Although slight adverse or beneficial and neutral impacts are not considered significant, they remain worthy of consideration throughout the decision making process.

8.3 Baseline Conditions

8.3.1 Baseline surveys were carried out to record and analyse the existing landscape characteristics to establish the quality and value of the landscape and its capacity to

accept change. Visual resources in the vicinity of the proposed development were identified and categorised according to their sensitivity. The process included:

- Analysis of landscape characteristics through published assessments and field survey in order to understand how they are made up and experienced as well as ascertaining their relative quality, value and capacity to accept change of the type proposed.

- Computer based studies to identify the Zone of Theoretical Visibility (ZTV);

- Desk and field based studies to verify the likely (ZTV), and sensitivity of receptor at the principle viewpoints.

The Site and its Surroundings

8.3.2 Fig 8.2 shows an aerial view of the proposed development site and the diverse character of the surrounding areas.

Landscape / Townscape Character: LANDMAP

8.3.3 A landscape character assessment has been undertaken using the Countryside Council for Wales' national landscape information system LANDMAP[3]. It breaks the landscape down into a number of constituent layers or 'aspects' that can be characterised and evaluated individually or for their contribution to the landscape as a whole. The following aspects were identified:

Visual and Sensory

8.3.4 The following points relevant to Barry and Barry docks are:

- *'Barry Docks are a saltwater body surrounded by hard rock edges and moorings and connected to Bristol Channel by dock gates. The docks are still functional except for those to the north east where new development is taking place…..They are a positive asset indicating the original function of the settlement as a coal port'.* The overall evaluation describes the docks as having a distinctive character and forming an important element in Barry. However the dock edges vary in age and condition which detracts from the overall value of the area.

- *'Barry….is set on an undulating hilly landform with a flat coastal plain and Barry island, it is the largest town in the Vale. The highest point in Barry is approximately 90m AOD near the north west section of the town. The lowest point is approximately 5m AOD next to the Bristol Channel. Barry has a Victorian core of 4 – 5 storey buildings with stone detailing around walls and doors'.* The overall evaluation describes Barry as having *'strong topography with built form. Areas of core and pleasant suburb intact but large areas of poor quality illegible urban form with industrial detractors'.*

Historic Landscape

8.3.5 Barry Docks are described as follows:

'Barry docks was developed by industrialist David Davies in the late 19th century, the docks were to designed to supplement the larger docks at Cardiff, in particular relating to the export of coal. An act of parliament was passed in 1884 establishing the Barry Dock and Railway Company, work then commenced on building of the docks and culminated with the completion of the Docks Office (now the Custom House) in 1898/9. Two docks and an inter-tidal basin were built by the engineers Henry Marc Brunel and John Barry from 1889; the first dock was over a kilometre long and 336m wide, whilst the second dock, to the east of the first, was even larger and incorporated a rolling caisson. Large hydraulic hoists, which used to load coal onto waiting ships, sat on massive limestone dock walls and were serviced by the complex Barry Railway network. The area east of the docks, in what was once part of Sully Moors, is now given over to modern industry including chemical works and the Atlantic Trading.

8.3.6 Listed Buildings and Buildings and Structures of Interest in the Docks area are included in 8.3.19 below.

Landscape Habitat

8.3.7 The Hayes Point to Bendrick Rock geological Site of Special Scientific Interest lies to the south west of the site of the proposed development and is described in Section 6.3.3.

Landscape / Townscape Character: UDP Barry Development Guidelines[4]

8.3.8 Supplementary planning guidance to the UDP, Barry Development Guidelines (BDG), provides landscape and townscape assessments of parts of the study area, as well as design guidance for the future development of Areas of Special Identity (ASI).

8.3.9 The following ASIs are identified as having a special character or function within Barry and lie in close proximity to the site of the proposed development. They are described below and are shown on Fig 8.3.

The Waterfront

8.3.10 '*Barry Docks has traditionally been at the heart of the Town's economic prosperity and the opportunities which it presents for the Town's regeneration are such that it provides a focal point for change in Barry.*

Severance of Docks from Town Centre

The alignment of the main railway line creates a clear physical severance of the Waterfront from the rest of the town. This is emphasised by a steep ridgeline that defines the northern edge of the Barry Sound. The railway, which follows the base of the ridgeline, has traditionally split the employment and residential parts of Barry and both the railway line and the ridge restrict access to the Waterfront from the Town Centre.

Docks Heritage Area

Much of the dock-related machinery and artefacts were demolished during the 1980's. However, some remain and these features should be retained in future redevelopment proposals as reminders of Barry's economic heritage'.

The BDG identifies several Listed Buildings and Buildings and Structures of Interest in the Docks area including:

- Former Barry Docks offices (Listed Grade II*)
- Six Lamp Standards outside former Barry Dock offices (Listed Grade II)
- Statue of David Davies of Llandinam on plinth (Listed Grade II*)
- North Hydraulic Pumping House, No. 1 Dock (Listed Grade II)
- Pumping Station, north of Bendrick Road (Building of Interest)
- Lock Gates (Structures of Interest)
- Walls of No. 3 Basin (Listed Grade II)
- Dock Walls (Structures of Interest)
- Dock Bridges and cabin (Listed Grade II)
- Dry Docks (Structures of Interest)

Atlantic Trading Estate

8.3.11 Atlantic Trading Estate covers approximately 30 hectares of land on the south-eastern periphery of Barry. The UDP continues;

'The Estate is separated from the Town by the docks located to the north-west. To the north-east is located other industrial development where chemical plants predominate. Immediately adjoining the Estate are isolated pockets of residential development fronting Bendicks Road and Hayes Road.

The Estate was originally developed as a Ministry of Defence storage depot around 1940. The infrastructure of the Estate was neglected for many years and is in very poor condition….. The site was released by the MOD in 1968….and the Council and Welsh Development Agency are investing in improving the Estate. Major access improvements are in progress as well as demolition of redundant buildings and site clearance.

The Estate has a distinctive environment by virtue of its history, its physical separation from the rest of Barry and its seafront location. It has an unusually low density in that buildings were widely separated to allow for access by rail. These extensive areas between buildings became unused and overgrown and were

convenient targets for fly tipping. Recent demolitions and site clearance have left still larger vacant sites.

A number of original buildings remain and are generally in poor condition….. Modern buildings on the Estate tend to be basic utilitarian structures, usually with metal cladding to walls and roofs.

There is very little mature tree or shrub planting on the Estate.

Guidelines

- *New industrial buildings should be designed to establish a benchmark of higher quality design;*
- *New development should be orientated such that office areas and car parking is located at the front of plots with manufacturing and service areas to the rear;*
- *New development proposals will be expected to include landscape design proposals as part of any redevelopment proposal; and*
- *Recent road works have opened up the Estate and this places greater onus in future on individual plot holders to be responsible for site security. Fencing should be robust and painted to an agreed colour to improve its appearance and supplemented with a generous screen of shrubbery.*

Barry Island

8.3.12 *Barry Island presents a very different facet of the town. It is very much an archetypal British seaside resort with the beach, funfair, amusement arcades, entertainment facilities, and some good examples of late Victorian and Edwardian architecture.*

The Island is divided into four distinctive townscape sub-areas, the Old Harbour to the west; Whitmore Bay beach area; the local residential area to the north, and to the east, Jackson's Bay and the Dock entrance.

Jackson's Bay

Situated almost in relative isolation on the east of the island is Jackson's Bay. The bay comprises a small sandy beach which sits below the cliff side overlooked by Redbrink Crescent, and is adjacent to the Dock's entrance and Barry Yacht Club. The built area, situated at the Dock's entrance is dominated by Barry Yacht Club's Clubhouse, the former RNLI building and slipway, and on the dockside rows of yachts. The latter area is presently operational dock land owned by Associated British Ports'.

Barry Town Centre

8.3.13 The UDP Townscape Appraisal states;

'There are two main shopping areas in the Town Centre which originally developed around historical access points to the Docks.

High Street has a mix of turn-of the-Century buildings with different styles evident on either side of the street…. Materials are of local coursed stone with ashlar window heads and soft red brick quoining… three storey buildings are built in brick with stone dressings and gable dormers, all heavily ornamented'.

Baseline Landscape Quality, Value and Capacity

8.3.14 With reference to the four ASIs described above the quality, value and capacity of each area to accept change is assessed using the methodology set out in 8.2, applying the criteria defined in Tables 8.2, 8.3 and 8.4 respectively.

8.3.15 The quality of The Waterfront landscape/townscape is assessed to be **Ordinary**, it is of **Medium** value and has a **Medium** capacity to accept change.

8.3.16 The quality of the Atlantic Trading Estate landscape/townscape is assessed to be **Poor**, it is of **Low** value and has a **High** capacity to accept change.

8.3.17 The quality of Barry Island landscape/townscape is assessed to be **Good**, it is of **Medium** value and has a **Low** capacity to accept change

8.3.18 The quality of Barry Town Centre landscape/townscape is assessed to be **Good**, it is of **Medium** value and has a **Low** capacity to accept change.

Baseline Views

8.3.19 Figures 8.1 and 8.4 show the Zone of Theoretical Visibility (ZTV) of the proposed development. The ZTV was produced using a computer generated model based on the stack height of 45 metres above existing ground level when viewed at 1.6 metres AOD, i.e. average eye level, which was verified on site from publicly accessible areas. It is noted that the ZTV is approximate only and whilst the existing landform is above 0 metres AOD the screening effect of vegetation, landform, buildings or structures will reduce any impacts from the increase in height when taking the existing landform into consideration; in some areas there are no views at all, there may also be views from outside the ZTV from localised areas of high ground.

8.3.20 Features of the local area that serve to limit the visibility of the site include the following:

- To the north: built development north of Dock View Road;
- To the east: industrial buildings within the Atlantic Trading Estate;
- To the south: coastal defences, dock entrance structures, hedges and shrub/scrub vegetation; and
- To the west: Barry Island and oil storage terminal adjacent to Dock No. 1 and industrial development on the western side of Atlantic Way.

8.3.21 Public access to the site is restricted by ABP and the nearest publicly accessible viewpoint from the east is the coastal footpath east of Black Rocks from which there may be limited middle distance views of the site through scrub vegetation and hedgerows during winter months.

8.3.22 All views of the site are in the middle and long distance range. Even though most are from elevated locations views of the undeveloped site are currently largely screened by adjacent industrial buildings.

8.3.23 All of the viewpoints in Fig 8.4 are from areas where there are many receptors including residents, pedestrians and users of outdoor recreation facilities. It is not possible to ascertain precisely the number of residential units at each location therefore the description is representative of the general nature of the view currently experienced by most receptors.

8.3.24 Correspondence with the LPA has indicated that the proposed developments at South and East Quays should be taken into consideration. As few details of the proposed development are available it has been assumed that views would be similar to those currently experienced by residents of Cei Daffyd, Y Rhodfa, The Waterfront, Barry (View 8.6).

8.3.25 Visual receptors and significant representative viewpoints (VPs) identified during this process are described in Table 8.10 below, and are illustrated in Fig 8.5

Table 8.10: Existing Views

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View
8.1	Barry Dock Office, Ffordd Y Mileniwm, Barry	People at work in offices, pedestrians and road users Middle - long distance **High**	From this location there are elevated views over industrial development in Cory Way and David Davies Road with the dock in the foreground. The site is screened by and lies behind the large Port of Barry building in Atlantic Way. There are distant views of mature woodland east of Hayes Lane, the Bristol Channel and English coastline.
8.2	Dock View Road, Barry	Occupiers of residential premises and pedestrians Middle - long distance **High**	From this location there are elevated views over open space, scrub vegetation and industrial development in David Davies Road and the dock in the foreground. The site lies behind and is screened by the large Port of Barry building in Atlantic Way. There are distant panoramic views of the Bristol Channel and English coastline over the industrial premises in Atlantic Way, which form the backdrop to the site.
8.3	Victoria Park Road, Cadoxton, Barry	Occupiers of residential premises, users of school grounds and pedestrians Long distance **High**	From this location there are elevated views over residential development, scrub vegetation and industrial development in David Davies Road and the dock in the foreground. The site lies behind and is screened by the large Port of Barry building in Atlantic Way. There are distant panoramic views of chemical plants at Cadoxton and Sully and the Rank

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View
			Hovis building in the west. The Bristol Channel and English coastline form the backdrop to views looking due south over the site.
8.4	Victoria Park, Cadoxton, Barry	Occupiers of residential premises, users of Victoria Park and pedestrians Long distance **High**	From this location there are elevated views of the docks between buildings and parkland trees. The site lies behind and is screened by the large Port of Barry building in Atlantic Way. There are distant panoramic views of the Bristol Channel and English coastline due south of the site.
8.5	David Davies Road, Barry	People at work in industrial premises Middle distance **Low**	There are views over the dock in the foreground of industrial premises in Atlantic Way including the landmark Rank Hovis building and the Port of Barry building which screens the site.
8.6	Cei Daffyd, Y Rhodfa, The Waterfront, Barry	Occupiers of residential premises, pedestrians & people using public open space Long distance **High**	The site is screened by large scale industrial buildings in the foreground, although there may be oblique views of it from the upper storeys from south facing windows. There may be limited direct views of part of the site from east facing windows from the upper storeys. The foreground includes views of the docks, scrub vegetation / open space and Barry Island. There are distant views of tall structures/stacks associated with chemical plants at Cadoxton and Sully. The Rank Hovis building is prominent on the skyline.
8.7	Ffordd Sealand / Ffordd Y Mileniwm, The Waterfront, Barry	Occupiers of residential premises, walkers & people using public open space Long distance **High**	From this location there are wide views of the docks including new development on the Waterfront, the clock tower to Barry Dock Office and Barry Island as well as industrial premises in Atlantic Way. The site is screened by the large scale Port of Barry building in the foreground. Mature woodland between Hayes Lane and Hayes Point in the west forms the backdrop to part of this building and the proposed development site.
8.8	Harbour Road, Barry	Occupiers of residential premises, pedestrians & rail travellers Long distance **High**	From this location there are wide views of the docks including new development on the Waterfront and chemical plants at Cadoxton and Sully, the clock tower to Barry Dock Office and the eastern edge of Barry Island. The site is screened by the large scale Port of Barry building. Mature woodland between Hayes Lane and Hayes Point in the west forms the backdrop to this building and the proposed development site.
8.9	Redbrink Crescent, Dyfrig Street,	Occupiers of residential premises,	There are elevated, far-reaching panoramic views over Barry to the east. It includes the docks and associated industry in the foreground

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View
	Barry Island	pedestrians & people using public open space Long distance **High**	with residential development on the margins. There are distant views of tall structures/stacks associated with chemical plants at Cadoxton and Sully. Undulating woodland and agricultural land forms the visual horizon. Industrial premises in Atlantic Way are relatively insignificant in the overall view and the site is screened by the large Port of Barry building in the foreground. Mature woodland behind this building forms the backdrop to the site.
8.10	Clos Yr Wylan, Gwennol Y Graig and public open space, Barry Island	Occupiers of residential premises, walkers & people using public open space Long distance **High**	There are elevated, far-reaching panoramic views over Barry and the coastline to the east. There are distant views of the docks and industrial premises, including the site, and chemical plants at Cadoxton and Sully. The Rank Hovis building is clearly distinguishable from this location.
8.11	Marine Drive, Nr Romilly Park, Barry	Occupiers of residential premises, walkers & people using public open space Long distance **High**	There are elevated, far-reaching panoramic views over Barry towards woodland and farmland on high ground to the east. Views of the docks are partly screened by residential development in the foreground. Chemical plants at Cadoxton and Sully and the Atlantic Mills building owned by Rank Hovis Ltd are prominent in the middle distance, where several tall structures./stacks are visible on the skyline. Industrial premises in Atlantic way are relatively insignificant in the overall view and the site is screened by large scale industrial buildings in the foreground.
8.12	Perrcoe Drive Road, Seaview Terrace, Barry	Occupiers of residential premises and pedestrians Long distance **High**	Typical view from south facing roads and properties on higher ground in Barry. Distant view over the docks and Port of Barry building, which screens the site, to the Bristol Channel and English coastline beyond.

8.3.26 From Table 8.10 it can be concluded that the undeveloped site is currently substantially screened from most locations by the Port of Barry building. Mature woodland between Hayes Lane and Hayes Point forms the backdrop to the site in Views 8.6 – 8.11 from the western side of Barry. However, the remaining south facing views are generally from elevated locations which overlook the Port of Barry building and the site to the Bristol Channel and English coastline beyond. The Rank Hovis building is a prominent feature in Atlantic Way, and is substantially higher than other adjacent industrial buildings in the vicinity of the site.

8.4 Proposed Mitigation Measures

8.4.1 Mitigation measures have been considered in relation to:

- Primary measures which form part of the iterative design process; and

- Secondary measures designed to address any residual adverse effects of the development.

8.4.2 Mitigation of adverse impacts can be achieved by avoidance, reduction, remedying of, or compensation for the impact. Primary mitigation measures are those included in the design of the proposed development, which will inherently achieve one of the above. Secondary mitigation measures are those applied to the final design, which further mitigate any remaining adverse effects. Possible adverse landscape and visual effects that could arise from the proposed development will be mitigated as follows:

- Through the high quality design of the buildings and structures, as shown on Planning Application Drawing 08-1353-P06.

- Through the arrangement of the site so that car park areas are located at the front of the site adjacent to Atlantic Way, service areas to the rear, and by screening all storage areas where practical, as shown on Planning Application Drawing 08-1353-P01.

- Through the colours of the buildings and structures to reduce their visual presence when viewed against the sky and sea, as shown on Planning Application Drawing 08-1353-P06.

- By planting the perimeter of the site with a broad belt of native species trees and shrubs, which would be routinely maintained to ensure full and successful establishment after a period of five years, as shown on Fig 8.6.

- By planting a proportion of trees in key locations at Extra Heavy Standard size for immediate effect. Planting would be undertaken using local provenance stock where available. The effectiveness of screen planting will increase with growth: after 10 years planting will be approximately 5 metres high; at maturity tree species will be >18 metres high. As growth rates are affected by a number of factors, including microclimate, rainfall, maintenance etc., this cannot be predicted with any accuracy beyond 10-15 years.

- Through the design and finish of the boundary fencing.

- Through the design of external lighting to reduce trespass, glare and spillage and by restricting usage to the minimum periods required.

8.4.3 Overall, these mitigation measures would provide a high quality industrial building in Atlantic Way that would be designed to reduce adverse visual impacts whilst assimilating the development into the surrounding landscape. The proposals would contribute positively to the regeneration of this part of Atlantic Way. Outline landscape proposals showing the proposed hard and soft landscaping are shown on Fig 8.6.

8.5 Assessment of Predicted Impacts

8.5.1 This section identifies the potential landscape and visual effects that would occur during the construction and operational phases of the development using significance

criteria identified in 8.2 Methodology. Mitigation described in section 8.4 forms an integral part of the proposals and the potential effects have been assessed inclusive of the measures proposed.

Construction Phase - General

8.5.2 The construction of the proposed development would impact on the same areas as those affected by the operational phase. However, the nature and scale of the impact would be different in that construction activities are likely to result in a greater area of disturbed land and a concentration of seemingly discordant features and activities that would result in temporary adverse impacts on landscape character and visual amenity.

8.5.3 The duration of the construction phase would be 18 months. Temporary impacts, even when likely to be 'substantial' are regarded as less significant than similar impact magnitudes arising from a permanent effect.

8.5.4 Adverse impacts during the construction phase could arise from the following typical items associated with work of this nature:

- Site clearance and removal of vegetation;
- General construction activities including: movement of construction machinery and large scale construction equipment; soil stripping; cutting excavations; presence of construction workers; presence of site compounds and parking on site; batching plants; material stockpiles; presence of hoardings and protective fencing; presence of temporary lighting and signage; installation of new infrastructure; installation of lighting; and planting; and
- vehicles moving materials to and from the site.

Operational Phase – General

8.5.5 The following potential landscape and visual effects have been considered during the operational phase:

- permanent loss of some landscape elements including scrub and grassland;
- increase and greater diversity in built form including infrastructure, i.e. stack, lighting columns;
- creation of new hard and soft landscape elements; and
- landscape changes impacting on the composition of views would include new tree and shrub screen planting.

Effects on Landscape / Townscape Character

Atlantic Trading Estate Area of Special Identity (ASI)

8.5.6 The proposed development would introduce large scale buildings/structures, hard surfaced car parking areas/service yard, boundary planting and fencing to a currently vacant area of brownfield land. The buildings would be of a similar mass, scale and architectural style to the rectangular blocks of the Rank Hovis building further west in Atlantic Way. However, it would be substantially taller and of a different style from the adjacent single storey industrial buildings with their deep pitched roofs constructed from light coloured metal cladding. The proposed perimeter planting would introduce a significant extent of native species planting that would screen the operational areas of the proposed development.

8.5.7 The magnitude of impact would be **intermediate** in a landscape that has a **high** capacity for change of this nature, and the overall significance of impact would be **slight adverse** due to the large scale of the proposed building and stack**.**

The Waterfront ISA

8.5.8 There would be no direct or indirect impacts on the landscape character of this area resulting in a **neutral effect.**

Barry Town Centre ISA

8.5.9 There would be no direct or indirect impacts on the landscape character of this area resulting in a **neutral effect.**

Barry Island

8.5.10 There would be no direct or indirect impacts on the landscape character of this area resulting in a **neutral effect.**

Effects on Views

8.5.11 Table 8.11 below sets out the predicted significance of impact on baseline views described in Table 8.10 and are summarised on Fig 8.5.

Table 8.11 Visual Impact Schedule

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View	Construction Visual Effects / Significance	Operational Visual Effects / Significance
8.1	Barry Dock Office, Ffordd Y Mileniwm, Barry	Occupiers of residential premises, office workers, pedestrians and road users Middle distance **High**	From this location there are elevated views over open space, scrub/shrub vegetation and industrial development in Cory Way, David Davies Road and the docks in the foreground. The site is screened by the large Port of Barry building in Atlantic Way. There are distant views of the Bristol Channel.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be set against the backdrop of the Bristol Channel and English coastline and would be a prominent feature in relation to the adjacent low rise industrial buildings. There would be a **slight adverse impact** on views from this location.
8.2	Dock View Road, Barry	Occupiers of residential premises and pedestrians Middle - long distance **High**	From this location there are elevated views over open space, scrub vegetation and industrial development in David Davies Road and the dock in the foreground. The site is screened by the large Port of Barry building in Atlantic Way. There are distant panoramic views of the Bristol Channel and English coastline over the industrial premises in Atlantic Way, which forms the backdrop to the site.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be set against the backdrop of the Bristol Channel and English coastline and would be a prominent feature in relation to the adjacent low rise industrial buildings. There would be a **slight adverse impact** on views from this location.
8.3	Victoria Park Road, Barry	Occupiers of residential premises, users of school grounds and pedestrians Long distance **High**	From this location there are elevated views over residential development, scrub vegetation and industrial development in David Davies Road and the dock in the foreground. The site is screened by the large Port of Barry building in Atlantic Way. There are distant panoramic views of chemical plants at Cadoxton and Sully and the Rank Hovis building in the west. The Bristol Channel and English coastline to the south form the backdrop	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary**	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be set against the backdrop of the Bristol Channel and English coastline and would be a prominent feature in relation to the adjacent low rise industrial buildings.

Table 8.11 Visual Impact Schedule

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View	Construction Visual Effects / Significance	Operational Visual Effects / Significance
			to views looking due south over the site.	**slight adverse impact** on views from this location.	There would be a **slight adverse impact** on views from this location
8.4	Victoria Park, Barry	Occupiers of residential premises, users of Victoria Park and pedestrians Long distance **High**	From this location there are elevated views of the docks between buildings and parkland trees. The site is screened by the large Port of Barry building in Atlantic Way. There are distant panoramic views of the Bristol Channel and English coastline due south over the site..	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be set against the backdrop of the Bristol Channel and English coastline and would be a prominent feature in relation to the adjacent low rise industrial buildings. There would be a **slight adverse impact** on views from this location.
8.5	David Davies Road, Barry	People at work in industrial premises Middle distance Low	There are views over the dock in the foreground of industrial premises in Atlantic Way including the Rank Hovis building and the Port of Barry building which screens the site.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary moderate adverse impact** on views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be set against the backdrop of the Bristol Channel and English coastline and would be a prominent feature in relation to the adjacent low rise industrial buildings. There would be a **slight adverse impact** on views from this location.
8.6	Cei Daffyd, Y Rhodfa, The Waterfront, Barry	Occupiers of residential premises, walkers & people using public open space Long distance	The site is screened by large scale industrial buildings in the foreground, although there may be oblique views of it from the upper storeys from south facing windows. There may be limited direct views of part of the site from east facing windows from the upper storeys. The foreground includes views of the docks, scrub vegetation /	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be partly set against the backdrop of mature woodland between Hayes Lane and Hayes Point.

Table 8.11 Visual Impact Schedule

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View	Construction Visual Effects / Significance	Operational Visual Effects / Significance
		High	open space and Barry Island. There are distant views of tall structures/stacks associated with chemical plants at Cadoxton and Sully. The Rank Hovis building is prominent on the skyline.	elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	There would be a **slight adverse impact** on views from this location.
8.7	Fford Sealand / Ffordd Y Mileniwm, The Waterfront, Barry	Occupiers of residential premises, walkers & people using public open space Long distance **High**	From this location there are wide views of the docks including new development on the Waterfront, the clock tower to Barry Docks office and Barry Island as well as industrial premises in Atlantic Way. The site is screened by the large scale Port of Barry building in the foreground. Mature woodland between Hayes Lane and Hayes Point in the west forms the backdrop to this building and part of the proposed development site.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be partly set against the backdrop of mature woodland between Hayes Lane and Hayes Point. There would be a **slight adverse impact** on views from this location.
8.8	Harbour Road, Barry	Occupiers of residential premises, pedestrians & travellers by rail Long distance **High**	From this location there are wide views of the docks including new development on the Waterfront and chemical plants at Cadoxton and Sully, the clock tower to Barry Dock Office and the eastern edge of Barry Island. The site is screened by the large scale Port of Barry building. Mature woodland between Hayes Lane and Hayes Point in the west forms the backdrop to this building and the proposed development site.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be partly set against the backdrop of mature woodland between Hayes Lane and Hayes Point. There would be a **slight adverse impact** on views from this location.
8.9	Redbrink Crescent, Dyfrig Street, Barry	Occupiers of residential premises, pedestrians &	There are elevated, far-reaching panoramic views over Barry to the east. It includes the docks and associated industry in the foreground with residential development on the margins. There	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be partly

Table 8.11 Visual Impact Schedule

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View	Construction Visual Effects / Significance	Operational Visual Effects / Significance
	Island	people using public open space Long distance **High**	are distant views of tall structures/stacks associated with chemical plants at Cadoxton and Sully. Undulating woodland and agricultural land forms the visual horizon. Industrial premises in Atlantic Way are relatively insignificant in the overall view and the site is screened by the large Port of Barry building in the foreground. Mature woodland behind this building forms the backdrop to the site.	construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location.	set against the backdrop of mature woodland between Hayes Lane and Hayes Point. There would be a **slight adverse impact** on views from this location.
8.10	Clos Yr Wylan, Gwennol Y Graig and public open space, Barry Island	Occupiers of residential premises, walkers & people using public open space Long distance **High**	There are elevated, far-reaching panoramic views over Barry and the coastline to the east. There are distant docks and industrial premises, including the site, and chemical plants at Cadoxton and Sully. The Rank Hovis building is clearly distinguishable from this location.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a barely discernible change resulting in **no change** to views from this location.	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be partly set against the backdrop of mature woodland between Hayes Lane and Hayes Point. There would be a barely discernible change resulting in **no change** to views from this location.
8.11	Marine Drive, Nr Romilly Park, Barry	Occupiers of residential premises, walkers & people using public open space Long distance **High**	There are elevated, far-reaching panoramic views over Barry towards woodland and farmland on high ground to the east. Views of the docks are partly screened by residential development in the foreground. Chemical plants at Cadoxton and Sully and the Atlantic Mills building owned by Rank Hovis Ltd are prominent in the middle distance, where several tall structures./stacks are visible on the skyline. Industrial premises in Atlantic way are relatively	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a barely discernible change resulting in	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be partly set against the backdrop of mature woodland between Hayes Lane and Hayes Point. There would be a barely discernible change resulting in **no change** to views from this location.

Table 8.11 Visual Impact Schedule

View	Location	Receptor(s) / Distance / Sensitivity	Description of Existing View	Construction Visual Effects / Significance	Operational Visual Effects / Significance
			insignificant in the overall view and the site is screened by large scale industrial buildings in the foreground.	**no change** to views from this location.	
8.12	Perrcoe Drive Road, Seaview Terrace, Barry	Occupiers of residential premises and pedestrians Long distance **High**	Typical view from south facing roads and properties on higher ground in Barry. Distant view over the docks and Port of Barry building, which screens the site, to the Bristol Channel and English coastline beyond.	Construction plant and activities would be substantially screened by the Port of Barry building in the foreground. Elevated construction activities including cranes, lighting scaffolding etc. would be new temporary elements visible on the skyline. There would be a **temporary slight adverse impact** on views from this location	The upper part of the proposed building and stack would be visible on the skyline, rising above the Port of Barry building. It would be set against the backdrop of the Bristol Channel and English coastline and would be a prominent feature in relation to the adjacent low rise industrial buildings. There would be a **slight adverse impact** on views from this location.

Summary of Visual Impact Schedule

8.5.12 From Table 8.11 and Fig 8.5 the visual impacts predicted to arise during the construction and operational phases can be summarised as follows:

- Impacts arising during the construction phase would have a slight adverse impact on highly sensitive receptors at all viewpoints identified with the exception of View 8.5 (least sensitive receptors) who would experience a temporary moderate adverse impact.

- Impacts arising during the operational phase would have a permanent slight adverse impact on receptors at all viewpoint identified with the exception of Views 8.10 and 8.11 (highly sensitive receptors) who would experience no change due to their distance from the proposed development.

Significance of Residual Impacts

8.5.13 Residual impacts are those that persist after the application of the mitigation measures described in 8.4 above. In the case of the proposed Energy Recovery Facility, the residual landscape and visual impacts would be as follows:

- The proposed development will be a prominent feature in the surrounding landscape due to the large scale of the buildings in comparison to the adjacent industrial buildings. This will result in a **permanent slight adverse impact** on landscape character.

- The upper part of the main buildings and stack would be visible from higher ground to the north in Barry and Barry Island to the west, up to about 3km away. Screening would increase as planting matures resulting in a **long term slight adverse** change in view;

- Broken views of the upper parts of the buildings and stack from short sections of the coastal footpath within 1km of the site to the east, resulting in a **long term slight adverse change** in view, subject to seasonal screening by existing hedges / scrub vegetation.

Landscape Planning Policy Considerations

8.5.14 The effects of the proposed development have been considered in the light of landscape related policies contained in the UDP and supplementary planning guidance contained in the Barry Development Guidelines.

8.5.15 In terms of its predicted landscape and visual impacts, the proposed Energy Recovery Facility has been designed as far as possible to accord with the above policies, in the following respects:

- the layout of the site, design of the buildings and perimeter planting/fencing has been developed in accordance with the above design guidance for the Atlantic Trading Estate;

- assessment of likely visual impacts, both by predictive techniques and in the field, has shown that permanent slight adverse effects would occur over a limited area only, extending up to about 3km to the north, and less in other directions; and

- The proposed development, which would be designed to a high standard, would contribute positively to the regeneration of Atlantic Way and the Atlantic Trading Estate as a whole.

8.6 Conclusions

8.6.1 A landscape and visual impact assessment has been undertaken for the proposed Energy Recovery Facility in accordance with the methodology and assessment criteria contained in the Guidelines for Landscape and Visual Impact Assessment [(1)].

8.6.2 The method of the study was firstly to determine baseline landscape character through published assessments and field survey, and to describe existing views and the sensitivity of receptors from principal viewpoints. This was followed by consideration of the likely nature, magnitude and duration of impacts, which was combined with an assessment of the sensitivity of the receiving landscape to change, to determine the significance of the impact of the predicted changes.

8.6.3 There would be a slight adverse change to the landscape character of the Atlantic Trading Estate Area of Special Identity due to the large scale of the proposed building and stack which cannot be fully mitigated. However, other aspects of the development can be mitigated and the proposals would result a well designed, high quality building in a soft landscaped setting on an existing vacant brownfield site.

8.6.4 Temporary moderate adverse visual impact from a close distance was identified from one industrial location (low sensitivity) during the construction phase. The temporary and permanent impacts on all other views were assessed as either slight adverse or no change. The most significant change would be to south facing views where the proposed large scale building and stack would be a prominent feature in relation to adjacent low rise industrial buildings set against the low horizon of the Bristol Channel and distant English coastline.

8.6.5 The design (with mitigation) of the proposed development would comply with the objectives of policies contained in the Vale of Glamorgan Unitary Development Plan 1996-2011 (adopted 2005) and supplementary planning guidance that seek to control development and minimise adverse environmental effects. The development would make a positive contribution to the regeneration of Atlantic Way and the Atlantic Trading Estate as a whole.

8.7 References

(1) `Guidelines for Landscape and Visual Impact Assessment', published by the Institute of Environmental Management and Assessment and The Landscape Institute, Second Edition, 2002.

(2) The Vale of Glamorgan Adopted Unitary Development Plan 1996-2011 (adopted 2005)

(3) Vale of Glamorgan LANDMAP, Countryside Council for Wales.

(4) The Vale of Glamorgan Adopted Unitary Development Plan 1996-2011, Supplementary Planning Guidance, Barry Development Guidelines

SECTION 9

NOISE

9 NOISE

9.1 Introduction

9.1.1 This section aims to identify and assess the impact of noise and vibration, due to the construction and operation of the proposed Energy Recovery Facility, and auxiliary equipment at the proposed site in Barry.

9.1.2 A glossary of acoustics terminology is provided in Appendix H.

9.2 Assessment Methodology

Legislative Drivers

9.2.2 The following legislative and guidance have been used in this assessment:

- Technical Advice Note (TAN) 11: noise 1997;
- BS 4142:1997 '*Method for rating industrial noise affecting mixed residential and industrial areas,*' BSI;
- BS 5228: 1997 (Various parts) '*Noise and vibration control on construction and open sites*';
- BS 7445-1: 2003 *'Description and Measurement of Environmental Noise – Guide to quantities and procedures';*
- BS 7445-3: 1991 *'Description and Measurement of Environmental Noise* - Guide to application to noise limits;*'*
- BS 8233: 1999 '*Sound Insulation & Noise Reduction for Buildings';*
- Department for Environment, Food and Rural Affairs (DEFRA), 2005 '*Update of Noise Levels for the Prediction of Noise on Construction and Open Sites';*
- Department of the Environment (DoE), 1976, Advisory Leaflet 72;
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7; Traffic Noise and Vibration; and
- ISO 9613 '*Acoustics – Attenuation of sound during propagation outdoors*'

Noise & Vibration Assessment Methodologies

9.2.3 The quantification and assessment of the potential noise and vibration impacts of the proposed development have been undertaken through a combination of site surveys,

desktop studies, literature reviews, consultations and predictions. The main sources of noise and vibration are identified as follows:

- Construction noise during the construction phase of the Facility;
- Operational noise as a result of on site plant and operational processes; and
- Noise impact from traffic on existing and future sensitive receptors surrounding the proposed Facility.

9.2.4 The following sections summarise the assessment methodologies adopted for each noise and vibration source identified, drawing from the list of guidance provided above.

9.3 Baseline Conditions

9.3.1 The existing noise climate in the areas surrounding the proposed site has been determined by way of a baseline noise survey, undertaken by PB, between the 29 May and 3 June 2008.

9.3.2 The full results of the baseline noise survey including monitoring locations and methodologies are documented in the PB report entitled: *EfW Barry Baseline Noise Report June 2008.* This report has been included in Appendix H for reference.

9.3.3 As part of the baseline noise assessment, attended noise monitoring took place at a number of locations around the site. Data was recorded in third octave bands to enable a detailed analysis of local noise sources. The locations were chosen based on their sensitivity to noise and the likelihood that they would be affected by any change in the local noise climate resulting from the construction or operation of the proposed facility.

9.3.4 Each measurement recorded the same five statistical parameters ($L_{A90,}$ L_{Aeq}, L_{Amax}, L_{A10}, L_{Amin}.) in un-weighted third octave bands, with the broadband figure reported after application of the A-weight adjustment on each third octave band.

9.3.5 All monitoring was conducted using a Class 1 Integrating/Averaging Sound Level Meter as defined by IEC 61672:2003 *"Electroacoustics - sound level meters"*. A field calibrator was used to calibrate and check the meter before and after the measurement period with no change in the level recorded.

9.3.6 In accordance with the standards above, the measurement microphones were positioned 1.2 to 1.5m above ground level, and at least 3.5m from any reflective structure wherever possible. Measurements were taken in weather conditions conducive to successful monitoring: zero precipitation, and wind speeds of less than $5ms^{-1}$. A wind-shield was used to minimise the effects of wind noise.

9.3.7 PB has consulted with the Environmental Health Officer at Barry Council. Information was requested on any history of previous noise complaints, issues, planning conditions, and any additional noise sensitive receptors in the area to validate and add to existing information.

Site Description

9.3.8 The site proposed for the facility lies on Atlantic Road, within Barry Docks. The site is approximately 200m-300m from the sea to the south. The site is bordered by other industrial activities. To the northeast (along the coast) industrial developments stretch for 2km or so, ending in farmland.

9.3.9 The only residential and other noise sensitive receptors that may be affected by any change in the noise climate caused by the proposed development lie to the southwest, west and northwest of the proposed site on Barry Island and in the Dock View Road and in the recent developments off Ffyordd y Mileniwm.

9.3.10 Apart from the existing industrial activity other noise sources in the area include:

- A railway line running diagonally, between the docks area and the residential and commercial centre of the town, southwest to the northeast;
- Local traffic and other activity noise from the residential and commercial centre of Barry; and
- Noise from shipping in the Bristol Channel.

SSSI Area

9.3.11 To the south east of the proposed site at a distance of approximately 240m there is an area of marshland which forms the Hayes Point to Bendrick Rock SSSI. The invertebrate species that can be found in this SSSI are not considered to be sensitive to noise, as such this area is not considered any further in this section of the ES. Further details can be found in Section 6 Ecology.

Noise Sensitive Receptors

9.3.12 The Noise Sensitive Receptors (NSR's) identified below and shown in Table 9.1 are considered to be representative of the worst case affected areas adjacent to the Facility:

1. Location 1 - Corner of St. Marys Avenue & Dock View Road, CF63 4LQ
2. Location 2 - Dyfrig Street, CF62 5TW
3. Location 3 - Bendrick Road, CF63 3RE
4. Location 4 - Y Rhodfa, CF63 4BB

9.3.13 The ambient noise level at each of these locations was sampled during the baseline noise measurement phase, and statistical data was collected. The subjective impression of the noise climate at each location is as follows:

Corner of St Marys Avenue and Dock View Road

9.3.14 Regular local road traffic noise from Dock View Road was dominant during the day. Noise from the railway line was occasionally audible at all times of the day. Activity noise from pedestrians could be heard from the street at all times.

Dyfrig Street

9.3.15 Distant traffic from Ffordd y Mileniwm (north) was audible during the day. Industrial noise from the dock area was also audible during the day – mainly HGV and tipper truck movements. Some shipping noise was also noted.

Bendrick Road

9.3.16 Industrial noise from the dock area (west) made the largest contribution to the ambient noise levels at all times of day. This consisted of mainly HGV and tipper truck movements during the day with some continuous low frequency noise. During the evening and at night only the continuous low frequency noise persisted.

Y Rhodfa

9.3.17 HGV movements could be heard coming from the dock area, and from the southwest, during the day. Road traffic noise from the main road (Ffordd y Mileniwm) could be heard during the day and evening when some aircraft noise could also be heard on occasion. Seagulls' made a considerable contribution to the ambient noise levels at all times.

9.3.18 Table 9.1 provides a summary of the lowest measured L_{A90} noise level recorded at each NSR.

Table 9.1: Summary of lowest measured background noise levels at NSR locations

Measurement Position	Approximate distance from site to NSR (m)	Lowest Recorded L_{A90} (dBA)	
		Daytime	Night-time
NSR Location 1 – Corner of St Mary's Avenue and Dock View Road	770	49.3	29.7
NSR Location 2 - Dyfrig Street	840	45.2	30.7
NSR Location 3 – Bendrick Road	630	43.1	38.5
NSR Location 4 – Y Rhodfa	1000	46.8	28.5

9.4 Assessment of Predicted Impacts

Construction Impacts

9.4.2 Construction activity inevitably leads to some degree of noise disturbance at locations in close proximity to the construction activities. It is however a temporary source of noise, with construction of the proposed Energy Recovery Facility anticipated to take 18 months. The noise levels generated by construction activities have the potential to impact upon local NSR's. Noise levels at any one location will vary as different combinations of plant machinery are used, and throughout the construction period as the construction activities and locations change. However, changes in noise levels depend upon a number of variables, the most significant of which include the following:

- The noise generated by plant or equipment used on site. This is either expressed as the equipments Sound Power Levels (SWL), or the resultant sound pressure level (SPL) at a given distance);
- The periods of time construction plant is operational;
- The distance between the noise source and the receptor; and
- The level of attenuation likely due to: ground absorption, air absorption, and barrier effects.

9.4.3 Construction noise predictions can be made based on the methodology outlined in BS5228: 1997 '*Noise and vibration control on construction and open sites*'. Construction noise levels are predicted as a 'free field' equivalent continuous noise level averaged over a one-hour period ($L_{Aeq,1h}$), and then subsequently averaged over a 12-hour working day to give the $L_{Aeq,12h}$.

9.4.4 Whilst the exact methods of working would be determined by the appointed contractor it is anticipated that some crane operations would be required. It has been assumed that some piling of foundations would also be required. In the absence of specific information regarding the proposed construction plant and activities, it is possible to assess the potential construction noise impacts using the methodology set out in BS5228 in conjunction with general information regarding proposed activities.

9.4.5 Advisory Leaflet (AL) 72 noise control on building sites while Department of Environment Property Services Agency (1976), gives advice on maximum levels of construction site noise at residential locations during daytime hours. The leaflet states that the noise level outside the nearest occupied room should not exceed 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise. This increases to 75 dB(A) for urban areas near to main roads.

9.4.6 Table 9.2 displays the estimated Sound Pressure Levels from various items of plant and construction equipment at distances of 10m and 1km. 1km is the approximate distance from the centre of the site to the nearest NSR.

Table 9.2: Sound pressure levels associated with typical construction activities

Construction Activity/Associated Plant	Typical Sound Pressure Level, dB(A) at 10m	Estimated Sound Pressure Level, dB(A) at 500m
Site Preparation		
Dozer	75	41
Tracked Excavator	78	44
Wheeled Backhoe Loader	68	34
Excavation		
Dozer	81	47
Tracked Excavator	79	45
Loading Lorry	80	46
Articulated Dump Truck	81	47
Rolling and Compaction		
Roller	79	45
Vibratory Plate	80	46
Piling		
Hydraulic Hammer Rig	89	55
Large Rotary Bored Piling Rig	83	49
Welding/Cutting Steel		
Welder (Welding Piles)	73	39
Generator for welder	57	23
Cutter (Cutting Piles)	68	34
Other		
Large Lorry Concrete Mixer	77	43
Concrete Pump (Discharging)	67	33
Tower Crane	77	43
Total	-	59

9.4.7 The sound pressure levels shown are worst-case estimates based on attenuation over flat/hard ground, and assume all plant running simultaneously. Any screening or ground absorption could further reduce the level at the receptor.

9.4.8 Considering the temporary and changing nature of the proposed construction work, and without specification of the exact plant to be used, it is not possible to predict precise levels at the NSR locations. On comparison the worst case predicted construction noise level exceeds the measured L_{Aeg} noise level at NSR locations 2, 3 and 4 by around 10dB. However, this worst case predicted exceedance is well within accepted limits for construction noise, and is therefore considered to be of only minor significance.

Operational impacts

Increased Road Traffic Noise

9.4.9 Noise from increased levels of road traffic as a result of the proposed development has the potential to impact upon existing receptors. The DMRB states that an 'overnight' increase in traffic flow of 25% (assuming all other factors remain unchanged, i.e. traffic speed) would produce an increase in traffic noise of 1 dB or less. An increase in the road traffic noise of 1 dB would make a negligible difference to the overall level of ambient noise in the area. Assuming no change in the nature of the sound it can be assumed that an increase in the level of ambient noise of less than 2dB is imperceptible to most people.

9.4.10 A study has been conducted of the traffic flow increase likely to be associated with the proposed Energy Recovery Facility. Table 9.3 presents the potential increase in heavy vehicles (HGV's) on current HGV numbers.

Table 9.3: Summary of predicted HGV traffic increase

Survey Site - Barry	Existing HVG Flows	Proposed Development HGV Traffic Generation (Two-way)	% Increase
Wimbourne Road	316	27	8.5%
Ffordd y Mileniwm	405	27	6.7%

9.4.11 The rise in overall traffic noise as a result of the Facility is therefore not considered to be significant.

Noise levels for proposed plant

9.4.12 At this stage specific noise levels for individual plant items are not available. Whilst the final plant selections will be made if the Facility proceeds, a noise model based on the expected plant has been generated to estimate the worst case noise that would be produced by the proposed plant.

9.4.13 The information presented in Table 9.4 has been provided from a report (Ref: 8012-GW-RP-001) prepared by Energos for a comparable facility.

Table 9.4: Summary of plant noise levels anticipated for use at the Barry site

Noise Source	Sound Pressure Level, dB(A)	Distance, (m)	Calculated Sound Power Level, dB(A)
Energy recovery Plant	72.0	25	108.0
Air Cooled Condenser	88.5	1	96.5
Intake Fan	71.1	2	91.1
Ventilation Outlet	79.8	2	93.8
Total	-	-	108.5

Prediction of Operational Noise Levels

9.4.14 The prediction of noise levels at the nearest sensitive receptors is based on an acoustic propagation model. The model has been created to estimate the contribution to noise levels from each major identified plant source, using the measured background noise levels as the project limits for the site. Corrections have been applied to account for:

- Distance propagation;
- Directivity effects of the sound source;
- Screening effects due to existing buildings, plant, or other proposed on-site structures; and
- Type of ground between source and receiver.

9.4.15 The model is intended to provide a worst-case assessment of the noise level likely to be experienced at each NSR location. A number of assumptions are made with regards to the noise control likely to be installed on major plant items, these being:

- Turbines are to be housed in individual acoustic enclosures, of heavy construction, specified at 85dB(A) Sound Pressure Level at 1m.
- Turbine filter and ventilation apertures are to be fitted with high performance silencers, and designed such that they face towards the existing plant or towards new plant such that all sensitive receptors benefit from screening and/or directivity corrections;
- Due to the impracticality of screening stack noise, discharge noise will be controlled using high performance silencers tuned to attenuate low frequencies from the turbine exhausts; and
- The model considers normal operational noise. As such, noise due to non-normal operation plant items has not been considered.

BS4142 Assessment

9.4.16 A BS4142 assessment has been completed using the measured background noise levels as the project noise limits for the site, and the calculated plant noise levels from the acoustic propagation model.

9.4.17 Equipment procured for use in the proposed Facility will be specified to ensure that the project limits are met.

9.4.18 This assessment has been made under the assumption that no emergency operations would be undertaken. Such operations could include noise events such as sirens, additional night operations, or any high noise activities outside the scope of the plant noise levels already listed.

9.4.19 Table 9.5 compares the predicted noise levels L_{Aeq} and measured background noise levels L_{A90} at each NSR location for the night time period. A tonal correction has not been applied to the noise sources due to the assumptions made.

Table 9.5: BS 4142 Summary table

NSR Location	Predicted Noise Level due to Gasification Plant (Rating Level) L_{Aeq} (dB(A))	Lowest Recorded Night Time Background Level L_{A90} (dB(A))	Night time Noise Level Difference dB
NSR Location 1 – Corner of St Mary's Avenue and Dock View Road	24	29.7	- 5.7
NSR Location 2 - Dyfrig Street	30	30.7	- 0.7
NSR Location 3 – Bendrick Road	30	38.5	- 8.5
NSR Location 4 – Y Rhodfa	28	28.5	- 0.5

9.4.20 In the semantics of BS4142, a difference of around +10dB or more indicates that complaints are likely. A difference of around +5dB is of marginal significance, and if the rating level is more than 10 dB below the measured background level then this is a positive indication that complaints are unlikely.

9.4.21 The results of the BS4142 assessment indicate that noise levels from the proposed Energy Recovery Facility are of less than marginal significance at all locations and that complaints from existing residents due to noise are unlikely.

Sites For Future Development

9.4.22 It has been indicated that there are four sites in the vicinity of the proposed Energy Recovery Facility that are to be developed in the near future. The locations of development sites A, B, C & D are identified on the site figure in Appendix I. Operational noise levels from the Energy Recovery Facility are predicted to be below existing background noise levels at all four sites, as such these development sites are not considered any further in this assessment.

Operational Vibration

9.4.23 It is predicted that on site vibration sources will include the following:

- Balanced rotating equipment, such as turbines; and
- Wind induced vibrations in the buildings and structures, if any, that could be transmitted to the foundations.

9.4.24 It is not anticipated that the level of induced vibration will be sufficient to propagate to the nearest sensitive receptors, the closest of which is approximately 1km from the centre of the proposed site. Hence the impact of operational vibration is not assessed further.

9.5 Proposed Mitigation Measures

Construction Mitigation

9.5.2 The proponent, will require its appointed contractor to minimise the impact of construction activities through the implementation of an agreed Construction Environmental Management Plan (CEMP) and proper communication with local residents. The CEMP will include the following issues:

- core site working hours would be established. Should it be necessary to work outside these core hours the prior agreement of the relevant Environmental Health Officer will be sought;
- specific method statements and risk assessments will be required for night working. In order to minimise the likelihood of noise complaints in such eventualities, the contractor would inform and agree the works in advance with the relevant Environmental Health Officer. Any potentially affected residents would be informed of the nature of the works and their likely duration. Furthermore, the residents will be provided with a point of contact for any queries or complaints;
- all vehicles and mechanical plant will be fitted with effective exhaust silencers and regularly maintained;
- inherently quiet plant will be used where appropriate. All major compressors will be sound-reduced models fitted with properly lined and sealed acoustic covers which would be kept closed whenever the machines were in use. All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- All ancillary plant such as generators, compressors and pumps will be positioned so as to cause minimum noise disturbance. If necessary, acoustic barriers or enclosures would be provided; and
- The contractor will adhere to the codes of practice for construction working and piling given in British Standard BS 5228:1992 and the guidance given therein minimising noise emissions from the site.

Operational Mitigation

9.5.3 Operational noise levels from the Facility are predicted to be suitably low and are not considered to warrant a noise mitigation strategy.

9.6 Conclusions

9.6.1 The impact of construction noise and vibration has been assessed and is considered to be of only minor significance at NSR 1, 2 and 3. However, these noise levels are well within accepted noise limits for construction.

9.6.2 The impact of predicted operational noise from the proposed Energy Recovery Facility has been assessed against background noise levels obtained during the baseline noise survey. The BS4142 assessment has shown that noise levels at all

NSR locations due to the proposed Facility are predicted to be of less than marginal significance, and that complaints from existing residents are unlikely.

9.6.3 The impact of increased traffic noise has been assessed, the predicted increases in traffic noise are not considered to be significant.

9.6.4 Overall the noise and vibration impact of the proposed Facility is considered to be of less than marginal significance.

9.6.5 Through careful plant design there are not considered to be any residual noise impacts associated with the proposed Energy Recovery Facility.

SECTION 10

TRAFFIC

10 TRAFFIC

10.1 Introduction

10.1.1 This Section of the ES addresses the transportation and highway issues related to the construction and operation of the proposed Energy Recovery Facility. It includes a traffic impact assessment to quantify the effect the plants operation on the local highway network.

10.2 Assessment Methodology

Legislation and Guidance

10.2.2 The following guidance documents have been taken into account in this assessment:

- Guidance on Transport Assessment – Department for Communities and Local Government and Department for Transport (DfT), 2007;
- Circular 02/99: Environmental Impact Assessment – Department for Communities and Local Government, 1999;
- Guidelines for Traffic Impact Assessment – Institute of Highways and Transportation (IHT), 1994;
- Guidelines for Providing for Journeys on Foot – Institute of Highways and Transportation (IHT), 2000; and
- Guidelines for the Environmental Assessment of Road Traffic – Institute of Environmental Assessment (IEA) / Institute of Environmental Management and Assessment (IEMA), 1993.

10.2.3 The Guidance on Transport Assessment states that:

'The LHA and/or the HA would require assessment of the environmental impact from any increase of traffic on the highway network where statutory limits might be breached. The same is true if any highway mitigation measures were to be proposed as a result of the development. Further details on environmental assessments can be found in Circular 02/99 published by the Department of the Environment, Transport and the Regions (DETR) in 1999 and available from the Communities and Local Government website.'

10.2.4 Whilst providing extensive guidance on the contents of the majority of an Environmental Statement, the Circular 02/99 referred to above does not contain guidance on conducting a traffic impact assessment. Therefore, older guidance from relevant Institutions has been used for the purposes of this assessment. The IHT's document *'Guidelines for Traffic Impact Assessment'* states:

'Some schemes will be of such size or nature that a formal Environmental Statement will need to be produced.'

'The Institute of Environmental Assessment (IEA) has recently published its own Guidelines (Reference 13) on how traffic from developments should be assessed. That report was

created in parallel with these Guidelines and is designed to be a complimentary document. The reader is therefore referred to the IEA document for details'

10.2.5 This traffic impact assessment has been conducted in accordance with the IEA/IEMA Guidelines. The Institute of Environmental Assessment has now become the Institute of Environmental Management and Assessment (IEMA) and will be referred to as such for the remainder of this section of the statement.

10.2.6 The following documents give relevant guidance on the proposed development in terms of planning:

- Planning Policy Guidance 13: Transport; and
- Vale of Glamorgan Adopted Unitary Development Plan (UDP) 1996 – 2011.

Methodology

10.2.7 The main considerations for a suitable scope of the assessment are contained in the IEMA guidelines. Two rules are contained in the guidelines and are recommended to be 'used as a screening process to delimit the scale and extent of the assessment'. They are as follows:

- Rule 1 – include highway links where the traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
- Rule 2 – include any other specifically sensitive areas where traffic flows have increased by 10% or more.

10.2.8 It is generally accepted that an increase of traffic of 10% is insignificant considering that daily variations in background traffic flows can fluctuate by this amount. Therefore, an increase in traffic flow less than 10% is assumed to result in no discernible or significant environmental effects.

10.2.9 The area of the local highway network likely to have a greater than a 10% increase in traffic flow, are the roads in the immediate vicinity of the site. Therefore, this assessment estimates the percentage increase that the HGV development trips have on the road network immediately adjacent to the site. Atlantic Way has been excluded from the assessment as it is a private road. The impact the HGV development traffic has on Wimbourne Road and Ffordd y Mileniwm will therefore be assessed.

10.2.10 A desk study was undertaken using maps and aerial photography to gain an understanding of the local highway network. This provided information regarding the existing conditions surrounding the site and aided the route choice process.

10.2.11 At this stage it is difficult to determine the exact number of HGV trips to and from the site as the plant is being planned as a merchant Facility and the waste sources are yet to be identified. However, BERL has provided an estimate of the number of HGV movements generated by the site. They have also specified assumptions regarding the type of HGV and amount of waste likely to be delivered. From this, the development HGV trip rates are calculated in section 10.4.13.

10.2.12 Vale of Glamorgan Council was approached regarding the availability of traffic flow information in the required assessment locations. However, a complete set of up to date data could not be provided therefore Count-on-Us were commissioned to conduct an Automatic Traffic Count (ATC) on the 3 June 2008. This provided classified (different vehicle types) traffic flow and speed information on Wimbourne Road and the adjoining stretch of Ffordd y Mileniwm over a 24 hour period.

10.2.13 Using the baseline traffic flows from the ATC survey and the estimated development HGV traffic, the percentage traffic impact on the local highway network can be found.

10.2.14 The IEMA guidelines indicate the following as potential traffic related environmental effects caused by the development:

- Noise
- Vibration
- Visual Effects
- **Severance**
- **Driver Delay**
- **Pedestrian Delay**
- **Pedestrian Amenity**
- **Fear and Intimidation**
- **Accidents and Safety**
- Hazardous Loads
- Air Pollution
- Dust and Dirt
- Ecological Effects
- Heritage and Conservation

10.2.15 Those factors highlighted in bold will be considered in this section of the ES as the factors not highlighted require specialist skills to assess. Therefore, they are considered in other relevant sections of this ES. The factors in bold are considered in relation to the IEMA guidelines as follows:

10.2.16 Severance – The IEMA guidance states the following regarding severance:

'Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery.'

'The measurement and prediction of severance is extremely difficult.'

'Changes in traffic flow of 30%, 60% and 90% are regarded as producing "slight", "moderate" and "substantial" changes in severance respectively.

10.2.17 Therefore, the percentage change in HGVs on the local road network will give an indication of the degree of severance, if any, caused by the proposed Energy Recovery Facility

10.2.18 Driver Delay – As the guidance states, the valuation of delays for road users is included in the transport economic evaluation of the Facility and is not usually carried out for a single development. The guidance also highlights the following specific points of the surrounding highway network where non-development traffic could be delayed by the addition of development traffic:

- *At the site entrance where there will be additional turning movements;*
- *On the highway passing the site where there is likely to be additional traffic and the flow might be affected by additional parked cars;*
- *At other key intersections along the highway which might be affected by increased traffic; and*
- *At side roads, where the ability to find gaps in the traffic may be reduced, thereby lengthening delays.*

10.2.19 The percentage change in HGVs on the local road network will provide an indication as to whether the above are likely to be a cause of driver delay.

10.2.20 Pedestrian Delay – The IEMA guidance states the following regarding pedestrian delay:

'Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads. In general, increases in traffic levels are likely to lead to greater increases in delay.'

10.2.21 Therefore, pedestrian delay is proportional to the percentage change in HGVs on the local road network, which will be quantified later in the assessment.

10.2.22 Pedestrian Amenity – Pedestrian amenity is broadly defined in the guidance as:

'the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition and pavement width / separation from traffic.'

10.2.23 It is also stated that:

'the significance of changes in pedestrian amenity would be where the traffic flow (or its lorry component) is halved or doubled.'

10.2.24 The degree of any change in pedestrian amenity can be estimated by the percentage change in HGVs on the local road network.

10.2.25 Fear and Intimidation – The IEMA guidance states the following regarding fear and intimidation:

'The impact of this is dependant on the volume of traffic, its HGV composition, its proximity to people or lack of protection caused by such factors as narrow pavement widths.'

10.2.26 A quantitative indication of how this will be affected will be provided by the percentage change in HGVs on the local road network.

10.2.27 Accidents and Safety – Due to the numerous local causal factors involved in personal injury accidents, the IEMA guidelines do not recommend the use of thresholds to determine significance.

10.3 Baseline conditions

10.3.1 The proposed site of the Energy Recovery Facility is in the docks area of Barry on the south western end of Atlantic Way.

10.3.2 Atlantic Way, a single carriageway road with several speed bumps in place along its length, connects with Wimbourne Road. This in turn connects with Ffordd y Mileniwm and the remainder of the Barry road network.

10.3.3 Security barriers are in place on Atlantic Way to control access to the docks. The land beyond these barriers is privately owned and therefore the traffic impact on this road will not be assessed.

10.3.4 It is assumed that the development traffic with the greatest impact to the local highway network will be the Heavy Goods Vehicles (HGVs) that deliver the waste to the plant. It is further assumed that the HGVs will be arriving at Barry using the trunk road network and the M4. The junction of the M4 in closest proximity to the site is Junction 33 to the west of Cardiff. From this junction, the shortest route to the site is via the A4232, A4050, The Barry Docks Link Road, Cardiff Road, Ffordd y Mileniwm, Wimbourne Road and Atlantic Way.

10.3.5 The nearest public transport link to the site is Barry Docks train station which is 600m away. However, as there is no longer a swing bridge over the mouth of the dock, the shortest route from the station is 2.5km.

10.3.6 All bus stops are further away from the site than the train station. Therefore, the distance to the nearest public transport link is larger than the threshold stated in the IHT Journey on Foot guidelines.

10.3.7 Whilst there is a suitable footpath for the entire length of Atlantic Way the site is approximately a 1km walk from the junction of Atlantic Way and Wimbourne Road. There are no residential areas within a 2km maximum threshold stated in the IHT Journey on Foot guidelines and PPG13.

10.3.8 A 5km catchment area for cycling includes many of the residential areas Barry. National Cycle Route 88 runs along Ffordd y Mileniwm. Therefore, good cycling routes are accessible from the junction of Wimbourne Road and Ffordd y Mileniwm.

10.3.9 The ATC survey data described in section 10.2.12 were used to derive the 12 hour two way traffic flows shown in Table 10.1.

Table 10.1 Existing Two-Way Traffic Flows (12 hour – 07:00-19:00 hours)

Survey Site	Total Traffic Flows (vehs)	HGV Flows (HGVs)
Wimbourne Road	4,743	316
Fford y Mileniwm	13,308	405

Sensitive Receptors

10.3.10 The methodology used in the assessment will adhere to that set out in the IEMA guidelines and will therefore focus on:

- Potential effects on local roads and the users of those roads; and
- Potential effects on land uses and environmental resources fronting those roads, including the relevant occupiers and users.

10.3.11 It should be noted that certain receptors such as school children, the elderly and other vulnerable road user groups are generally deemed to be more sensitive and will therefore be considered carefully.

10.3.12 Four criteria have been used in evaluating the significance of the effects of the proposed development.

- The type of effect, i.e. whether it is Positive, Negative, Neutral or Uncertain;
- The probability of the effect occurring based on the scale of Certain, Likely or Unlikely;
- The number of receptors e.g. population exposed to each effect, on a scale of High (e.g. at a regional or higher level), Medium (e.g. at a district level) or Low (e.g. only local populations); and
- The magnitude of the effect in relation to the frequency of the disturbance, using the scale High, Medium or Low.

10.3.13 Professional judgement has been used to assess the findings in relation to each of these criteria to give an assessment of significance for each effect. The significance of the effect is considered to be; Significant, of Minor Significance or Not Significant.

10.3.14 In terms of defining 'sensitive' areas according to the IEMA guidelines, the routes proposed for construction traffic in the vicinity of the Development Site are not considered to be specifically sensitive.

10.4 Assessment of Predicted Impacts

Construction

10.4.2 During construction vehicles will need to gain access to the site. The construction of the Energy Recovery Facility will generate insignificant volumes of traffic over a prolonged period. Any large or unusual vehicles required will use appropriate highway routes, at suitable time of day or night and will be given a police escort if necessary. The possibility of delivering unusual components by boat will be considered as the site is located in Barry Docks.

Operation

10.4.3 The Vale of Glamorgan UDP states that a development's Transport Proposals should:

'ensure that developments are accessible by means of travel other than the private car;'

'encourage greater use of public transport, cycling and walking;'

10.4.4 Therefore, access to the site by public transport, car sharing, cycling and walking should be encouraged. Due to the type of development, only the employees of the Energy Recovery Facility will need to be considered in the use of alternative modes. Although there is rail and water infrastructure nearby the site, it is assumed that HGVs using the local highway network is the only way to deliver waste to the site. Therefore, this section will consider the likelihood of plant employees being able to access the site by alternative modes.

10.4.5 Expanding the local public transport service to place a bus stop for employees within 400m is not financially viable due the low number of plant employees and the times at which they commute.

10.4.6 As the site has no residential areas within the 1.2km threshold, walking to work is not a viable option for employees.

10.4.7 Cycling to work will be a viable option for some employees of the plant as there are nearby links to the national cycle network as discussed in Section 10.3.8.

10.4.8 To further promote cycling as a viable means of transport for the employees 5 bicycle parking spaces, showers and changing rooms have been incorporated into the design as shown in Drawing P3706-BARRY-SK001.

10.4.9 The site will incorporate 18 car parking spaces (2 disabled) – 7 adjacent to the front entrance of the site and 11 abutting the workshop and office building. Car sharing would potentially reduce employee trips to and from the site. However, the majority of employees would work on a shift basis and therefore car sharing is considered an unviable travel option.

10.4.10 BERL have specified a 7.5MWe Energy Recovery Facility which will process 80,000 tonnes of residual waste per annum (tpa). It will operate 24 hours a day but will take delivery of waste during working hours as follows:

- 0700 and 1900 Monday to Friday

- 0700 and 1700 on Saturdays

10.4.11 BERL estimate that each delivery vehicle will carry 21 tonnes of waste. The vehicle loading and plant waste information can be used to calculate that there will be 11.3 daily deliveries of waste based on a 6 day working week. Wimbourne Road is a private road which provides access to the dock to HGVs. However there is some permitted public use of the road as it provides access to the residential Bendrick Road and the Atlantic Trading Estate.

10.4.12 It is assumed that the ash residue produced by the plant is 20% of the waste input. Consequently, 16,000 tpa of ash would required to be removed from the site. Information provided by BERL indicates that the vehicles removing the ash would carry 26 tonnes per load which would give a daily traffic generation of 1.8 movements.

10.4.13 A summary of the plants daily deliveries and removals, and the calculation of a total daily two-way traffic generation estimate is shown in Table 10.2.

Table 10.2: Traffic Generation Summary

Survey Site	**HGV Deliveries / Removal**	**Two-way Traffic**
Articulated Trucks delivery to the site	11.3	22.6
Ash residue removed from the site	1.8	3.6
Total	**13.1**	**26.2**

10.4.14 Table 10.2 shows that it is estimated that the plant will generate 27 two-way HGV trips during a 12 hour weekday.

10.4.15 The percentage impact that the proposed development HGV traffic has on the local highway network is summarised in Table 10.3. This assumes that all operational HGVs use the chosen site access route described in Section 10.3.4.

Table 10.3: Predicted Impact of HGV Traffic

Survey Site	**Existing HGV Flows (HGVs)**	**Proposed Development HGV Traffic Generation (Two-way)**	**% Impact**
Wimbourne Road	316	27	**8.5%**
Fford y Mileniwm	405	27	**6.7%**

10.4.16 Table 10.3 shows that the percentage impact of the predicted development HGV traffic is 8.5% on Wimbourne Road and 6.7% on Ffordd y Mileniwm. Both of these percentage impacts are below the 10% threshold stated in the IEMA guidelines.

10.4.17 As the HGV percentage impacts are below 10%, there is no significant effect on the highway network. Therefore, there are no discernable or significant environmental effects in terms of severance, driver and pedestrian delay, pedestrian amenity, fear and intimidation, and accidents and safety.

10.5 Proposed mitigation measures

10.5.1 The assessment of predicted impacts has shown that the Energy Recovery Facility has no discernable or significant environmental effects caused by the traffic generation. Therefore no mitigation measures are required.

10.6 Conclusions

10.6.1 A traffic impact assessment has been conducted for the proposed Plant in Barry Docks. The assessment indicates that operation of the plant will result in a less than 10% increase in HGVs on the local highway network. The operational traffic has no impact on the local highway network greater than daily variation in traffic flows. This includes transport related effects such as severance, driver delay, pedestrian delay, pedestrian amenity, fear and intimidation, and accidents and safety.

10.6.2 No mitigation measures are proposed for either the construction or operational phases of the project.

10.7 Technical References

1. Guidance on Transport Assessment – Department for Communities and Local Government and Department for Transport (DfT), 2007;

2. Guidelines for Providing for Journeys on Foot – Institute of Highways and Transportation (IHT), 2000;

3. Guidelines for Traffic Impact Assessment – Institute of Highways and Transportation (IHT), 1994; and

4. Guidelines for the Environmental Assessment of Road Traffic – Institute of Environmental Assessment (IEA) / Institute of Environmental Management and Assessment (IEMA), 1993.

SECTION 11

WATER RESOURCES

11 WATER RESOURCES

11.1 Introduction

11.1.1 This Section assesses the potential impacts of the proposed development on the water environment. It describes the assessment methodology, outlines the existing conditions with respect to surface water and groundwater, summarises the existing site drainage provisions, and provides details of mitigation measures and residual effects.

11.2 Assessment Methodology

Overall Approach

11.2.1 The water environment is a vital component of the existence of living plants and animals. The Government has set standards for the protection of the water environment and is committed to maintaining, and where justified, improving the quality of the nation's drinking water, watercourses, groundwater and coastal waters. To achieve this, the assessment techniques described below are directed at maintaining the integrity of all waters likely to be affected by the proposed Facility.

11.2.2 The desk study for the Water Resources Section was conducted with regard to methodologies outlined in 'EIA: A Guide to Procedures' (DETR 2000)[1] and the requirements of Technical Advice Note 15: Development and Flood Risk (TAN 15)[2].

11.2.3 An assessment of potential impacts upon the water environment was undertaken in general accordance with the provisions of the Design Manual for Roads and Bridges (DMRB) Vol. 11, Section 3, Part 10 (Environmental Assessment Techniques)[3], and follows current best practice guidelines and standards.

11.2.4 In order to assess the potential impacts of the proposed development, baseline information relating to existing surface and groundwater conditions, abstractions, discharges, aquifers, groundwater protection zones, flooding and flood sensitive areas was obtained and reviewed. The existing conditions within the study area have been described using the following sources:

- Landmark Enviro**check**® Report No. 25314547_1_1 and historical plans, May 2008 (Appendix F);
- Environment Agency (EA) website indicative mapping;
- EA General Quality Assessment (GQA) scheme for the assessment of surface water quality;
- Tidal Flood Levels, Flood Zone Map, Water Quality Data attained from the EA[4];
- MAGIC data search website[5];
- Geological Survey Map of Great Britain, Drift Edition[6];

- British Geological Survey Map, Solid Geology Edition[7];
- Ordnance Survey 1:25,000 series, Explorer 151, Cardiff & Bridgend;
- Groundwater Vulnerability Map(8);
- EA Pollution Prevention Guidelines;
- Sewerage plans for the area supplied by Dwr Cymru Welsh Water (DCWW); and
- Sustainable Urban Drainage System (SUDS): A Manual of Good Practice (CIRIA/ C523)(9).

11.2.5 Following consultation with the EA, a Flood Consequence Assessment (FCA) was requested and has been included within Appendix J of this ES. A summary of flood implications identified during the FCA can be found in this Section.

11.2.6 This Section will consider and assess potential pollution issues during construction, modifications to current site drainage, the management, treatment and disposal of waste water and the potential for flooding.

11.2.7 This Section also presents proposed mitigation measures, as the exact nature of all effluents, including drainage systems, will be finalised during the detailed design phase of the project. The proposed Energy Recovery Facility will be engineered to adhere to the standards and limits set by the EA.

Study Area

11.2.8 The site is defined as the area within the boundaries shown in Figure 2.1. Water conditions are considered on-site and in the immediate surrounding area.

Legislative Framework

11.2.9 In Wales, water resources are protected and regulated through a number of Legislative instruments and guidance documents, including the following:

- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003(10), which brings into law the provisions of 2000/60/EC Water Framework Directive (primarily water management at river basin district level and implementation of River Basin Management Plans);
- The Water Resources Act 1991(11), which makes it an offence to cause or permit pollution of controlled waters;
- The Groundwater Regulations, 1998(12);
- The Surface Waters (Dangerous Substances) (Classification) Regulations 1992(13);

- DMRB Volume 11, Section 3, Part 10 – Road Drainage and the Water Environment (HA216/06); and

- TAN 15: Development and Flood Risk (2004), which advises on development and flood risk in relation to sustainability principles, and provides a framework within which risks arising from both river and coastal flooding, and from additional runoff from development in any location, are assessed.

Consultations

11.2.10 Consultation with following organisations was undertaken by Parsons Brinckerhoff in relation to this Section:

- EA Wales;

- Vale of Glamorgan Council– Local Planning Authority (LPA);

- Associated British Ports (ABP); and

- Dwr Cymru Welsh Water.(DCWW).

11.2.11 The EA was consulted in April 2008 via a Scoping Opinion request. In response, the EA made the following comments and observations with respect to the proposed Facility:

- The site lies entirely within Zone C2;

- A Flood Consequence Assessment is required for the proposed development in accordance with TAN 15 to demonstrate that the consequences of flooding can be acceptably managed;

- The risk of flooding is to be considered as part of the Environmental Impact Assessment (EIA); and

- There is no runoff restriction in place for site due to its proximity to the Barry Docks.

11.2.12 Further consultation with the EA was undertaken in June 2008 and the EA provided the following information:

- The site lies partially within Flood Zone 2 and partially within Flood Zone 3;

- Energy from Waste facilities are classified as 'Highly Vulnerable Development';

- 1 in 200 year tidal flood levels;

- 1 in 1000 year tidal flood levels;

- Climate Change levels;

- Flood Zone Map;
- Flood warming information; and
- Water quality sampling data.

11.2.13 Additional consultation with the EA was undertaken in August 2008 and the following information was supplied:

- Energy from Waste facilities are classified as 'Highly Vulnerable Development';
- Critical tidal flood level is 1 in 200 year plus climate change of 20 years; and
- Hydraulic modelling of the Cadoxton River is not required for project.

11.3 Baseline Conditions

Surface Water

11.3.1 There are no surface water features located within the site boundaries.

11.3.2 Existing surface water features identified in the vicinity of the site include the Cadoxton River, Severn Estuary, Breakwater Streams, and features of the Barry Docks, including the entrance channel, main dock gates, and Eastern Dock Wharf.

11.3.3 The Cadoxton River flows through the Atlantic Trading Estate via an open channel in a south-westerly direction before entering a culvert under Wimbourne Road, approximately 280m east of the site. This culvert marks the normal tide limit (NTL) of the Cadoxton River. The River then flows through the Black Rocks where it discharges into the Severn Estuary.

11.3.4 The East Breakwater Stream extends from the Cadoxton River at Black Rocks (immediately downstream of the NTL) in a south-westerly direction, and is located approximately 250m southeast of the site. The Cross Breakwater Stream lies to the East Breakwater Stream approximately 300m southwest of the site.

11.3.5 The site is also situated approximately 100m southeast of the Eastern Dock Wharf, 450m east of the main gates to Barry Docks, and approximately 370m north of the Severn Estuary. Barry Dock No. 1 is located approximately 450m to the west of the site. Barry Dock No. 2 lies approximately 100m west of the site, and Barry Dock No. 3 is located approximately 350m southwest of the site.

11.3.6 The proposed development lies approximately 240m and 485m northwest of the Hayes Point to Bendrick Rocks Site of Special Scientific Interest (SSSI). The Barry Island (including Cosmeston Lakes) SSSI lies approximately 920m southwest of the site.

Surface Water Flood Risk

11.3.7 Consultation with the EA has indicated that the site lies entirely within Zone C2, as defined by the development advice maps (dam). TAN 15 identifies Zone C2 as areas of the floodplain without significant flood defence infrastructure.

11.3.8 There are currently no flood defences (tidal or fluvial) within the vicinity of the site, operated or maintained by either the EA or Vale of Glamorgan County Borough Council.

11.3.9 The EA requested that a FCA be submitted to demonstrate the consequences of flooding can be acceptably managed, in accordance with TAN 15. The FCA is included in Appendix J.

Surface Water Runoff

11.3.10 The site is generally rectangular in shape and is lies in a northeast-southwest direction. Based upon the existing topography, surface water generally flows towards the centre of the site, and then exits in a north-westerly direction. On-site elevations range from approximately 12.5 mAOD to 7.5 mAOD.

11.3.11 As described in Section 7, the existing ground cover consists mainly of scrub and dense vegetation, and, according to historical development records, has remained in this condition since approximately 1994.

11.3.12 The EA has specified that there is no runoff restriction in place at the Barry site, due to its proximity to the Barry Docks.

Surface Water Quality

11.3.13 The EA reports on river quality in England and Wales, with data accessible via their website. Water chemistry and biology are classified on a scale of Grade A (very good) to Grade F (bad). Nutrients (nitrates and phosphates) are classified from Grade 1 (very low presence of nutrients) to Grade 6 (very high presence of nutrients).

11.3.14 The EA conducts on-going water sampling and testing at two locations along the Cadoxton River in the vicinity of the site. Location 1 is near the confluence of Cadoxton River with Cold Brook, located approximately 1.6km upstream of the development site. Location 2 is located near the confluence of Cadoxton River with Dinas Powys, approximately 2.1km upstream of Location 1.

11.3.15 A review of the water quality sampling data indicates that the Cadoxton River has an overall classification of Grade C (fairly good) at Location 1 and Grade B (good) at Location 2 between the years 2004 to 2006. Table 11.1 summarises the quality of the Cadoxton River at these two locations.

Table 11.1: Cadoxton River Water Quality Results

Determinant	Units	Location 1		Location 2	
		Average	Grade	Average	Grade
Ammonia	(mgN/L)	0.180	B	0.056	A

Copper	(µg/L)	82.28	Comp.	96.04	Comp.
Zinc	(µg/L)	11.85	Comp.	10.90	Comp.
Nitrates	(mg/L)	13.34	3	15.78	3
Phosphates	(mg/L)	0.23	5	0.15	4
pH Value	(unit)	7.82	Comp.	7.98	Comp.
Biochemical Oxygen Demand (BOD)	(mg/L)	1.60	B	1.73	B
Dissolved Oxygen (DO)	(% saturation)	82.28	C	96.04	A
Hardness	(mg/L CaCO3)	291		307	

Comp. = 'Compliant'

Surface Water Discharge Consents

11.3.16 The Enviro**check®** Report (Appendix F) indicates that there are no active or inactive surface water discharge consents registered to the site.

11.3.17 The report also indicates that there are eight active surface water discharge consents within approximately 1km of the site. The closest of these is located 283m to the west of the site. It is operated by MDH Tanker Cleaning Services Ltd. and relates to the release of combined sewage and trade discharge to Barry Dock No. 3.

11.3.18 Other active discharge consents in the area permit the release of final/treated sewage effluent, sewage effluent from a pumping station, trade effluent, storm sewage overflow, and unspecified wastes to the Bristol Channel, River Cadoxton, Barry Docks and Barry Outer Harbour.

Surface Water Abstractions

11.3.19 The Landmark Enviro**check** Report indicates there are no surface water abstraction licenses currently or historically associated with the site. In the surrounding area, however, there are nine operational surface water abstraction licenses (tidal, surface, or groundwater) identified within approximately 0.3km of the area. They are identified as follows:

- Three water abstraction licenses are registered to Evans & Reid Coal Company Ltd (coal depot) located 298m to the east of the site. The licences permit the abstraction of water from the River Cadoxton for dust suppression, top-up water and mineral washing activities;

- Three water abstraction licenses are registered to Apex Coal Ltd (coal depot) located 298m to the east of the site. The licences permit the abstraction of water from the River Cadoxton for dust suppression, top-up water, and mineral washing activities; and

- Three water abstraction licenses are registered to W Baker and Sons Ltd (flour mill) located 299m to the east of the site. The licences permit the abstraction of water from the River Cadoxton for dust suppression, top-up water, and mineral washing activities.

Existing Urban Drainage

11.3.20 Dwr Cymru Welsh Water provides public utility record plans, which show the layout of public foul, surface water, and combined sewer systems (if exist) within or in proximity to the site. Dwr Cymru Welsh Water indicates that no public foul sewers exist within the vicinity of the site. Associated British Ports (ABP) also confirm that no private drainage exists within the vicinity of the site.

Groundwater and Hydrogeology

11.3.21 A review of the Groundwater Vulnerability Map indicates that the site is underlain by a designated Minor Aquifer with variable permeability. Such features may comprise of fractured or potentially fractured rocks, which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although these types of aquifers do not produce large quantities of water for abstraction, these aquifers can be important for both local supplies and supplying base flow to rivers.

11.3.22 Local groundwater flow is likely to be influenced by the topographic slope in the area. The flow may be in a generally southerly direction toward the Bristol Channel, which represents the natural outflow of the groundwater system.

11.3.23 Groundwater was encountered by CS during formation of the boreholes at a depth of between 3 and 7.5m below ground level. Rest levels were between 0.63m and 3.26m below ground level generally within the Estuarine Deposits.

11.3.24 Based on the geological maps of the Barry area, the ground conditions beneath the site are likely to comprise of Mercia Mudstone Group (solid) overlain by Made Ground (drift), and are described in more detail below:

Solid Geology

11.3.25 The Solid geology underlying the site consists of structure-less red mudstones and siltstones with scattered evaporate nodules belonging to the **Mercia Mudstone Group**;

Made Ground

11.3.26 Information provided by the Envirocheck Report and the Vale of Glamorgan Council indicates that the site and proximal area are registered as a landfill site permitting deposition of inert, industrial, commercial and household wastes. Special Waste and liquid sludge was also permitted for deposition including asbestos insulation, PVC powder, PVC compound, nitrile rubber, latex PVC, latex nitrile and sludge. A Waste Management Licence (WML) exemption has also permitted further tipping of construction and demolition waste in order to increase the height of the land. The waste material is overlain by topsoil containing various anthropogenic components.

The site is densely vegetated with a mixture of grasses, brambles, ruderal plants and immature trees. There is also evidence of fly tipping.

11.3.27 The Phase II investigation undertaken by Capita Symonds identified Japanese knotweed on site. They also recommended that Made Ground and natural soils arising from excavations will require off site disposal. Made Ground was encountered in all of the boreholes and comprised ash, clinker, brick and concrete i.e. materials typical of construction waste but with some instances of polythene, railway sleepers and a pocket of white granular material. No environmental issues were raised during CS discussion of foundations, ground floor slabs, road pavement construction, buried concrete, drainage and mining/subsidence risk potential.

Contamination

11.3.28 The CS report concludes that no further action is required with respect to soil and groundwater contamination. Notwithstanding this conclusion, CS state that conditions may vary away from the CS exploratory hole locations. Therefore during development good working practices should be implemented as necessary throughout the construction period. CS consider of particular potential concern is the identification of asbestos in one of their trial pits (No. 107). Any excavations proposed in this area will need careful consideration of the potential hazards associated with this substance.

11.3.29 Levels of soil and groundwater contamination has been identified by CS investigations indicative of the site landfill and railway past use with some contaminants above CS screening criteria. There is a low risk that other areas of significant contamination could be present on the site in areas not covered by investigations completed to date.

11.3.30 CS consider that gas protection measures will likely be required in line with BS8485:2007.

Designations

11.3.31 A review of the Environment Agency website indicates that the development site is not situated within a groundwater Source Protection Zone (SPZ).

11.3.32 The site is not located within or adjacent to a Nitrate Vulnerable Zone.

11.3.33 The Site is under the protection of a Catchment Abstraction Management Strategy (CAMS), which aims to manage the quantity of water removed from the groundwater. Under this Strategy, industrial abstraction license holders may be required to suspended abstraction in drought conditions to maintain water levels for personal use.

11.3.34 The underlying ground conditions of the site, including the potential for groundwater contamination, are detailed within Section 7 (Ground Conditions) of this ES.

Recorded Pollution Incidents

11.3.35 The Enviro**check** Report indicates that there are no recorded pollution incidents to controlled waters sourced to the site. The report identified thirteen pollution incidents

to controlled waters recorded within 0.5km of the site. Of these, seven significant incidents occurred between 1991 and 1994. Most of the causes are unknown, but pollutants include diesel oil and farm effluent, deliberate effluent discharges, and crude sewage. The nearest pollution incident occurred 325m east of the site and involved the release of industrial solid waste to an unknown receiving water in 1991.

11.3.36 Six minor incidents are recorded between 1992 and 1998. A majority of the causes include the direct discharge of either paints/dyes or farm effluent. The nearest pollution incident occurred 325m east of the site and involved the release of an unknown pollutant to an unknown receiving water in 1992.

11.4 Assessment of Predicted Impacts

11.4.1 The proposed development may result in both direct and indirect impacts on the water quality, flooding, drainage and the hydrogeology of the study area. These are assessed in this ES, for both the construction and operational phases. Any impact may also extend beyond the site through indirect effects upon the wider catchment, particularly with regard to flood risk. DMRB Volume 11, Section 3, Part 10 HA216/06 describes potential impacts on the water environment, and those that will affect the proposals are highlighted in this section.

11.4.2 The proposed development is not located within a Site of Special Scientific Interest (SSSI), or within an Area of Outstanding Natural Beauty (AONB). The proposed works would not affect statutory protected areas of a geological nature.

11.4.3 The construction of the plant will require site clearance, installation of the drainage systems, foundations for buildings, and provision for on-site roads and parking areas, therefore, the Facility will directly impact the existing site. Post-construction much of the site will be hardstanding.

Flooding

11.4.4 A full FCA has been undertaken for the project and is included in Appendix J. The FCA was undertaken following the guidance and requirements of TAN 15. The FCA concluded the following:

- The proposed development is designed above the extreme tidal flood level (1 in 1000 year flood event).
- The tidal flap control structure at the downstream end of the Cadoxton River (located approximately 280m east of the site) provides a physical barrier to tidal influx. Providing that the integrity of the structure is maintained, and flood defence levels are maintained at least to the present levels, the proposed development site is not at risk from tidal inundation.
- The risk of overland surface water flooding from adjacent sites, site generated surface water runoff, and groundwater flooding is considered to be low.
- Appropriately designed drainage infrastructure, as well as the incorporation of sustainable drainage systems (SUDS) can reduce flood risk and other environmental damage, as well as minimise on-site storage volume, control surface water runoff, as well as provide natural water treatment.

- The preliminary design of the Energy Recovery Facility indicates that site egress is designed at 8.50 mAOD, which is approximately 440mm above the critical tidal flood level. This enables a safe exit to be made from the site.

11.4.5 The proposed Facility will alter the ground surface from being primarily scrub growth and dense vegetation to hardstanding, which will alter flooding and drainage patterns.

11.4.6 Construction methods can increase flood risk, as follows:

- temporary paved surfaces or roofed areas may increase the rate of runoff;
- ditch or drainage diversions may affect catchment characteristics;
- temporary bunding or material stockpiles may alter runoff from upstream areas; and
- large areas stripped of vegetation can increase the rate of runoff when compared with grassed areas (some provision for temporary surface water storage may be necessary).

11.4.7 Excavation during the construction phase may make the area vulnerable to flooding if on-site ground levels are reduced below the critical tidal flood level (see Table 2.8 of FCA). This may occur during site preparation and levelling, as well as during excavation and construction of foundations, service runs, and the waste/fuel silos.

11.4.8 Post-construction an increase in impermeable area will increase the proportion and rate of rainfall-runoff, which may cause a marginal increase in the risk of surface water flooding if the capacity is not sufficient in the existing drainage system. This may also increase the risk of flooding downstream of the receiving watercourse.

11.4.9 Flooding caused by surface water runoff in an un-drained area or across impermeable surfaces may also flood a road surface, particularly after intense storms.

11.4.10 Discharges to ground are also considered to be a possible source of flooding. Runoff from road surfaces may infiltrate and surcharge local groundwater and cause a local rise in the water table, which may lead to increased groundwater discharges. Water logging in the vicinity of the discharge system may also contribute to flooding.

11.4.11 Preliminary site layout drawings indicate that the site is designed at an elevation of 8.50 mAOD. To reduce the risk of flooding, final site elevations, and in particular roadways and site entrances, will remain above the 1 in 200 year tidal flood level (plus effects of climate changes) as a minimum (see Table 2.8 of FCA, Appendix J).

Drainage

11.4.12 The proposed Facility includes large areas of impermeable features such as parking areas, buildings, and roadways, which will generate surface water runoff. This variation in surface conditions from the existing situation may impact upon the local urban drainage system.

11.4.13 The construction of the proposed Facility may form a barrier to existing drainage routes from adjacent sites and thus altering local catchment areas and boundaries.

11.4.14 The EA has specified that there is no runoff restriction in place at the Barry site, due to its proximity to the Barry Docks.

11.4.15 Post-construction, during normal rainfall events, surface water will drain from impervious areas, such as hardstandings and roadways, then travel through the drainage system before discharging into the surrounding drainage channels. During heavy rainfall events, surface water will drain through the drainage system until the system is exceeded. Water will then be attenuated to control runoff rates, ensuring that the risk of flooding downstream of the site is not increased. Appropriately sized and designed storage lagoons, soakaways, and other SUDS techniques will be incorporated at the detailed design stage to attenuate surface water drainage. Attenuation areas identified in Figure 8.6 are indicative only, and will be refined during the detailed design phase of the project. The detailed design will ensure that any land proposed for soakaways has adequate permeability.

11.4.16 Advice from the EA indicates that the site must be drained by separate foul and surface water drainage systems, with all clean roof and surface water being kept separate from foul waste water. The existing sewer system that will service the development must have sufficient capacity to accommodate the additional flows generated as a result of the development, without causing pollution. Due to the distance to the nearest foul sewer foul discharges from the Facility will go to a cess pit. The capacity of the foul sewer system has therefore not been considered.

11.4.17 In line with EA recommendations all surface water drainage from parking areas and hardstanding will be passed through a suitably designed oil interceptor prior to discharge. Roof water will not pass through the oil interceptor. These requirements will be incorporated at the detailed design stage

11.4.18 Within normal plant operation, the air cooling condensers supply water to the quench pits. If a supply shortage occurs, surface water from haul roads and/or building roofs could supplement the quench pits. Supplemental water from these sources will pass through an interceptor prior to use. Further consideration of this option will be made during the detailed design.

Water Quality

11.4.19 Water quality can be affected through a discharge of dissolved heavy metals, hydrocarbons, and suspended solids into the water environment during construction. Pollution events may include the accidental spillage of fuels, lubricants, lime, and hydraulic fluids, as well as pollution due to vandalism, pumped discharges, herbicides, erosion, and wash waters from mobile pressure washers. Surface water runoff can become contaminated during basic construction practices, such as the disturbance of contaminated soils and through the use of heavy machinery.

11.4.20 There are a broad range of potential pollutants associated with routine runoff from operational roads and hardstanding. These may include combustion products of hydrocarbons, fuel and fuel additives, metals from wear of vehicle parts, lubricants, catalytic converter materials, and materials spread during gritting and de-icing operations. Particulate contaminants originating from vehicles can include carbon,

organic solids, rubber, plastics, grit, rust, metal filings, and asbestos. The severity of contamination can increase if runoff takes place after periods of drought.

11.4.21 The proposed Facility will result in relatively small increases in the volume of road traffic along the proposed access route. Whilst these increases in traffic volumes may contaminate surface water runoff the potential to increase water pollution beyond that already occurring as a result of traffic on the access road is considered to be low.

11.4.22 Post construction water quality can also be affected by pollution generated from routine cleaning or flushing-out of gullies or other entrapment structures. Spillages and run-off water from fire-fighting activities have the potential to cause vast damage to controlled waters. Appropriate control measures to prevent pollution will be identified prior to operation of the Energy Recovery Facility.

Hydrogeology

11.4.23 Spillage, incorrect storage of chemicals/waste materials, or unsuitable disposal activities can cause serious damage to groundwater resources especially during the construction phase when the underlying ground surface is exposed. EA Pollution Prevention Guidelines indicate chlorinated solvents are the most widespread and severe cause of groundwater pollution. Special care will be taken when handling these chemicals.

11.4.24 Localised dewatering may be required during excavations (e.g. construction of Waste Reception Hall, site levelling, etc.). Given the number of water features in proximity to the site, groundwater may be shallow. Waste water will require discharge to a suitable receiving environment, or be taken offsite.

11.4.25 Post-construction, the majority of the site will be covered by hardstanding/roadways, therefore, there will be a restricted pathway to the underlying geology.

11.4.26 Discharges to soakaways are generally acceptable outside of any identified Source Protection Zone (SPZ); however, the possible installation of soakaways may require investigation before being permitted. Such investigations would be undertaken during the detailed design phase if required. Soakaways or other drainage systems that discharge into the ground may impact upon groundwater resources if they become contaminated with soluble contaminants or particulates.

11.4.27 Although acute groundwater pollution from roads is rare, mobile pollutants such as fuels or pesticides can cause widespread harm if they enter the groundwater system. Containing the spread of such pollutants can be extremely difficult, as is remediating their affect on groundwater resources.

11.4.28 The proposed Facility includes a very high proportion of impermeable surfacing, which will increase the proportion of rainfall intercepted by hard surfacing. This will result in a reduction of groundwater recharge. Redistribution of the natural recharge may result in slightly lower groundwater levels and reduced groundwater flow adjacent to the Facility, which may affect the groundwater supply.

Impacts Due to Climate Change

11.4.1 The impacts of climate change pose a challenge and risk to operating authorities (e.g. Internal Drainage Boards [IDB], Local Authorities, and Environment Agency) and the

government. Impacts can include sea level rise, an increase in frequency, severity, and intensity of coastal storms, and rainfall event changes that affect urban surface water system flooding and flooding in fluvial catchments.

11.4.2 General guidance on climate change is available through publications such as The Flood and Coastal Defence Project Appraisal Guidance, FCDPAG3 Economic Appraisal, Supplementary Note to Operating Authorities - Climate Change Impacts[15], which was published by the Department for Environment, Food, and Rural Affairs (Defra). This publication states the effects of climate change on the environment, including indicative sensitivity ranges, which cover peak rainfall intensity and peak river flow, and sea level rise allowances.

11.4.3 An excerpt of the 'Indicative Sensitivity Ranges' table is included in Table 11.2 below.

Table11.2: Excerpts from Flood and Coastal Defence Appraisal Guidance: Indicative Sensitivity Ranges

Parameter	1990-2025	2025-2055	2055-2085	2085-2115
Peak rainfall intensity (preferably for small catchments)	5%	10%	20%	30%
Peak river flow (preferably for larger catchments)	10%	20%		

11.4.4 These allowances suggest that fluvial flood levels in the surrounding area may elevate by as much as 20% during the anticipated lifespan of the proposed Energy Recovery Facility. An excerpt of the 'Regional Net Sea Level Rise Allowances' table of the FCDPAG3 publication is included in Table 11.3 below.

Table 11.3: Excerpts from Flood and Coastal Defence Appraisal Guidance: Regional Net Sea Level Rise Allowances

Administrative or Devolved Region	Net Sea-Level Rise (mm/year)			
	1990-2025	2025-2055	2055-2085	2085-2115
Southwest England and Wales	3.5	8.0	11.5	14.5

11.4.5 These allowances suggest that tidal flood levels may elevate by between 3.5mm and 8.0mm above the predicted tidal flood levels at the site (as shown in the FCA) during the lifespan of the facility.

11.5 Proposed Mitigation Measures

11.5.1 All construction works will be undertaken in compliance with a Construction Environmental Management Plan (CEMP) to be produced by the construction contractor. The CEMP will also cover all work undertaken by subcontractors. The CEMP will:

- Define the roles and responsibilities of key staff such as the Project Manager and Environmental Manager, as well as all other staff and subcontractors working on the project;

- Set out requirements and procedures for environmental site inspections, monitoring, auditing and reporting of performance;
- Describe how the CEMP will be implemented on site, including training of and communication with site staff and subcontractors;
- Set out site working hours, site access arrangements and delivery routes;
- Provide specific control procedures for various aspects including but not limited t:
  (1) timing of the works and vegetation removal;
  (2) air emissions such as dust;
  (3) water management;
  (4) storage and handling of hazardous or polluting substances and waste;
- Methods of communication with the local community;
- Contact information for local residents;
- How plant and equipment are to be managed on site; and
- Emergency response and the reporting of environmental incidents.

11.5.2 General mitigation measures that may be required include:

- Appropriate spill kits, fire extinguishers, etc to be readily available on site and site operatives to be trained in their use;
- Oil storage tanks to be located on an impervious base provided with bund walls to give a containment capacity of at least 110 % of the tank volume. All valves and couplings to be contained within the bunded area;
- Any surface water used during the construction phase is to be passed through oil/grit interceptor(s) prior to discharge. Water inflows to excavated areas to be minimised by the use of lining materials;
- Measures to be taken to ensure that no leachate or potentially contaminated surface water be allowed to enter directly or indirectly into any underground strata or adjoining land;
- Provisions to be made so that all existing drainage systems continue to operate; and
- Designated ‘washdown’ areas will be identified;

Flooding

11.5.3 The proposed Facility includes the construction of significant areas of concrete hardstanding / roadways which will increase the proportion and rate of rainfall-runoff when compared with the existing 'Greenfield' conditions. On-site drainage, therefore, has the potential to cause a marginal increase in the risk of flooding in receiving watercourses adjacent to the site. This can be mitigated by appropriate and effective drainage design, which may include soakaways. Where possible, swale ditches and other SUDS drainage techniques will be incorporated into the drainage at the detail design stage.

11.5.4 Road levels, parking areas, and building floor levels on the site will be arranged in such a manner that essential buildings are not put at risk from site-generated surface water flooding, and that there is no increased risk of flooding to existing parts of the site or outside the site. A properly designed and sized oil separator(s) will control pollution originating from surface water runoff from the impermeable process areas.

Drainage

11.5.5 The EA has specified that there is no runoff restriction in place at the Barry site, due to its proximity to the Barry Docks. A volume of rainwater will be used as part of the process, the remainder will pass to a wetland area on site prior to discharge at 'Greenfield' rate. Figure 8.6 provides an indication of the wetland area. During detailed design further consideration will be given to the form of the wetland area in order to accommodate sufficient storage whilst maximising its potential to create habitat.

11.5.6 Rainwater harvesting is a process in which rain from roofs is collected and then stored (in a tank) until required for use. When required, the water is then pumped to the point of use. In the process, a volume of water is kept out of the storm-water management system, thereby helping to reduce flooding risks. During detailed design the possibility of utilising storm water in the process will be explored.

11.5.7 Permeable paving is a structural surface that allows water to pass straight through the pavement construction for temporary storage and dispersal into the ground or for collection.

11.5.8 New drainage systems will be designed and sized in accordance with current best practice to ensure that no flooding out of manholes results from storms of 1 in 30 year return period. In addition, the new drainage systems will be simulated under a 1 in 100 year design storm to determine which parts of the drainage system are likely to flood in such a storm event, and finished levels will be arranged so as not to place buildings at risk of flooding.

11.5.9 Under terms of the Water Resources Act 1991, the prior written consent of the EA is currently required for any discharge of sewage or trade effluent onto or into ground or surface water.

11.5.10 The proposed plant will be designed and engineered to ensure that all water effluents or discharges will be in accordance with the limits set by the EA. Foul discharges will go to cess pit. Any contaminated material will be disposed of to a suitably licensed landfill.

11.5.11 An oily waste water drainage system will drain all areas where oil spillages could occur. The design will incorporate oil interceptors and traps. These will discharge with other surface water discharges to the storm water discharge system. The discharge from each oil interceptor will contain no visible oil or grease.

11.5.12 Adequate oil interceptor inspection and maintenance facilities will be provided and the interceptors will be regularly emptied and de-sludged to ensure efficient operation. An appropriately licensed contractor will dispose of the sludge off-site.

11.5.13 All elements of the surface water treatment systems will be regularly monitored to ensure optimum performance and maintenance.

11.5.14 Preliminary design drawings of the Facility indicate a continuous surface elevation of 8.50 mAOD within the site boundary. To prevent on-site 'ponding', detailed design of hardstanding/roadway will include properly designed sloping, bunding, kerbs, etc. to ensure adequate drainage.

Water Quality

11.5.15 In general, standard good working practises will ensure that the quality of water discharging from the site during construction will have insignificant impacts on the water environment.

11.5.16 Post construction the proposed Facility will generate small increases in the volume of road traffic along the proposed access route, potentially generating contamination of surface water runoff. Outside the site boundary no mitigation measures are proposed as it is assumed that existing facilities have been designed to cope with the effects of increases in traffic volumes.

11.5.17 Where appropriate within the site surface water runoff will be mitigated through the use of vegetated drainage systems (described in DMRB Volume 4, Section 2, Part 1, HA 103/06[16]). When selected appropriately, designed and built, vegetated drainage systems reduce the pollution risks by treating the water running off the impermeable surfaces before it outfalls to the receiving watercourse. Vegetated systems can also enhance aspects of biodiversity within the water environment. Examples of these systems may include swales, ponds, wetlands, ditches, basins, silt traps, filter drains, and soakaways. Due consideration will be given to the use of vegetated systems at the detailed design stage. Figure 8.6 shows a wetland area, however, this design is indicative and will be reconsidered during the detailed design phase of the project.

11.5.18 The Environment Agency will set limits on the quality of water that is discharged from the site under the Environmental Permits which will be applied for during the detailed design phase of the development.

Hydrogeology

11.5.19 Localised dewatering may be required during excavations (e.g. construction of the waste/fuel silos and service runs). Any temporary dewatering required during excavations will be assessed in line with CIRIA 515, Groundwater Control Design and Practice[17], and the EA will be consulted with regard to any required discharge consents.

11.5.20 Under the terms of the Water Resources Act 1991, an Abstraction Licence may be required from the Environment Agency for the abstraction of water from any inland water or underground strata. This will be applied for prior to commencement of construction.

11.6 Conclusions

11.6.1 An assessment of potential impacts upon the water environment was undertaken in general accordance with the provisions of DMRB Volume 11 and following current best practice guidelines and standards. The potential water environment receptors include surrounding surface water features, underlying groundwater or aquifers, and flood sensitive areas. All surface water features are located at least 100m from the site and the site is underlain by a Minor Aquifer with variable permeability. The proposed Energy Recovery Facility will be constructed in such a way as to minimise flood risk to the building and will incorporate appropriately designed drainage so as to minimise flood risk to other sites in the vicinity. The EA's recommendations regarding the use of oil interceptors will be incorporated at the detailed design stage.

11.6.2 With incorporation of appropriate mitigation measures and the use of construction best practice impacts on water resources during construction are considered to be slight adverse, impacts during operation are considered to be not significant. Overall the impacts of the proposed Facility on water resources are considered to be not significant.

11.7 References

(1) Department of the Environment Transport and the Regions (DETR), *EIA: A Guide to Procedures*, 2000.

(2) Welsh Assembly Government, *Planning Policy Wales Technical Advice Note 15 (TAN 15) – Development and Flood Risk*, July 2004.

(3) Highways Agency, Design Manual for Roads and Bridges, Volume 11, Section 3, Part 10 – Road Drainage and the Water Environment (HA 216/06), May 2006.

(4) Environment Agency, Tide Flood Levels and Flood Map, June 2008.

(5) MAGIC (Multi-Agency Geographic Information for the Countryside), www.magic.gov.uk.

(6) Geological Survey Map of Great Britain, Geological Map Sheet 263 – Cardiff, Drift Edition, 1946.

(7) British Geological Survey, 1:50:000 Series, England and Wales Sheet 263 – Cardiff, Solid Geology Edition, 1986.

(8) Environment Agency Policy and Practice for the Protection of Groundwater, Groundwater Vulnerability Map Sheet 36 - Gwent, South & Mid Glamorgan, 1996.

(9) Construction Industry Research and Information Association, Sustainable *CIRIA C523: Urban Drainage System (SUDS): A Manual of Good Practice for England, Scotland, Wales, and Northern Ireland*, 2001.

(10) Water Environment (Water Framework Directive) (England and Wales) Regulations, 2003.

(11) Water Resources Act, 1991.

(12) Groundwater Regulations, 1998.

(13) Surface Waters (Dangerous Substances) (Classification) Regulations, 1992.

(14) Environment Agency Flood Mapping, www.environment-agency.gov.uk/maps/info/floodmaps/?lang=_e

(15) Department for Environment, Food, and Rural Affairs (Defra), *Flood and Coastal Defence Appraisal Guidance, FCDPAG3, Economic Appraisal Supplementary Note to Operating Authorities - Climate Change Impacts*, October 2006.

(16) Highways Agency, Design Manual for Roads and Bridges, Volume 4, Section 2, Part 1 – Vegetated Drainage Systems for Highway Runoff (HA 103/06), May 2006.

(17) Construction Industry Research and Information Association, *CIRIA C515: Groundwater Control - Design and Practice*, 2000.

SECTION 12

CUMULATIVE EFFECTS

12 CUMULATIVE EFFECTS

12.1 Introduction

12.1.1 This section describes the potential cumulative effects which could arise from the interaction of the proposed Facility and other developments in the study area. The EIA regulations seek that, as part of the environmental assessment process, projects should identify the potential for and assess, where present, the beneficial or adverse impact of cumulative effects in the wider environmental context.

12.1.2 This assessment aims to identify the potential for cumulative effects to occur during the construction and operation of the proposed Facility, and where possible, identify the possibility of significant impacts. In determining the possible significance of such cumulative effects the location and timing of the most likely developments has been taken into account. In relation to the temporal nature of cumulative effects, consideration has been given to whether the effect would be temporary or permanent and, if temporary, the probable duration.

12.2 Methodology

12.2.1 The EIA Regulations under which this ES is prepared do not contain guidance upon the methodology to be used for cumulative impact assessment. The cumulative assessment of the proposed Facility has therefore applied the guidance available in DMRB, IAN 81/06, Volume 11, Section 2, Part 5. The DMRB does not however stipulate any particular methodology and thus the assessments have been made using professional judgement and are qualitative.

12.2.2 The prediction and evaluation of cumulative effects is not straightforward as the interaction between schemes can be complex and subject to change if developments are delayed or postponed. Contributing to the complexity is the geographical proximity of other schemes as they may either be within the study area, or elsewhere in the region.

12.2.3 The significance of individual impacts on each receptor would play a role in the overall significance of the cumulative effect; a cumulative effect is likely to be as significant as the most significant contributory environmental impact. Therefore the cumulative impact is assessed according to the frequency of impacts upon receptors in the identified locality, as well as the significance of the impacts on each receptor.

12.2.4 The three main types of cumulative effects that could occur in relation to an Energy Recovery Facility are presented below. In each case the impacts may arise from the same Facility, or from different schemes or projects in the area.

- Multiple effects should be considered from the proposed Facility, and from different projects of the same or similar type, upon the same resource; such as the effect noise from industrial sources on a single community of receptors;
- Different multiple effects from the proposed Facility, and from other projects, upon the same resource; such as land take and damage due to hydrological change affecting several sites of the same habitat; and
- Incremental effects arising from a number of small actions, for example daily waste delivery traffic movements, developing over time.

12.2.5 Receptors are considered to be those environmental elements considered in this ES.

Study Area

12.2.6 The proposed Facility is a local scheme and thus the effects have been primarily assessed for site and its immediate environs.

Data Collection

12.2.7 This assessment is qualitative and is based on the available desk based information as well as references to fieldwork. Desk based information involved liaison with the local authority to identify other development taking place in the vicinity of the site. Information collected relates to project descriptions, their expected timelines and likely environmental impacts. General information about the sensitivity of the various environmental receptors has been obtained from baseline data elsewhere in this ES.

12.3 Other Developments / Potential Developments

12.3.1 In consultation with the Local Authority a number of potential developments have been identified as having potential to cause cumulative impacts in association with the Facility. A copy of correspondence with the Local Authority can be found in Appendix K. Developments identified as having potential to cause cumulative impacts are shown in Table 12.1.

Table 12.1: Other Potential Developments

Site Details	Description of Development	Timescale	Environmental issues identified
Site 1: South and East Quays	Development of approximately 2000 homes plus commercial properties.	Application not yet submitted.	No environmental information available.
Site 2: Land at Woodham Road, application for a 9MWe fuelled renewable energy plant.	Development of a 9MWe wood burning gasification plant which will generate electricity for export to the National Grid. Also has potential to generate CHP.	Planning Application submitted however further information has been requested by the LPA.	Planning Statement available. The document indicates all environmental issues will be addressed through compliance with relevant Permits and Legislation.

12.3.2 Whilst Site 1 is identified as scheduled for development an application has not yet been submitted, this therefore limits the information available as to the environmental impacts associated with the proposals. Professional judgement has therefore been used to identify the likely impacts associated with the development of Site 1.

12.4 Cumulative Impact Assessment

12.4.1 The assessment of cumulative effects has been developed from an assessment of impacts likely to occur during the operation of the proposed Facility together with an assessment of the impacts likely to occur as a result of the developments identified above.

12.4.2 At this stage timings and detailed construction methodologies for the Facility are not available, nor are those for the other developments, therefore cumulative impacts have not been considered for the construction phase of the project. The construction impacts associated with the Energy Recovery Facility (and indeed for the other developments) will be controlled using best practice techniques and a CEMP will be produced and implemented for the proposed Facility.

12.4.3 The predicted impacts arising from the operation of the proposed Facility, taking into account mitigation measures, have been summarised in Table 12.2. Where those impacts are to any degree positive (or beneficial) or neutral, they have not been included. However where impacts are predicted to be minor, moderate or major adverse, the topic has been identified and the likely impacts considered in relation to the other schemes identified in the vicinity of the proposed Facility.

Table 12.2: Cumulative Impacts Summary

Receptor	Location	Description of potential impacts
Air Quality – Ecological Receptors	Site 1: South and East Quays	It is unlikely that a cumulative impact upon the Ecologically Sensitive receptor will occur as a result of the development of Site 1 since the ecological receptors are outside the region of impact from the anticipated extra vehicular emissions.
Landscape – Landscape / Townscape and effect on views	Site 1: South and East Quays	Development of Site 1 is likely to increase the urban nature of the area. As with the proposed Energy Recovery Facility it is assumed that Site 1 will be developed to a high standard and this will go some way to reducing the impacts upon landscape / townscape. Without further information upon the nature and layout of the development proposed for Site 1 it is difficult to determine the effect on views. Whilst there is potential for some of the development to have views of the proposed Facility it is likely that other properties will have their views screened by properties closer to the development.
Air Quality – Ecological Receptors	Site 2: Land at Woodham Road, application for a 9MWe fuelled renewable energy plant	Information provided in support of the planning application indicates that emissions will be controlled via the sites Environmental Permit, detailed information was not included in the planning application for this site. There is potential for a cumulative impact to occur at the Ecological receptors, although this is likely to be along a limited stretch of the site. As a result of limited available information it has not been possible to quantify the impact. Professional judgement suggests that the cumulative impact is unlikely to increase above the current minor adverse impact currently predicted.
Landscape – Landscape / Townscape and effect on views	Site 2: Land at Woodham Road, application for a 9MWe fuelled renewable energy plant	The existing landscape within the Atlantic Trading Estate has been assessed as having a high capacity to accept change. It is assumed that as with the proposed Facility the development proposed for Site 2 would be of a high standard. In combination the developments have the potential to the impact on Townscape within the Atlantic Trading Estate.

Receptor	Location	Description of potential impacts
		Development of Site 2 would reduce the prominence of the proposed Facility by decreasing its prominence. Whilst the development proposed at Site 2 will be lower than the proposed Facility (14m for the building at Site 2 and 23.58m for the proposed Facility) it will help to reduce the prominence of the proposed Facility.

12.5 Conclusions

12.5.1 In consultation with the LPA, two proposed developments were identified in the vicinity of the application site which had the potential to generate cumulative impacts. Both sites lie within or adjacent to areas of existing development. The first proposal considered was for a residential development with some associated commercial development; a planning application had not been submitted for this development at the date of this ES and therefore environmental information relating to the proposals was not available. Professional judgement has therefore been used. The second development considered was for a Wood Burning Gasification Facility. A planning application has been submitted for this site and was viewed prior to undertaking the cumulative impact assessment. The planning application contained limited environmental information and again professional judgement has been used as to the likely environmental effects associated with the development proposed.

12.5.2 Due to the absence of construction information for either site, construction impacts could not be considered for cumulative assessment. Cumulative impacts were considered for environmental topics, included in this ES, which are likely to result in a negative impact (air quality - impacts upon ecological receptors and landscape - impacts upon landscape/townscape and effect on views). The assessment of the proposed Facility and the two developments considered indicates that although cumulative impacts may occur these are likely to be minimal at worst in the case of impacts to air quality and potential exists for a reduction in landscape impacts.

SECTION 13

IMPACT SUMMARY TABLE

13 IMPACT SUMMARY TABLE

13.1 Introduction

13.1.1 This Impact Summary Table (IST) has been developed specifically for the proposals to provide a summary of the impacts associated with each environmental element for the proposed Facility including mitigation measures. Table 13.1 considers impacts during both construction and operation of the proposed Facility.

Table 13.1: Impact Summary Table

Environmental Element	Description of impact		Level of impact
	Construction	**Operation**	
Air Quality	Potential exists for increased emissions associated with construction traffic. Potential exists for low levels of dust soiling upon nearby Geological SSSI.	Operational traffic impacts will be negligible. Potential odour problems will be addressed via mitigation measures and are considered to be minimal. Modelling indicates that process contribution to concentrations of all pollutants does not exceed 4% of the relevant target at any of the sensitive receptors. A stack height of at least 45m decreases air quality impacts to acceptable levels. Nitrogen deposition at adjacent ecologically designated sites is less than 2% of the critical load and has been deemed to be Minor Adverse.	Not Significant – Construction; Negligible - Operation
Ecology	Vegetation clearance could lead to direct loss of habitat, direct mortality, fragmentation of habitats and disturbance. Removal/treatment of Japanese knotweed is required prior to construction.	Landscaping scheme will provide habitat through use of native species of local provenance. Shrub, tree and marginal planting will be subject to a detailed Programme of Aftercare.	Not significant construction Slight Positive - Operation
Ground Conditions	Further studies are required to confirm the presence of contaminants within the ground. A Phase II investigation will be undertaken during detailed design. Potential exists for any contaminants present to impact upon construction workers, through ingestion, inhalation and dermal contact with contaminated soil, wind blown dust and vapours. Sulphates and sulphide has the potential to impact upon building foundations.	Post-construction, a number of the pathways are broken (ingestion, inhalation, dermal contact with contaminated soil, windblown dust and vapours).	Moderate Negative – Construction Slight Positive – Operation

Landscape	Temporary impacts are likely to occur as a result of construction equipment, particularly cranes. These will be most noticeable over short distances.	The proposed development will be a prominent feature in the surrounding landscape due to the large scale of the buildings in comparison to the adjacent industrial buildings. The upper buildings and emission stack would be visible from higher ground to the north and west (up to a distance of approximately 3km). However, vegetation, particularly along boundaries will have a screening effect. This will result in a permanent slight adverse impact on landscape character.	Moderate Adverse – Construction; Slight Adverse - Operation
Noise	Some construction noise is likely to affect receptors at locations 1, 2 and 3 (Corner of St Marys Avenue & Dock View Road, Dyfrig Street, and Bendrick Road respectively). However these are considered to be of only minor significance and will be well within the acceptable limits for construction.	The rise in road traffic noise is not considered to be significant. Increases in noise levels associated with the operation of the plant are not considered to be significant and are unlikely to give rise to noise complaints from existing residents.	Not significant
Traffic	Construction will generate insignificant volumes of traffic.	It is considered that there will be no discernable or significant impacts in terms of severance, driver and pedestrian delay, pedestrian amenity, fear and intimidation and accidents and safety as a result of traffic associated with the operation of the Facility	Not significant
Water Resources	Excavations (foundations, service runs, waste reception bunker etc.) may require de-watering. Water would be dealt with in an appropriate manner.	Surface water run off volumes are likely to increase as a result of the Facility. Mitigation measures will be incorporated into the design to ensure run off is restricted to 'Greenfield' rates. Reductions in infiltration of surface water may lead to a localised reduction in groundwater.	Slight adverse – Construction Not significant – Operation