Appendix 5: 2010 Planning Application Documents

PLANNING STATEMENT

CONTENTS:

APPENDICES: (submitted electronically on the Planning Portal):

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	SRB/003	Site Layout Plan
	SRB/004	Building Elevations
	SRB/005	Internal Layout
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APPENDIX II SUPPORTING DOCUMENTATION	SRB-A	Design and Access Statement
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	SRB-F	Groundsure Report Extract - Maps
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	SRB-H	Groundsure Environmental Data Report
	SRB-I	WRAP Wood Recycling Guide
	SRB-J	Flood Risk Assessment (RSK)

Document history:

Document Versions	Issue date	Status	Revisions	By	Checked by
1.0	24 June 2008	Draft	proof reading stage	MM	n/a
1.1	15 August 2008	Final	approved document	IH	MM
1.3	3 September 2008	Submitted	completed	AA	MM

1.0 INTRODUCTION

1.1 This document provides a detailed account of the planning application by Sunrise Renewables Limited ("the applicant") to install a Biomass Plant ("the plant") of up to 9MW capacity on land off Woodham Road at the Port of Barry. The plant will be fuelled by reclaimed wood arising from local recycling operations.

1.2 The application site is located on existing industrial land at the Port of Barry which is an established business and industrial area in the Vale of Glamorgan. The site location is shown on Drawing Nos. SRB/001 and SRB/002. The site will be occupied by the applicant under the terms of a lease with the landowner Associated British Ports.

1.3 Contact details for Sunrise Renewables Limited are as follows:

Contact: David Heath Title: Director
Address: Sunrise Renewables Limited, Warrington Business Centre, Gilbert Wakefield House, 67 Bewsey Street, Warrington WA2 7JQ

1.4 Oaktree Environmental Limited act as planning and environmental consultants for Sunrise Renewables Limited . Contact details are as follows:

Contact:	Marco Muia	Tel:	01606 558833
Title:	Director	Fax:	01606 861182
Address:	Oaktree Environmental Ltd Unit 5, Oasis Park, Road One Winsford Industrial Estate Winsford, Cheshire CW7 3RY		

1.5 The Biomass plant will be built and installed by Prestige Thermal Equipment. Contact details are included in the brochure submitted with the application as document reference SRB-E.

1.6 The site will provide a local source of renewable energy and will be available by appointment to members of the public and educational bodies to view the facility to enhance public knowledge of recycling and Biomass energy production.

1.7 During the preparation of this statement the advice given by national, regional and local planning policies and guidance documents has been taken into consideration. Detailed consideration of policies is addressed in the Policy Review document reference SRB-B.

1.8 The area which is the subject of this planning application is outlined in red on Drawing No. SRB/002. All references to 'the site' in this statement shall mean this area. No adjoining land is occupied by the applicant.

1.9 The benefits of the proposal are:

i. Reduction in disposal of wood to landfill.

ii. Additional outlet for recycled wood as a buffer against the fluctuating board mill and animal bedding market sectors for recycled wood chip.

iii. Contributes to national and regional targets for renewable energy provision as well as providing additional energy capacity.

iv. Contributes to reduction in carbon dioxide emissions.

v. Supply of energy to the grid equivalent to the annual usage of approximately 22,000 households (average household consumption in the UK is 3,300kWh).

vi. Reduction in vehicle movements to local landfill sites.

vii. Will utilise the latest technology available for biomass energy schemes providing a source of both heat (can be used up to 1km from the site) and electricity locally (via the National Grid).

1.10 All application documents have been submitted electronically via the Planning Portal. Paper copies are available from Oaktree Environmental at the address shown in paragraph 1.4 above.

2.0 APPLICATION PROPOSALS

2.1 The title of the application is

"Erection of New Industrial Building and Installation of 9MW Wood Fuelled Renewable Energy Plant"

The plant will be capable of pyrolysing up to 72,000 tonnes of wood per annum. This equates to approximately 216 tonnes per day, which will be sourced from wood recycling operations locally under a fuel agreement.

2.2 The plant will be operated during the following hours for the receipt of fuel and all other external operations, otherwise the plant will operate as a 24 hour process within the building:

Monday to Friday	07:00 - 19:00
Saturday	07:00 - 19:00
Sunday /Bank/Public holidays	08:00 - 16:00

2.3 The Biomass plant will operate and provide electricity to the grid 24 hours per day, with allowances for maintenance and breakdowns. The entrance gates will be closed upon the cessation of daily operations to ensure that there is no unauthorised access.

2.4 Adequate lighting will be provided within the building in addition to rooflights. Directional floodlights will be used externally after official lighting up times and their location will be agreed with the local planning authority prior to installation. Proposed locations are shown on Drawing No. SRB/004.

2.5 The site will be set out in accordance with and use the access/egress points shown on the site layout plan (Drawing No.SRB/003). Vehicle movements are addressed in Section 9.0 below. The site is already secured by a fence a round part of the perimeter, much of which is in disrepair. The site will be enclosed by new galvanised steel palisade security fencing and gates to a maximum height of 2.4 metres.

2.6 Operational space within the site is shown on Drawing No. SRB/003. There will be sufficient space within the building for the overnight storage of plant and equipment associated with operations.

2.7 The installation of the new Biomass plant is amongst the first of its kind in the UK and will result in the generation of a minimum of 8 local jobs based at the site and further jobs at the designated fuel supplier.

2.8 External plant and equipment on the site will be minimal and will consist of an exhaust stack for the gas engine exhaust, which will be a maximum of 6 metres above the ridge line of the building i.e. 20 metres. Additional modelling has indicated that the stack will be closer to 16 metres in height and further confirmation will be available following receipt of test data from the manufacturer in October 2008. The stack is shown on Drawing No. SRB/004.

3.0 ENVIRONMENTAL INFORMATION

3.1 Drawing No. SRB/001 shows the environment around the site and in particular the immediate neighbours. Desk top study information is presented in Document SRB-F which includes plans from the Groundsure Report showing other land uses and sensitive sites within 500 metres of the application site.

3.2 The site is partially vacant and occupied by a container storage and refurbishment operation.

3.3 The site is within an area affected by flooding and is within the indicative Zone 3 floodplain. RSK have prepared a flood risk assessment for the application (document reference: SRB-D) in liaison with the Environment Agency.

3.4 The site is not located over a groundwater Source Protection Zone (SPZ). In any event the site will not impact upon groundwater as any potentially polluting outputs will be discharged to foul sewer in accordance with the requirements of a trade effluent consent or removed from the site by vehicle.

3.5 An ecological survey is not required as the site is previously developed and consists only of a compacted hard standing surface which is not vegetated . There are no sites with sensitive flora or fauna having a statutory or local nature conservation designation within 500 metres of the site in the Groundsure Report. The nearest designated site is the SSSI named "Hayes Point to Bendrick Rock" at a distance of 616 metres from the site (SSSI 510 administered by the Countryside Council for Wales) and covering an area of 29 hectares.

3.6 The site has no clearly defined planning history but historical maps indicate that the following uses have occurred on the site:

1879: Undeveloped estuarine land and river bed of Cadoxton River
1898 to 1900: Land reclaimed to rail head, coal tip/loading dock
1920 to 1973: Railway engineering works/rail head
1989: Builder's yard

4.0 PLANT, EQUIPMENT AND INFRASTRUCTURE

4.1 The biomass feedstock will be provided by existing recycling and waste wood processing operations within a 15 mile radius of the site under the terms of a fuel agreement. The UK currently faces an over supply of waste wood for the types of reuse shown in the WRAP Wood Recycling Guide (Document SRB-I), resulting in large volumes of wood remaining in the landfill bound waste stream or provided to uses which are unsustainable.

4.2 The wood feedstock will be produced to specification at the site by appropriate chipping, shredding and screening plant equipped with magnetic separators to remove nails etc

4.3 The Biomass Plant requires an Environmental Permit (formerly a Pollution Prevention and Control [PPC]) permit from the Environment Agency, which will be submitted following determination of the planning application. For the purposes of this document all references to 'the site' shall mean the area of site allocated to the Biomass plant and the associated infrastructure, plant and equipment. The site is shown on Drawing No. SRB/002.

4.4 The plant layout is shown on Drawing Nos. SRB/003 and SRB/005. The specific plant to be installed is as follows:

Type of plant/equipment	No.	Function
Wood chipper	1	Size reduction of feedstock
Dryer	1	Reduction of feedstock moisture content
Grinder	1	Reduction of feedstock to <5mm size
3 MW pyrolyser	3	Heating wood waste to produce the raw syngas
Gas engine (1.5 MW)	6	Burning the refined gas to produce energy
Thermal oxidiser	1	Emissions abatement
Exhaust stack	1	Emits cleaned exhaust emissions from all engines

4.5 In addition to the above installation the plant will use mobile plant i.e. a loading shovel or grab as required.

4.6 A water bowser will also be available for use on site, mainly to keep dust to minimum on all vehicle running surfaces. A vacuum tanker/road sweeper or brush and shovel will be used to clean the site access road and the highway, although it is not expected to be required beyond the site construction phase.

4.7 The proposed building will be of steel portal frame construction, to be surfaced with micro profile or box profile cladding to all external elevations. The colour and specification of the panels will be agreed with the planning authority prior to construction. The roof will have rooflights to reduce the requirement for internal lighting.

4.8 The floor slab of the building will be surfaced with mesh or fibre reinforced concrete floor slab, the specification of which requires agreement with the Environment Agency and will be of sufficient strength for the tipping and storage of fuel and operating loading plant. The internal layout of the building is shown on Drawing No. SRB/005.

4.9 The building will be split into specific areas, the main subdivisions of which are summarised below and shown in further detail on Drawing No. SRB/005:

i. Storage and loading area;

ii. Fuel preparation area (chipper, dryer and grinder);

iii. Pyrolysers;

iv. Gas engines located within an acoustic enclosure;

v. Thermal oxidiser and exhaust stack;

vi. Switchroom;

The layout on Drawing No. SRB/005 is indicative only and the final layout will be subject to the design engineers specifications and calculations.

4.10 Vehicle access and egress to and from the site will not change and is shown on Drawing No. SRB/003.

4.11 All internal surfaces will drain to a sealed sump or foul sewer. External surfaces will drain to a sustainable surface water system and roof water will drain to a soakaway or be reused in the process.

4.12 Parking provision will be as agreed with the local planning authority. Initial provision is for 5 spaces plus 1 disabled space.

4.13 Details of the building design are discussed the Design and Access Statement submitted as document reference SRB-A.

5.0 SITE MANAGEMENT

5.1 The site will be inspected every day by a person who is familiar with the requirements of the planning and permit requirements for the site. All details of defects, problems and repairs carried out will be recorded in the site diary or on suitable forms agreed with the Environment Agency.

5.2 Detailed procedures for the maintenance of the Biomass plant, including breakdowns, spillages, accidents etc. are all regulated by the Environment Agency as part of the EP application process. The site will open for the receipt of fuel or for other essential operations during the hours listed in Section 2.0 above. Depending upon shift patterns there will be a requirement for approximately 8-9 industrial and office staff to support the new operation. Additional staff will be required for holiday cover. The list below details the staff structure required when the plant is fully operational:

Position	No.	Responsibilities
Site manager	1	Overall site management
Administrator	1	Off site at head office
Machine/plant operator	1	Operating loading plant/site supervision
Maintenance /plant operators	2	Plant supervision

5.3 The staff will be trained to supervise the Biomass plant. All operations on site will be carried out in accordance with the relevant requirements of the Health and Safety at Work Act 1974 and the company health and safety policy. Conditions of site use for employees, visitors and contractors will be available to all visitors who will be required to sign in and out of the site when making visits for any purposes. Minors and disabled visitors may be escorted around the building in a company vehicle to ensure compliance with the site rules. Anyone not complying with the conditions of use will be asked to leave the site.

5.4 Fire extinguishers will be kept on site to deal with fires and site staff will be trained in emergency procedures and the emergency services will be given a copy of site plans and contact names and numbers for emergency purposes. This will form part of the accident management plan required by the Environment Agency.

5.5 A first aid kit will also be kept on site and will be maintained to the standard required by the Health And Safety (First-Aid) Regulations 1981 and at least one person per shift will be a trained first aider.

6.0 RECEPTION AND HANDLING PROCEDURES

6.1 All vehicle deliveries will be pre-booked and drivers will report to the person responsible for site supervision upon arrival at the site. The load will be visually inspected before and during discharge to ensure that it meets the specification set out in the fuel supply contract.

6.2 Unsuitable loads will be rejected and loaded back on to the vehicle for delivery to another more suitable site and where necessary the Environment Agency will be notified. A skip will be available on site for waste generated as part of the process i.e. packaging, sweepings etc. All residues arising from the process will be dealt with as detailed in Section 9.0 below.

6.3 The fuel will be discharged directly into the building via the doors at the front of the building, which will be electrically operated roller shutters.

6.4 The site will be staffed at all times when it is open, to effectively supervise the reception and handling of fuel and removal of waste.

6.5 The wood fuel will be sourced from existing operations nearby to ensure that the correct sized fuel is produced. Other sources of wood fuel will be researched and contracts made where necessary to secure suitable material from other wood recyclers to protect against shortages in supply or breakdowns in the processing plant on site. The wood fuel accepted will be manufactured from clean wood, pallets, construction timber and other woods which have been removed from the construction and demolition waste stream locally. In short, the plant will process dry, non-hazardous batches of timber and wood.

7.0 ENVIRONMENTAL CONTROL - GENERAL

7.1 Site operations will be carried out to minimise the creation of dust. A permanent constant mains water supply will be available on site in all climatic conditions to ensure that the dust suppression systems can function effectively and all external water pipes are lagged to prevent frost damage during Winter months. Dust in the hopper and conveyor area will be controlled using a hand held water hose or vacuum extraction system.

7.2 The site staff will continuously monitor dust emissions whilst the plant is in operation and take appropriate action when required. In addition the site supervisor will visually monitor for dust emissions at the site perimeter at least twice daily to ensure that no dust blows off the site. Results of monitoring exercises will be entered into the site diary.

7.3 Water sprays and/or bowsers will be used to reduce dust levels on all external site surfaces where necessary. This particularly applies to site roads, storage, loading and unloading areas. Vehicles carrying potentially dusty loads off site will be securely sheeted or sprayed with water to reduce dust emissions.

7.4 Stockpiles will be located within the proposed building to ensure that vehicles leaving the site cannot track through the stored material to prevent deposit of debris on the highway. The deposit of material on the highway will be treated as an emergency and will be cleaned with a road sweeper if necessary.

7.5 Mud/litter on roads - The deposit of material onto the access road and highway is unlikely, however if it does occur during the construction phase, for example, it will be cleared using a road sweeper or hand picked in the case of litter.

7.6 Visual inspections of the site surface will be carried out daily and staff will report any problems with debris on the site surface immediately to the site supervisor. Vehicles will be visually inspected before exit to check that loads are safe and that no debris is carried out on the wheels or body of the vehicle.

7.7 Odour - No material will be accepted which is likely to cause an odour nuisance. Any loads which are malodorous will be rejected and the Environment Agency informed. The Biomass plant itself does not produce odorous emissions.

7.8 Vermin/insect/bird control - The proposed fuel types will ensure that the site will not suffer from a vermin infestation. However, given the proximity of water bodies the site will be inspected daily for the presence of vermin and the results of the inspection noted in the site diary or site inspection form. In the event that vermin are discovered on site a recognised pest control contractor will be hired.

8.0 THE BIOMASS PROCESS

8.1 The detail of the process is complex and outside the remit of this document. For land planning purposes we need to predict the potential impacts of the proposal in terms of emissions and outputs.

8.2 Drawings SRB/007 provides a simplified breakdown of the gas production process in the form of an energy flow diagram.

8.3 Photographs in the PTE brochure in (ref SRB-E) show the appearance of similar plant. The plant has been designed by a Welsh company, Hudol Ltd, with planning consent passed for 3 sites incorporating the technology i.e. Tythegston Landfill and Capital Valley in South Wales and Hooton on the Wirral. The two Welsh sites have been built and have permit applications before the EA, with the issue of both permits expected shortly. The sites are larger than this proposal. The technology has met the BAT (Best Available Technology) requirements of the permitting regime.

8.4 The wood to be processed must meet a uniform specification for effective gas production i.e. a moisture content of 10% after drying, free of contamination from litter, metals etc.

8.5 The process is in summary as follows:

i. Wood fuel at up to 35% moisture content is deposited into a hopper by a wheeled loading shovel which feeds a chipper which reduces the size of the wood prior to entry into the dryer.

ii. The dryer reduces the moisture content of the wood to 10% in preparation for the grinding process.

iii. The grinder reduces the wood chips further to a sub 5mm feedstock. Excess heat from the engine exhausts is used in the drying process.

iv. The fine feedstock is delivered to a silo which enables a constant feed to the pyrolysers.

v. The pyrolysers operate on a ... principal.... which evolves the raw syngas from the wood fuel, which provides a constant fuel for the gas engines with the residual gas stored in the syngas buffer tank to regulate the gas flow to the engines.

vi. The engines burn the gas to produce electricity.

vii. The engines transfer electricity to the grid via an alternator, transformer and substation.

8.6 The applicant is also investigating the feasibility of reusing the waste thermal energy to heat adjoining offices and buildings. The conversion of energy in biomass to producer gas is 80%.

8.7 The gas engines are compressed natural gas and combined heat and power engines. Each engine is in an acoustic enclosure to reduce noise to a minimum. The whole process is controlled from a computerised control room where all temperature and pressure sensors provide a visual display for the operator to regulate the process.

8.8 Output calculations/projections are based on the maximum annual throughput of 72,000 tonnes of fuel and 52 weeks' operation as a 24 hour process (8,000 operational hours out of 8,760 hours per year).

i. Input tonnages used to calculate the outputs are:

Hourly - 9 tonnes; Daily - 216 tonnes; Weekly - 1,512 tonnes

ii. The pre-processing of wood waste to produce fuel off site removes the need to store large volumes of contamination such as ferrous, non-ferrous metals, plastics and fines etc.

iii. The figures given below for char and ash is combined because the plant has a combined collection bin. Both can be used for manufacturing such as building block manufacture. The char may be reintroduced back into the process or sold as filter media.

iv. The particulates from any filter/abatement equipment produce a low volume of residues which will be bagged or discharged to sealed containers for landfill disposal unless a recovery option can be used.

v. The stack (exhaust) will have no visible air emissions as particulates will be controlled using the abatement equipment agreed with the Environment Agency. The process does not use hot water to produce steam and all water involved in the cooling process will go to sewer.

8.9 In summary the main emissions / outputs are:

i. Ash/ char
ii. Condensate
iii. Filtration solids similar to ash.
iv. Steam/heat
v. Exhaust gases

8.10 The table below gives approximate figures for process outputs based on the throughput and operational hours stated in the previous paragraphs:

Table 8.1 - Process input requirements and outputs

Type	Quantity required or produced			Notes
	Hourly	Daily	Weekly	
Wood fuel	**9 tonnes**	**216 tonnes**	**1512 tonnes**	**totals assume constant operation**
Water feed input requirement	**4.5 m^3**	**108 m^3**	**756 m^3**	**26 m^3 initial fill required, additional moisture from wood**
Total recirculating cooling water	**67 m^3**	-	-	**@ 30 to 40^{O}C**
Drainage/condensate	**0.75 m^3**	**18 m^3**	**126 m^3**	
Char / Ash	**270 kg**	**6.48 tonnes**	**45.36 tonnes**	**3%**
Filter residues/ abatement residues (particulates)	**< 1 tonne**	**< 1 tonne**	**< 1 tonne**	**n/a**

9.0 TRAFFIC MANAGEMENT, ACCESS AND NOISE CONTROL

9.1 Access to the site will be gained from the surrounding road network as shown on Drawing No. SRB/001. Car parking space will be adequately provided for as shown on Drawing No. SRB/03. There will also be adequate space within the building for the overnight storage of plant and equipment.

9.2 Wood fuel will be delivered to the site during the hours of 07:00 to 19:00 i.e. a 12 hour day. The site gates will be closed to vehicular access outside these hours with only authorised personnel on site to open the gates for emergency and regulatory access.

9.3 The daily fuel requirement of the plant will be a maximum of 216 tonnes and the loading bay within the building will have up to 3 days' storage capacity (approximately 650 tonnes) to ensure constant availability of fuel. The plant can be shut down if no fuel is available but down time, other than for planned essential maintenance, is costly and reduces the overall electricity generation.

9.4 As the fuel is processed within the building it will be delivered in bulk vehicles with a payload of between 15 and 20 tonnes. For ease of calculation and as a worst case scenario an average of a 15 tonne load is assumed, which gives a net requirement of 15 loads of fuel per day. Over a 12 hour working day the deliveries equate to an average of less than 2 deliveries per hour. Even if deliveries were restricted to weekdays there would be 20 loads per day maximum i.e. less than 2 per hour. The surrounding road network has sufficient capacity to meet these movements. However, the applicant has agreed to unload a minimum of 20,000 tonnes of wood by boat at the dock facility, which will save over 1,333 vehicle movements. This is likely to reduce the weekly input by road by 385 tonnes i.e. 20 - 25 vehicle movements per week. Over the entire year the inputs by road are expected to be between 50 - 67 loads per week i.e. 10 - 13 per day for a 5 day week.

9.5 The additional 3 days' storage capacity will be built up during commissioning and will be topped up by an additional 2 loads per day over a month long period after which movements will reduce to normal.

9.6 It is anticipated that in addition to staff cars approximately 4 cars (8 movements) will visit the site during a normal working day.

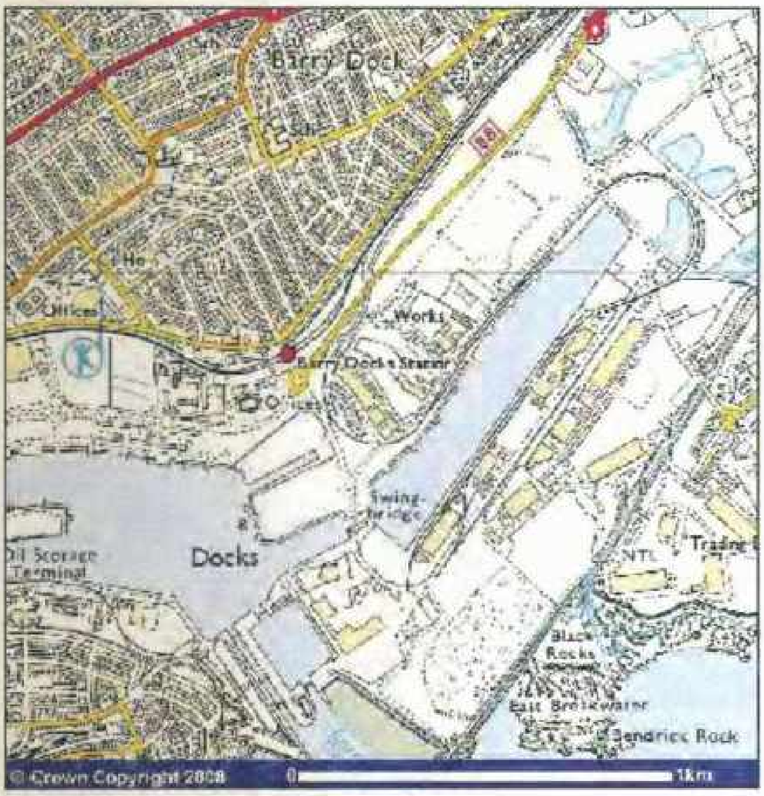
9.7 The best practicable means will be used in all waste handling and other operations to ensure that noise levels do not exceed agreed levels. The enclosure of the process entirely within the building and location of the storage bay within the building will ensure that noise levels are not significant.

9.8 The plant has been designed to meet the BAT (Best Available Technology) requirements of the Environmental Permitting regime, which include noise emissions controls. The gas engines produce the most noise, hence their enclosure within an acoustically screened compound within the building. The engine enclosure has been designed to meet a specification of 80 dB @ 1 metre outside the enclosure within the building. Additional attenuation (reduction) of 40dB will be provided by the insulated outer skin of the building.

9.9 The plant as a whole inside the building is designed to meet 85 dBA @ 1 metre. These levels within the building are lower than many other industrial operations. The roller shutter doors will not remain open at all times and will be opened as required for deliveries.

9.10 Emissions data is included in the case studies enclosed with the application. The site will not impact upon local air quality because its emissions must meet the limits set in the Environmental Permit. Some characterisation of emissions has been carried out at this plant and details are enclosed in Document reference SRB-F. The application plant must be compliant because the number of pyrolyser which form the process place it within the Environmental Permitting regime enforced by the Environment Agency (3MW +) rather than the local Environmental Health Department (<3MW). Gaining a planning consent does not authorise the operation, it must still have a permit and agreed abatement technology before it can operate. Not only does the plant have to meet strict emission criteria it must also be the Best Available Technology (BAT) for the use.

Ordnance Survey



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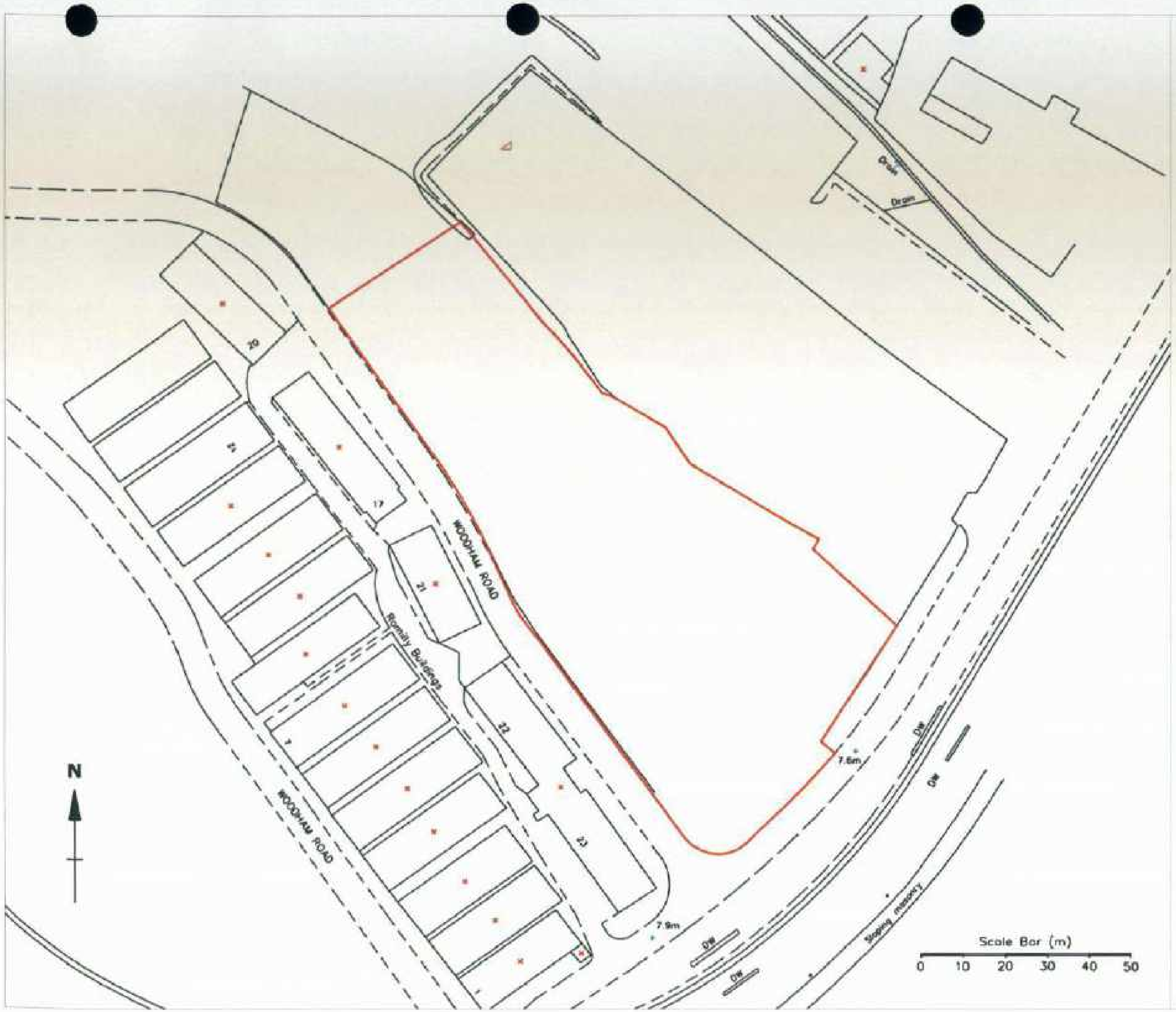
Drawing No.	SRB/01	**Date**	06 August 2008		
Revision	A	**Prepared by**		IH	
Title	Site Location Map				
Scale	as shown				
Client	Sunrise Renewables				
Site	Barry Docks, Barry				

Oaktree Environmental Ltd

Unit 5, Oasis Park, Road One, Winsford Industrial Estate,
Winsford, Cheshire CW7 3RY
Tel: 01606 558833 Fax: 01606 861182
e-mail: sales@oaktree-environmental.co.uk



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Title: SITE LOCATION PLAN

Drawing No: SRB/02

Client: Sunrise Renewables Ltd

Site: Woodham Road, Barry

NGR:

Date: 5 September 2008

Printed At: A4

Scale: 1:1,250

Revision: A

Drawn By: RS

Checked:

KEY:

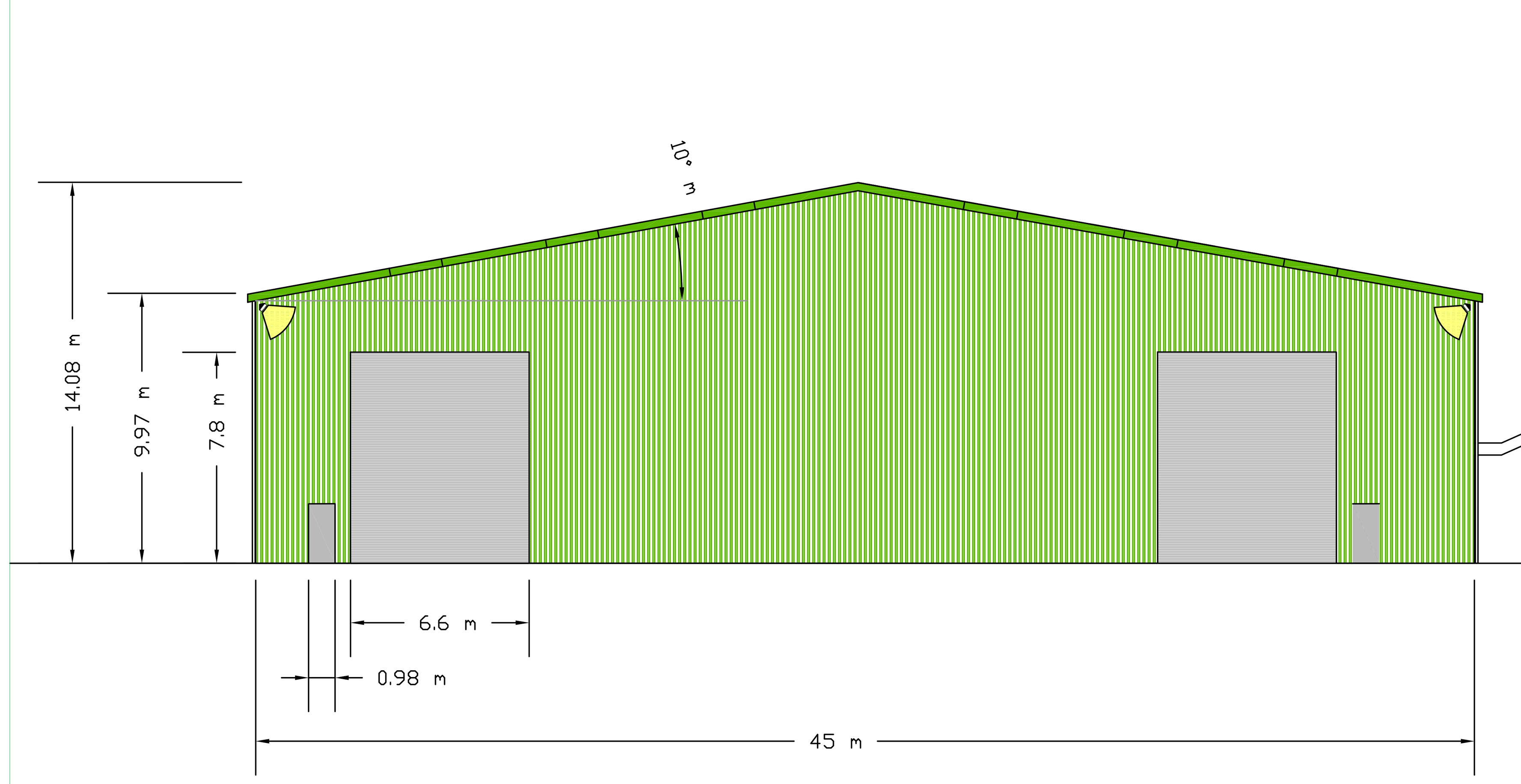
— = Application Site

Notes:

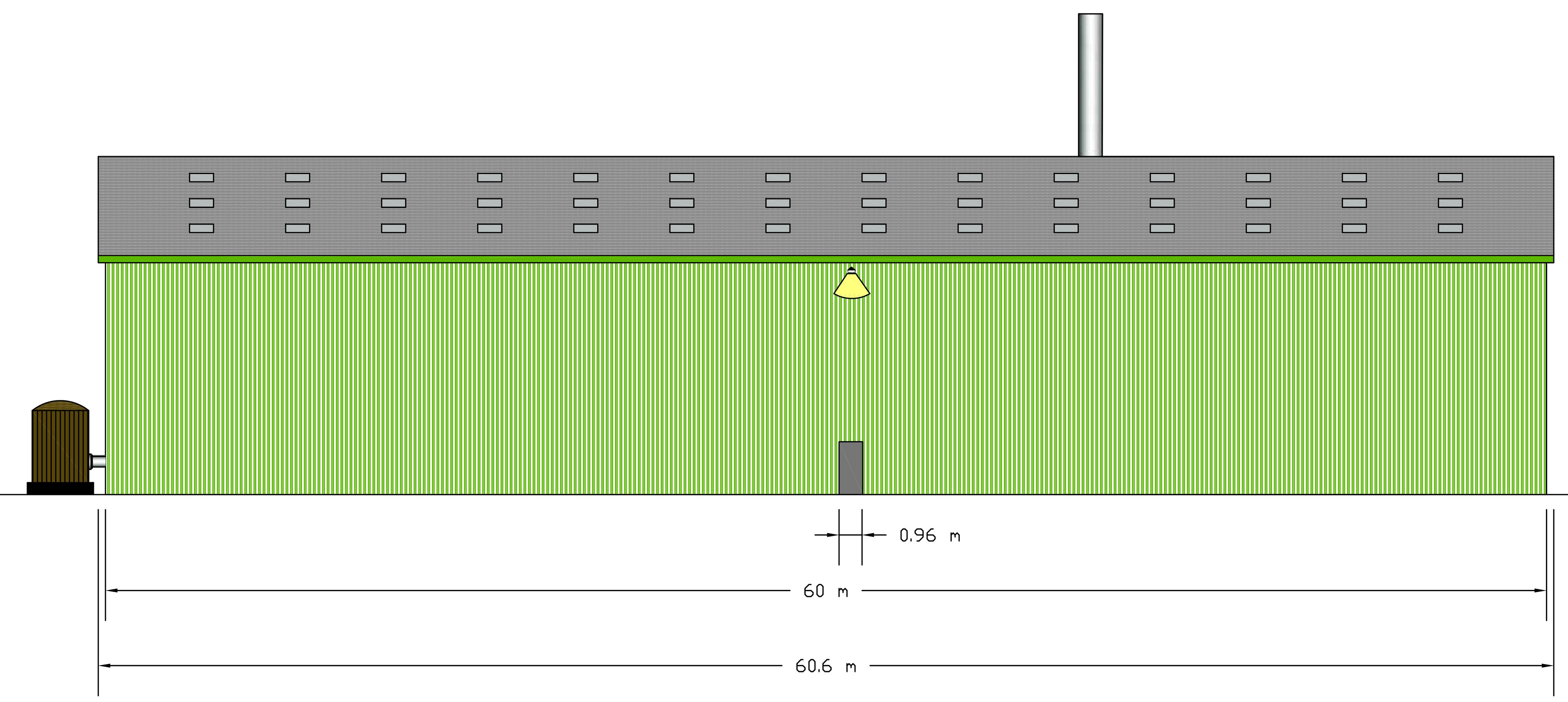
Revision Details:

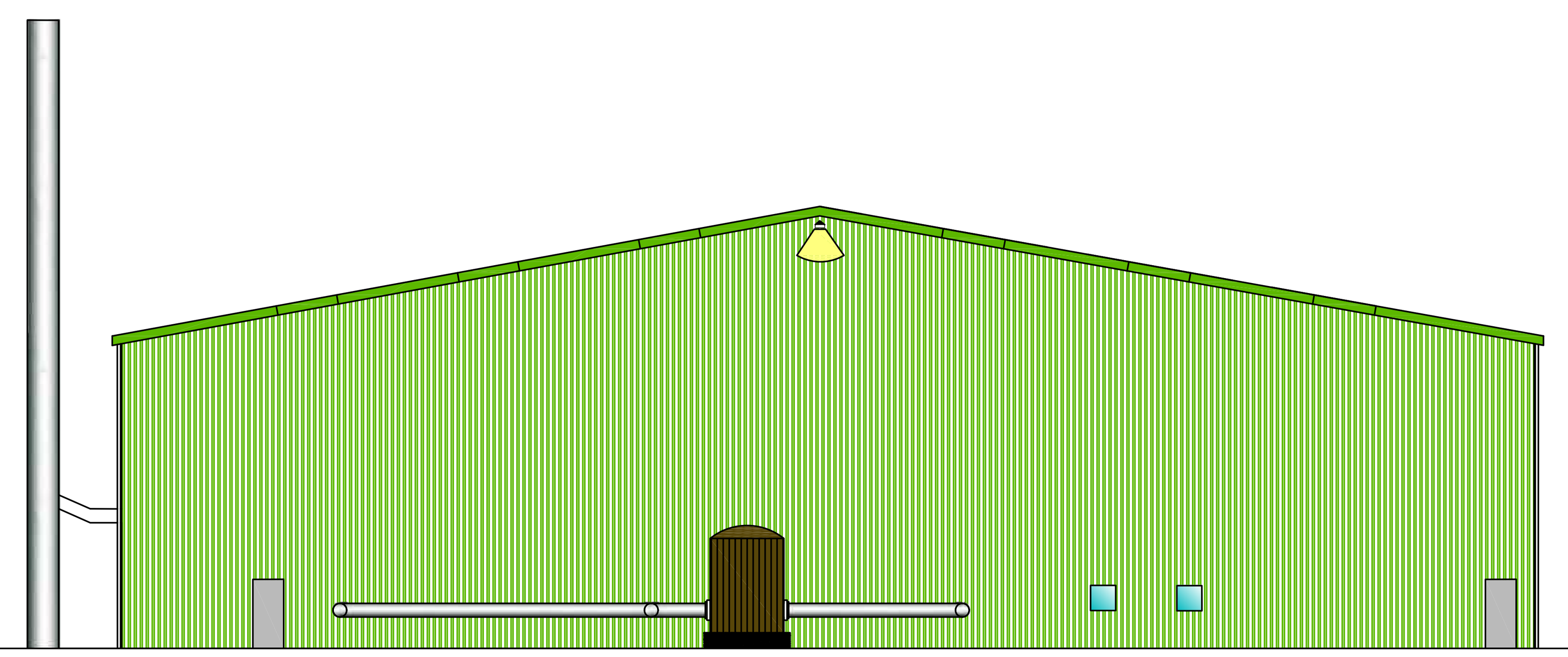
Rev	Description	Date
–	First Draft	14/08/08
A	Application copy	05/09/08

a) front elevation (from the south)

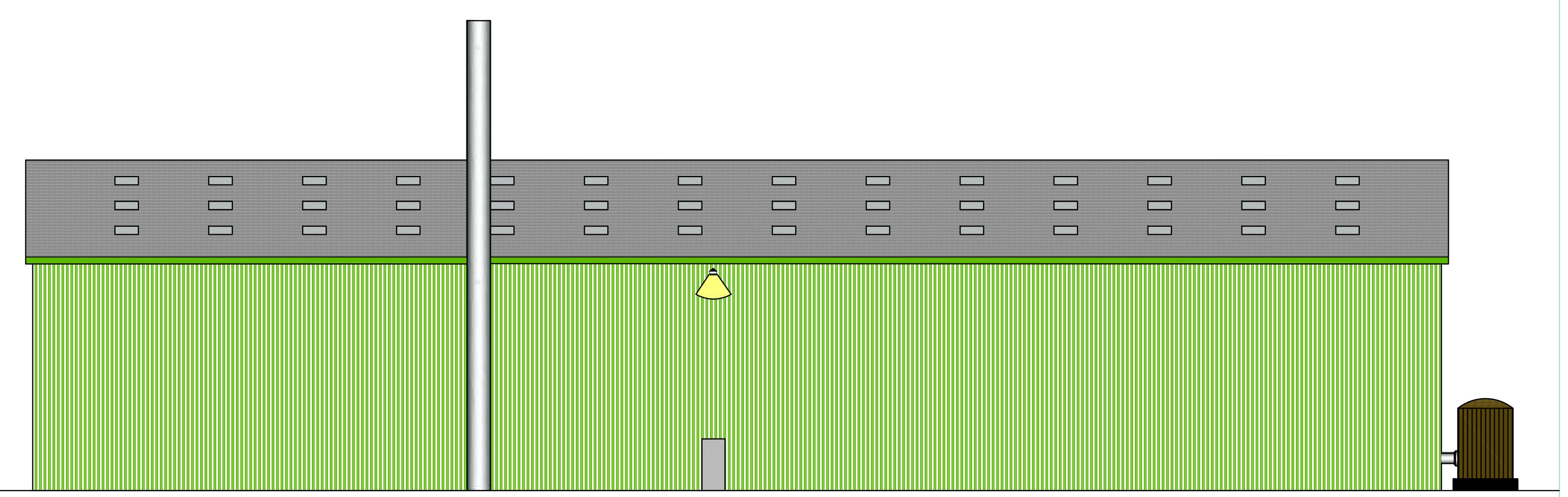


b) side elevation (from the west)





a) rear elevation (from the north)



a) side elevation (from the east)

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Unit 5, Oasis Park, Road One
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Title: BUILDING ELEVATIONS

Drawing No: SRB/04

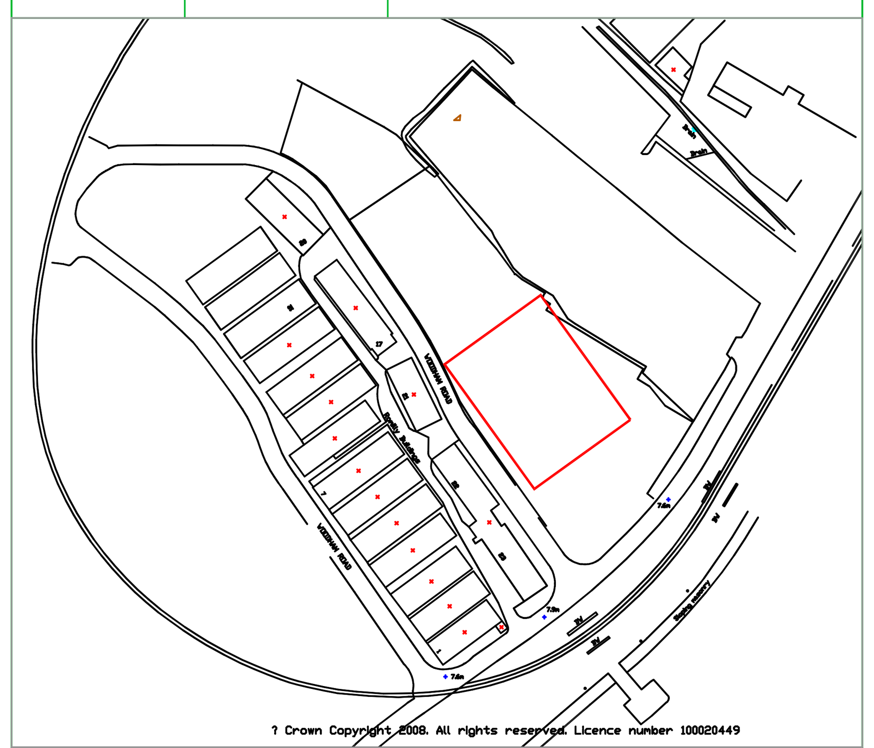
Client: SUNRISE RENEWABLES LTD

Site: WOODHAM ROAD, BARRY

NGR:

Date:	Scale:	Printed At:
29 AUGUST 2008	1:200 1:2,500	A1

Revision:	Drawn By:	Checked:
-	RS	



Notes:

Building eve height = 10 m

Building ridge height = 14.07 m

Angle of roof pitch = 10°

Building footprint = 60 m x 45 m

Roller shutter doors = 6 m width x 7.5 m height

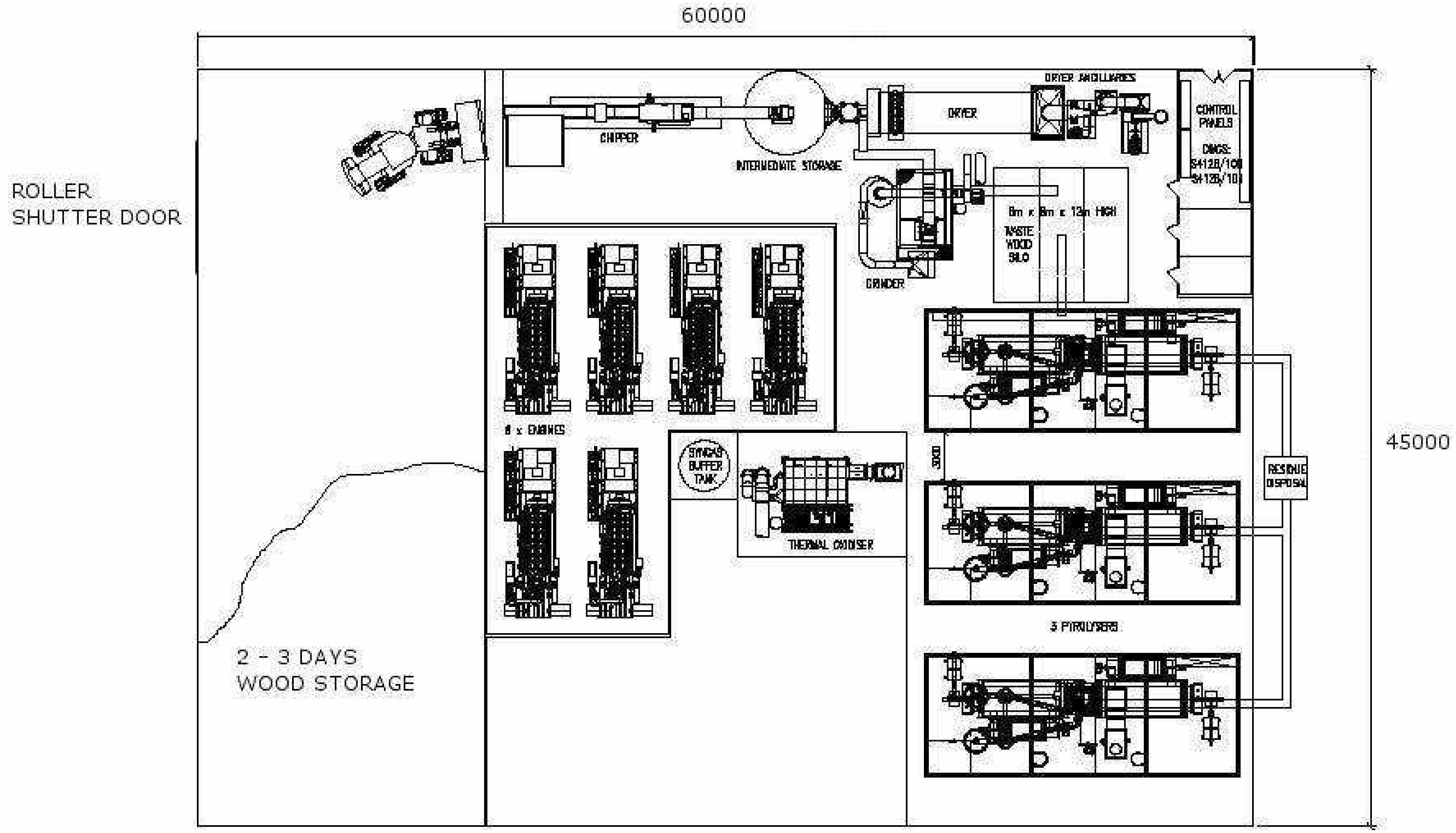
Fire doors = 0.98 m width x 2.2 m height

Stack height shown is 20 m which is given for indication, actual stack height will be lower

FOR CONSULTATION ONLY

Revision Details:

Rev	Description	Date
-	First Draft	03/07/2008
A	Application Copy	29/08/2008



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IF IN DOUBT ASK

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A1

CAD

REV	REV	REV	REV	REV	REV

DRAWN BY	
DATE	
CHECKED BY	
DATE	
APPROVED (ENG)	
DATE	
APPROVED (CLIENT)	
DATE	
MICROFILMED DATE	

ITEM	QTY	DESCRIPTION	DRAWING NO	MATERIAL	MASS
		MATERIAL LIST		MASS KG	

PRESTIGE THERMAL EQUIPMENT
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TEL : +27 11 824-5280
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EMAIL : pte@pte-online.co.za

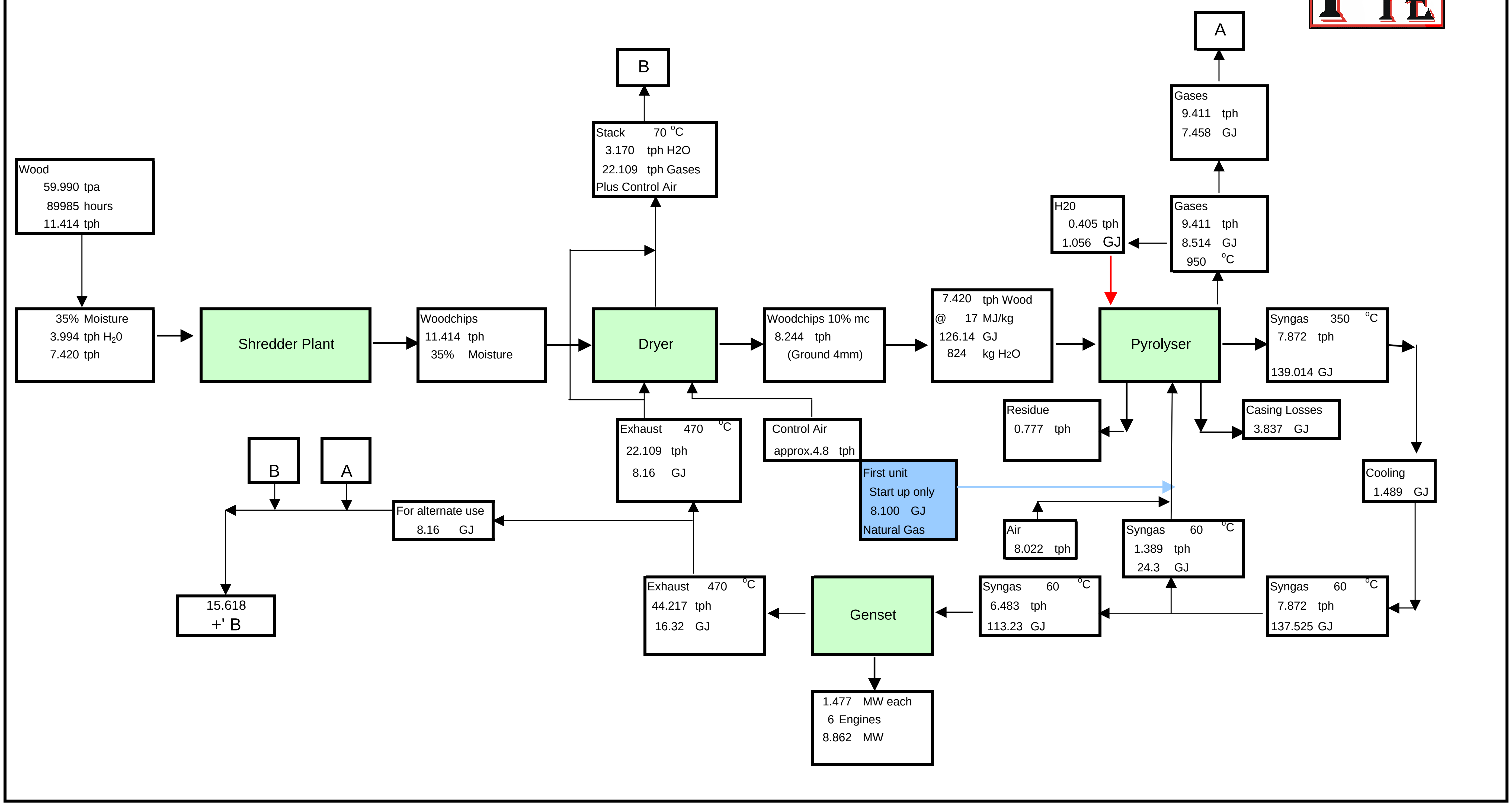
TITLE
PTE WOOD WASTE TO ENERGY SCHEME
3 PYROLYSER / 6 ENGINE PLANT LAYOUT

SCALE	DRG NO	REV
	S 4263 - 002	A


MAERSK

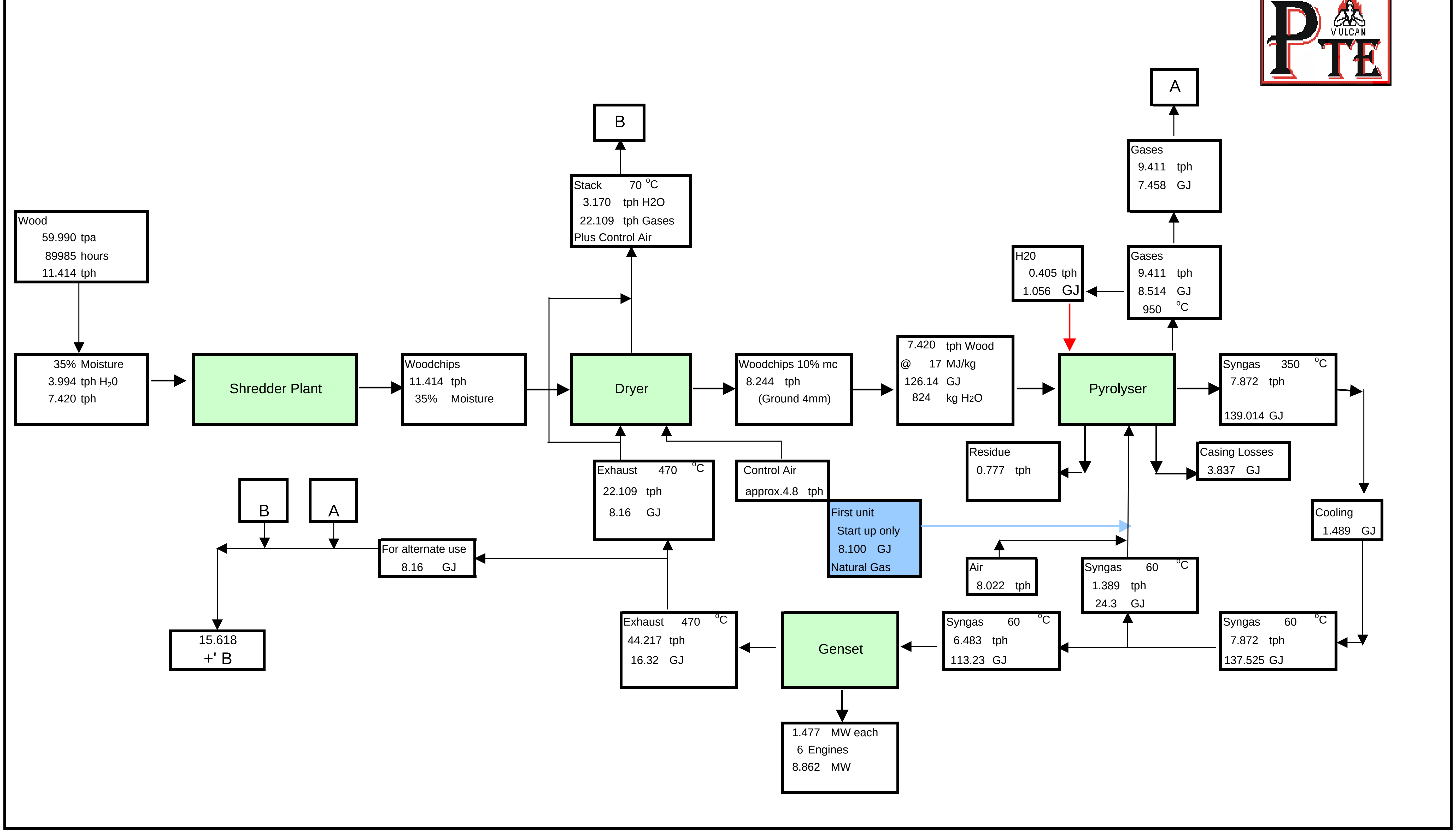
Mass & Energy Flow Diagram

(NOMINAL 9Mw)



S4274

Mass & Energy Flow Diagram (NOMINAL 9Mw)



S4274

DESIGN AND ACCESS STATEMENT

Applicant: Sunrise Renewables Limited

Site: Barry Docks, Woodham Road, Barry

Application: Erection of New Industrial Building and Installation of 9MW Wood Fuelled Renewable Energy Plant

1.1 The applicant favours using allocated industrial land for creation of new energy facilities in line with government guidance. Such sites are becoming more scarce as in many areas new industrial development competes with the housing market on brownfield sites.

1.2 The building will be of steel portal frame construction and covered with micro profile cladding to all elevations with the option of wood cladding on the front elevation.

1.3 The building location has been chosen because it is within an industrial site and set against a backdrop of existing industrial buildings. The only access to the plant by vehicle is for parking and deliveries/collections. Delivery/collection vehicles will enter the site from the existing road on Woodham Road and will not affect any other business users. The building has been chosen to ensure that it does not impose upon the adjacent uses and is set back against an existing series of large buildings which ensures that the proposal will not be obtrusive. The parking and access areas are flat and travel distances from parking spaces are short. Disabled parking is available adjacent to the building. The height of the building is the minimum required to accommodate the Biomass plant. All access areas have doors, which will accommodate wheelchair access and ensure that pedestrian access is not necessary through the roller shuttered doors.

1.4 The site will be manned 24 hours per day so additional security is not necessary. The building will be closed to external access i.e. all visitors will have to make their presence known by ringing a doorbell.

1.5 A supplementary planting scheme will be prepared as agreed with the local planning authority.

1.6 The location of the external plant such as the flue, cooling tower etc. has been assessed and the area chosen has been found to be the best location for screening. The height of the flue at 20 metres will be partially screened by the proposed building and positioned as unobtrusively as possible.

1.7 The layout has been designed to accommodate the maximum amount of plant and equipment within the building. Very little space will remain unused in the proposal enabling the plant to have a negligible impact upon its surroundings.

1.8 The application process for the PPC Permit will involve widespread consultation.

1.9 The main access point has been chosen because it is established and there are also no other feasible access points.

1.10 Site visitors performing statutory functions usually travel by car as officers have to bring their own PPE (personal protective equipment) such as safety boots, hi-vis vest etc.

1.11 The site access route and internal surfaces provide sufficient access for emergency services, who will be provided with an updated emergency and access plan and contact numbers before the plant is operational. The building has sufficient access and egress points in the event that evacuation is required in an emergency.

1.12 The site is designed to facilitate inclusive access and it is envisaged that young persons undertaking educational visits and disabled visitors will be guided around the site in a company vehicle to comply with the requirements of the Health and Safety at Work Act. Where disabled visitors and other visitors are able to access the warehouse on foot to observe operations they will be individually risk assessed and provided with appropriate PPE and an induction on relevant safety matters. A representative of "The plant operator" will accompany all visitors to the site.

1.13 All visitors are welcome to observe the new plant, which is amongst the first of its size in the UK. The planning application is available for all environmental and community groups to comment on. Electronic copies of the application statement are available on CD upon request from Oaktree Environmental's office stated in Section 1.4 of the planning statement.

1.14 The site is able to adapt to changing needs and is equally capable of pyrolysing biomass fuels, natural wood and other renewable feedstocks. The time of day/year will have little impact upon the development, which will continuously supply energy to the national grid. There may be seasonal fluctuations in the availability of timber in the transfer station's wood inputs but there will be sufficient capacity inside the building to store excess feedstock.

1.15 In summary the pyrolyser provides a facility, which enables energy to be generated from waste wood, which would otherwise be taken to landfill or burnt in the open on garden bonfires or demolition sites. The plant provides a facility to process fuel with minimal emissions and produce sustainable electricity making the site a net producer of renewable energy.

1.16 Where possible all signs will have a combination of written instructions and/or symbols and pictures to enable ease of understanding by all users. Site users other than employees and contractors will not be permitted to move around the site without an escort for safety reasons.

1.17 The design of the Biomass plant is being undertaken by a South African company, Prestige Thermal Equipment (PTE). PTE are the leaders in the chosen technology and have several established pyrolysers, including one at Tythegston Landfill and Capital Valley in South Wales.

1.0 POLICIES AND LEGISLATION

1.1 The following section outlines the policies relevant to the application site and addresses the issues as required. As well as requiring planning consent the application proposals will also require a PPC Permit, issued by the Environment Agency. The applicant proposes to apply for the permit after the planning application has being considered.

NATIONAL POLICIES

2.1 Energy policy is a reserved function that is not devolved to the Assembly Government. Nevertheless, all decisions relating to renewable energy in Wales must take account of the Assembly Government's policy. Government policy with regard to waste management is constantly changing to keep pace with EC legislation and best environmental practice and numerous documents provide guidance and assistance to planning authorities when determining waste planning applications.

2.2 Ministerial Interim Planning Policy Statement 01/2005 (MIPPS) replaces Planning Policy Wales (PPW) sections 12.8 to 12.10 which relate to renewable energy. Until PPW is reviewed, the MIPPS replaces those sections. MIPPS sets renewable electricity targets for Wales of 4TWh per annum by 2010 and 7 TWh per annum by 2020.

2.3 MIPPS states that it is the Assembly Government's aim to secure an appropriate mix of energy provision for Wales by means of strengthening renewable energy production. MIPPS also states that, for the purposes of this policy, the definition of renewable energy includes biomass. MIPPS states that biomass is generally regarded as fuel (other than fossil fuel) the energy content of which is derived organically from plant or animal matter.

2.4 MIPPS also states that LPAs are encouraged to facilitate the development of all forms of renewable energy by:

i) Considering the contribution that their LPA area can make towards developing and facilitating renewable energy.

ii) Ensuring decisions are consistent with national / international climate change obligations, including contribution to renewable energy targets, having regard to national policy on levels of renewable energy required.

iii) Recognising the environmental, economic and social opportunities that renewable energy provides to wider planning goals and delivery of renewable energy targets.

2.5 Technical Advice Note 8 (Renewable Energy) (TAN8) refers to the Renewables Obligation 2002 which states that only electricity derived from biomass will be eligible for Renewables Obligations Certificates. Biomass is defined in this context as a fuel of which at least 98% of the energy content is derived from plant or animal matter or substances derived directly or indirectly therefrom (whether or not such matters or substances are waste) and includes forestry or wood waste.

2.6 The implementation of the EC Landfill Directive by the Landfill Regulations (England and Wales) 2002 has restricted the waste types which can be landfilled and requires pretreatment of certain wastes before deposit, making landfill a more costly disposal operation than in previous years. Since October 2007 all non-hazardous wastes, with limited exceptions, have required pre-treatment prior to deposit in landfill. It is expected that this requirement will have a significant increase in the volume of wood recycled in the UK.

2.7 Recent research quoted in the Waste Strategy 2007 consultation document estimated that 7.5 million tonnes of waste wood arisings in the UK 80% is landfilled, 16% reused and recycled and 4% used in energy recovery. The current market for recycled wood products is reaching saturation point in some areas as many of the recyclers have sufficient supply for their needs and recycled timber cannot be composted or used for some of the uses shown in the WRAP Wood Recycling Guide (see *SRB-I* in supporting documents).

2.8 The UK Government, in its response to the report of Sir Ben Gill's task force on Biomass Energy, acknowledged the case for extracting more energy from waste wood but wished to ensure that no wood was burned which could be recycled. Given the figures in 4.2.7 above it is likely that a significant number of Biomass plants will be needed throughout the UK.

2.9 The introduction of the aggregate tax, the continuing increases in landfill tax (£32.00/tonne in April 2008 rising to £48.00/tonne in 2010) and landfill tipping prices are all factors which will effectively encourage the diversion of wood waste away from landfill.

3.0 REGIONAL POLICIES

3.1 The adopted regional policy is shaped by the South Wales Regional Waste Plan. It sets out six different options for dealing with the region's waste, all of which include energy from waste. The 1st Review document acknowledges that waste cannot continue to be landfilled. Residual waste that cannot be recycled is dealt with in the 1st Review document and energy generation is regarded as one of the ways that this type of waste should be dealt with. The seven sub-options identified all have a common 'front end' recycling and composting rate and all options identified include the use of energy from waste. The 1st Review acknowledges that 'energy from waste' has a clear role to play in any sustainable waste management strategy. The 1st Review also acknowledges that the majority of waste management facilities could be located on planning use class B2 sites, with some being on B1 and B8 sites.

4.0 LOCAL POLICIES

4.1 Vale of Glamorgan Council adopted the Unitary Development Plan in 2005 - It is considered that the proposal complies with the following policies of the UDP as follows:-

i) Policy 2:
The proposal will contribute to waste reduction or recycling.

ii) Policy 13:
Waste Management Facilities - The proposal will provide the best sustainable waste management option for the fractions of materials being dealt with. The proposal will be dealing with wood that cannot be recycled due to market saturation. It is the next best available option for the wood to be dealt with in the waste hierarchy, avoiding the need for landfill. In terms of the proximity principle the waste arisings will be from the sub-region and being located within one of the principle urban areas of South East Wales, the proposal is situated within close proximity to one of the main sources of waste arisings.

iii) COMM 8:
New infrastructure will be provided. However, it will not have an unacceptable impact upon identified environmental interests.

iv) ENV 6:
The proposal is in context with the existing industrial surroundings, and will not cause unacceptable environmental effects.

v) ENV 7:
Surrounding natural water bodies will not be affected by this development, and the proposal was confirmed not to pose a flood risk by Matthew Parry of the EAW during pre-application correspondence (see SRB-J RSK Flood Risk Assessment).

vi) ENV 11:
This biomass plant will not unacceptably affect features of importance to landscape or nature conservation in the area.

vii) ENV 28:
Appropriate site access for disabled persons has been designed in accordance with Section 76 of the Town and Country Planning Act 1990.

viii) EMP 1:
The proposed use is likely classed as B2, therefore meeting the requirements of the land allocated at Barry Docks for use classes B1, B2 and B8. A small number of local jobs will also be created with this development.

ix) EMP 2:
The proposal meets the criteria required to permit new business and industrial development.

x) EMP 3:
The proposal is a biomass facility, likely to be classed as B2 as it is energy generation (as defined by Town and Country Planning [use classes] Order 1987 [as amended]).

xi) TRAN 10:
A sufficient number and type of parking is provided on site in accordance with the national parking guidelines.

xii) WAST 1:
The proposed site is on land allocated for B2 use.

xiii) WAST 2:
The proposal fulfills the 'proximity principle' and is appropriate for the size of the site located within an industrial area. It is also well placed for access to the surrounding road network. The ancillary equipment will be sited to be as unobtrusive as possible. Any electricity connections will be underground. The building where the plant and equipment will be located will be acoustically screened keeping noise levels to a minimum. There are no residential properties nearby. The main sources of noise (the engines) will all be located within the building. Externally the main source of noise will be from fans and these will be sited to minimise any potential noise impacts upon neighbouring uses. Drainage will be provided to ensure safe disposal of water.

PLANNING APPLICATION WASTE AUDIT AND FACILITIES STRATEGY

Applicant: Sunrise Renewables Limited

Site: Barry Docks, Woodham Road, Barry

Application: Erection of New Industrial Building and Installation of 9MW Wood Fuelled Renewable Energy Plant

SCOPE OF DOCUMENT: ESTIMATION OF THE TYPE AND QUANTITY OF WASTE LIKELY TO BE PRODUCED DURING THE LIFE OF THE DEVELOPMENT AND IDENTIFICATION OF WASTE MANAGEMENT TARGETS

1. The application proposals represent the redevelopment of part of an existing industrial site with the erection of a new industrial building.

2. Since the project planning started there have been several changes in secondary legislation which affect the development. Of these The Site Waste Management Plan Regulations 2008 (SI 314/2008) and The Environmental Permitting (England and Wales) Regulations 2007 are the most relevant to waste generation from the development construction, operation and decommissioning stages.

3. As the project cost is greater than £300,000 the development would appear to be regulated by The Site Waste Management Plan Regulations 2008. However, Regulation 3 exempts the project from the requirement to have a Site Waste Management Plan (SWMP) if it is a Part A installation as defined in the Environmental Permitting (England and Wales) Regulations 2007. However, the details required by a SWMP will be submitted as part of the permit application i.e. waste generation and minimisation.

4. As the biomass plant is defined as a Part A installation it will require an Environmental Permit, issued by the Environment Agency. The application for the permit is a comprehensive process which requires the submission of detailed information on all emissions to air, water or land which will be regulated by the imposition of conditions in the permit.

5. The planning statement (version 1.3, 03/09/08, ref: 816_891_SRB/PS) details waste arising from the operation of the plant in Section 8.10.

6. Waste arising from the construction phase will be closely controlled. Any material arising from the excavation of existing concrete floor slabs will be taken off site to a materials recycling facility for recycling if it cannot be reused on site. Any waste produced by the development will be dealt with as follows:

   i. Redundant fencing - reused or recycled on site
   ii. Soil - removed from site and deposited at a suitably licensed or exempt infill operation.

iii. Bricks and concrete - taken off site for crushing and screening to produce secondary aggregates, which will be used in the development.

7. The development is a recovery activity which will utilise approximately 72,000 tonnes of wood per annum to generate electricity. The wood fuel arises from natural sources and recycling sites so the development sits well in the waste hierarchy as markets for recycling construction and demolition timber are volatile, with large quantities still being deposited to landfill. The other main recycling activities for wood are board (MDF etc) and animal bedding manufacture, which have limited capacity. The biomass plant uses 'new carbon' which is stored in natural wood and timber rather than 'old carbon' which is locked up in fossil fuel reserves, peat bogs etc. The degradation of wood deposited in landfill produces methane, which is 25 times more potent than carbon dioxide as a greenhouse gas, which can be avoided by the use of sustainable development such as the application plant.

8. 95% of waste generated by the development will be reused or recycled at a transfer station. Where possible vehicles will use the return trip to bring recycled aggregates to the site for use in the development.

9. All raw materials will be sourced from local suppliers to the detailed design specification of the building to reduce waste generation from the building works.

10. All waste carriers used in the project will have a carrier registration certificate issued by the Environment Agency.

11. All off site waste management operations will have an environmental permit or exemption issued by or registered with the Environment Agency.

12. All waste removal from the site will be documented to comply with the Duty of Care (S.34 of the Environmental Protection Act 1990).

13. Contractors have not yet been selected to carry out the construction works as the project size necessitates the issue of a tender document inviting companies to bid for the works. Tenders will be evaluated on an equivalent basis to 'best value' to ensure that the selected companies meet the requirements of this waste audit and SWMP requirements submitted with the environmental permit application.

14. Waste hierarchy - the biomass plant will process wood fuel (derived from waste wood), most of which cannot be recycled, reused or composted. The plant has been designed to prevention and minimise the generation of waste and will be able to provide waste heat to users up to 1 km from the development site, if required.

15. Proximity principle - the wood fuel will be primarily sourced from local suppliers.

16. High quality innovative design - the plant meets the BAT (Best Available Technology) requirements of the environmental permitting regime. Pyrolysis is an advanced conversion technology which turns the inputs into gas fuel which feeds an engine and also generates heat for re-use, rather than relying on heat alone (like traditional mass burn plants).

17. Provision of complementary facilities – Complementary facilities will be provided for within the site boundary.

18. Environmental protection and enhancement - the site's emissions will be regulated by the Environment Agency and the plant will not be able to operate before the environmental permit is issued. The permitting process also requires consideration of site history and completion and closure of the plant before a permit can be surrendered.

19. Adequate space and access – The site was chosen as it is an existing site with good access and sufficient space to accommodate the development.

20. Environmental education - the design and access statement in the planning statement refers to the use of the site for educational purposes.

21. Public safety - the plant will operate as a 24 hour process and be manned at all times, with remote telemetry for technical assistance and monitoring.

The environmental regulation of wood

Purpose of this position statement
It advises our staff and external stakeholders on when we consider wood to be a waste, what regulatory controls should be followed and our recommendations to industry. The document deals with virgin timbers and non-virgin timbers.

Background
The Waste Protocols Project[1] commissioned a Technical Advisory Group (TAG) made up of representatives from the Environment Agency, WRAP and industry to produce a technical report to consider at what point waste wood ceases to be waste and to consider whether a Quality Protocol could be developed.

The report identified numerous information gaps concerning what quality control systems should be put in place and what standards should be adopted when reprocessing waste wood to ensure the outputs do not pose a risk to human health or the environment.

It was therefore not possible to produce a Quality Protocol which would identify the point at which waste wood may cease to be waste. Instead we have produced this position statement to provide clarity on how we regulate wood.

The Environment Agency's position

Virgin timber is timber from:

- whole trees and the woody parts of trees including branches and bark derived from forestry works, woodland management, tree surgery and other similar operations (it does not include clippings or trimmings that consist primarily of foliage[2]);
- virgin wood processing (e.g. wood offcuts, shavings or sawdust from sawmills) or timber product manufacture dealing in virgin timber.

[1] The Waste Protocols Project is a joint Environment Agency and WRAP (Waste & Resources Action Programme) initiative, funded by the Department for Environment, Food and Rural Affairs (Defra) Business Resource Efficiency and Waste (BREW) Programme.

[2] The leaves of a tree, or leaves on the stems or branches on which they are growing.

Virgin timbers are not waste and are not subject to waste regulatory controls provided they are certain to be used for purposes to which virgin wood is commonly put. These include use as:

- woodchip in gardens or on pathways;
- a raw material for composting;
- animal bedding;
- fuel in an appliance;
- a raw material for the production of wood-based products or in paper production.

But if virgin timber is mixed with waste timber or any other waste, the mixed load is classed as waste.

Non-virgin timber may be either treated or clean.

- Clean non-virgin timber is any timber or timber product that has not been treated.
- Treated non virgin timber is any timber or timber product that has been chemically treated (e.g. to enhance or alter the performance of the original wood). Treatments may include penetrating oils, tar oil preservatives, waterborne preservatives, organic-based preservatives, boron and organo-metallic based preservatives, boron and halogenated flame retardants and surface treatments.

The references to types of waste wood or their uses in this position statement are not intended to be exhaustive. Please contact us for further guidance on any waste type or use not mentioned.

Non-virgin timber offcuts, shavings, chippings and sawdust from the processing of non-virgin timbers (whether clean or treated) are waste. They remain waste and subject to regulatory control until the point of final use unless this is the spreading of compost that complies with the requirements of the compost Quality Protocol (see below).

The regulatory controls covering the use of processed waste wood depend on the intended use. Some examples are given below. Further information on the regulatory framework is given in Annex 1.

- **Use as fuel.** Waste wood remains waste until burned as a fuel. Its burning will normally be regulated by an environmental permit under the Environmental Permitting (England and Wales) Regulations 2007. In addition, burning of waste wood is normally subject to the requirements of the Waste Incineration Directive (WID). Plants that only burn wood not contaminated with halogenated organic compounds or heavy metals (resulting from treatment with wood preservatives or coating) are excluded from the WID requirements. In limited circumstances, the storage and burning of waste wood may be exempt from permitting requirements under Schedule 3 of the Environmental Permitting (England and Wales) Regulations 2007 ('Schedule 3').

- **Use in wood-based panel manufacture.** The wood remains waste until it is made into panelboard. It must be stored and processed into panelboard as specified either in an environmental permit or an exemption under Paragraph 14 of Schedule 3.

- **Use in landscape applications.** Examples include weed suppressant, decorative woodchip, pathways and arena chip. The material must be stored and applied to land as specified either in an environmental permit or an exemption under Paragraph 7 of Schedule 3. The wood remains waste until it is applied to land.

- **Use in animal bedding**. Examples include cattle, horse and pet bedding. Untreated waste wood must be stored and used either as specified in an environmental permit or an exemption under Paragraph 15 of Schedule 3. The wood remains waste until incorporated into animal bedding.

  We do not consider treated timber acceptable for use in animal bedding. The exemption in Paragraph 15 of Schedule 3 does not apply to treated waste wood.

- **Used to make compost.** Untreated waste wood must be stored and composted as specified either in an environmental permit or an exemption under Paragraph 12 of Schedule 3.

  If you have complied with the *Quality Protocol for the Production and Use of Quality Compost from Source-segregated Biodegradable Waste*,[3] the material will cease to be waste once the quality compost has been despatched to an end user from one of the groups identified in the protocol. Waste regulatory control will cease at that point.

  If the compost does not comply with the Quality Protocol, it will remain waste until it has been applied to land. The compost must be stored and applied to land as specified either in an environmental permit or an exemption under Paragraph 7 of Schedule 3.

  We do not consider treated timber acceptable for use in composting. The exemption under Paragraph 12 of Schedule 3 does not apply to treated waste wood.

[3] The Quality Protocol can be downloaded from the waste pages of the Environment Agency website. Click on 'Waste Protocols Project' and then Compost Quality Protocol' in the left-hand navigation bar.

Our recommendations to industry
The information in the technical report on wood waste was insufficient to give us confidence that all non-virgin clean timber is clean enough and we will continue to classify it as waste.

To move beyond this point and to give greater certainty to the wood recycling industry, we recommend that industry develops an approved standard with appropriate certification and accreditation systems that:

- specifies minimum quality controlled production processes to be used;
- identifies the point at which the output can be verified as free from (or have an acceptable level of) contaminants.

It may then be possible to agree a Quality Protocol indicating when clean non-virgin timber is considered to be fully recovered and ceases to be waste.

We recognise there is a wide variation in the specifications used in waste wood markets. As the market for waste wood products develops, it will remain an option for companies to make a case to us that the waste wood has been fully recovered to a standard that can be widely marketed as a product. We will consider submissions on a case-by-case basis to encourage higher standards to prevail.

Further information
Further information and guidance on regulatory controls can be obtained from our National Customer Contact Centre on 08708 506 506 or from the waste section of our website.

This regulatory position will be reviewed by 31 March 2009.

Position Statement 005
Version 1.0
Issued June 2008

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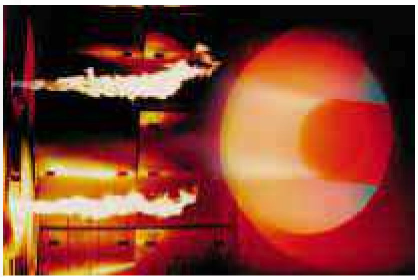

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GroundSure Environmental Data Report

GroundSure Environmental Data Report

Address: WOODHAM ROAD, DOCKS, BARRY, CF62

Date: Mar 6, 2008

GroundSure Reference: HMD-188-62960

Your Reference: Barry

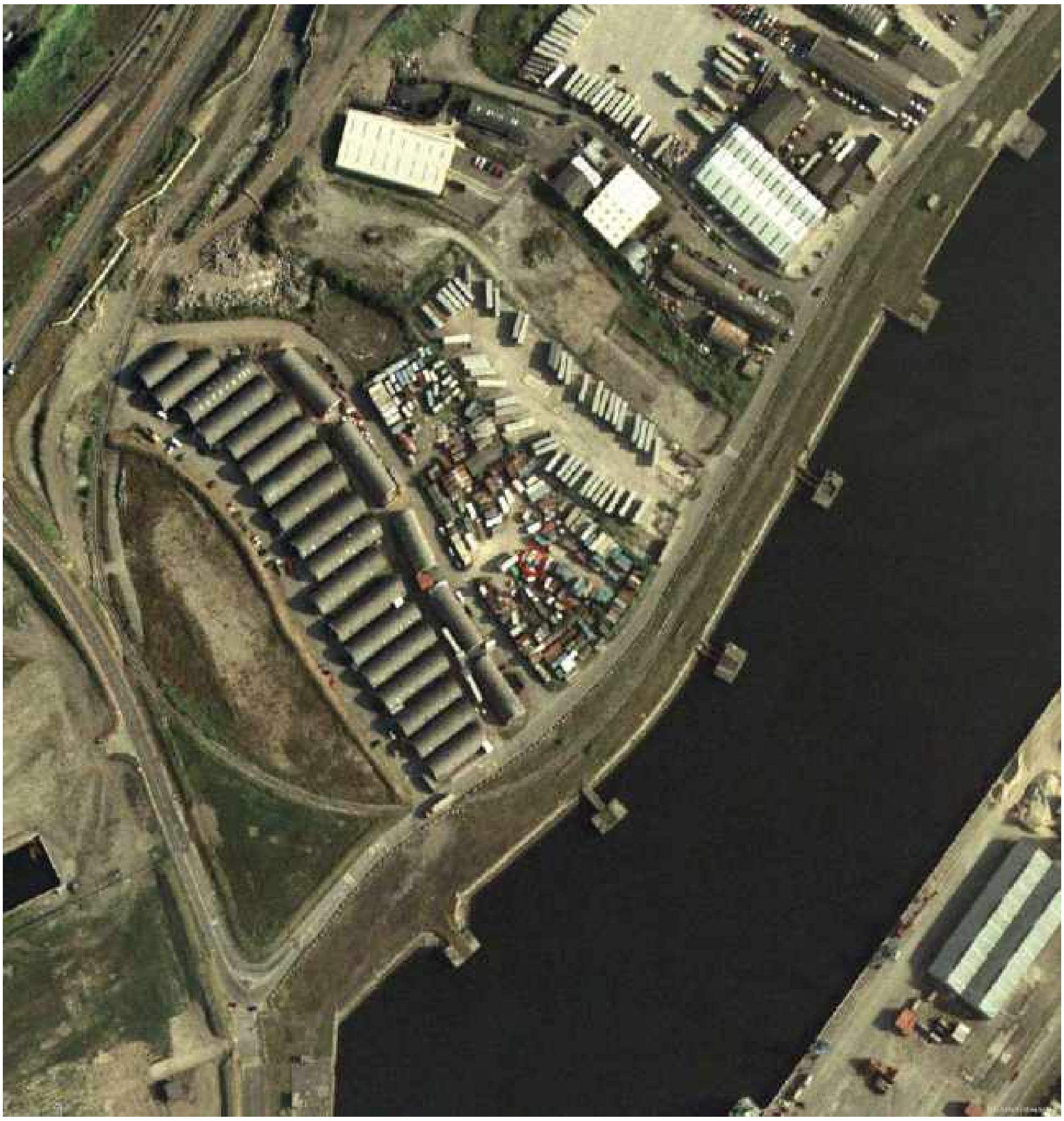
Client: Oaktree Environmental

Brought to you by GroundSure

Aerial Photograph of Study Site

NW N NE

W E



SW S SE

Site Name:WOODHAM ROAD, DOCKS, BARRY, CF62
Grid Reference: 312620,167670

Overview of Findings

For further details on each dataset, please refer to each individual section in the main Report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary					
1. Authorisations, Incidents and Registers	on-site	0-50	51-250	251-500	501-1000	1000-1500
1.1 Industrial Sites Holding Licenses and/or Authorisations						
Records of IPC Authorisations	0	0	0	0	0	-
Records of IPPC Authorisations	0	0	0	7	12	-
Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0	-	-
Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0	-	-
Records of List 1 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of List 2 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of LAPPC (LAPC) Authorisations	0	0	0	2	-	-
Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0	-	-
Records of Licensed Discharge Consents	0	1	1	1	-	-
1.2 Records of COMAH and NIHHS sites	0	0	0	0	-	-
1.3 Environment Agency Recorded Pollution Incidents						
National Incidents Recording System, List 2	0	0	2	-	-	-
National Incidents Recording System, List 1	0	0	0	-	-	-
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0	0	0	-	-
2. Landfill and Other Waste Sites	on-site	0-50	51-250	251-500	501-1000	1000-1500
2.1 Landfill Sites						
Environment Agency Registered landfill Sites	0	0	0	0	1	0
Landfill Data – Operational Landfill Sites	0	0	0	0	1	0
Environment Agency Historic Landfill Sites	0	0	1	3	3	2
Landfill Data – Non-Operational Landfill Sites	0	0	0	1	2	2
BGS/DoE Landfill Site Survey	0	0	0	0	0	0
GroundSure Local Authority Landfill Sites Data	0	0	0	1	0	0
2.2 Landfill and Other Waste Sites Findings						
Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Environment Agency (REGIS) Waste Sites	0	0	0	9	15	16
3. Current Land Uses	on-site	0-50	51-250	251-500	501-1000	1000-1500
3.1 Current Industrial Sites Data	0	0	21	35	-	-
3.2 Records of Petrol and Fuel Sites	0	0	0	0	-	-
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0	-	-

4. Geology

	Description
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site? *	Yes
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
4.3 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	

Source: Scale: 1:50,000 BGS Sheet 263

* This includes an automatically generated 50m buffer zone around the site.

5. Hydrogeology and Hydrology

	on-site	0-50	51-250	251-500	501-1000	1001-2000*
5.1 Environment Agency Groundwater Vulnerability and Soil Classification						
Minor Aquifer (within 200m)	No	No	Yes	-	-	-
Major Aquifer (within 200m)	No	No	No	-	-	-
Soil Classification (within 200m)	No	No	Yes	-	-	-
5.2 Groundwater Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	6
5.3 Surface Water Abstraction Licences (within 1000m of the study site).	0	0	0	0	15	-
5.4 Source Protection Zones						
Source Protection Zones within 500m of the study site.	0	0	0	0	-	-
5.5 Potable Water Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	0
5.6 River Quality						
Is there any Environment Agency information on river quality within 500m of the study site?	No	No	No	No	-	-
5.7 Main Rivers						
Main Rivers within 500m of the study site.	0	0	0	0	-	-

6. Flooding

6.1 Are there any Environment Agency indicative Zone 2 floodplains within 250m of the study site?	Yes
6.2 Are there any Environment Agency indicative Zone 3 floodplains within 250m of the study site?	Yes
6.3 Are there any Areas benefiting from Flood Defences within 250m of the study site?	No
6.4 Are there any Areas used for Flood Storage within 250m of the study site?	No
6.5 What is the maximum BGS groundwater flooding susceptibility within 50m of the study site?	High
6.6 What is the BGS confidence rating for the groundwater flooding susceptibility areas?	Moderate

7. Ecological Designated Sites	on-site	0-50	51-250	251-500	501-1000	1001-1500
7.1 Records of Sites of Special Scientific Interest (SSSI):	0	0	0	0	1	-
7.2 Records of National Nature Reserves (NNR) :	0	0	0	0	0	-
7.3 Records of Local Nature Reserves (LNR):	0	0	0	0	0	-
7.4 Records of Special Areas of Conservation (SAC):	0	0	0	0	0	-
7.5 Records of Special Protection Areas (SPA):	0	0	0	0	0	-
7.6 Records of Ramsar sites:	0	0	0	0	0	-
7.7 Records of World Heritage Sites:	0	0	0	0	0	-

8. Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Very Low

9. Mining

9.1 Are there any coal mining areas within 75m of the study site?	No
9.2 What is the risk of subsidence relating to shallow mining within 150m of the study site?	Negligible

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between GroundSure and the Client. The document contains the following sections:

1. Authorisations, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by the Environment Agency, and sites determined as Contaminated Land. This search is conducted using radii up to 1000m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on artificial andsuperficial deposits and bedrock beneath the study site. These searches are conducted onsiteand includes a 50m buffer zone.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site. These searches are conducted using radii of up to 250m and includes a 50m buffer zone.

5. Hydrogeology and Hydrology

Provides information on groundwater vulnerability, soil leaching potential, abstraction licenses, Source Protection Zones (SPZ) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Ecological Designated Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR) and World Heritage Sites. These searches are conducted using radii of up to 1000m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These searches are conducted using radii of up to 75m.

9. Mining

Provides information on areas of coal and shallow mining. These searches are conducted using radii of up to 150m.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, GroundSure provide a free Technical Helpline (01273 819700) for further information and guidance.

Note: Maps

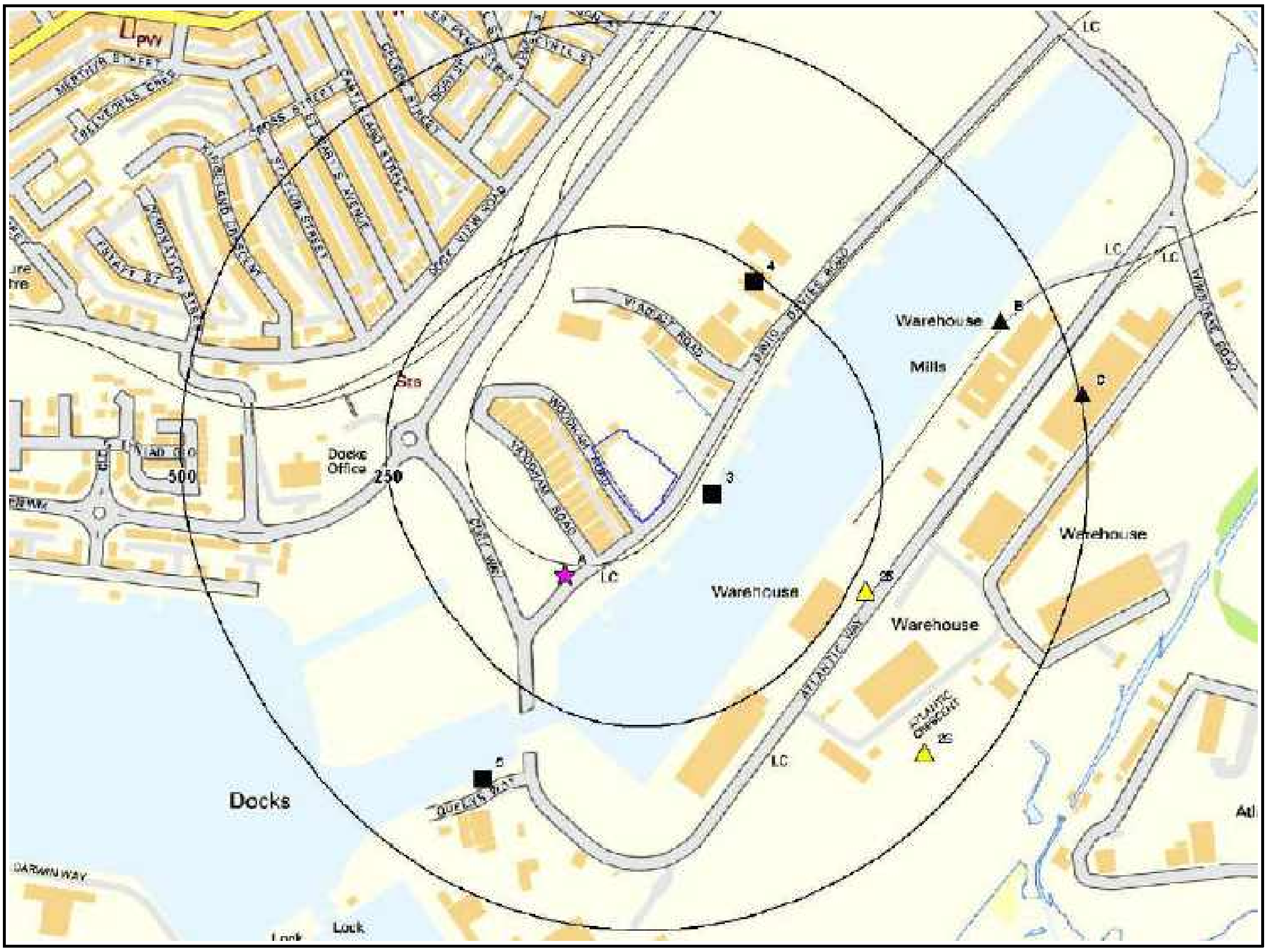
Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Authorisations, Incidents and Registers Map

NW N NE



W E

SW S SE

Incidents and Registers Legend

Site Outline

Search Buffers (m)

Recorded Pollution Incident

Dangerous Substances (List 1)

Dangerous Substances (List 2)

Water Industry Referrals

Licenced Discharge Consents

Red List Discharge Consents

RAS 3 & 4 Authorisations

IPPC & IPC Authorisations

LAPPC Authorisations

COMAH / NIHHS Sites

Sites Determined as Contaminated Land

1.Authorisations, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

Records of Part A Licences (IPC Processes) within 1000m of the study site: 0

Database searched and no data found.

Records of Part A Licences (IPPC Processes) within 1000m of the study site: 19

The following Part A Licences (IPPC Processes) are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
6B	436.0	NE	313070,167850	Operator: Rank Hovis Limited Installation Name: Barry Flour Mill Status: Effective	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: 17/08/2005 Effective Date: 17/08/2005
7B	436.0	NE	313070,167850	Operator: Rank Hovis Limited Installation Name: Barry Flour Mill Status: Effective	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: 17/08/2005 Effective Date: 17/08/2005
8B	436.0	NE	313070,167850	Operator: Rank Hovis Ltd Installation Name: Rank Hovis Ltd Barry Status: Determination	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: - Effective Date: -
9B	436.0	NE	313070,167850	Operator: Rank Hovis Ltd Installation Name: Barry Flour Mill Status: Effective	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: 17/08/2005 Effective Date: 17/08/2005
10B	436.0	NE	313070,167850	Operator: Rank Hovis Ltd Installation Name: Barry Flour Mill Status: Effective	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: 17/08/2005 Effective Date: 17/08/2005
11B	436.0	NE	313070,167850	Operator: Rank Hovis Limited Installation Name: Barry Flour Mill Status: Effective	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: 20050817 Effective Date: 20050817
12B	436.0	NE	313070,167850	Operator: Rank Hovis Limited Installation Name: Barry Flour Mill Status: Effective	Permit Number: BP3376IE Original Permit Number: BP3376IE Issue Date: 20050817 Effective Date: 20050817
13C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd. Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 07/11/2005 Effective Date: 07/11/2005
14C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 07/11/2005 Effective Date: 07/11/2005
15C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 07/11/2005 Effective Date: 07/11/2005
16C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd. Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 07/11/2005 Effective Date: 07/11/2005
17C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 20051107 Effective Date: 20051107
18C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 20051107 Effective Date: 20051107

19C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 20051107 Effective Date: 20051107
20C	503.0	E	313170,167760	Operator: Alembic Manufacturing Ltd Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 20051107 Effective Date: 20051107
Not shown	991.0	SE	313170,166770	Operator: Alembic Manufacturing Ltd. Installation Name: Barry Aluminium Chlorohydrate Plant Status: Determination	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: - Effective Date: -
Not shown	991.0	SE	313170,166770	Operator: Alembic Manufacturing Ltd. Installation Name: Barry Aluminium Chlorohydrate Plant Status: Determination	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: - Effective Date: -
Not shown	991.0	SE	313170,166770	Operator: Alembic Manufacturing Ltd. Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 07/11/2005 Effective Date: 07/11/2005
Not shown	991.0	SE	313170,166770	Operator: Alembic Manufacturing Ltd. Installation Name: Barry Aluminium Chlorohydrate Plant Status: Effective	Permit Number: MP3431SP Original Permit Number: MP3431SP Issue Date: 07/11/2005 Effective Date: 07/11/2005

Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site: 0

Database searched and no data found.

Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site: 0

Database searched and no data found.

Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site: 0

Database searched and no data found.

Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site: 0

Database searched and no data found.

Records of LAPPC (LAPC) Authorisations within 500m of the study site: 2

The following LAPPC (LAPC) Authorisations are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
25	270.0	SE	312906.0,167519.0	Address: Hanson Building Material Europe Limited, Atlantic Trading Estate, Wimborne Road,Barry Docks,Barry Process: Cement Batching	Status: Date: 20040401
26	443.0	SE	312978.0,167320.0	Address: Apex Coal Ltd., Coal Yard, No. 2 Dock, Off Atlantic Way, Barry Docks, Barry, Process: Coal Handling	Status: Current Date: 2004

Records of Category 3 or 4 Radioactive Substance Licences within 500m of the study site: 0

Database searched and no data found.

Records of Licenced Discharge Consents within 500m of the study site: 3

The following Licenced Discharge Consents records are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
3	48.0	SE	312720,167640	Address: Fisher Containers David Davies Road, Fisher Containers David Davies R, David Davies Road Barry Dock Bar, Barry Dock Barry ,, Barry , Effluent Type: Unspecified Permit Number: AN0033206 Permit Version: 2	Receiving Water: Barry Docks Status: Lapsed Under Schedule 23 Environment Act 1995 Issue date: 00//1/10/7 Effective Date: - Revocation Date: -
4	239.0	NE	312770,167900	Address: Factory At David Davies Road Barry, Factory At David Davies Road, Barry Docks, Barry, Vale Of Glamorgan Effluent Type: Unspecified Permit Number: AN0238001 Permit Version: 1	Receiving Water: Barry Docks Status: New Consent, By Application (wra 91, Section 88) Issue date: 00/0//27/1 Effective Date: - Revocation Date: -
5	370.0	SW	312440,167290	Address: Brt International Ltd, No3 Dock, Barry Docks, CF63 3RA Effluent Type: Unspecified Permit Number: AN0033237 Permit Version: 2	Receiving Water: Barry Docks Status: Modified - (wra 91 Sched 10 - As Amended By Env Act 1995) Issue date: 00/19/9/7/ Effective Date: - Revocation Date: -

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: **0**

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

Records of National Incidents Recording System, List 2 within 250m of the study site: **2**

The following NIRS List 2 records are represented as points on the Authorisations, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details	
1A	112.0	SW	312540,167540	Incident Date: 16-Dec-2002 Incident Identification: 126244 Pollutant: - Pollutant Description: -	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)
2A	112.0	SW	312540,167540	Incident Date: 16-Dec-2002 Incident Identification: 126244 Pollutant: Inert Materials and Wastes Pollutant Description: Construction and Demolition Materials and Wastes	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

Records of National Incidents Recording System, List 1 within 250m of the study site: **0**

Database searched and no data found.

1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990[1]

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? **0**

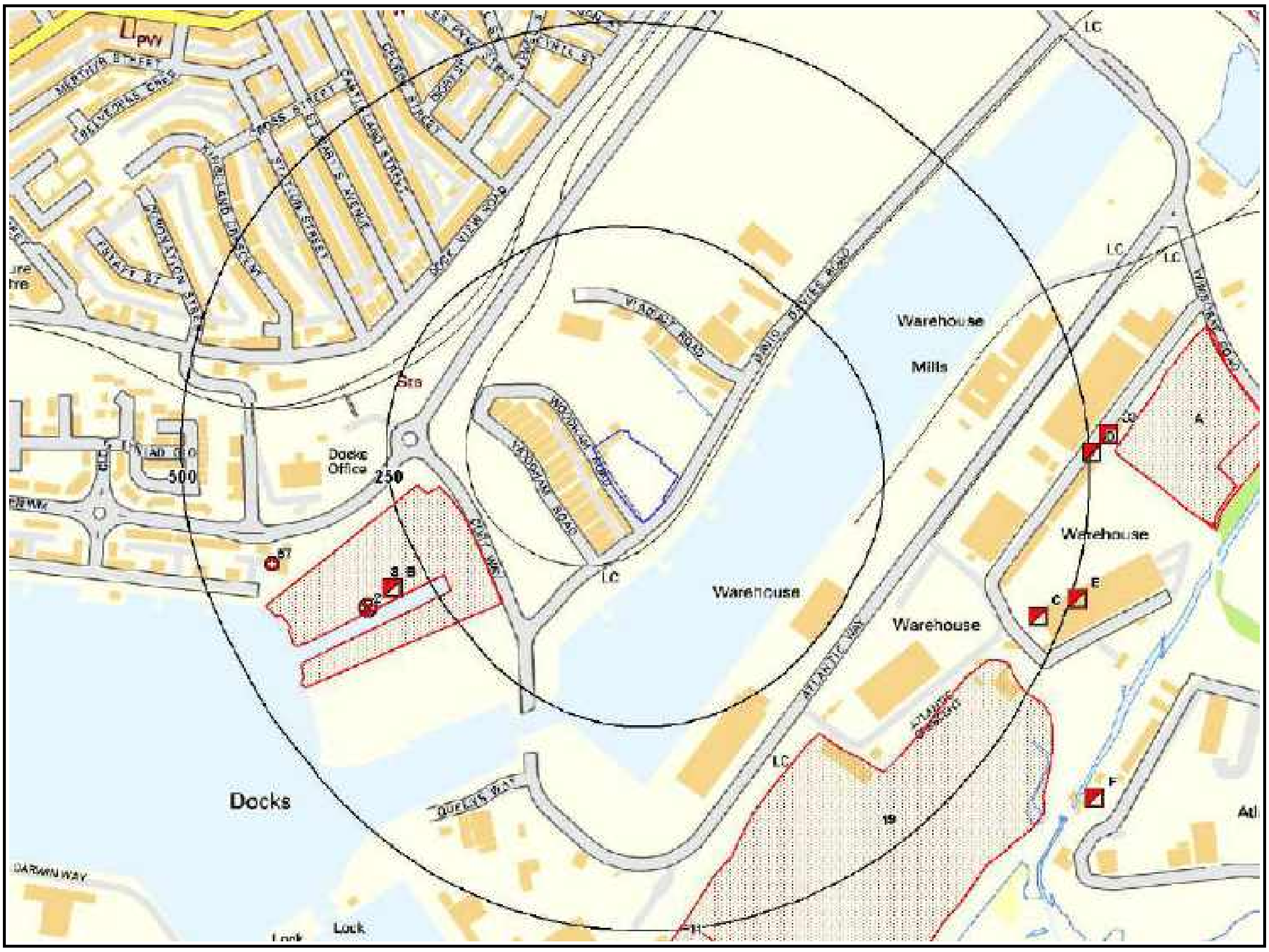
Database searched and no data found.

[1]Further information on sites that have been determined under the Contaminated Land Regime is maintained by Local Authorities under Section 78R of the Environmental Protection Act 1990. Information should be available on both sites currently determined as Contaminated Land and Special Sites.

2. Landfill and Other Waste Sites Map

NW N NE

W E



SW S SE

Landfill & Other Waste Sites Legend

Mapping sourced from Ordnance Survey

- Site Outline
- Search Buffers (m) 250 500
- E.A. Active Landfill
- E.A. Historic Landfill (Area Data)
- E.A. Historic Landfill (Point Data)
- BGS / DoE Survey Landfill
- Local Authority Landfill (Area Data)
- Local Authority Landfill (Point Data)
- Operational Waste Treatment Licence
- Closed Waste Treatment Licence
- REGIS Waste Licence
- Operational Landfill
- Closed Landfill

2. Landfill and Other Waste Sites

2.1 Landfill Sites[1]

Records from Environment Agency landfill data within 1000m of the study site: 1

The following Environment Agency landfill records are represented as polygons on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
Not shown	897.0	NE	313462.0,168356.0	Address: Dow Corning Landfill, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Landfill Reference: 30043.0 Regis Reference: DOW001 Landfill Type: A7 - Industrial Waste Landfill (Factory curtilage)	Operator: Dow Corning Ltd Status: Licence issued IPPC Reference:

Records of operational landfill sites sourced from Landmark within 1500m of the study site: 1

The following landfill records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
Not shown	964.0	NE	313400.0,168300.0	Site Address: Dow Corning Factory, East No 2 Dock, BARRY, South Glamorgan, Agency Reference: EAWML30043 Waste Type: Difficult Waste Description: Difficult Landfill Known Restrictions: Waste produced/controlled by licence holder	Record Date: 01-Apr-1991 Transfer Date: Modification Date: 01-Mar-1999 Status: Operational as far as is known Category: LANDFILL Regulator: EA - Welsh Region - South East Area (Cardiff) Size: Undefined

Records of Environment Agency historic landfill sites within 1500m of the study site: 9

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
8	177.0	SW	312300,167500	Site Address: Barry Graving Dock, Off Cory Way, Barry, Vale Of Glamorgan Waste Licence: Yes Site Reference: 61 Waste Type: Industrial, Household, Special Regis Reference: WU1/L/ASS001	Data Type: Polygon Licence Issue: 11-Oct-1994 Licence Surrendered: 16-Jan-2006 Licence Hold Address: 150 Holborn, London Operator: Associated British Ports
9	334.0	SE	312900,167200	Site Address: Barry Docks Area A, Atlantic Trading Estate, Atlantic Crescent, Barry, South Glamorgan Waste Licence: Yes Site Reference: 4 Waste Type: Industrial, Special, Liquid sludge Regis Reference: -	Data Type: Polygon Licence Issue: 26-Oct-1977 Licence Surrendered: 31-Dec-1978 Licence Hold Address: - Operator: BP Chemicals Limited

[1] This information is gathered from a wide range of sources including, the Environment Agency (Agency), The British Geological Survey (BGS) and under licence from Landmark Information Group Limited®. Data supplied by Landmark Information Group Limited® and the Agency refers to waste management licences required (under either the Control of Pollution Act 1974 and/or the Environmental Protection Act 1990) by anyone involved in waste disposal. A survey by the BGS undertaken in 1972/3 provides data on some older landfill sites that were not subject to legislation. Environment Agency data on historic waste / landfill sites is still being updated by the Agency as part of an ongoing project. GroundSure use this data because more accurate data is not yet publicly available and will use enhanced Environment Agency data when it is released.

10	334.0	SE	312800,167100	Site Address: Barry Docks Area A and B, Atlantic Trading Estate, Atlantic Crescent, Barry, South Glamorgan Waste Licence: Yes Site Reference: 16 Waste Type: Inert, Industrial, Commercial, Household, Special Regis Reference: -	Data Type: Polygon Licence Issue: 15-Mar-1979 Licence Surrendered: Licence Hold Address: - Operator: BP Chemicals Limited
11	494.0	S	312700,166900	Site Address: Barry Docks Area B, Atlantic Trading Estate, Atlantic Crescent, Barry, South Glamorgan Waste Licence: Yes Site Reference: 8 Waste Type: Industrial Regis Reference: -	Data Type: Polygon Licence Issue: 27-Feb-1978 Licence Surrendered: 31-Dec-1978 Licence Hold Address: - Operator: BP Chemicals Limited
12A	531.0	E	313300,167700	Site Address: Atlantic Trading Estate, Barry Dock No 2, Wimbourne Road, Barry, South Glamorgan Waste Licence: - Site Reference: 6950/0060 Waste Type: Inert, Industrial, Household, Special Regis Reference: -	Data Type: Polygon Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: Penarth Contractor
13A	531.0	E	313300,167700	Site Address: Barry Dock No.1, Atlantic Trading Estate, Wimbourne Road, Barry, South Glamorgan Waste Licence: Yes Site Reference: 6, 6950/0025 Waste Type: Inert, Industrial, Household Regis Reference: -	Data Type: Polygon Licence Issue: 02-Nov-1977 Licence Surrendered: 31-Dec-1978 Licence Hold Address: - Operator: F J H Brackett
14	793.0	NE	313500,168200	Site Address: Barry Factory Salt Water Pond, Wimbourne Road, Barry, South Glamorgan Waste Licence: Yes Site Reference: 22A Waste Type: Inert, Industrial, Household, Special, Liquid sludge Regis Reference: -	Data Type: Polygon Licence Issue: 19-Dec-1980 Licence Surrendered: Licence Hold Address: - Operator: Dow Corning Limited
Not shown	1097.0	NE	313700,168300	Site Address: Barry Factory Ponds A, B and C, Wimbourne Road, Barry, South Glamorgan Waste Licence: Yes Site Reference: 9 Waste Type: Industrial Regis Reference: -	Data Type: Polygon Licence Issue: 06-Apr-1978 Licence Surrendered: Licence Hold Address: - Operator: Dow Corning Limited
Not shown	1438.0	W	311100,167000	Site Address: West Pond, Barry, South Glamorgan Waste Licence: - Site Reference: - Waste Type: Inert, Industrial, Commercial, Household, Special Regis Reference: -	Data Type: Polygon Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: -

Records of non-operational landfill sites sourced from Landmark within 1500m of the study site: 5

The following landfill records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
2	332.0	SW	312300.0,167500.0	Site Address: Graving Docks 1 & 2 and Barry No.1 Dock, off Cory Way, BARRY, South Glamorgan, Landfill Licence: W7BABWAL Agency Reference: EAWML30147 Waste Type: Difficult Waste Description: Difficult Landfill Known Restrictions: Only waste produced on site	Record Date: 01-Oct-1994 Transfer Date: Modification Date: 01-Nov-1999 Status: Site closed Category: LANDFILL Regulator: EA - Welsh Region - South East Area (Cardiff) Size: Large (<- 250,000 tonnes/year)

Not shown	708.0	S	312700.0,166900.0	Site Address: Atlantic Trading Estate, Barry Dock, BARRY, South Glamorgan, Landfill Licence: W7BAATAL Agency Reference: Waste Type: Putrescible Waste Description: Putrescible Landfill Known Restrictions: No known restriction on source of waste	Record Date: 01-Mar-1979 Transfer Date: Modification Date: Status: Licence lapsed/cancelled/defunct/not applicable/surrendered Category: LANDFILL Regulator: EA - Welsh Region - South East Area (Cardiff) Size: Undefined
Not shown	964.0	NE	313400.0,168300.0	Site Address: Dow Corning Factory, East No 2 Dock, BARRY, South Glamorgan, Landfill Licence: W7BAAAAL Agency Reference: Waste Type: Difficult Waste Description: Difficult Landfill Known Restrictions: Only waste produced on site	Record Date: 01-Dec-1980 Transfer Date: Modification Date: Status: Record superseded Category: LANDFILL Regulator: EA - Welsh Region - South East Area (Cardiff) Size: Very Small (<-10,000 tonnes/year)
Not shown	1078.0	W	311500.0,167795.0	Site Address: Barry Docks, BARRY, South Glamorgan, Landfill Licence: W7BAALAL Agency Reference: Waste Type: Difficult Waste Description: Difficult Landfill Known Restrictions: No known restriction on source of waste	Record Date: 01-Jun-1985 Transfer Date: Modification Date: Status: Licence lapsed/cancelled/defunct/not applicable/surrendered Category: LANDFILL Regulator: EA - Welsh Region - South East Area (Cardiff) Size: Undefined
Not shown	1078.0	W	311500.0,167800.0	Site Address: Barry Docks, BARRY, South Glamorgan, Landfill Licence: W7BAAEAL Agency Reference: Waste Type: Difficult Waste Description: Difficult Landfill Known Restrictions: No known restriction on source of waste	Record Date: 01-Mar-1979 Transfer Date: Modification Date: Status: Record superseded Category: LANDFILL Regulator: EA - Welsh Region - South East Area (Cardiff) Size: Small (<-25,000 tonnes/year)

Records of BGS/DoEnon-operational landfill sites within 1500m of the study site: 0

Database searched and no data found.

Records of Local Authority landfill sites within 1500m of the study site: 1

The following landfill records are represented as points or polygons on the Landfill and Other Waste Sites map:

ID	Distance	Direction	Site Address	Source	Data Type
57	415.0	W	Barry Graving Dock, The Waterfront, Barry	Vale of Glamorgan Council	Point

2.2 Other Waste Sites[1]

Records of operational waste treatment, transfer or disposal sites within 500m of the study site: 0

Database searched and no data found.

Records of non-operational waste treatment, transfer or disposal sites within 500m of the study site: 0

Database searched and no data found.

[1]This information is gathered from a wide range of sources including, the Environment Agency (Agency), The British Geological Survey (BGS) and under licence from Landmark Information Group Limited®. Data supplied by Landmark Information Group Limited® and the Agency refers to waste management licences required (under either the Control of Pollution Act 1974 and/or the Environmental Protection Act 1990) by anyone involved in waste disposal. A survey by the BGS undertaken in 1972/3 provides data on some older landfill sites that were not subject to legislation. Environment Agency data on historic waste / landfill sites is still being updated by the Agency as part of an ongoing project. GroundSure use this data because more accurate data is not yet publicly available and will use enhanced Environment Agency data when it is released.

Records of Environment Agency (REGIS) waste sites within 1500m of the study site: 40

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
17B	295.0	SW	312329,167525	Site Address: Graving Docks Landfill, 1 & 2 Dock, Off Cory Way, Barry Docks, Barry, Vale Of Glam, CF1 7QB Type: Other landfill sites taking special waste Size: →= 75000 tonnes Regis Licence Number: ASS001 Operator: Associated British Ports Surrendered Date: - Waste Management licence No: 30147 Annual Tonnage: 0.0	Issue Date: 11/10/1994 Expiry Date: - Effective Date: - Status: Closure Modified: - Site Name: Graving Dock Cancelled Date: - Correspondence Address: 150, Holborn Road, London, , EC1 2LR
18B	295.0	SW	312329,167525	Site Address: Graving Docks Landfill, 1 & 2 Dock, Off Cory Way, Barry Docks, Barry, Vale Of Glam, CF1 7QB Type: - Size: 1 Regis Licence Number: - Operator: Associated British Ports Surrendered Date: - Waste Management licence No: 30147 Annual Tonnage: 0.0	Issue Date: - Expiry Date: - Effective Date: - Status: - Modified: - Site Name: Graving Dock Cancelled Date: - Correspondence Address: , ,
19B	295.0	SW	312329,167525	Site Address: Graving Docks Landfill, 1 & 2 Dock, Off Cory Way, Barry Docks, Barry, Vale Of Glam, CF1 7QB Type: Other landfill sites taking special waste Size: ← 25000 tonnes Regis Licence Number: ASS001 Operator: Associated British Ports Surrendered Date: 16/1/2006 Waste Management licence No: 30147 Annual Tonnage: 300000.0	Issue Date: 11/10/1994 Expiry Date: - Effective Date: - Status: Surrendered Modified: - Site Name: Graving Dock Cancelled Date: 0 Correspondence Address: Arup, 4, Pierhead Street, Capital Waterside, Cardiff, CF10 4QP
20B	295.0	SW	312329,167525	Site Address: Graving Docks Landfill, 1 & 2 Dock, Off Cory Way, Barry Docks, Barry, Vale Of Glam, CF1 7QB Type: Other landfill sites taking special waste Size: →= 75000 tonnes Regis Licence Number: ASS001 Operator: Associated British Ports Surrendered Date: - Waste Management licence No: 30147 Annual Tonnage: 0.0	Issue Date: 11/10/1994 Expiry Date: - Effective Date: - Status: Closure Modified: - Site Name: Graving Dock Cancelled Date: - Correspondence Address: Alan Stark, 150, Holborn Road, , London, , EC1 2LR
21B	295.0	SW	312329,167525	Site Address: Graving Docks Landfill, 1 & 2 Dock, Off Cory Way, Barry Docks, Barry, Vale Of Glam, CF1 7QB Type: Other landfill sites taking special waste Size: →= 75000 tonnes Regis Licence Number: ASS001 Operator: Associated British Ports Surrendered Date: - Waste Management licence No: 30147 Annual Tonnage: 0.0	Issue Date: 11/10/1994 Expiry Date: - Effective Date: - Status: Closure Modified: - Site Name: Graving Dock Cancelled Date: - Correspondence Address: Arup, 4, Pierhead Street, Capital Waterside, Cardiff, CF10 4QP
22C	470.0	E	313114,167490	Site Address: Sub Unit 1, 19, Atlantic Crescent, Barry Docks, Barry, South Glam, CF63 3RF Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: LEV001 Operator: Levics Len Surrendered Date: - Waste Management licence No: 30362 Annual Tonnage: 2499.0	Issue Date: 14/6/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Levics Vehicle Dismantlers Cancelled Date: - Correspondence Address: Sub Unit 1, 19, Atlantic Cresent, Barry Docks, Barry, South Glam, CF63 3RF

23C	470.0	E	313114,167490	Site Address: Sub Unit 1, 19, Atlantic Crescent, Barry Docks, Barry, Vale Of Glam, CF63 3RG Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: LEV001 Operator: Levics Len Surrendered Date: - Waste Management licence No: 30362 Annual Tonnage: 2499.0	Issue Date: 14/6/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Levics Vehicle Dismantlers Cancelled Date: - Correspondence Address: Sub Unit 1, 19, Atlantic Cresent, Barry Docks, Barry, Vale Of Glam, CF63 3RF
24C	470.0	E	313114,167490	Site Address: Sub Unit 1, 19, Atlantic Crescent, Barry Docks, Barry, Vale Of Glam, CF63 3RG Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: LEV001 Operator: Levics Len Surrendered Date: - Waste Management licence No: 30362 Annual Tonnage: 2499.0	Issue Date: 14/6/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Levics Vehicle Dismantlers Cancelled Date: 0 Correspondence Address: Sub Unit 1, 19, Atlantic Cresent, Barry Docks, Barry, Vale Of Glam, CF63 3RF
25C	470.0	E	313114,167490	Site Address: Sub Unit 1, 19, Atlantic Crescent, Barry Docks, Barry, Vale Of Glam, CF63 3RG Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: LEV001 Operator: Levics Len Surrendered Date: - Waste Management licence No: 30362 Annual Tonnage: 2499.0	Issue Date: 14/6/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Levics Vehicle Dismantlers Cancelled Date: - Correspondence Address: Sub Unit 1, 19, Atlantic Cresent, Barry Docks, Barry, Vale Of Glam, CF63 3RF
26D	504.0	E	313180,167691	Site Address: Atlantic Salvage Company, 22, Atlantic Business Park, Barry Docks, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: COM003 Operator: Comerford David John Surrendered Date: - Waste Management licence No: 30354 Annual Tonnage: 2499.0	Issue Date: 29/9/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Atlantic Salvage Company Cancelled Date: - Correspondence Address: 22, Barry Docks, Atlantic Business Park, Barry, Vale Of Glam, CF63 3RF
27D	504.0	E	313180,167691	Site Address: Atlantic Salvage Company, 22, Atlantic Business Park, Barry Docks, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: COM003 Operator: Comerford David John Surrendered Date: - Waste Management licence No: 30354 Annual Tonnage: 2499.0	Issue Date: 29/9/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Atlantic Salvage Company Cancelled Date: - Correspondence Address: 22, Barry Docks, Atlantic Business Park, Barry, Vale Of Glam, CF63 3RF
28D	504.0	E	313180,167691	Site Address: Atlantic Salvage Company, 22, Atlantic Business Park, Barry Docks, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: COM003 Operator: Comerford David John Surrendered Date: - Waste Management licence No: 30354 Annual Tonnage: 2499.0	Issue Date: 29/9/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Atlantic Salvage Company Cancelled Date: 0 Correspondence Address: 22, Barry Docks, Atlantic Business Park, Barry, Vale Of Glam, CF63 3RF
29D	504.0	E	313180,167691	Site Address: 22, Atlantic Business Park, Barry Docks, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: ← 25000 tonnes Regis Licence Number: COM003 Operator: Comerford David John Surrendered Date: - Waste Management licence No: 30354 Annual Tonnage: 2499.0	Issue Date: 29/9/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Atlantic Salvage Company Cancelled Date: - Correspondence Address: 22 Atlantic Business Park, Barry Docks, , Barry, Vale Of Glam, CF63 3RF

30D	504.0	E	313180,167691	Site Address: Atlantic Salvage Company, 22, Atlantic Business Park, Barry Docks, Barry, South Glamorgan, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: COM003 Operator: Comerford David John Surrendered Date: - Waste Management licence No: 30354 Annual Tonnage: 2499.0	Issue Date: 29/9/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Atlantic Salvage Company Cancelled Date: - Correspondence Address: 22, Barry Docks, Atlantic Business Park, Barry, South Glamorgan, CF63 3RF
31E	508.0	E	313162,167511	Site Address: Sub Unit 1, 19, Atlantic Crescent, Barry Docks, Barry, South Glam, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: LEV001 Operator: Levics Len Surrendered Date: - Waste Management licence No: 30362 Annual Tonnage: 0.0	Issue Date: 14/6/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Levics Vehicle Dismantlers Cancelled Date: - Correspondence Address: Sub Unit 1, 19, Atlantic Cresent, Barry Docks, Barry, South Glam, CF63 3RF
32E	508.0	E	313162,167511	Site Address: Sub Unit 1, 19, Atlantic Crescent, Barry Docks, Barry, South Glam, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: LEV001 Operator: Levics Len Surrendered Date: - Waste Management licence No: 30362 Annual Tonnage: 0.0	Issue Date: 14/6/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Levics Vehicle Dismantlers Cancelled Date: - Correspondence Address: Len Levics, Sub Unit 1, 19, Atlantic Cresent, Barry Docks, Barry, South Glam, CF63 3RF
33	525.0	E	313200,167713	Site Address: 22, Atlantic Business Park, Barry Docks, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: COM003 Operator: Comerford David John Surrendered Date: - Waste Management licence No: 30354 Annual Tonnage: 2499.0	Issue Date: 29/9/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Atlantic Salvage Company Cancelled Date: - Correspondence Address: 22 Atlantic Business Park, Barry Docks, , Barry, Vale Of Glam, CF63 3RF
34F	636.0	SE	313183,167268	Site Address: Unit 14e, Atlantic Trading Estate, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: AND003 Operator: Andrew Brown & Lee Walter Peacock Surrendered Date: - Waste Management licence No: 30372 Annual Tonnage: 2499.0	Issue Date: 26/1/2006 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: A & L Scrap Metal Merchants Cancelled Date: - Correspondence Address: Unit 14e, Atlantic Trading Estate, Barry, Vale Of Glam, CF63 3RF
35F	636.0	SE	313183,167268	Site Address: Unit 14e, Atlantic Trading Estate, Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: AND003 Operator: Andrew Brown & Lee Walter Peacock Surrendered Date: - Waste Management licence No: 30372 Annual Tonnage: 2499.0	Issue Date: 26/1/2006 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: A & L Scrap Metal Merchants Cancelled Date: - Correspondence Address: Unit 14e, Atlantic Trading Estate, Barry, Vale Of Glam, CF63 3RF
36F	636.0	SE	313183,167268	Site Address: Unit 14e, Atlantic Trading Estate,Barry, Vale Of Glam, CF63 3RF Type: End of Life Vehicles Size: <- 25000 tonnes Regis Licence Number: AND003 Operator: Andrew Brown & Lee Walter Peacock Surrendered Date: - Waste Management licence No: 30372 Annual Tonnage: 2499.0	Issue Date: 26/1/2006 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: A & L Scrap Metal Merchants Cancelled Date: 0 Correspondence Address: Unit 14e, Atlantic Trading Estate, Barry, Vale Of Glam, CF63 3RF

Not shown	968.0	NE	313398,168308	Site Address: Dow Corning Landfill, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Industrial waste landfills Size: ← 25000 tonnes Regis Licence Number: DOW001 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30043 Annual Tonnage: 18250.0	Issue Date: 9/4/1991 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Ltd Cancelled Date: - Correspondence Address: Cardiff Road, Barry, Vale Of Glam, CF63 2YL
Not shown	968.0	NE	313398,168308	Site Address: Dow Corning Landfill, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: - Size: 1 Regis Licence Number: - Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30043 Annual Tonnage: 0.0	Issue Date: - Expiry Date: - Effective Date: - Status: - Modified: - Site Name: Dow Corning Ltd Cancelled Date: - Correspondence Address: , ,
Not shown	968.0	NE	313398,168308	Site Address: Dow Corning Landfill, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Industrial waste landfills Size: ← 25000 tonnes Regis Licence Number: DOW001 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30043 Annual Tonnage: 18250.0	Issue Date: 4/9/1991 0:00:00 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Ltd Cancelled Date: - Correspondence Address: Cardiff Road, Barry, Vale Of Glam, CF63 2YL
Not shown	968.0	NE	313398,168308	Site Address: Dow Corning Landfill, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Industrial waste landfills Size: ← 25000 tonnes Regis Licence Number: DOW001 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30043 Annual Tonnage: 18250.0	Issue Date: 9/4/1991 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Ltd Cancelled Date: - Correspondence Address: Beth Voice, Cardiff Road, Barry, Vale Of Glam, CF63 2YL
Not shown	1019.0	N	312323,168696	Site Address: Court Road C/ A Site, Court Road, Barry, Vale Of Glam, CF31 3XT Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: ECO002 Operator: Ecovert Ltd Surrendered Date: - Waste Management licence No: 30076 Annual Tonnage: 24999.0	Issue Date: 22/12/1992 Expiry Date: - Effective Date: - Status: Issued Modified: 29/3/1999 Site Name: Court Road Civic Amenity Site Cancelled Date: - Correspondence Address: Stormy West Transfer Station, Stormy Down, Pyle, Bridgend, Vale Of Glam, CF32 0NP
Not shown	1019.0	N	312323,168696	Site Address: Court Road C/ A Site, Court Road, Barry, Vale Of Glam, CF31 3XT Type: - Size: 1 Regis Licence Number: - Operator: Ecovert Ltd Surrendered Date: - Waste Management licence No: 30076 Annual Tonnage: 0.0	Issue Date: - Expiry Date: - Effective Date: - Status: - Modified: - Site Name: Court Road Civic Amenity Site Cancelled Date: - Correspondence Address: , ,
Not shown	1019.0	N	312323,168696	Site Address: Court Road C/ A Site, Court Road, Barry, Vale Of Glam, CF31 3XT Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: ECO002 Operator: Ecovert Ltd Surrendered Date: - Waste Management licence No: 30076 Annual Tonnage: 24999.0	Issue Date: 22/12/1992 Expiry Date: - Effective Date: - Status: Issued Modified: 29/3/1999 Site Name: Court Road Civic Amenity Site Cancelled Date: - Correspondence Address: Zac Shell, Stormy West Transfer Station, Stormy Down, Pyle, Bridgend, Vale Of Glam, CF32 0NP
Not shown	1019.0	N	312323,168696	Site Address: Court Road C/ A Site, Court Road, Barry, Vale Of Glam, CF31 3XT Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: ECO002 Operator: Ecovert Ltd Surrendered Date: - Waste Management licence No: 30076 Annual Tonnage: 24999.0	Issue Date: 22/12/1992 Expiry Date: - Effective Date: - Status: Issued Modified: 29/3/1999 Site Name: Court Road Civic Amenity Site Cancelled Date: - Correspondence Address: Lakeside Pavillion, Chaucer Business Park, Watery Lane, Kemsing, Sevenoaks, TN15 6QY

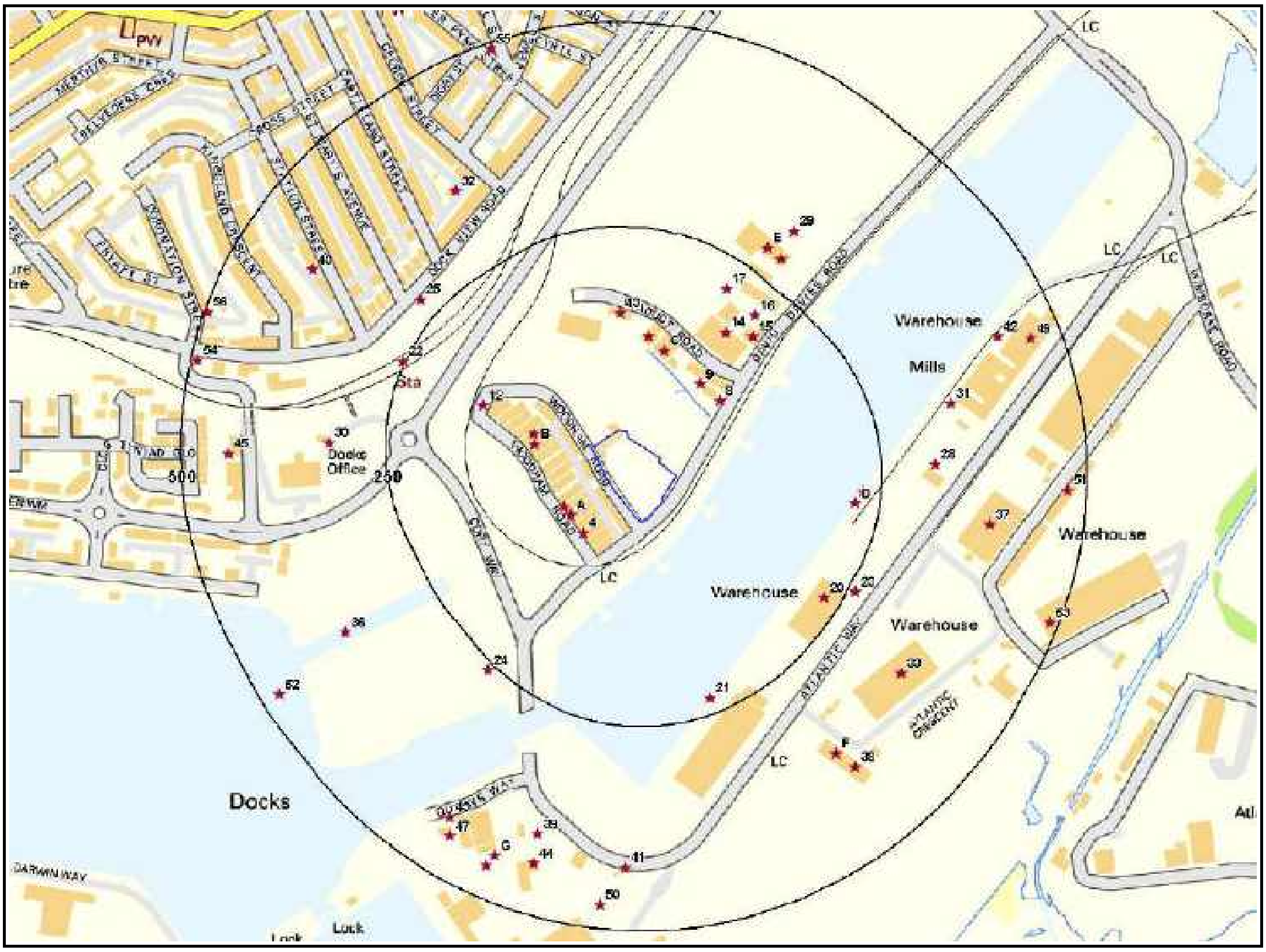
Not shown	1034.0	N	312290,168702	Site Address: Court Road C/ A Site, Court Road, Barry, Vale Of Glam, CF63 1ET Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: ECO002 Operator: Ecovert Ltd Surrendered Date: - Waste Management licence No: 30076 Annual Tonnage: 24999.0	Issue Date: 22/12/1992 Expiry Date: - Effective Date: - Status: Issued Modified: 29/3/1999 Site Name: Court Road Civic Amenity Site Cancelled Date: - Correspondence Address: Lakeside Pavillion, Chaucer Business Park, Watery Lane, Kemsing, Sevenoaks, Kent, TN15 6QY
Not shown	1034.0	N	312290,168702	Site Address: Court Road C/ A Site, Court Road,Barry, Vale Of Glam, CF63 1ET Type: Household, Commercial and Industrial transfer stations Size: ← 25000 tonnes Regis Licence Number: ECO002 Operator: Ecovert Ltd Surrendered Date: - Waste Management licence No: 30076 Annual Tonnage: 24999.0	Issue Date: 22/12/1992 Expiry Date: - Effective Date: - Status: Issued Modified: 29/3/1999 Site Name: Court Road Civic Amenity Site Cancelled Date: 0 Correspondence Address: Lakeside Pavillion, Chaucer Business Park, Watery Lane, Kemsing, Sevenoaks, Kent, TN15 6QY
Not shown	1034.0	N	312290,168702	Site Address: Aberthaw Power Station, Aberthaw, Barry, Vale Of Glam, CF62 4ZW Type: Industrial waste landfills Size: →= 75000 tonnes Regis Licence Number: INN001 Operator: R W E Innogy Plc Surrendered Date: - Waste Management licence No: 30067 Annual Tonnage: 1100200.0	Issue Date: 22/8/1992 Expiry Date: - Effective Date: 14/7/2001 Status: Modified Modified: 17/7/2003 Site Name: Aberthaw Power Station Cancelled Date: - Correspondence Address: Aberthaw Power Station, Aberthaw, Vale Of Glam, CF62 4ZW
Not shown	1050.0	NE	313595,168171	Site Address: Dow Corning Waste Transfer Station, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Material recycling treatment facilities Size: ← 25000 tonnes Regis Licence Number: DOW003 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30376 Annual Tonnage: 4999.0	Issue Date: 29/12/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Waste Transfer Station Cancelled Date: - Correspondence Address: Dow Corning Ltd, Cardiff Road, Barry, Vale Of Glam, CF63 2YL
Not shown	1050.0	NE	313595,168171	Site Address: Dow Corning Waste Transfer Station, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Material recycling treatment facilities Size: ← 25000 tonnes Regis Licence Number: DOW003 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30376 Annual Tonnage: 4999.0	Issue Date: 29/12/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Waste Transfer Station Cancelled Date: - Correspondence Address: Dow Corning Ltd, Cardiff Road, Barry, , Vale Of Glam, CF63 2YL
Not shown	1050.0	NE	313595,168171	Site Address: Dow Corning Waste Transfer Station, Cardiff Road,Barry, Vale Of Glam, CF63 2YL Type: Material recycling treatment facilities Size: ← 25000 tonnes Regis Licence Number: DOW003 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30376 Annual Tonnage: 4999.0	Issue Date: 29/12/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Waste Transfer Station Cancelled Date: 0 Correspondence Address: Dow Corning Ltd, Cardiff Road, Barry, Vale Of Glam, CF63 2YL
Not shown	1051.0	NE	313591,168181	Site Address: Dow Corning Ltd, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Material recycling treatment facilities Size: ← 25000 tonnes Regis Licence Number: DOW003 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30376 Annual Tonnage: 4999.0	Issue Date: 29/12/2005 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Waste Transfer Station Cancelled Date: - Correspondence Address: Cardiff Road, Barry, , CF63 2YL

Not shown	1210.0	NE	313530,168521	Site Address: Dow Corning Landfill, Cardiff Road, Barry, Vale Of Glam, CF63 2YL Type: Industrial waste landfills Size: ← 25000 tonnes Regis Licence Number: DOW001 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30043 Annual Tonnage: 18250.0	Issue Date: 9/4/1991 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Ltd Cancelled Date: - Correspondence Address: Dow Corning Ltd, Cardiff Road, , Barry, Vale Of Glam, CF63 2YL
Not shown	1210.0	NE	313530,168521	Site Address: Dow Corning Landfill, Cardiff Road,Barry, Vale Of Glam, CF63 2YL Type: Industrial waste landfills Size: ← 25000 tonnes Regis Licence Number: DOW001 Operator: Dow Corning Ltd Surrendered Date: - Waste Management licence No: 30043 Annual Tonnage: 18250.0	Issue Date: 9/4/1991 Expiry Date: - Effective Date: - Status: Issued Modified: - Site Name: Dow Corning Ltd Cancelled Date: 0 Correspondence Address: Dow Corning Ltd, Cardiff Road, Barry, Vale Of Glam, CF63 2YL
Not shown	1430.0	E	314100,167522	Site Address: Sully Hospital Transfer Stn, Hayes Road, Sully, Vale Of Glam, CF64 5YA Type: Clinical waste transfer stations or A20 or A15 Size: ← 25000 tonnes Regis Licence Number: LLA002 Operator: Cardiff & Vale N H S Trust Surrendered Date: 21/12/2004 Waste Management licence No: 30065 Annual Tonnage: 0.0	Issue Date: 1/7/1992 Expiry Date: - Effective Date: - Status: Surrendered Modified: - Site Name: Sully Hospital Transfer Station Cancelled Date: - Correspondence Address: Llandough Hospital, Penlan Road, , Penarth, Vale Of Glam, CF64 2XX
Not shown	1430.0	E	314100,167522	Site Address: Sully Hospital Transfer Stn, Hayes Road, Sully, Vale Of Glam, CF64 5YA Type: - Size: 1 Regis Licence Number: - Operator: Cardiff & Vale N H S Trust Surrendered Date: - Waste Management licence No: 30065 Annual Tonnage: 0.0	Issue Date: - Expiry Date: - Effective Date: - Status: - Modified: - Site Name: Sully Hospital Transfer Station Cancelled Date: - Correspondence Address: , ,
Not shown	1430.0	E	314100,167522	Site Address: Sully Hospital Transfer Stn, Hayes Road,Sully, Vale Of Glam, CF64 5YA Type: Clinical waste transfer stations or A20 or A15 Size: ← 25000 tonnes Regis Licence Number: LLA002 Operator: Cardiff & Vale N H S Trust Surrendered Date: 21/12/2004 Waste Management licence No: 30065 Annual Tonnage: 1346.0	Issue Date: 1/7/1992 Expiry Date: - Effective Date: - Status: Surrendered Modified: - Site Name: Sully Hospital Transfer Station Cancelled Date: 0 Correspondence Address: Llandough Hospital, Penlan Road, Penarth, Vale Of Glam, CF64 2XX

3. Current Land Use Map

NW ▲ N NE

◀W



E▶

SW S ▼ SE

Current Land Use Legend

Site Outline

250 / 500 Search Buffers (m)

Current Industrial Sites

Petrol & Fuel Sites

Underground High Pressure Oil & Fuel Pipelines

3. Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 500m of the study site: 56

The following records are represented as points on the Current Land Uses map.

ID	Distance	Direction	Company	Address	Activity	Category
1A	60.0	SW	Cars On Gas	4, Woodham Road, Barry, CF63 4JE	Vehicle Repair and Servicing	Repair and Servicing
2A	60.0	SW	German Car Specialists	5, Woodham Road, Barry, CF63 4JE	Vehicle Repair and Servicing	Repair and Servicing
3A	60.0	SW	Welsh Caravan Specialist	5, Woodham Road, Barry, CF63 4JE	Sports and Leisure Equipment Repair	Repair and Servicing
4	62.0	SW	Ross Garage	3, Woodham Road, Barry, CF63 4JE	Vehicle Repair and Servicing	Repair and Servicing
5A	62.0	SW	Gym Systems & Servicing	6-7, Woodham Road, Barry, CF63 4JE	Hobby, Sports and Pastime Products	Consumer Products
6B	69.0	W	Potter	12, Woodham Road, Barry, CF63 4JE	Vehicle Bodybuilders	Industrial Products
7B	72.0	W	Topend Ltd	13, Woodham Road, Barry, CF63 4JE	Vehicle Repair and Servicing	Repair and Servicing
8	101.0	NE	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
9	103.0	NE	Works	-	Unspecified Works Or Factories	Industrial Features
10C	109.0	NE	Works	-	Unspecified Works Or Factories	Industrial Features
11C	119.0	N	Works	-	Unspecified Works Or Factories	Industrial Features
12	142.0	W	Church Motors	19, Woodham Road, Barry, CF63 4JE	Vehicle Repair and Servicing	Repair and Servicing
13	144.0	N	Works	-	Unspecified Works Or Factories	Industrial Features
14	170.0	NE	Vaughan Transport Systems	Dock 2, David Davies Road, Barry, CF63 4AB	Distribution and Haulage	Transport, Storage And Deliver
15	187.0	NE	S & K Haulage Ltd	David Davies Road, Barry, CF63 4AB	Distribution and Haulage	Transport, Storage And Deliver
16	209.0	NE	Depot	-	Container and Storage	Transport, Storage And Deliver
17	213.0	NE	Tank	-	Tanks (Generic)	Industrial Features
18D	220.0	E	Travelling Crane	-	Travelling Cranes and Gantries	Industrial Features
19D	228.0	E	Cranes	-	Travelling Cranes and Gantries	Industrial Features
20	230.0	SE	Warehouse	-	Container and Storage	Transport, Storage And Deliver
21	231.0	S	Travelling Cranes	-	Travelling Cranes and Gantries	Industrial Features
22	252.0	NW	Barry Docks Station	-	Railway Stations, Junctions and Halts	Transport Access Points
23	259.0	SE	Tank	-	Tanks (Generic)	Industrial Features
24	260.0	SW	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
25	276.0	NW	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
26E	283.0	NE	Works	-	Unspecified Works Or Factories	Industrial Features
27E	283.0	NE	Harris Pye Marine Ltd	David Davies Road, Barry, CF63 4AB	Marine Engineers and Services	Engineering Services

28	315.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
29	318.0	NE	Depot	-	Container and Storage	Transport, Storage And Deliver
30	320.0	W	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
31	345.0	E	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
32	354.0	NW	Vanguard (Wales) Ltd	Castleland Street, Barry, CF63 4LL	Construction Completion Services	Construction Services
33	358.0	SE	Warehouse	-	Container and Storage	Transport, Storage And Deliver
34F	367.0	SE	D B Engineering Services	Unit 1, Atlantic Crescent, Barry, CF63 3RG	Industrial Engineers	Engineering Services
35F	367.0	SE	Leisure Solutions	Unit 1, Atlantic Crescent, Barry, CF63 3RG	Hobby, Sports and Pastime Products	Consumer Products
36	369.0	SW	Graving Dock (Disused)	-	Marine Equipment Including Boats and Ships	Industrial Products
37	386.0	E	Warehouse	-	Container and Storage	Transport, Storage And Deliver
38	394.0	SE	Tank	-	Tanks (Generic)	Industrial Features
39	402.0	S	Depot	-	Container and Storage	Transport, Storage And Deliver
40	403.0	NW	Mr Fix I.T.	19, Station Street, Barry, CF63 4LW	Electrical Equipment Repair and Servicing	Electrical Equipment Repair and Servicing
41	423.0	S	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
42	426.0	NE	Silo	-	Hoppers and Silos	Hoppers and Silos
43	430.0	SW	Tank	-	Tanks (Generic)	Industrial Features
44	438.0	S	Groupe Samat UK Ltd	Atlantic Way, Barry, CF63 3RA	Distribution and Haulage	Transport, Storage And Deliver
45	441.0	W	Caterite Ltd	3, Subway Road, Barry, CF63 4QT	Food and Beverage Industry Machinery	Industrial Products
46G	446.0	SW	Tank	-	Tanks (Generic)	Industrial Features
47	449.0	SW	Tank	-	Tanks (Generic)	Industrial Features
48G	460.0	SW	Depot	-	Container and Storage	Transport, Storage And Deliver
49	463.0	E	Warehouse	-	Container and Storage	Transport, Storage And Deliver
50	471.0	S	Depot	-	Container and Storage	Transport, Storage And Deliver
51	476.0	E	Warehouse	-	Container and Storage	Transport, Storage And Deliver
52	478.0	SW	Jetty (Disused)	-	Moorings and Unloading Facilities	Water
53	489.0	E	Sos Salvage Car Breakers	Unit 19, Atlantic Crescent, Barry Docks, Barry, South Glamorgan, CF63 3RF	Vehicle Breakers	Recycling Services
54	492.0	W	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
55	493.0	N	Electricity Sub Station	-	Electrical Features	Infrastructure and facilities
56	496.0	W	A P C	35, Coronation Street, Barry, CF63 4JW	Construction Completion Services	Construction Services

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: **0**

Database searched and no data found.

3.3 Underground High Pressure Oil and Gas Pipelines

Records of underground pipelines within 500m of the study site: **0**

Database searched and no data found.

4. Geology

4.1 Artificial Ground and Made Ground

The database has been searched on site, this includes a 50m buffer.

Distance (m)	Direction	LEX Code	Description	Rock Type
0.0	On Site	MGR-MGRD	MADE GROUND (UNDIVIDED)	MADE GROUND (COMPOSITION UNSPECIFIED)

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

4.2 Superficial Ground and Drift Geology

The database has been searched on site, this includes a 50m buffer.

Distance (m)	Direction	Lex Code	Description	Rock Type
0.0	On Site	TFD-CLSS	Tidal Flat Deposits	Clay, Silt And Sand

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

4.3 Bedrock and Solid Geology

The database has been searched on site, this includes a 50m buffer.

Distance (m)	Direction	LEX Code	Description	Rock Type
0.0	On Site	MMG-MDST	Mercia Mudstone Group	Mudstone

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

For more detailed geological and ground stability data please refer to the "GroundSure Geology and Ground Stability Report". Available from our website.

5. Hydrogeology and Hydrology: - Aquifer and Abstraction Licence Map

NW N NE

W E

SW S SE

Hydrogeology and Hydrology Legend

Site Outline

Search Buffers (m)

Minor Aquifer - Low Leaching Potential

Minor Aquifer - Intermediate Leaching Potential

Minor Aquifer - High Leaching Potential

Major Aquifer - Low Leaching Potential

Major Aquifer - Intermediate Leaching Potential

Major Aquifer - High Leaching Potential

Main River

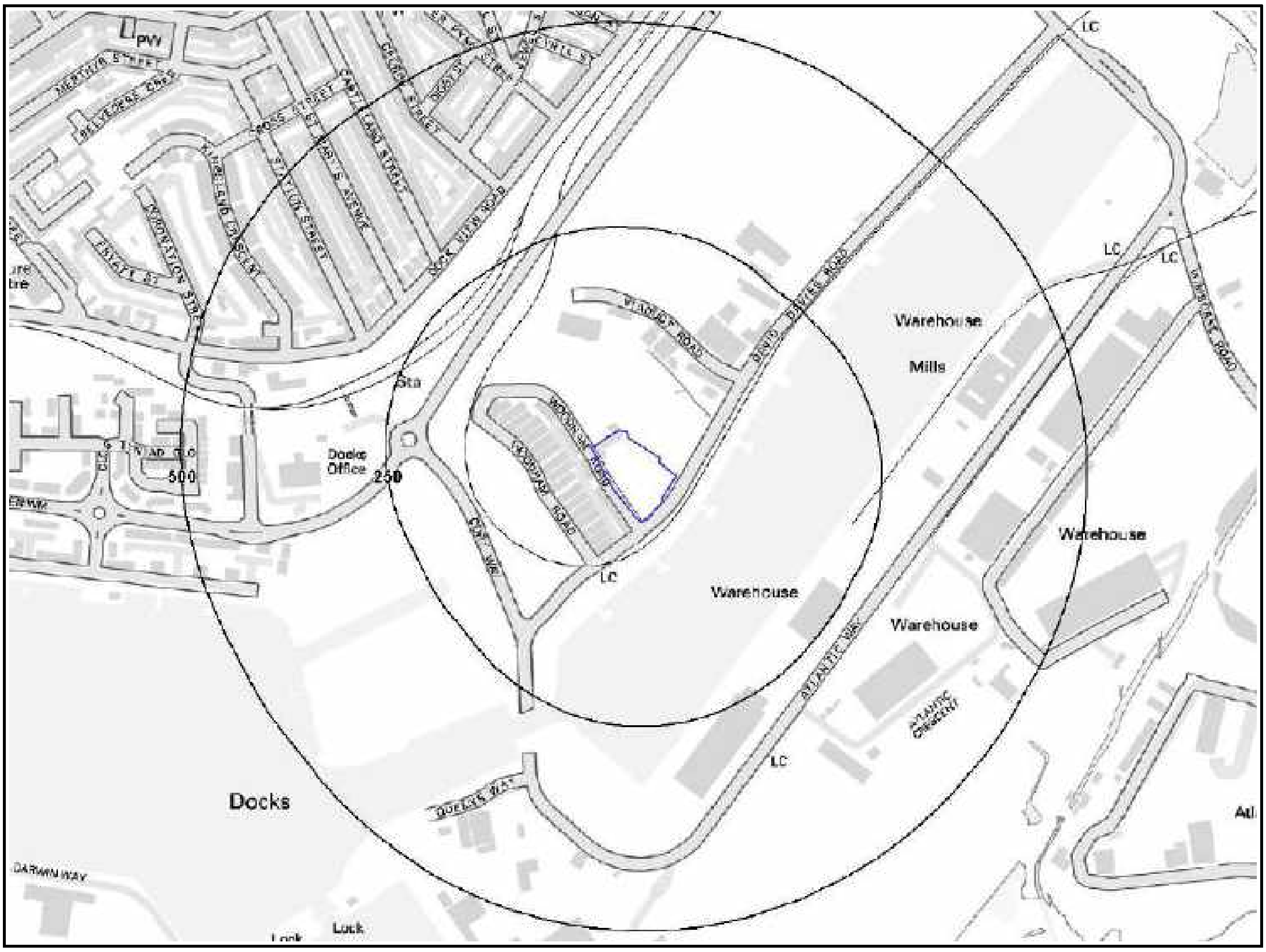
Groundwater Abstraction Licence

Surface Water Abstraction Licence

5b. Hydrogeology and Hydrology: - SPZ and Potable Water Abstraction Map

NW ▲ N NE

◀W E▶



SW S ▼ SE

Hydrogeology and Hydrology Legend

Mapping sourced from Ordnance Survey

Site Outline

100
250
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

5. Hydrogeology and Hydrology

5.1 Groundwater Vulnerability and Soil Classification

Records of aquifer and soil classification within 200m of the study site: **No**

Database searched and no data found.

5.2 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? **Yes**

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer and Abstraction Licence Map:

ID	Distance	Direction	NGR	Details	
Not shown	1413.0	SW	311620,166620	Licence No: 21/58/31/0031 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Eaw Groundwater Point: Borehole At Barry Island Pleasure Park Data Type: Point	Original Application No: Original Start Date: 31-May-2002 Expiry Date: 31-May-2002 Issue No: 1 Version Start Date: 31-May-2002 Version End Date: 31-May-2002
Not shown	1413.0	SW	311620,166620	Licence No: 21/58/31/0031 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Eaw Groundwater Point: Borehole At Barry Island Pleasure Park Data Type: Point	Original Application No: Original Start Date: 31-May-2002 Expiry Date: 31-Mar-2018 Issue No: 1 Version Start Date: 31-May-2002 Version End Date: 01-Jan-1900
Not shown	1413.0	SW	311620,166620	Licence No: 21/58/31/0030 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Eaw Groundwater Point: Borehole At Barry Island Pleasure Park Data Type: Point	Original Application No: Original Start Date: 21-Mar-1997 Expiry Date: Issue No: 100 Version Start Date: 21-Mar-1997 Version End Date:
Not shown	1413.0	SW	311620,166620	Licence No: 21/58/31/0031 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Eaw Groundwater Point: Borehole At Barry Island Pleasure Park Data Type: Point	Original Application No: Original Start Date: 31-May-2002 Expiry Date: 31-Mar-2018 Issue No: 1 Version Start Date: 21-May-2004 Version End Date:
Not shown	1413.0	SW	311620,166620	Licence No: 21/58/31/0031 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Eaw Groundwater Point: Borehole At Barry Island Pleasure Park Data Type: Point	Original Application No: Original Start Date: 31-May-2002 Expiry Date: 31-Mar-2018 Issue No: 1 Version Start Date: 21-May-2004 Version End Date:
Not shown	1413.0	SW	311620,166620	Licence No: 21/58/31/0031 Details: General Use Relating To Secondary Category (Medium Loss) Direct Source: Eaw Groundwater Point: Borehole At Barry Island Pleasure Park Data Type: Point	Original Application No: Original Start Date: 31-May-2002 Expiry Date: 31-Mar-2018 Issue No: 1 Version Start Date: 21-May-2004 Version End Date:

5.3 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 1000m of the study site? **Yes**

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer and Abstraction Licence Map:

ID	Distance	Direction	NGR	Details

12A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Mineral Washing Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 101 Version Start Date: 25-Jun-2001 Version End Date:
13A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Make-Up or Top Up Water Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 100 Version Start Date: 24-Apr-1996 Version End Date:
14A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Make-Up or Top Up Water Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: 30-Dec-1899 Issue No: 101 Version Start Date: 25-Jun-2001 Version End Date: 01-Jan-1900
15A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Dust Suppression Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 102 Version Start Date: 01-Oct-2005 Version End Date:
16A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Mineral Washing Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 102 Version Start Date: 01-Oct-2005 Version End Date:
17A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Dust suppression Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: 24-Apr-1996 Issue No: 101 Version Start Date: 24-Apr-1996 Version End Date: 24-Apr-1996
18A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Make-Up Or Top Up Water Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 102 Version Start Date: 01-Oct-2005 Version End Date:
19A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Mineral Washing Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: 24-Apr-1996 Issue No: 101 Version Start Date: 24-Apr-1996 Version End Date: 24-Apr-1996
20A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Dust suppression Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 100 Version Start Date: 24-Apr-1996 Version End Date:
21A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Make-Up or Top Up Water Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 101 Version Start Date: 25-Jun-2001 Version End Date:
22A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Mineral Washing Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 100 Version Start Date: 24-Apr-1996 Version End Date:
23A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Dust suppression Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: Issue No: 101 Version Start Date: 25-Jun-2001 Version End Date:

24A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Make-Up or Top Up Water Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: 24-Apr-1996 Issue No: 101 Version Start Date: 24-Apr-1996 Version End Date: 24-Apr-1996
25A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Mineral Washing Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: 30-Dec-1899 Issue No: 101 Version Start Date: 25-Jun-2001 Version End Date: 01-Jan-1900
26A	651.0	SE	313164,167218	Licence No: 21/58/11/0011 Details: Dust suppression Direct Source: Eaw Tidalwater Point: Cadoxton River At Barry Data Type: Point	Application No: Original Start Date: 24-Apr-1996 Expiry Date: 30-Dec-1899 Issue No: 101 Version Start Date: 25-Jun-2001 Version End Date: 01-Jan-1900

5.4 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? **No**

Database searched and no data found.

5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? **No**

Database searched and no data found.

5.6 River Quality

Is there any Environment Agency information on river quality within 500m of the study site? **No**

Database searched and no data found.

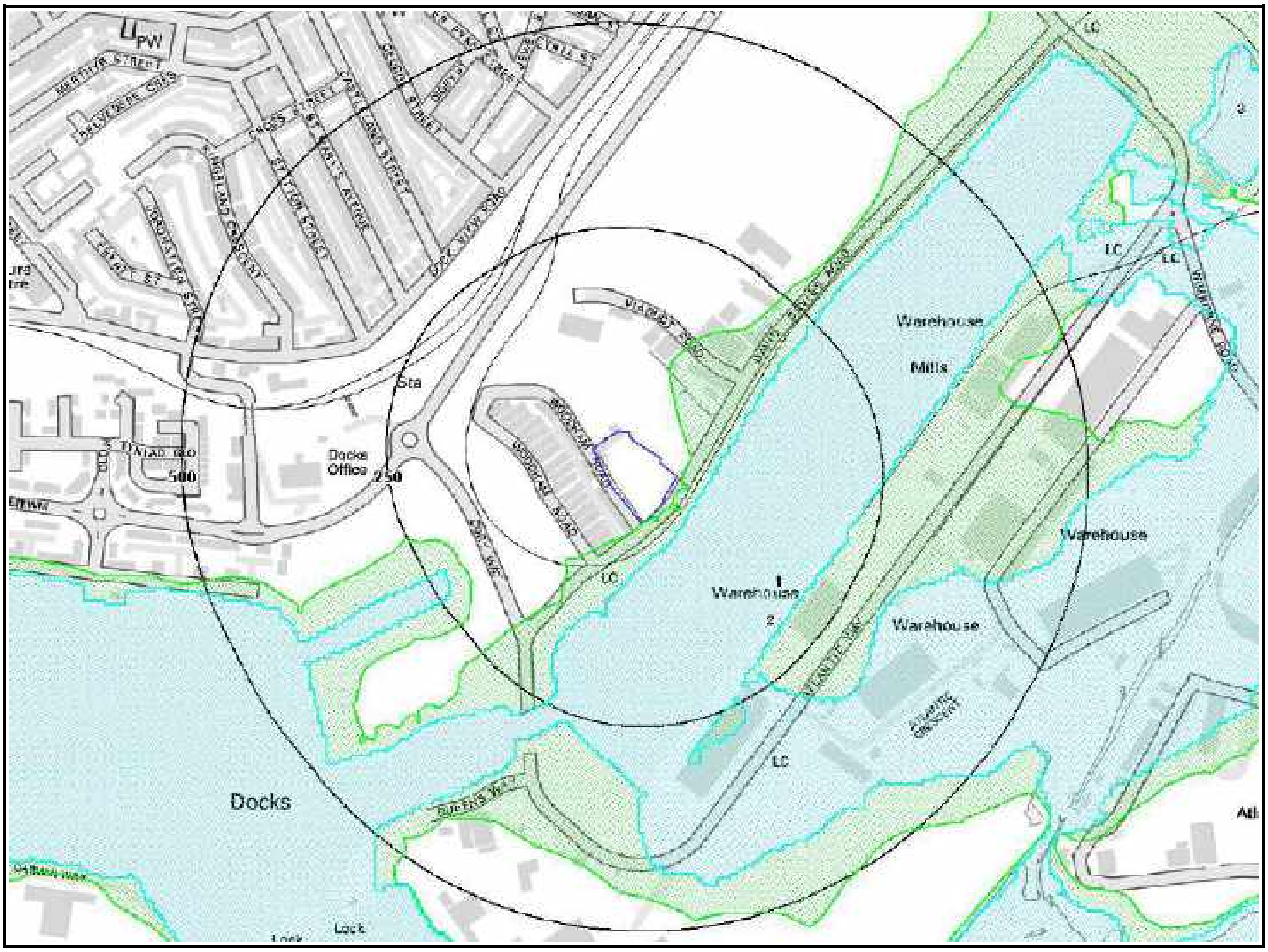
5.7 Main Rivers

Are there any Main Rivers within 500m of the study site? **No**

Database searched and no data found.

6. Surface Water Flood Map

N



S

Flood Legend

Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

Zone 3 Floodplain

Flood Storage Area

Area Benefiting from Flood Defences

Flood Defences

6. Flooding

6.1 Zone 2 Flooding

Zone 2 floodplain estimates the annual probability of flooding as one in one thousand (0.1%) or greater from rivers and the sea but less than 1% from rivers or 0.5% from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 2 floodplain? Yes

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

The following floodplain records are represented as green shading on the Flood Map:

ID	Distance	Direction	Update
1	0.0	SE	07-Feb-2008

6.2 Zone 3 Flooding

Zone 3 estimates the annual probability of flooding as one in one hundred (1%) or greater from rivers and a one in two hundred (0.5%) or greater from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 3 floodplain? Yes

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

The following floodplain records are represented as blue shading on the Flood Map:

ID	Distance	Direction	Update
2	32.0	E	07-Feb-2008

6.3 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

6.4 Areas used for Storage Areas

Are there any areas used for Flood Storage within 250m of the study site? No

Guidance: More detailed information may be available from the Environment Agency through their floodline (0845 988 1188) or by ordering an Environment Agency Flood Report from the local Environment Agency Office.

6.5. Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the centre of the study site? Yes

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?	**High**

6.6 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?	**Moderate**

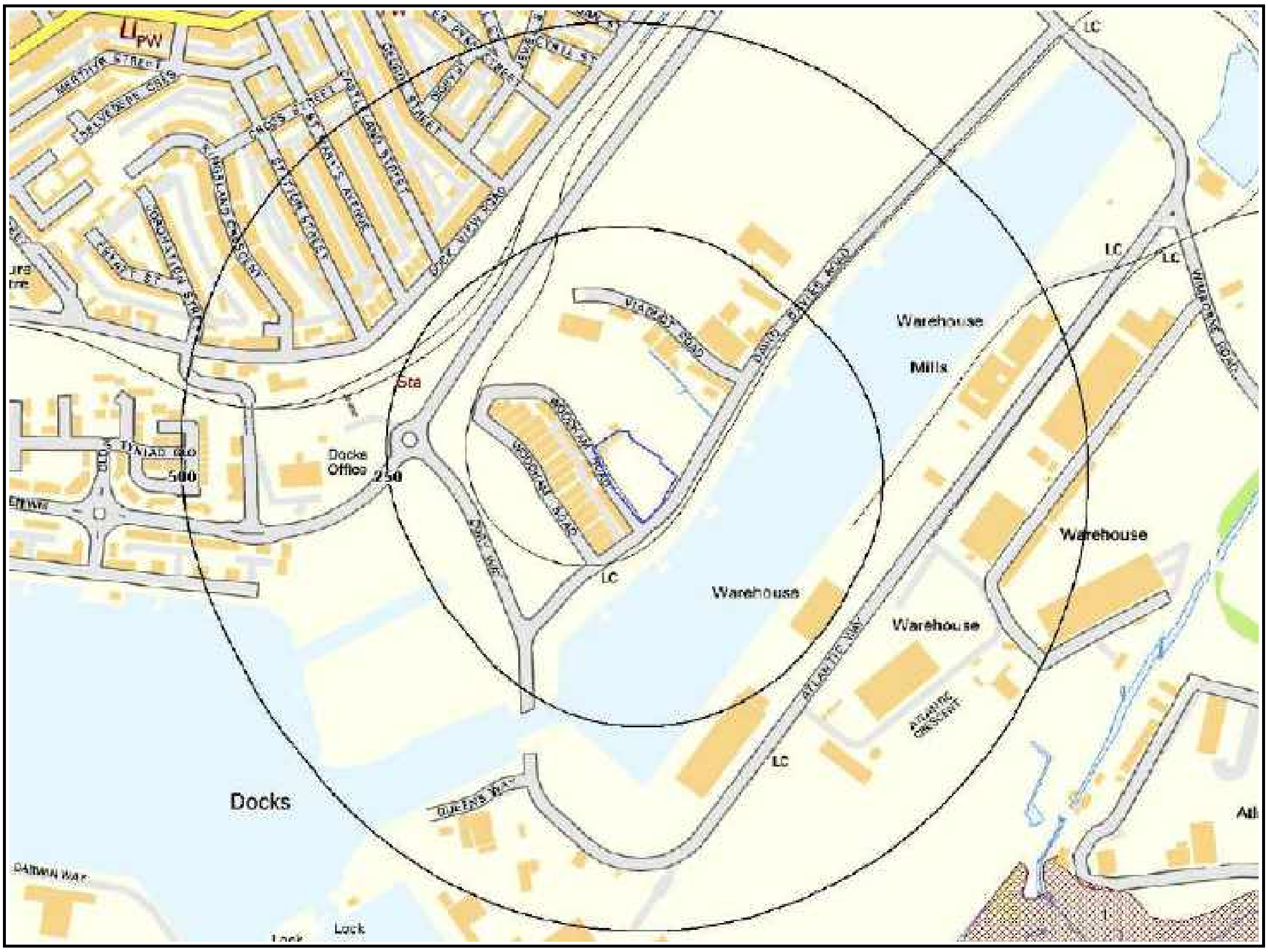
Notes:

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a fivefold scale - Low, Moderately Low, Moderate, Moderately High and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

7.Ecological Designated Sites Map

N



S

Ecological Designated Sites Legend

- Site Outline
- Search Buffers (m) (100, 250)
- SAC
- SSSI
- NNR
- World Heritage Sites
- SPA
- Ramsar
- LNR

7 Ecological Designated Sites

Presence of sites of ecological value within 1000m of the study site? **Yes**

Records of Sites of Special Scientific Interest (SSSI) within 1000m of the study site: **1**

The following Sites of Special Scientific Interest (SSSI) records provided by English Nature/Countryside Council for Wales are represented as polygons on the Ecological Designated Sites Map:

ID	Distance	Direction	SSSI Name	Data Source
1	616.0	SE	HAYES POINT TO BENDRICK ROCK	Countryside Council For Wales

Records of National Nature Reserves (NNR) within 1000m of the study site: **0**

Database searched and no data found.

Records of Special Areas of Conservation (SAC) within 1000m of the study site: **0**

Database searched and no data found.

Records of Special Protection Areas (SPA) within 1000m of the study site: **0**

Database searched and no data found.

Records of Ramsar sites within 1000m of the study site: **0**

Database searched and no data found.

Records of Local Nature Reserves (LNR) within 1000m of the study site: **0**

Database searched and no data found.

Records of World Heritage Sites within1000m of the study site: **0**

Database searched and no data found.

8. Natural Hazards Findings

8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information, please obtain a GroundSure Geology and Ground Stability Report. Available from our website. The following information has been found:

8.1.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site? **Very Low**

8.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? **Very Low**

8.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? **Null - Negligible**

8.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? **Very Low**

8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? **Null - Negligible**

8.1.6 Running Sand

What is the maximum Running Sand* hazard rating identified on the study site? **Very Low**

9.Mining

9.1 Coal Mining

Are there any coal mining areas within 75m of the study site? **No**

Database searched and no data found.

9.2 Shallow Mining

What is the hazard of subsidence relating to shallow mining onsite? (this includes a 150m buffer) **Negligible**

10.Contacts

GroundSure Helpline

Telephone: 01273 819700
mapsandinfo@groundsure.com

British Geological Survey (England & Wales)

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3136. www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

Environment Agency

South East
Rivers house / Plas Yr Afon - St. Mellons Business Park, Fortran Road, St. Mellons, Cardiff, CF3 0LT Tel: (01222) 770088
EA Wales Tel: (02920) 770 088

The Coal Authority

200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848. DX 716176 Mansfield 5
www.coal-authority.co.uk
Coal mining reports and related enquiries

Ordnance Survey

Romsey Road
Southampton SO16 4GU
Tel: 08456 050505

Local Authority

Vale of Glamorgan County Borough Council Tel:

Get Mapping PLC

Virginia Villas, High Street, Hartley Witney, Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements

This product includes map data licensed from Landmark Information Group Limited®.

This report has been prepared in accordance with the GroundSure Ltd standard Terms and Conditions of business for work of this nature.

Oaktree Environmental
Unit 5 Oasis Park, Road 1,
Winsford Industrial Estate, Winsford,
CW7 3PP

GroundSure Reference:	HMD-188-62961
Your Reference:	Barry
Report Date	Mar 6, 2008
Report Delivery Method:	Email - pdf

GroundSure Geology & Ground Stability Report

Address: **WOODHAM ROAD, DOCKS, BARRY, CF62**

Dear Sir/Madam,

Thank you for placing your order with GroundSure. Please find enclosed the **GroundSure Geology & Ground Stability Report** as requested.

If you need any further assistance, please do not hesitate to contact our maps and data helpline on 01273 819700 or email maps&data@groundsure.com quoting the above GroundSure reference number.

Yours faithfully,

[redacted]

Managing Director
Groundsure Limited

Enc.
GroundSure Geology & Ground Stability Report

GroundSure Geology & Ground Stability Report

Address: WOODHAM ROAD, DOCKS, BARRY, CF62

Date: Mar 6, 2008

GroundSure Reference: HMD-188-62961

Your Reference: Barry

Aerial Photograph of Study Site

NW N NE

W  E

SW S SE

Site Name:WOODHAM ROAD, DOCKS, BARRY, CF62
Grid Reference: 312620,167670

Overview of Findings

The GroundSure Geology and Ground Stability Report provides high quality geo-environmental information that allows geo-environmental professionals and their clients to make informed decisions and be forewarned of potential ground instability problems that may affect the ground investigation, foundation design and possibly remediation options that could lead to possible additional costs.

The report is based on the BGS 1:50,000 Digital Geological Map of Great Britain, BGS Geosure data; BRITPITS database; Shallow Mining data and Borehole Records, Coal Authority data including brine extraction areas, PBA non-coal mining and natural cavities database and GroundSure's unique database including historical surface ground and underground workings.

For further details on each dataset, please refer to each individual section in the report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Report Section	Number of records found within (X) m of the study site boundary

1. Geology	Description
1.1 Artificial Ground,	
1.1.1 Is there any Artificial Ground /Made Ground present beneath the study site? *	Yes
1.1.2 Are there any records relating to permeability of artificial ground within the study site* boundary?	Yes
1.2 Superficial Geology & Landslips	
1.2.1 Is there any Superficial Ground /Drift Geology present beneath the study site? *	Yes
1.2.2 Are there any records relating to permeability of superficial geology within the study site* boundary?	Yes
1.2.3 Are there any records of landslip within 500m of the study site boundary?	No
1.2.4 Are there any records relating to permeability of landslips within the study site* boundary?	No
1.3 Bedrock, Solid Geology & Faults	
1.3.1 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	
1.3.2 Are there any records relating to permeability of bedrock within the study site* boundary?	Yes
1.3.3 Are there any records of faults within 500m of the study site boundary?	Yes
1.3.4 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a radon Affected Area, as less than 1% of properties are above the Action Level
1.3.5 Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Resea rch Establishment?	No radon protective measures are necessary

* This includes an automatically generated 50m buffer zone around the site

Source:Scale 1:50,000 BGS Sheet No:263

2. Ground Workings	on-site	0-50	51-250	251-500	501-1000
2.1 Historical Surface Ground Working Features from Small Scale Mapping	3	9	22	-	-
2.2 Historical Underground Workings Features from Small Scale Mapping	0	0	5	0	9
2.3 Current Ground Workings	0	0	1	2	1

3. Mining, Extraction & Natural Cavities	on-site	0-50	51-250	251-500	501-1000
3.1 Historical Mining	0	4	11	10	23
3.2 Coal Mining	0	0	0	0	0
3.3 Shallow Mining*	1	-	-	-	-
3.4 Non – Coal Mining Cavities	0	0	0	0	0
3.5 Natural Cavities	0	0	0	0	0
3.6 Brine Extraction	0	0	0	0	0
3.7 Gypsum Extraction	0	0	0	0	0
3.8 Tin Mining	0	0	0	0	0
3.9 Clay Mining	0	0	0	0	0

*This includes an automatically generated 150m buffer zone around the site

4. Natural Ground Subsidence	on-site*	0-50	51-250	251-500	501-1000
4.1 Shrink-Swell Clay	Very Low	-	-	-	-
4.2 Landslides	Very Low	-	-	-	-
4.3 Ground Dissolution of Soluble Rocks	Negligible	-	-	-	-
4.4 Compressible Deposits	Very Low	-	-	-	-
4.5 Collapsible Deposits	Negligible	-	-	-	-
4.6 Running Sand	Very Low	-	-	-	-

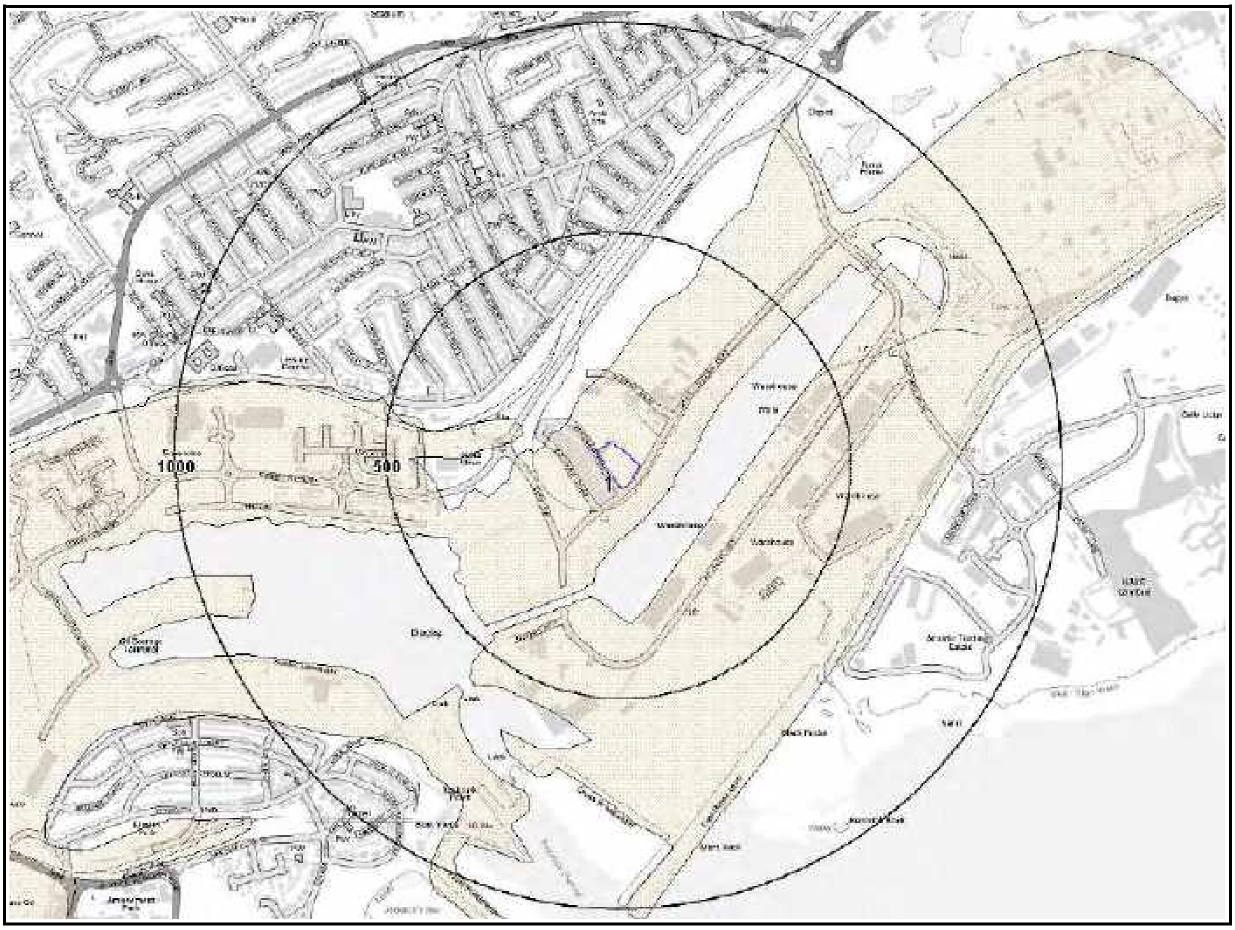
* This includes an automatically generated 50m buffer zone around the site

5. Borehole Records	on-site	0-50	51-250	251-500	501-1000
5.1 BGS Recorded Boreholes	0	0	3	-	-

1.1 Artificial Ground Map

NW N NE

W E



SW S SE

Artificial Ground Legend

Site Outline

— 50 —
—250— Search Buffers

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.1 Artificial Ground

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:263

1.1.1 Artificial/Made Ground

Are there any records of Artificial/Made Ground within 500m of the study site boundary: Yes

ID	Distance (m)	Direction	LEX Code	Description	Rock Description
1	0.0	On Site	MGR-MGRD	MADE GROUND (UNDIVIDED)	MADE GROUND (COMPOSITION UNSPECIFIED)

1.1.2 Permeability of Artificial Ground

Are there any records relating to permeability of artificial ground within the study site* boundary: Yes

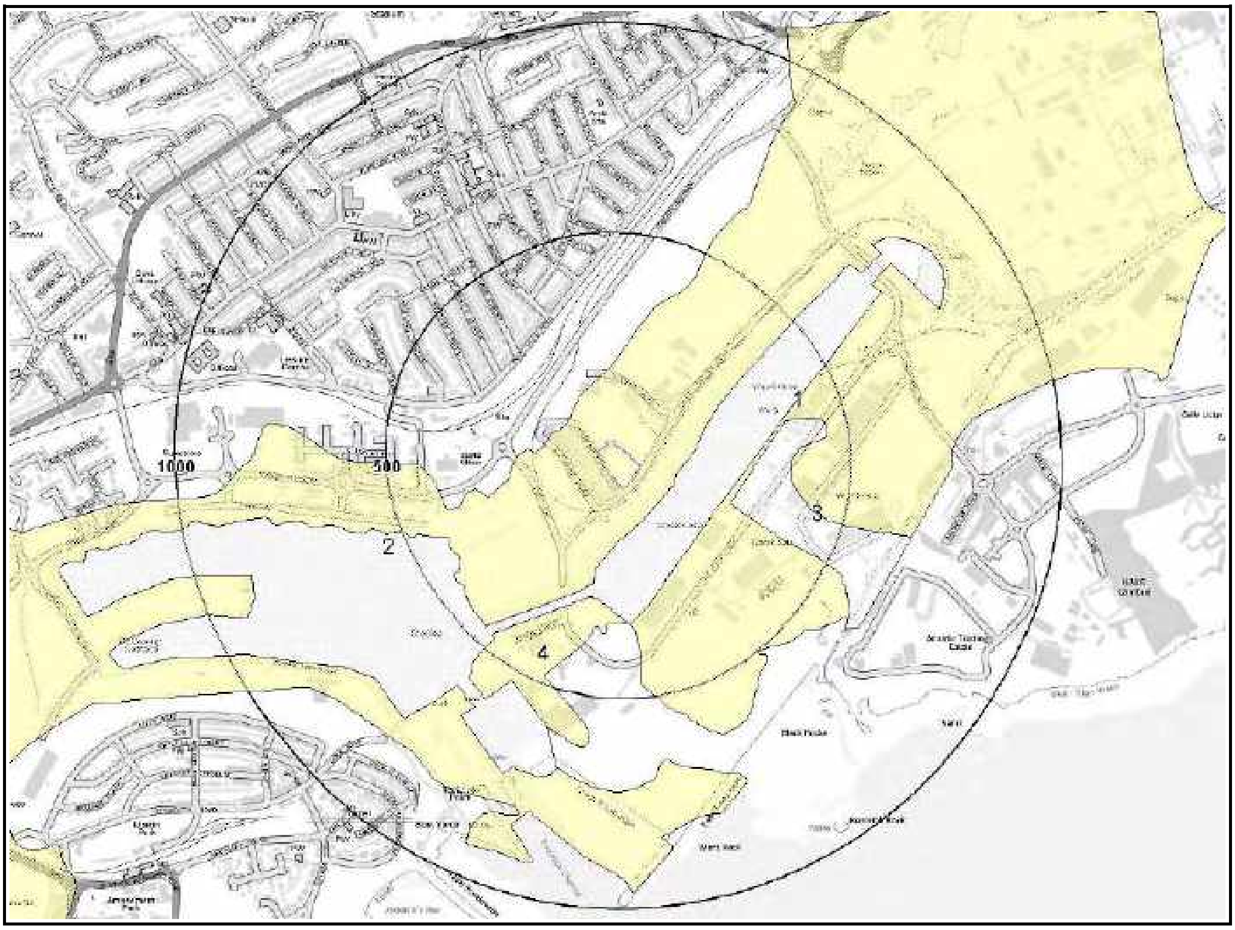
Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Very High	Very Low

* This includes an automatically generated 50m buffer zone around the site.

1.2 Superficial Deposits and Landslips Map

NW N NE

W E



SW S SE

Superficial and Landslips Legend

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.2 Superficial Deposits and Landslips

1.2.1 Superficial Deposits/Drift Geology

Are there any records of Superficial Deposits/Drift Geology within 500m of the study site boundary: Yes

ID	Distance (m)	Direction	Lex Code	Description	Rock Description
1	0.0	On Site	TFD-CLSS	Tidal Flat Deposits	Clay, Silt And Sand
2	81.0	SE	SUPNM-UNKN	Superficial Deposits Not Mapped [for Digital Map Use Only]	Unknown Lithology
3	233.0	SE	BSA-SAND	Blown Sand	Sand
4	267.0	S	TFD-CLSS	Tidal Flat Deposits	Clay, Silt And Sand

1.2.2 Permeability of Superficial Ground

Are there any records relating to permeability of superficial ground within the study site* boundary: Yes

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Intergranular	Moderate	Very Low

1.2.3 Landslip

Database searched and no data found.

Are there any records of Landslip within 500m of the study site boundary? No

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.
This Geology shows the main components as discreet layers, these are: Artificial / Made Ground, Superficial / Drift Geology and Landslips. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.2.4 Landslip Permeability

Are there any records relating to permeability of landslips within the study site* boundary: No

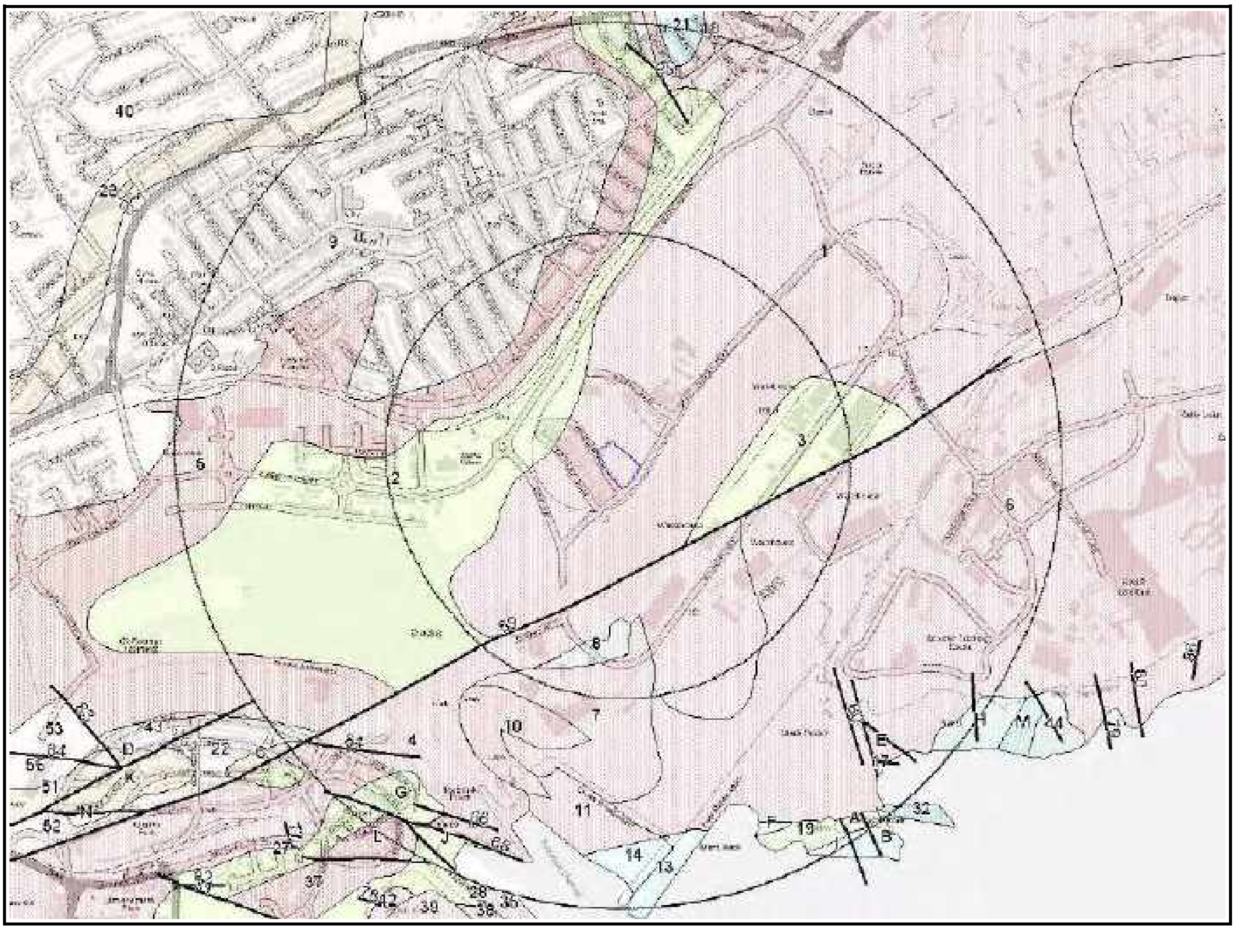
Database searched and no data found.

* This includes an automatically generated 50m buffer zone around the site.

1.3 Bedrock and Faults Map

NW N NE

W E



SW S SE

Bedrock & Faults Deposits Legend

Site Outline

— 50 —
—250— Search Buffers

Geological information represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

1.3 Bedrock, Solid Geology & Faults

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping, Sheet No:263

1.3.1 Bedrock/Solid Geology

Records of Bedrock/Solid Geology within 500m of the study site boundary:

ID	Distance (m)	Direction	LEX Code	Rock Description	Rock Age
1	0.0	On Site	MMG-MDST	Mercia Mudstone Group - Mudstone	Rhaetian / Scythian
2	93.0	NW	BAN-MDST	Blue Anchor Formation - Mudstone	Rhaetian / Norian
3	182.0	SE	BAN-MDST	Blue Anchor Formation - Mudstone	Rhaetian / Norian
4	189.0	SE	MMG-MDST	Mercia Mudstone Group - Mudstone	Rhaetian / Scythian
5	245.0	NW	PNG-MDLM	Penarth Group - Mudstone And Limestone, Interbedded	Rhaetian
6	269.0	SE	MMMF-CONG	Mercia Mudstone Group (marginal Facies) - Conglomerate	Triassic
7	302.0	S	QCG-SCON	Quartz Conglomerate Group (south Wales) - Sandstone And Conglomerate, Interbedded	Famennian
8	305.0	S	AVO-LSMD	Avon Group - Limestone And Mudstone, Interbedded	Courceyan
9	327.0	NW	STM-LSMD	St Mary's Well Bay Member - Limestone And Mudstone, Interbedded	Hettangian / Rhaetian

1.3.2 Permeability of Bedrock Ground

Are there any records relating to permeability of bedrock ground within the study site* boundary: Yes

Distance (m)	Direction	Flow type	Maximum Permeability	Minimum Permeability
0.0	On Site	Fracture	Low	Low

1.3.3 Faults

Are there any records of Faults within 500m of the study site boundary? Yes

ID	Distance (m)	Direction	Category Description	Feature Description
59	190.0	SE	FAULT	Normal fault, inferred

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale.

This Geology shows the main components as discreet layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

1.3.4 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

* This includes an automatically generated 50m buffer zone around the site.

The property is not in a radon Affected Area, as less than 1% of properties are above the Action Level

1.3.5 Radon Protection

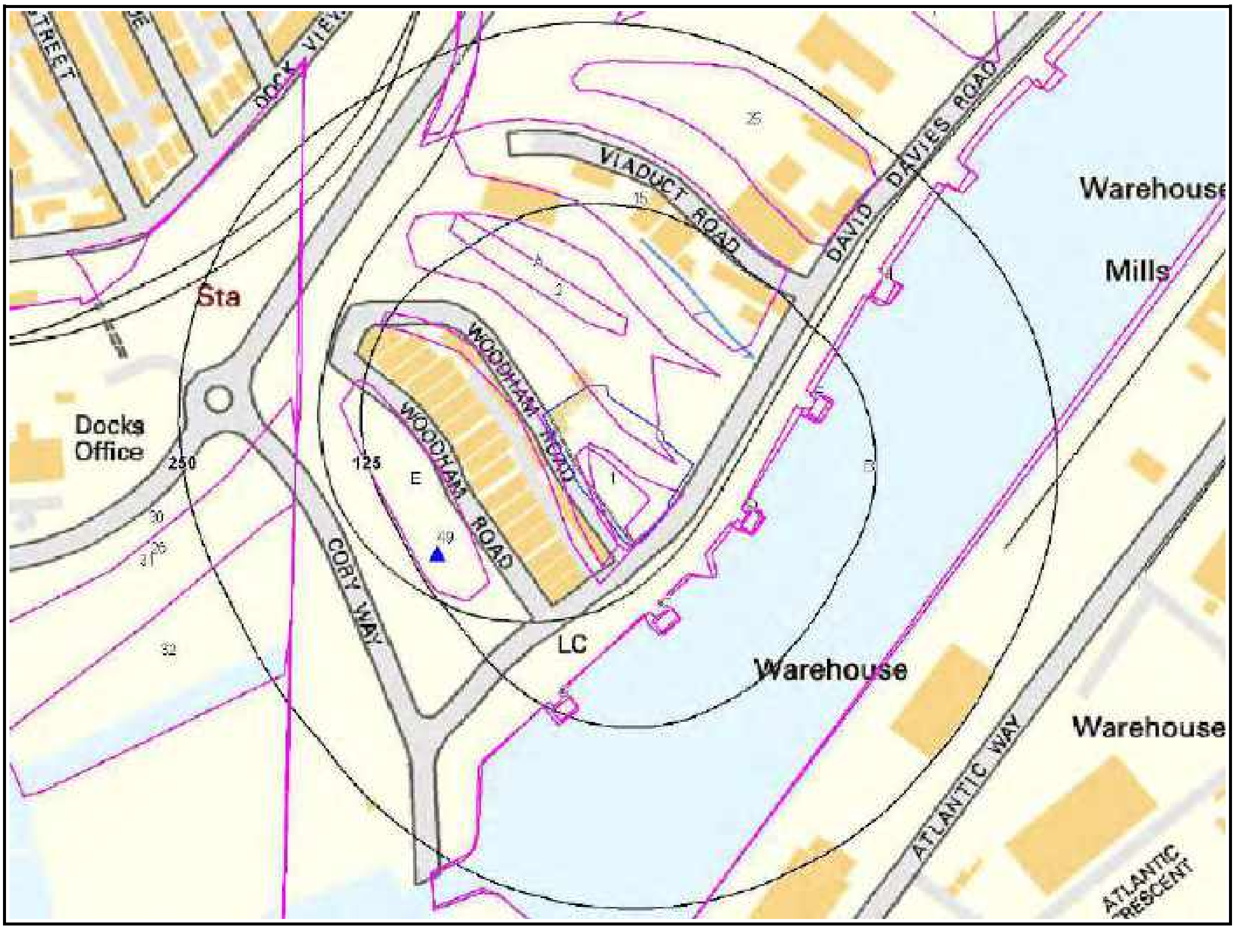
Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?

No radon protective measures are necessary

2 Ground Workings Map

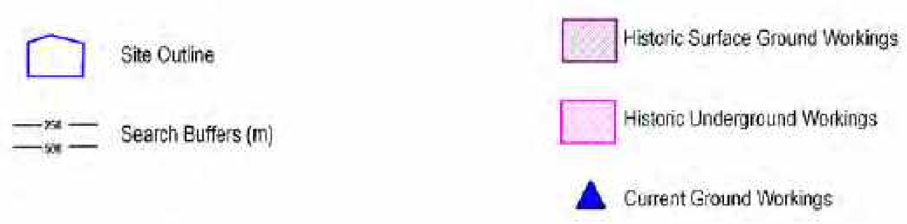
NW N NE

W E



SW S SE

Ground Workings Legend



2 Ground Workings

2.1 Historical Surface Ground Working Features derived from the Historical Mapping

This dataset is based on GroundSure's unique Historical Land Use Database derived from 1:10,560 and 1:10,000 scale historical mapping.

Are there any Historical Surface Ground Working Features within 250m of the study site boundary? Yes

The following Historical Surface Ground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
1	0.0	On Site	312621,167639	Unspecified Pit	1947
2	0.0	On Site	312588,167749	Unspecified Pit	1973
3	0.0	On Site	312574,167673	Unspecified Pit	1973
4A	37.0	N	312570,167793	Unspecified Ground Workings	1921
5A	37.0	N	312570,167793	Unspecified Ground Workings	1915
6A	37.0	N	312570,167793	Unspecified Ground Workings	1898
7B	38.0	SE	312815,167738	Dock	1898
8B	40.0	SE	312868,167729	Dock	1915
9C	49.0	SE	312658,167554	Coal Tips	1915
10D	49.0	SE	312717,167622	Coal Tips	1915
11C	50.0	SE	312656,167552	Coal Tips	1921
12C	50.0	SE	312656,167552	Coal Tips	1947
13D	51.0	SE	312716,167620	Coal Tips	1921
14D	51.0	SE	312716,167620	Coal Tips	1947
15	74.0	NE	312626,167820	Unspecified Pit	1973
16E	80.0	SW	312485,167644	Unspecified Heap	1973
17E	80.0	SW	312485,167644	Unspecified Heap	1991
18E	80.0	SW	312485,167644	Unspecified Heap	1982
19F	85.0	NE	312764,167700	Coal Tips	1915
20F	87.0	NE	312762,167701	Coal Tips	1921
21F	87.0	NE	312762,167701	Coal Tips	1947
22G	112.0	SW	312588,167494	Coal Tips	1915
23G	112.0	S	312587,167490	Coal Tips	1921
24G	112.0	S	312587,167490	Coal Tips	1947
25	165.0	NE	312748,167877	Unspecified Pit	1973
26	167.0	W	311610,167338	Docks	1915
27H	168.0	NE	312810,167783	Coal Tips	1921
28H	168.0	NE	312810,167783	Coal Tips	1947
29H	168.0	NE	312809,167782	Coal Tips	1915
30	169.0	W	311732,167331	Dock	1921
31	171.0	W	312285,167590	Graving Dock	1921
32	182.0	W	312300,167534	Graving Dock	1921
33I	249.0	N	312804,168020	Unspecified Ground Workings	1973
34I	249.0	N	312804,168020	Unspecified Ground Workings	1982

2.2 Historical Underground Workings Features derived from the Historical Mapping

This data is derived from the GroundSure unique Historical Land Use Database. It contains data derived from 1:10,000 and 1:10,560 historical Ordnance Survey Mapping and includes some natural topographical features (Shake Holes for example) as well as manmade features that may have implications for ground stability. Underground and mining features have been identified from surface features such as shafts. The distance that these extend underground is not shown.

Are there any Historical Underground Working Features within 1000m of the study site boundary? Yes

The following Historical Underground Working Features are provided by GroundSure:

ID	Distance (m)	Direction	NGR	Use	Date
35J	197.0	NW	312516,167957	Tunnel	1982

36J	197.0	NW	312516,167957	Tunnel	1991
37J	197.0	NW	312516,167957	Tunnel	1973
38J	197.0	NW	312516,167957	Tunnel	1947
39J	202.0	NW	312514,167960	Tunnel	1898
Not shown	932.0	SW	312007,166813	Tunnel	1921
Not shown	933.0	SW	312016,166814	Tunnel	1898
Not shown	933.0	SW	312016,166814	Tunnel	1938
Not shown	933.0	SW	312016,166814	Tunnel	1936
Not shown	933.0	SW	312016,166814	Tunnel	1915
Not shown	962.0	SW	311980,166815	Tunnel	1982
Not shown	962.0	SW	311980,166815	Tunnel	1991
Not shown	962.0	SW	311980,166815	Tunnel	1973
Not shown	962.0	SW	311980,166815	Tunnel	1947

2.3 Current Ground Workings

This dataset is derived from the BGS BRITPITS database covering active; inactive mines; quarries; oil wells; gas wells and mineral wharves; and rail deposits throughout the British Isles.

Are there any BGS Current Ground Workings within 1000m of the study site boundary? **Yes**

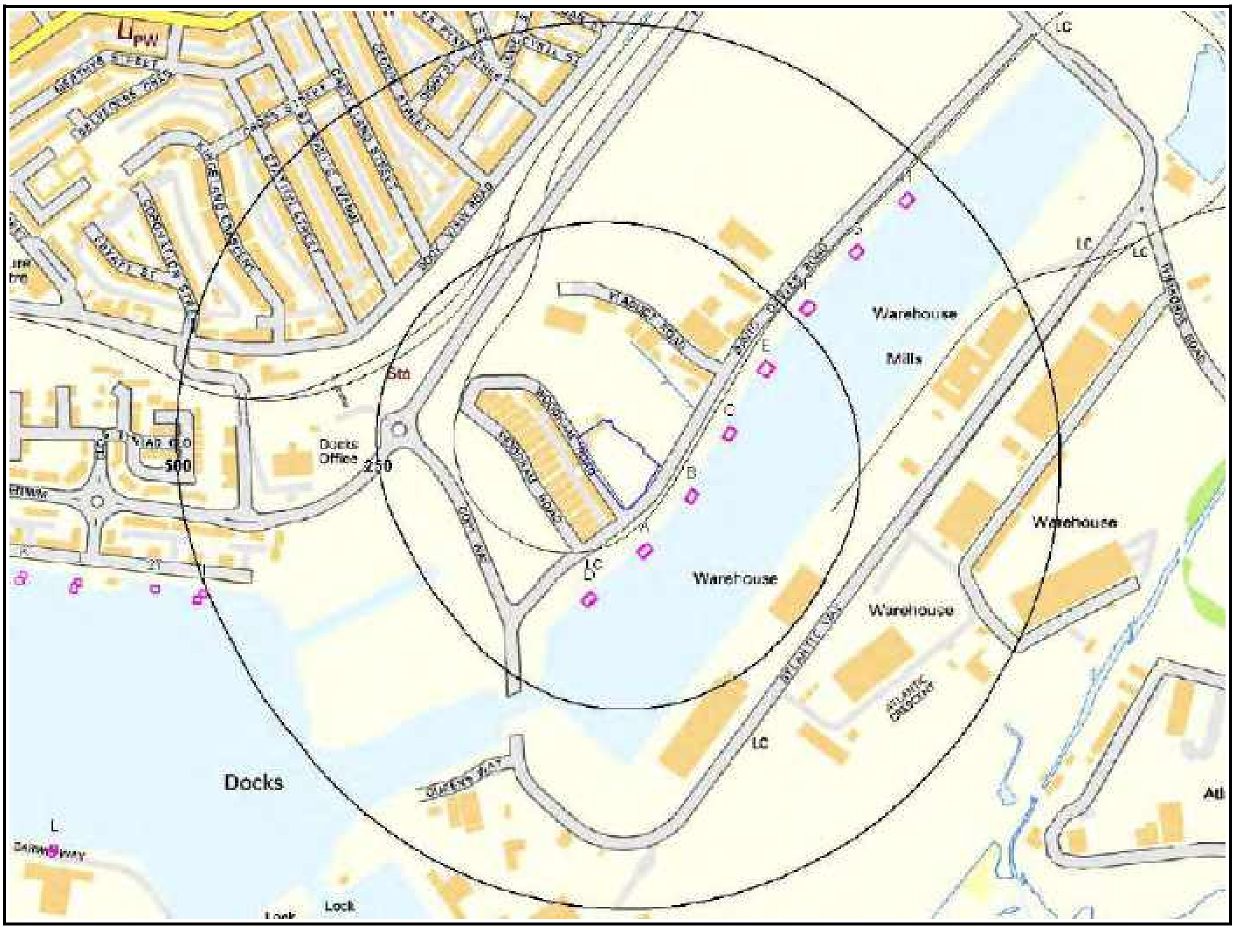
The following Current Ground Workings information is provided by British Geological Society:

ID	Distance (m)	Direction	NGR	Use	Date Updated
49	109.0	SW	312500.0,167600.0	Secondary	16-Jul-2007
Not shown	326.0	S	312750.0,167300.0	Marine Sand & Gravel	06-Sep-2007
Not shown	326.0	S	312750.0,167300.0	Marine Sand & Gravel	21-Sep-2007
Not shown	847.0	SW	312250.0,166850.0	Marine Sand & Gravel	06-Sep-2007

3 Mining, Extraction & Natural Cavities Map

NW N NE

W E



SW S SE

Mining, Extraction & Natural Cavities Legend

3 Mining, Extraction & Natural Cavities

3.1 Historical Mining

This dataset is derived from GroundSure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary? **Yes**

The following Historical Mining information is provided by Groundsure :

ID	Distance (m)	Direction	NGR	Details	Date
1A	49.0	SE	312658,167554	Coal Tips	1915
2B	49.0	SE	312717,167622	Coal Tips	1915
3A	50.0	SE	312656,167552	Coal Tips	1921
4A	50.0	SE	312656,167552	Coal Tips	1947
5B	51.0	SE	312716,167620	Coal Tips	1921
6B	51.0	SE	312716,167620	Coal Tips	1947
7C	85.0	NE	312764,167700	Coal Tips	1915
8C	87.0	NE	312762,167701	Coal Tips	1921
9C	87.0	NE	312762,167701	Coal Tips	1947
10D	112.0	SW	312588,167494	Coal Tips	1915
11D	112.0	S	312587,167490	Coal Tips	1921
12D	112.0	S	312587,167490	Coal Tips	1947
13E	168.0	NE	312810,167783	Coal Tips	1921
14E	168.0	NE	312810,167783	Coal Tips	1947
15E	168.0	NE	312809,167782	Coal Tips	1915
16F	260.0	NE	312862,167859	Coal Tips	1915
17F	262.0	NE	312862,167856	Coal Tips	1947
18F	262.0	NE	312862,167856	Coal Tips	1921
19G	353.0	NE	312923,167927	Coal Tips	1947
20G	353.0	NE	312923,167927	Coal Tips	1921
21G	354.0	NE	312923,167929	Coal Tips	1915
22H	443.0	NE	312984,167994	Coal Tips	1921
23H	443.0	NE	312984,167994	Coal Tips	1947
24H	444.0	NE	312984,167995	Coal Tips	1915
25I	500.0	SW	312107,167500	Coal Tips	1915
26I	509.0	SW	312099,167493	Coal Tips	1921
27	554.0	W	312046,167506	Coal Tips	1915
28J	644.0	W	311950,167514	Coal Tips	1915
29J	650.0	W	311945,167508	Coal Tips	1921
30K	707.0	W	311882,167524	Coal Tips	1915
31K	713.0	W	311878,167516	Coal Tips	1921
Not shown	796.0	W	311789,167534	Coal Tips	1915
Not shown	802.0	W	311784,167527	Coal Tips	1921
34L	818.0	SW	311920,167180	Coal Tips	1915
35L	823.0	SW	311918,167175	Coal Tips	1921
Not shown	880.0	W	311702,167538	Coal Tips	1915
Not shown	886.0	W	311696,167531	Coal Tips	1921
Not shown	890.0	W	311733,167367	Coal Tips	1915
Not shown	896.0	W	311736,167364	Coal Tips	1921
Not shown	906.0	SW	311806,167198	Coal Tips	1915
Not shown	915.0	SW	311797,167195	Coal Tips	1921
Not shown	945.0	W	311667,167405	Coal Tips	1915
Not shown	951.0	W	311661,167409	Coal Tips	1921
Not shown	960.0	SW	311679,167312	Coal Tips	1915
Not shown	970.0	W	311613,167532	Coal Tips	1915

Not shown	974.0	SW	311674,167307	Coal Tips	1921
Not shown	976.0	W	311607,167525	Coal Tips	1921
Not shown	997.0	SW	311696,167213	Coal Tips	1915

3.2 Coal Mining

This dataset provides information as to whether the study site lies within a known coal mining affected area as defined by the coal authority.

Are there any Coal Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.3 Shallow Mining

This dataset refers to the (largely very old) extraction of mineral deposits by means of near surface underground workings.

What is the maximum hazard rating of subsidence relating to shallow mining within the study site* boundary? **Negligible**

*This includes an automatically generated 150m buffer zone around the study site boundary

The following Shallow Mining information provided by the British Geological Survey is not represented on Mapping:

Distance (m)	Direction	Hazard Rating	Details
0.0	On Site	Negligible	Where negligible potential is indicated, this means that the rocks underlying the area are not likely to have been mined at shallow depth. However, you should still find out whether or not a Coal Authority mining search is required in the area, for example, to check for deeper mining.

3.4 Non – Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA)/DEFRA mining cavities database (compiled for the national study entitled "Review of mining instability in Great Britain, 1990" PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.5 Natural Cavities

This dataset provides information based on Peter Brett Associates/ DEFRA natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary? **No**

Database searched and no data found.

3.6 Brine Extraction

This dataset provides information from the Brine compensation board which has been discontinued and is now covered by the Coal Authority.

Are there any Brine Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.7 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.8 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records.

Are there any Tin Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

3.9 Clay Mining

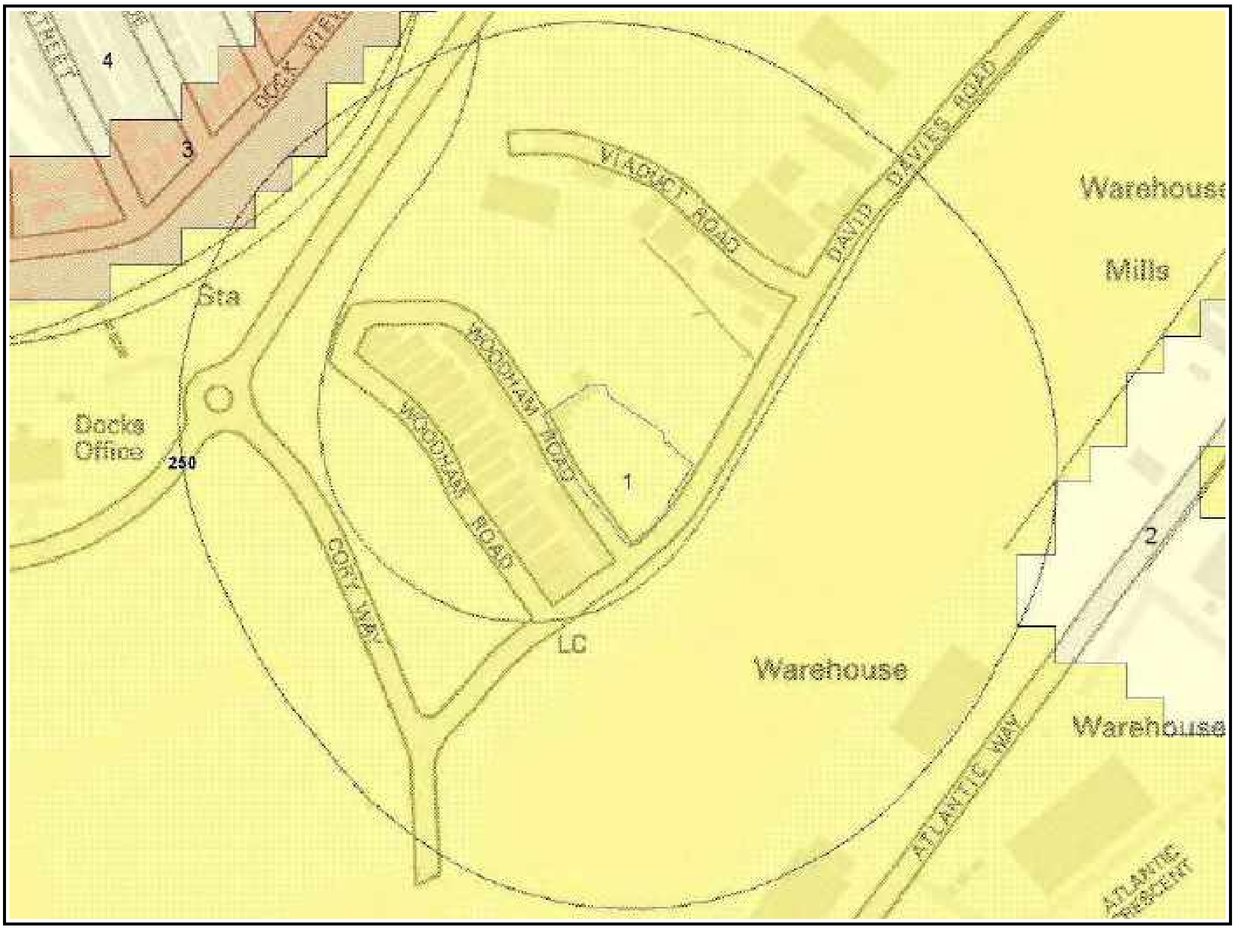
This dataset provides information on Kalin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary? **No**

Database searched and no data found.

4 Natural Ground Subsidence
4.1 Shrink-Swell Clay Map

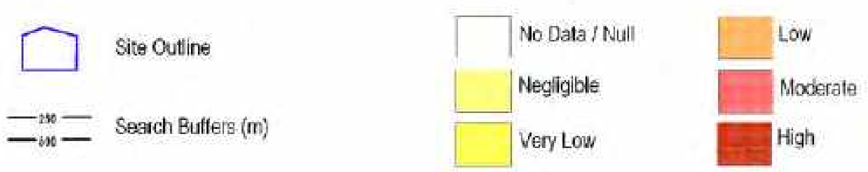
NW N NE



W E

SW S SE

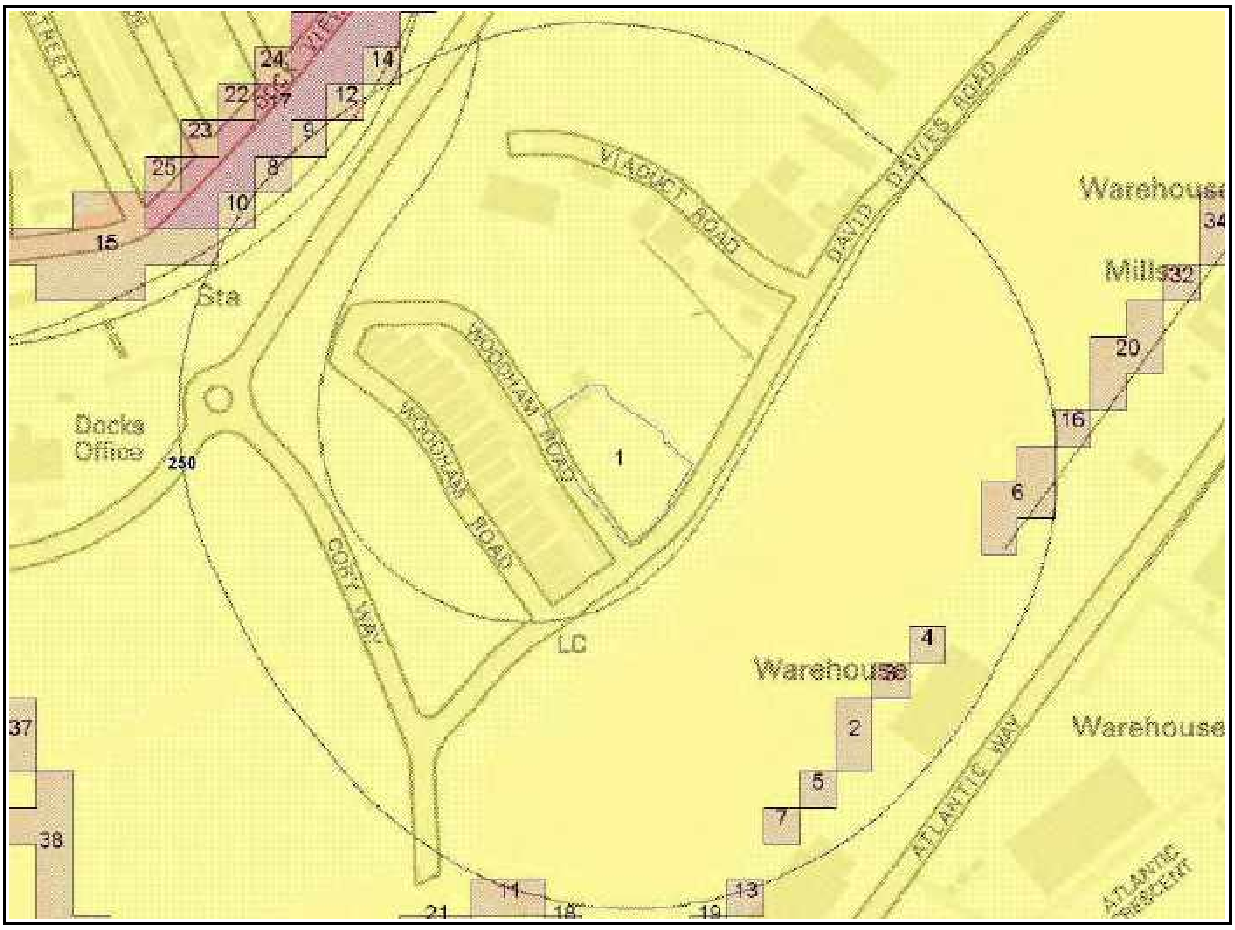
Shrink-Swell Clay Legend



4.2 Landslides Map

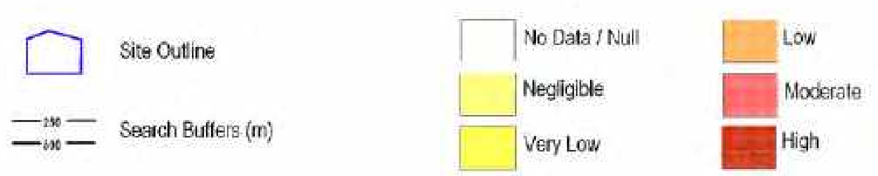
NW N NE

W E



SW S SE

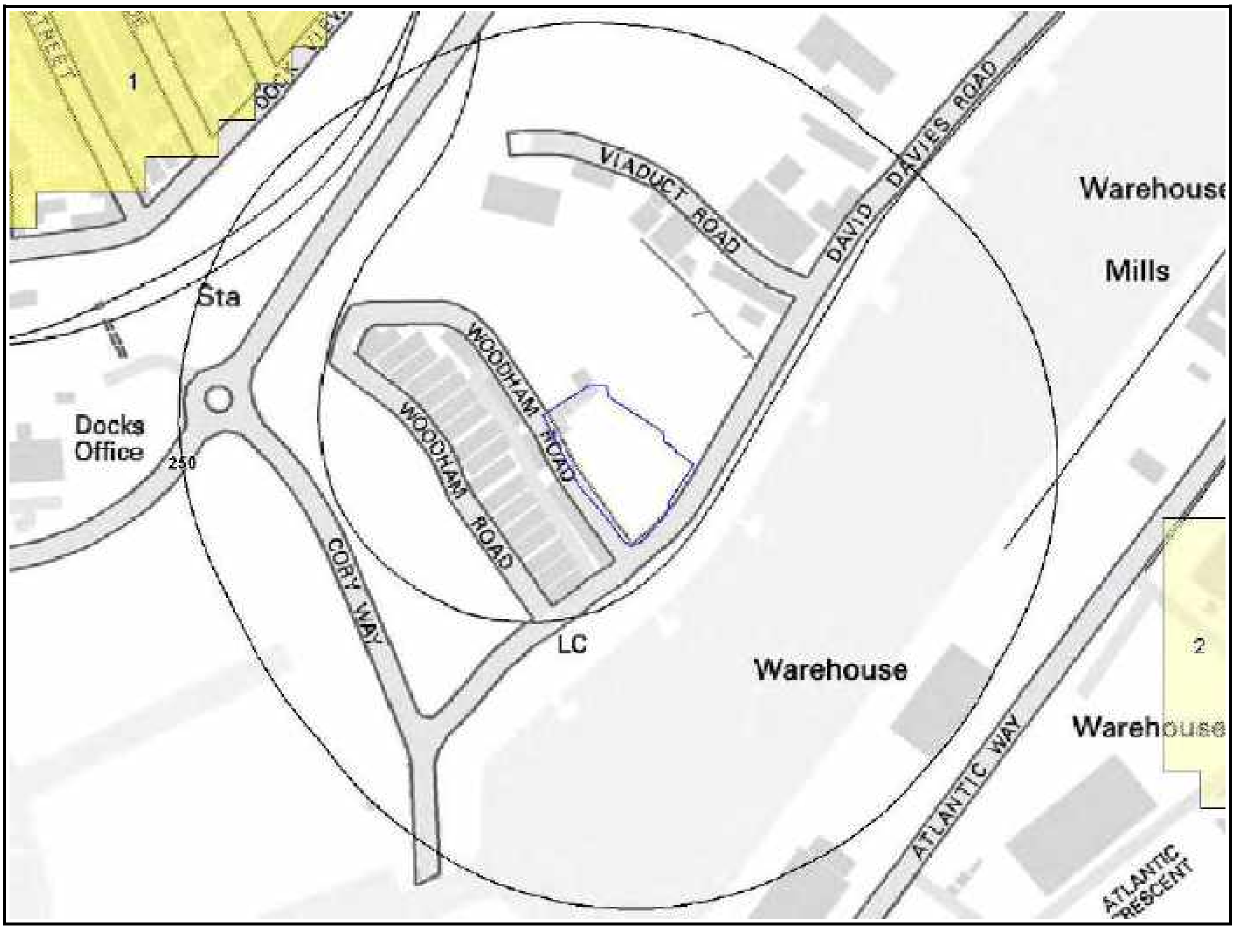
Landslides Legend



4.3 Ground Dissolution Soluble Rocks Map

NW N NE

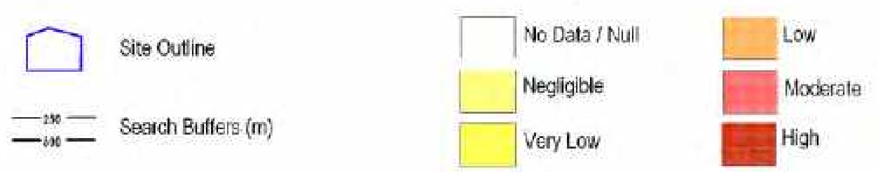
W E



SW S SE

Ground Dissolution Soluble Rocks Legend

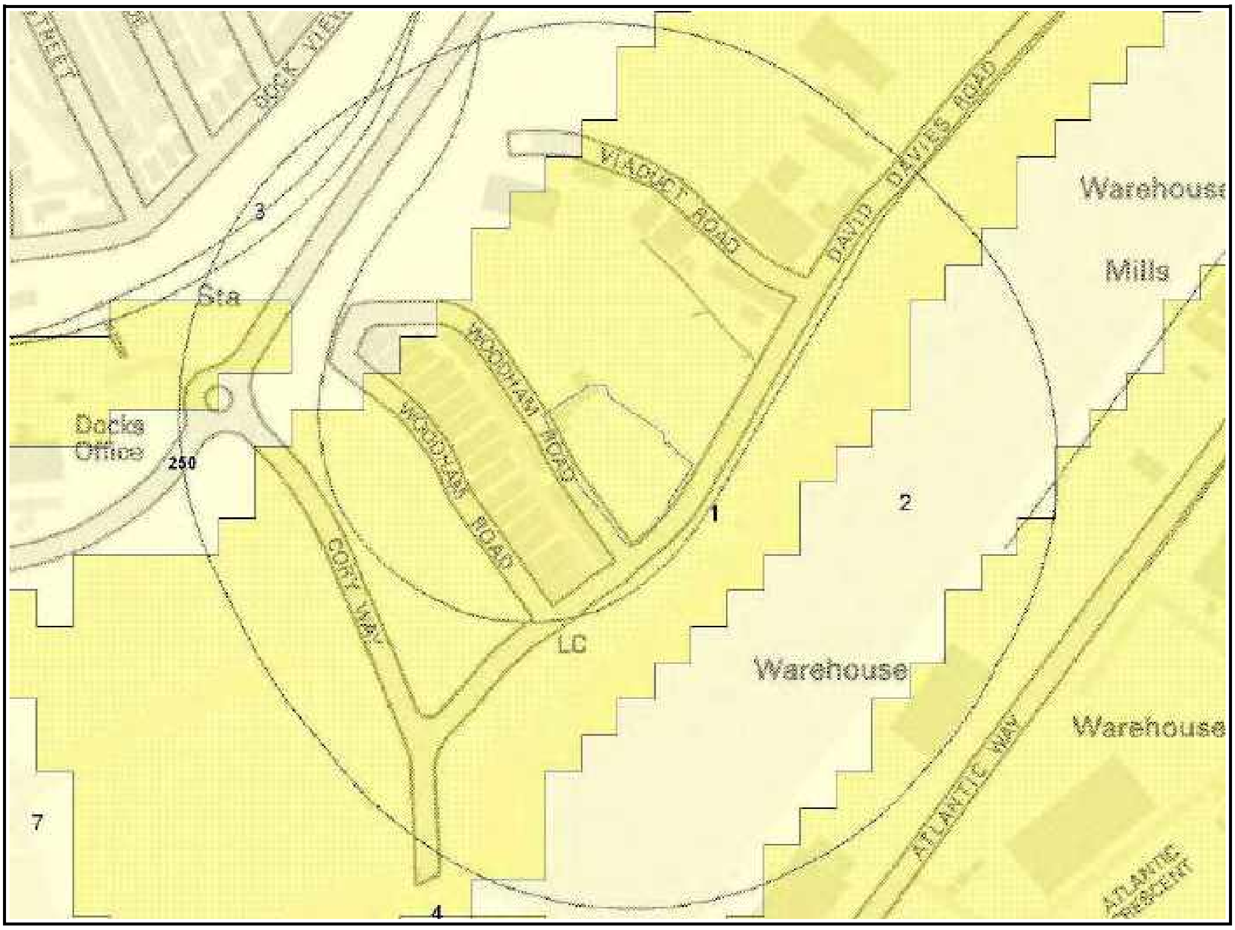
Mapping sourced from Ordnance Survey



4.4 Compressible Deposits Map

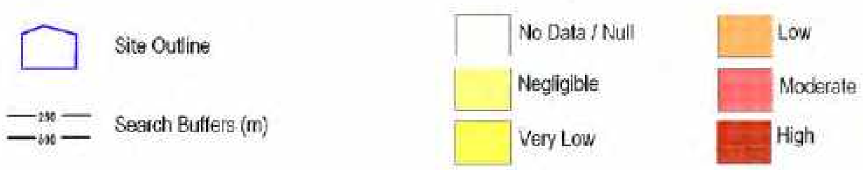
NW N NE

W E



SW S SE

Compressible Deposits Legend

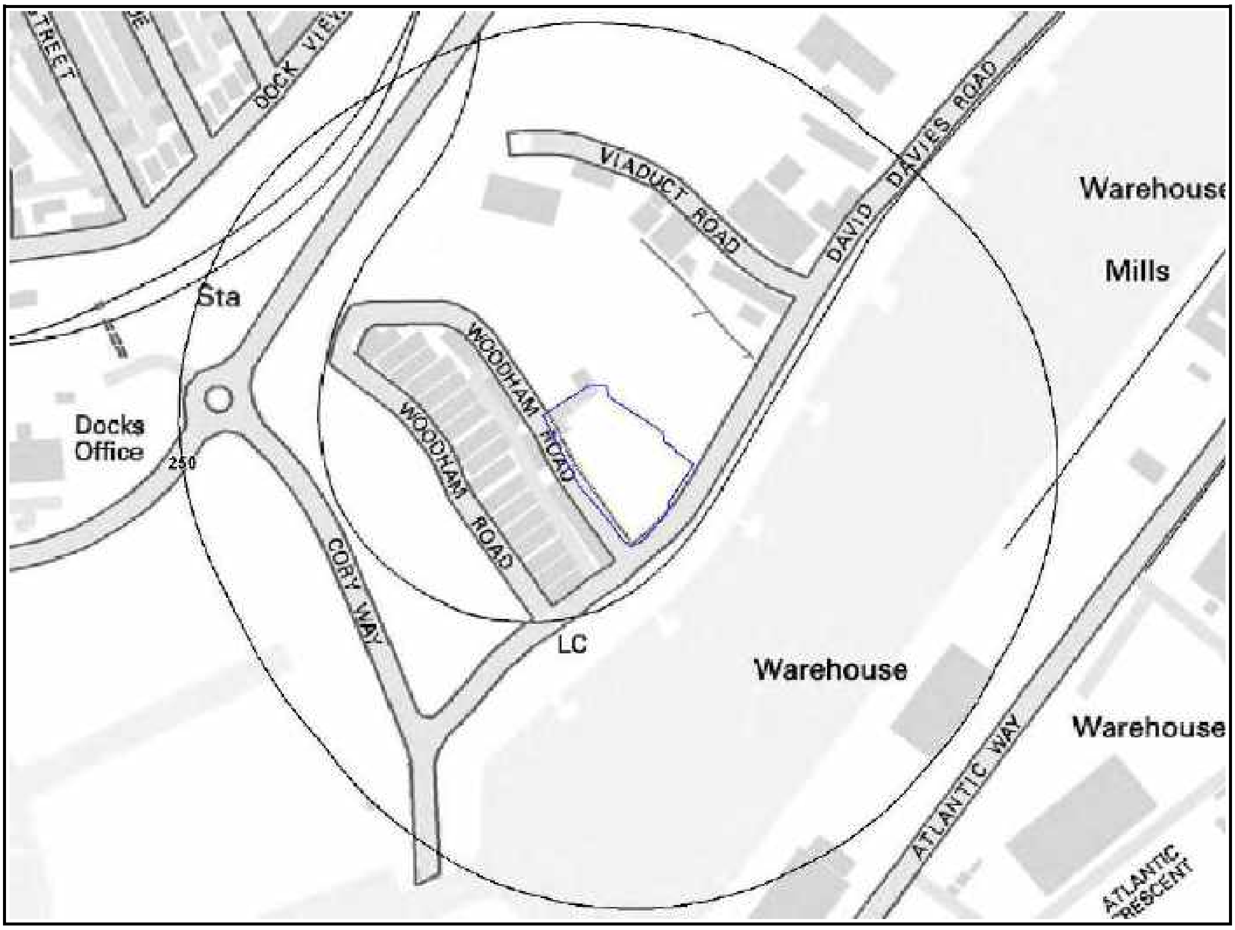


4.5 Collapsible Deposits Map

N

NW NE

◀W E▶



SW S SE

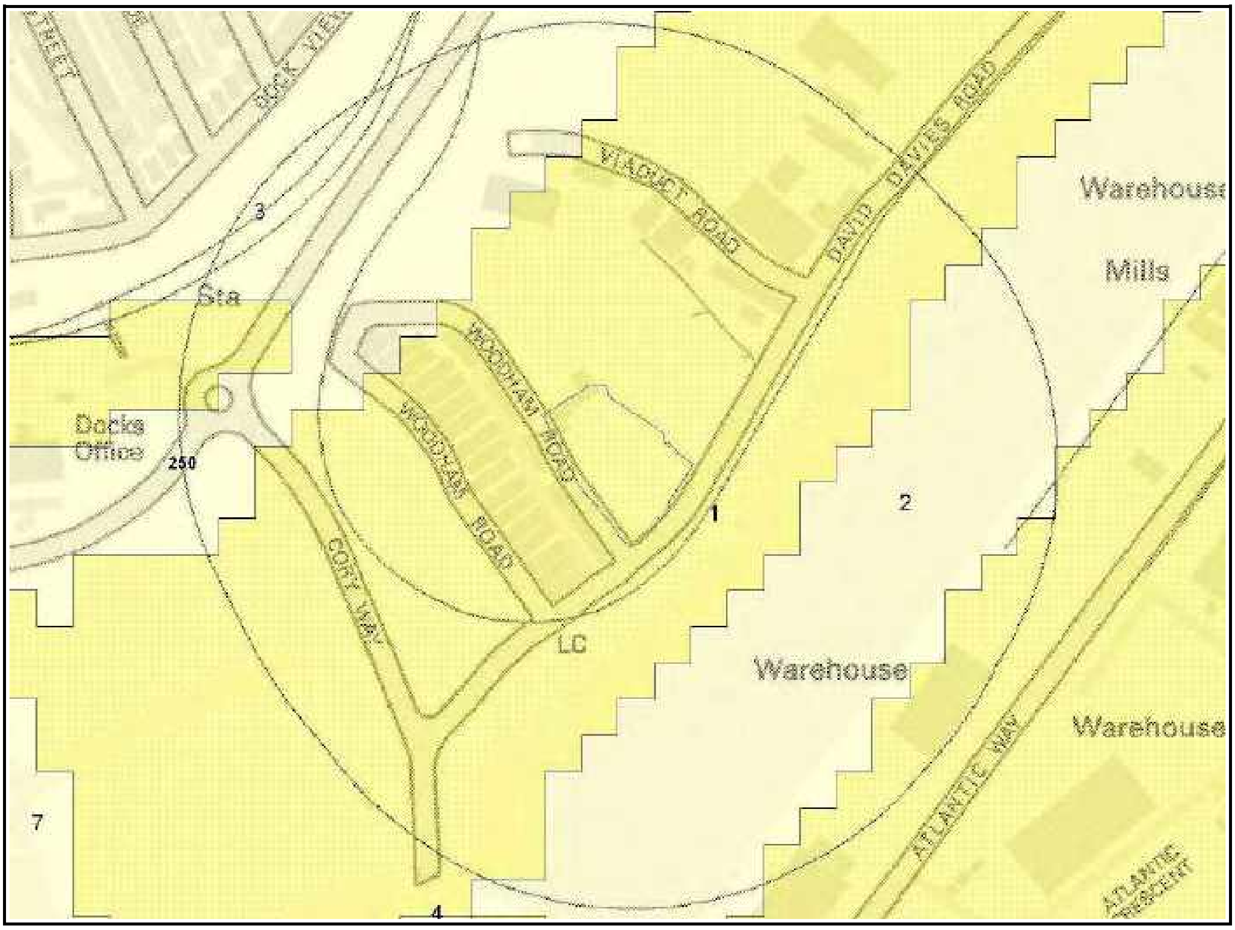
Collapsible Deposits Legend

Mapping sourced from Ordnance Survey

4.6 Running Sand Map

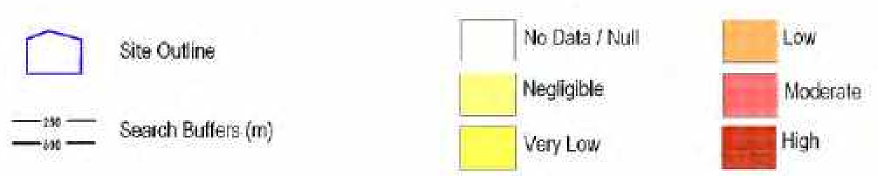
NW N NE

W E



SW S SE

Running Sand Legend



4. Natural Ground Subsidence

The National Ground Subsidence rating is obtained through the 6 natural ground stability hazard datasets, which are supplied by the British Geological Survey (BGS)
The following GeoSure data represented on the mapping is derived from the BGS Digital Geological map of Great Britain at 1:50,000 scale.

What is the maximum hazard rating of natural subsidence within the study site* boundary? **Very Low**

*This includes an automatically generated 50m buffer zone around the study site boundary.

4.1 Shrink – Swell Clays

The following Shrink Swell information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

4.2 Landslides

The following Landslides information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

4.3 Ground Dissolution of Soluble Rocks

The following Soluble Rocks information provided by the British Geological Survey:

Distance (m)*	Direction	Hazard Rating	Details
0	On site	Null-Negligible	Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

4.4 Compressible Deposits

The following Compressible Ground information provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for compressible deposits to be present. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

4.5 Collapsible Deposits

The following Collapsible Rocks information is provided by the British Geological Survey:

Distance (m)*	Direction	Hazard Rating	Details
0	On site	Null-Negligible	No Indicators for collapsible deposits identified. No Special actions required to avoid problems due to collapsible deposit.

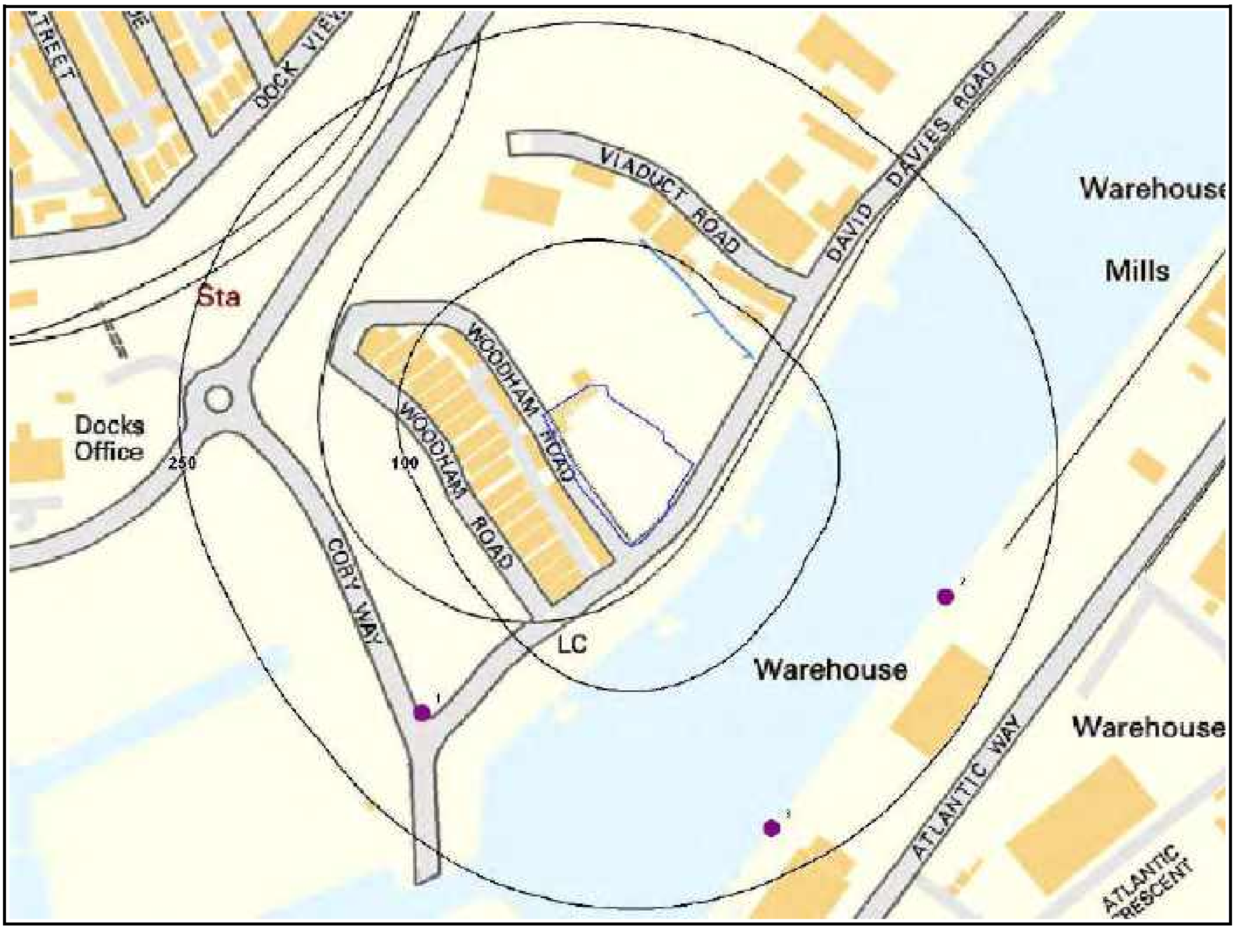
4.6 Running Sands

The following Running Sands information is provided by the British Geological Survey:

ID	Distance (m)*	Direction	Hazard Rating	Details
1	0.0	On Site	Very Low	Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

5. Borehole Records Map

NW N NE



W E

SW S SE

Borehole Records Legend

Mapping sourced from Ordnance Survey

Site Outline

Search Buffers (m)

Borehole Locations

5. Borehole Records

The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary: 3

ID	Distance (m)	Direction	NGR	BGS Reference	Drilled Length (m)	Borehole Name
1	183.0	SW	312490,167490	ST16NW109	1.8	BARRY DUCK CUSTOMS & EXICISE BLDG
2	196.0	SE	312850,167570	ST16NW157	14.0	CRANE BEAM, BARRY DOCKS, NO.2
3	217.0	SE	312730,167410	ST16NW158	12.7	CRANE BEAM, BARRY DOCKS, NO.3

Contacts

GroundSure Helpline
Telephone: 01273 819700
maps&data@groundsure.com

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Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143 www.bgs.ac.uk

British Gypsum
British Gypsum Ltd, East Leake, Loughborough, Leicestershire, LE12 6HX
Tel: www.british-gypsum.bpb.com

The Coal Authority
200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848
DX 716176 Mansfield 5 www.coal-authority.co.uk

Ordnance Survey
Romsey Road, Southampton SO16 4GU
Tel: 08456 050505

Getmapping PLC
Virginia Villas, High Street, Hartley Witney, Hampshire RG27 8NW
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Acknowledgements

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GroundSure

Site Details:

WOODHAM ROAD, DOCKS,
BARRY, CF62

Client Ref: Barry
Report Ref: HMD-188-62959
Grid Ref: 312620, 167670

Map Name: MasterMap

Map date: **2007**

Scale: 1:2,500

Printed at: 1:2,500

2007

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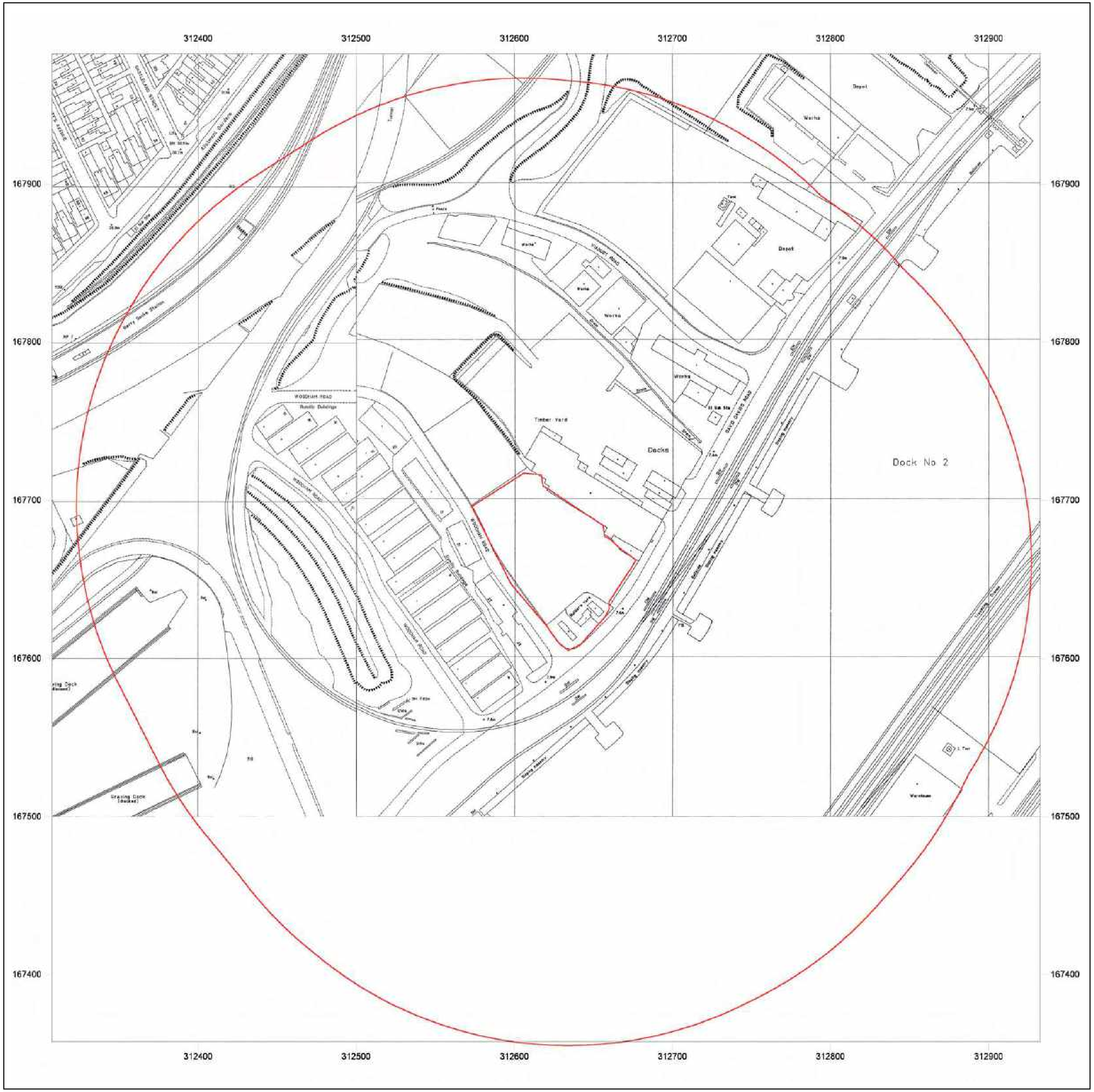


Site Details:

WOODHAM ROAD, DOCKS,
BARRY, CF62

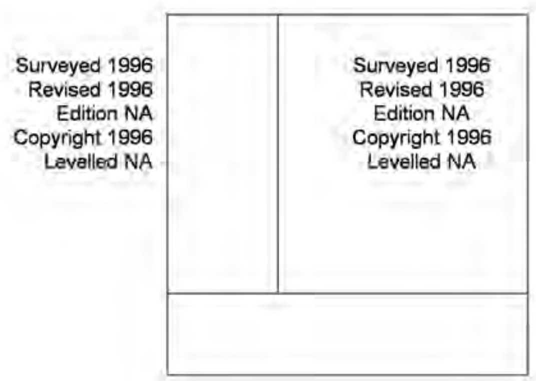
Client Ref: Barry
Report Ref: HMD-188-62959
Grid Ref: 312620, 167670

Map Name: National Grid

Map date: **1996**

Scale: 1:1,250

Printed at: 1:2,500



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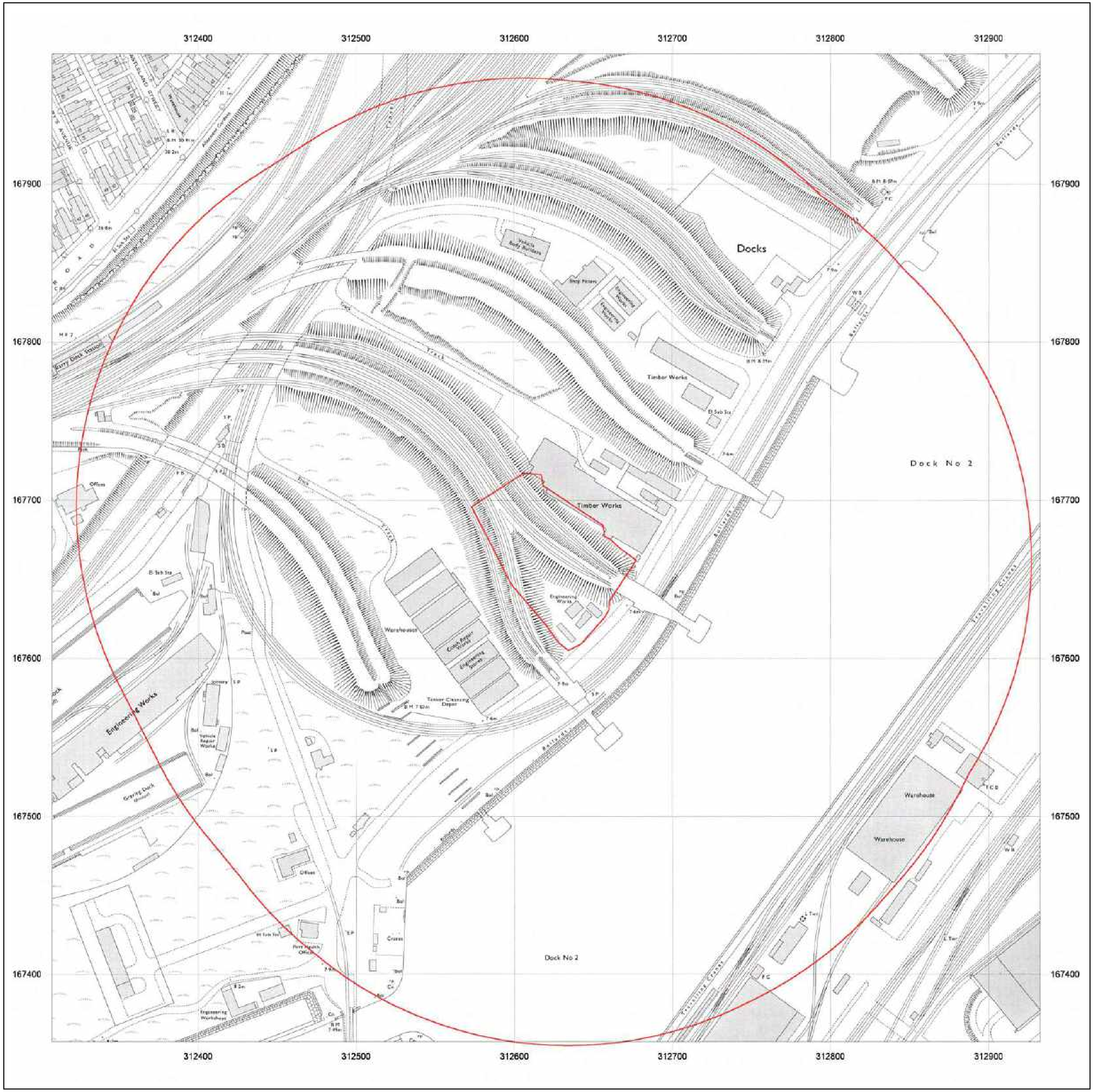

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Site Details:

WOODHAM ROAD, DOCKS,
BARRY, CF62

Client Ref: Barry
Report Ref: HMD-188-62959
Grid Ref: 312620, 167670

Map Name: National Grid

Map date: **1971**

Scale: 1:1,250

Printed at: 1:2,500

Surveyed 1954 Revised 1971 Edition NA Copyright 1971 Levelled 1961	Surveyed 1955 Revised 1971 Edition NA Copyright 1971 Levelled 1961
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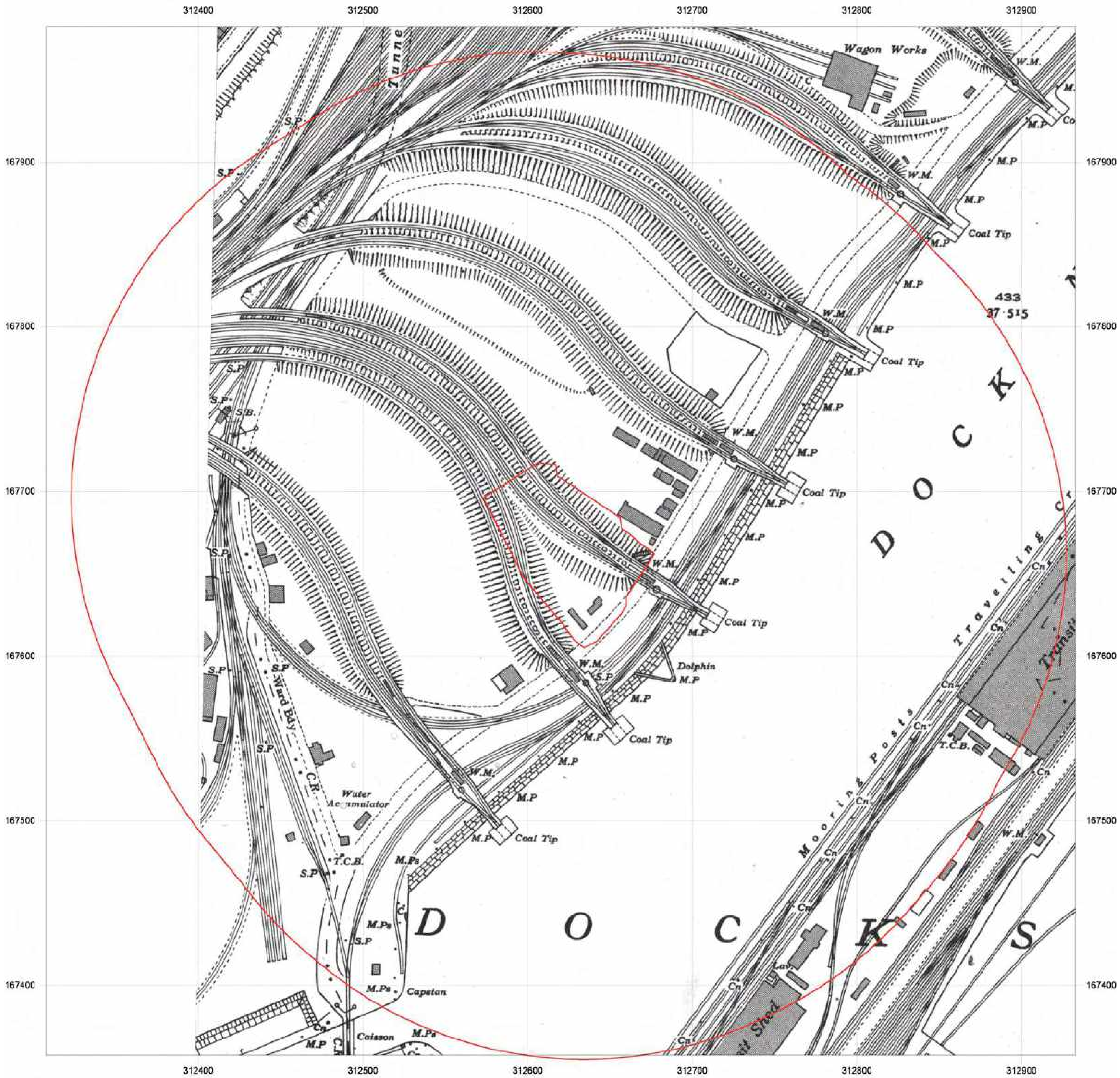

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Site Details:

WOODHAM ROAD, DOCKS,
BARRY, CF62

Client Ref: Barry
Report Ref: HMD-188-62959
Grid Ref: 312620, 167670

Map Name: County Series

Map date: **1943**

Scale: 1:2,500

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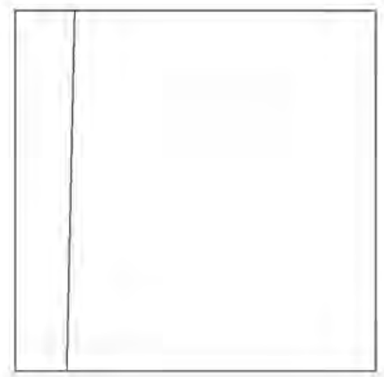

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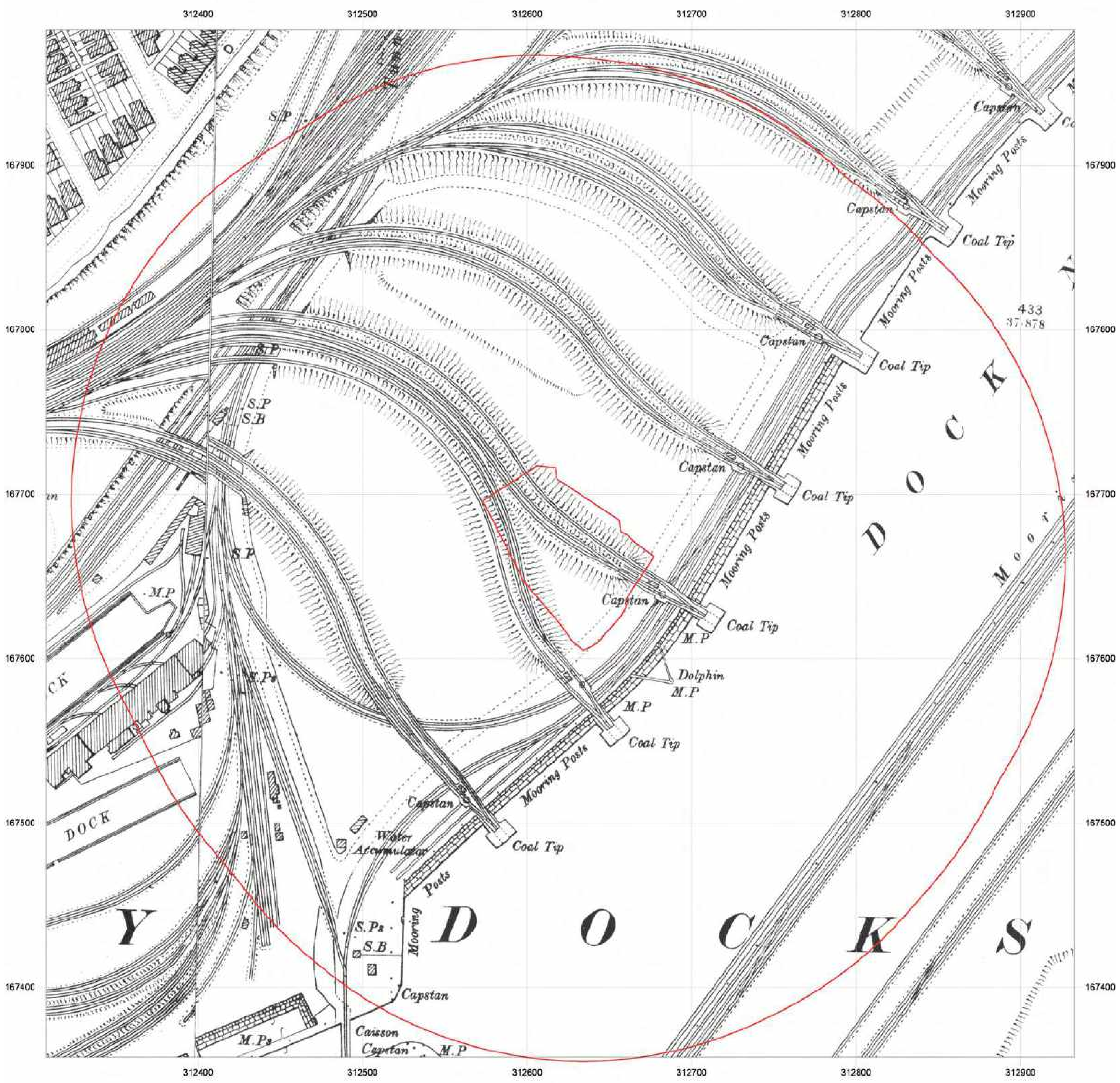
Production date:07 March 2008



GroundSure

Site Details:

WOODHAM ROAD, DOCKS,
BARRY, CF62

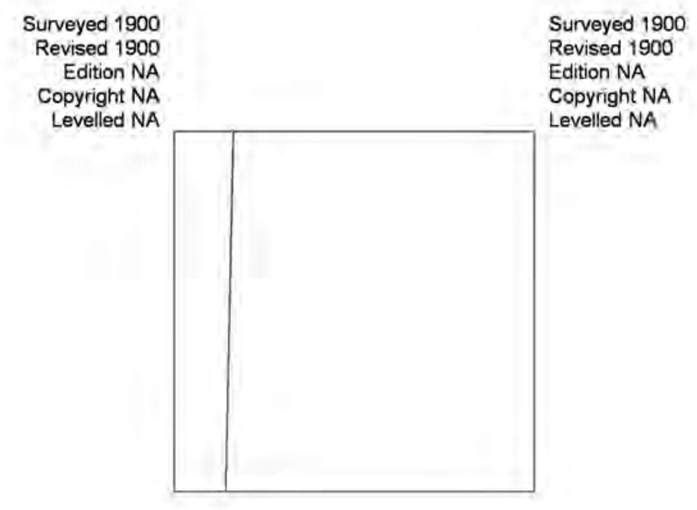
Client Ref: Barry
Report Ref: HMD-188-62959
Grid Ref: 312620, 167670

Map Name: County Series

Map date: **1900**

Scale: 1:2,500

Printed at: 1:2,500



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maps&data@groundsure.com

Production date:07 March 2008

1

Types of wood for recycling

This section shows the main wood types seen in the mixed waste stream. The purpose is to help you to recognise the different wood types that pass through your site and to help you meet your recycler’s specifications.

The wood types described here can be categorised as clean wood, laminated wood products and products made from various sizes of wood chip. Compare the types of wood described here with Section Four which you can use to show the specification you are using on site.

Softwood

Softwood is sourced from coniferous trees and tends to be cheaper and less dense (heavy) than hardwood. Softwood is normally used for packaging such as pallets, crates and reels and as framing.

Hardwood

Hardwood is sourced from broadleaved trees. It is often darker in colour than softwood and is longer lasting, denser & more decorative than softwood. Hardwood is typically used in expensive furniture and as a veneer on cheaper materials, such as chipboard or MDF.

Blockboard

Blockboard is made up of a core of softwood blocks (up to about 25mm wide) placed edge to edge and sandwiched between veneers of hardwood. The 'sandwich' is then bonded under high pressure. Blockboard is an old fashioned product now less common than chipboard. It is used in furniture and kitchen applications.

Plywood

Plywood sheets are made by bonding together a number of thin sheets to create a strong flexible product. Plywood has many uses depending on the wood used in the different layers and the bonding agent. It may be used in applications as varied as concrete shuttering, in DIY and marine ply.

Orientated Strand Board (OSB)

OSB is a layered board, made of wafers of softwood with opposing grain to give strength. OSB has similar uses to plywood.

Chipboard

Chipboard panels are made by bonding together wood particles with an adhesive under heat and pressure to form a rigid board with a relatively smooth surface, in which the wood chips are visible. Chipboard is used in most flat-pack furniture, though often with a painted or plastic laminated surface.

Medium Density Fibreboard (MDF)

MDF panels are made from wood fibres glued under heat and pressure. MDF differs from chipboard in that no woodchips are visible. MDF is used as doors and drawer fronts with decorative moulding and in DIY it is often painted or plastic coated.

Hardboard

Hardboard is a thin brown or painted panel in which the wood chips are not visible. Hardboard tends to be used in cheaper furniture as drawer bottoms or backs.

2

Contaminants and the problems they cause the recycler

This section shows the types of contamination you may see coming into your site, where it comes from and the main ways of removing it.

Your recycler may have equipment fitted to remove some contaminants, however prevention of contamination makes it easier to produce a quality product from the wood you collect.

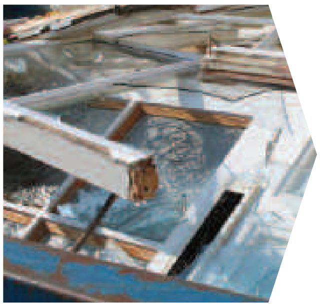
Compare the types of contamination described here with Section Four which you can use to show the specification you are using on site.

Surface Treatments – paints and varnishes

Surface treatments like paint and varnish are used to change the appearance of the finished product and to protect items from wear and water damage. A particular problem is that paints or varnishes may contain lead or other chemicals which make them unacceptable for some end market uses. Such items can only be removed by picking.

Metal

Metal components, such as nails and screws, are used to join wood together or as fittings for doors and windows. Large pieces of metal can cause damage to wood recycling machinery and can be dangerous to users of products made from recycled wood, for example nails in horse bedding. Ferrous metals, such as nails, can be removed using magnets. Non-ferrous metals, such as aluminium and brass fittings, may be removed by an eddy current separator.



Glass and Putty

Glass and putty are typically found in wooden windows. Putty may melt and soil or blunt cutting equipment. Glass contamination is dangerous to users of products made from recycled wood such as bedding or mulches. Putty contains oils which can affect the manufacturing processes used to create products from recycled wood, such as panelboard. Glass and putty found in doors and window frames should be removed where possible. Glass particles are difficult to remove except with expensive equipment.

Paper

Paper from labels, wrapping or cores in cheap doors affects the performance of products made from recycled wood as it does not behave in the same way as the rest of the wood. Paper should be removed by picking where possible.

Plastic – solid and sheeting

Plastic may be present as a packaging material in wood effect cabinets or as a veneer on chipboard and MDF. Plastic can melt resulting in fouling of the production process. The presence of plastic contamination can affect the end uses, for example they may be unacceptable in biomass fuels. Plastic is best removed by picking.

Rubber, Foam and Fabric

Rubber, foam and fabric tend to occur together in upholstery and, either separately or together, can cause tangles or jam equipment. These materials may burn or melt damaging cutting surfaces and other parts of the equipment. Rubber, foam and fabric are best removed by picking. Rubber, in particular, has a similar density to wood and is very difficult to remove mechanically, except with expensive equipment.

Chemical Treatments

Chemical treatments are usually applied to wood to provide protection against the weather and water. They can typically be recognised as a green or brown stain, for example on garden fencing or sleepers. Ask your site manager for advice as some may be acceptable. A few may be hazardous to health and banned by legislation. Chemically treated wood can be picked out. Remember to wear the correct clothing. New testing kits may help identify treated wood at source. See www.recyclewood.org.uk for more details.

3

Current markets for products made from recycled wood

This section shows the range of products that can be made from wood collected for recycling in the UK.

The cleanliness and type of recycled wood collected will directly affect the final products that can be manufactured. Some examples of the products being produced in the UK are shown here. Ask the recycler you supply which products they produce.

Panelboard

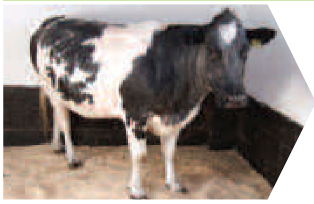
The most common product is chipboard. It is extensively used in construction, furniture and DIY. It may be sold in simple sheet form, or pre-machined for specific uses. It may also be laminated with decorative finishes for such uses as DIY.

Horse Bedding

Horse bedding can be made from recycled wood. Dust and nails must be extracted to protect the horses and only clean packaging wood waste can be used. Woodchip provides a warm and absorbent bedding which lasts for several weeks, reducing the costs and need for mucking out.

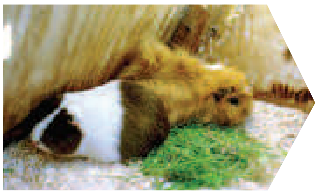
Poultry Bedding

Poultry bedding is used in the rearing of poultry for both meat and egg production. For this reason it must be free from health threats to both consumers and birds. The bedding must be light coloured and absorbent.



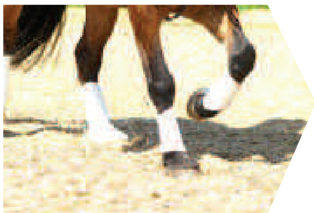
Cattle Bedding

Recycled wood products can be used successfully for over-wintering of cattle. Large particles are needed to provide free drainage outside. However when inside small particles are required to provide high rates of absorbency.



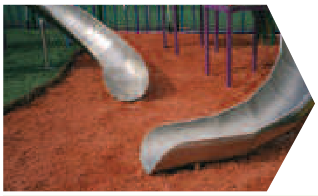
Pet Bedding and Cat Litter

Recycled wood based products are safe and clean for use as cat litter and pet bedding. The material needs to be very clean and free from contamination.



Horse Arenas and Gallops

The need to be able to train and ride horses despite the weather has lead to the development of all-weather surfaces for gallops and arenas, both internal and external. Recycled wood based products work well for all these uses, but all contaminants need to be removed and specific chip sizes are required.



Play Areas

Recycled wood based products are used in significant volumes for play area surfacing and have performance and cost benefits for this application. The material needs to be very clean and free from contamination.

Mulch and Pathway Coverings

Recycled wood chips can be used very effectively as a mulch to suppress weeds, reducing the need for chemical or manual weeding, and as a pathway surfacing to reduce maintenance requirements. These products can also be coloured for creative landscaping.

Composting

The process of composting materials with high moisture content can be improved by adding dry material such as shredded chipboard.

Fuel for Energy Production

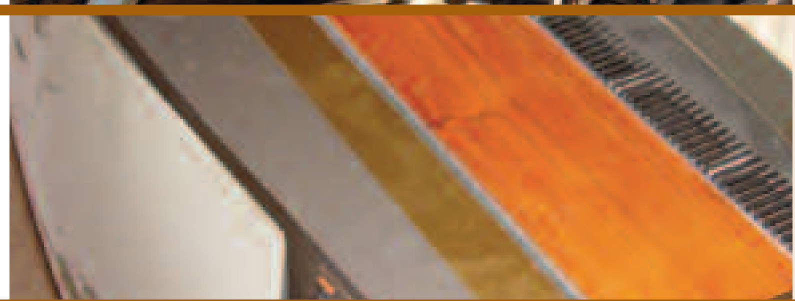
Highly efficient boiler systems are now available which burn wood for heat or for electricity generation. Recycled wood is ideal for conversion into fuel pellets or chips, due to its low moisture content.

4 Guidance on separating wood for recycling at source

The Specification – what we want & where it should go

This poster can be used to show the types of wood that typically come on to site.
It should be used to show what is wanted and what should not be separated for recycling.

You can put ✓ or ✗ in the last column or you may want to show which skips to use for different types of wood.

Different Wood for Recycling	What it Looks Like	Different Levels of Contamination	Wanted or Where to put it?
Clean white wood and offcuts		Without any nails, fixtures or fittings	
		With nails, including pallets and boxes	
		With nails and other metal fixtures	
Painted or stained wood		Including solid wood furniture with paint or varnished finish	
Panel and sheet materials including offcuts		Plain chipboard, plywood, MDF and blockboard	
		Painted & laminated chipboard, plywood, MDF and blockboard	
TV cabinets and electrical goods		Wood mixed with plastic or electrical items	
Indoor furniture		Chipboard and flat pack	
		Pine and solid wood	
		Upholstered	
Wooden doors and window frames		Without glass and metal fittings	
		With metal fittings	
		With glass and metal fittings	
Outdoor wooden furniture, fencing and fence panels		Anything stained or sprayed with preservative (green or brown)	
Wood mixed with other materials		For example with plasterboard, bricks etc	
Railway sleepers, fence panels and posts		Anything potentially treated with creosote (brown and oily)	
Green waste		Logs, branches, prunings and other freshly cut tree material	

wrap

Creating markets for recycled resources

For more information on wood waste please go to **www.recyclewood.org.uk** or to read more detailed studies on wood waste arisings visit **www.wrap.org.uk/materials/wood**

RSK GROUP PLC

RSK Environment Ltd
West Nash Road
Nash
Newport
NP18 2BZ

Telephone: +44 (0) 1633 272339

www.rsk.co.uk

30 June 2008

Marco Muia
Oaktree Environmental Ltd

Our Ref: RSK/MA/P660003/01/01

Dear Marco,

RE: FLOOD RISK, BARRY SUNRISE CHP PLANT, BARRY DOCKS

As a part of the planning application for the Barry site, RSK Environment Ltd has been commissioned to provide an assessment of flood risk. The following paragraphs explain the work undertaken.

The proposed development is located within Zone B but outside Zone C2, as identified by Technical Advice Note 15: Development & Flood Risk (July 2004) (TAN15). Zone B can be defined as "*areas known to have been flooded in the past evidenced by sedimentary deposits*" and Zone C2 as "*areas of floodplain without significant flood defence infrastructure*". Any development within Zone C would require a full Flood Consequences Assessment (FCA).

The proposed development is also located outside the Environment Agency Wales (EAW) extreme (0.1%) Flood Map, which would normally underlay Zone B. Although a full FCA is not required, the EAW promote a precautionary approach where site levels should be compared against the adjacent extreme outline to determine if the site is at risk of flooding.

We therefore undertook a topographic survey of the site and produced three cross sections from north of the site through to the direction of the dock to confirm that the development is above the adjacent extreme flood outline and corresponding Zone C2. These are attached as Annex A. When flood level data was requested from the EAW, we were notified that the only available data was over 10 years old and not for the location requested. The data would have to be extrapolated from levels in Cardiff and Porthcawl.

This information was submitted via email to the EAW as a pre-planning enquiry on the 25 June 2008 (E-mail to EA attached as Annex B together with previous correspondence). In a subsequent conversation with Matthew Parry, Development Control Officer (and Acting Team Leader) of the EAW on the 26 June 2008, he confirmed that the site was not at risk of flooding and the cross sections were acceptable. A recent policy change within the EAW meant that applications in Zone B were taken on a risk-based approach and if the zone is outside the Q1000 Flood Map, then there is no perceived risk to the development.

A formal response from the Planning Liaison to the pre-planning enquiry is awaited, although Matthew has indicated that there is no objection to the proposed development from the information submitted.

I trust this information is sufficient for the purposes of the planning application and please do not hesitate to contact me should you have any further questions or queries.

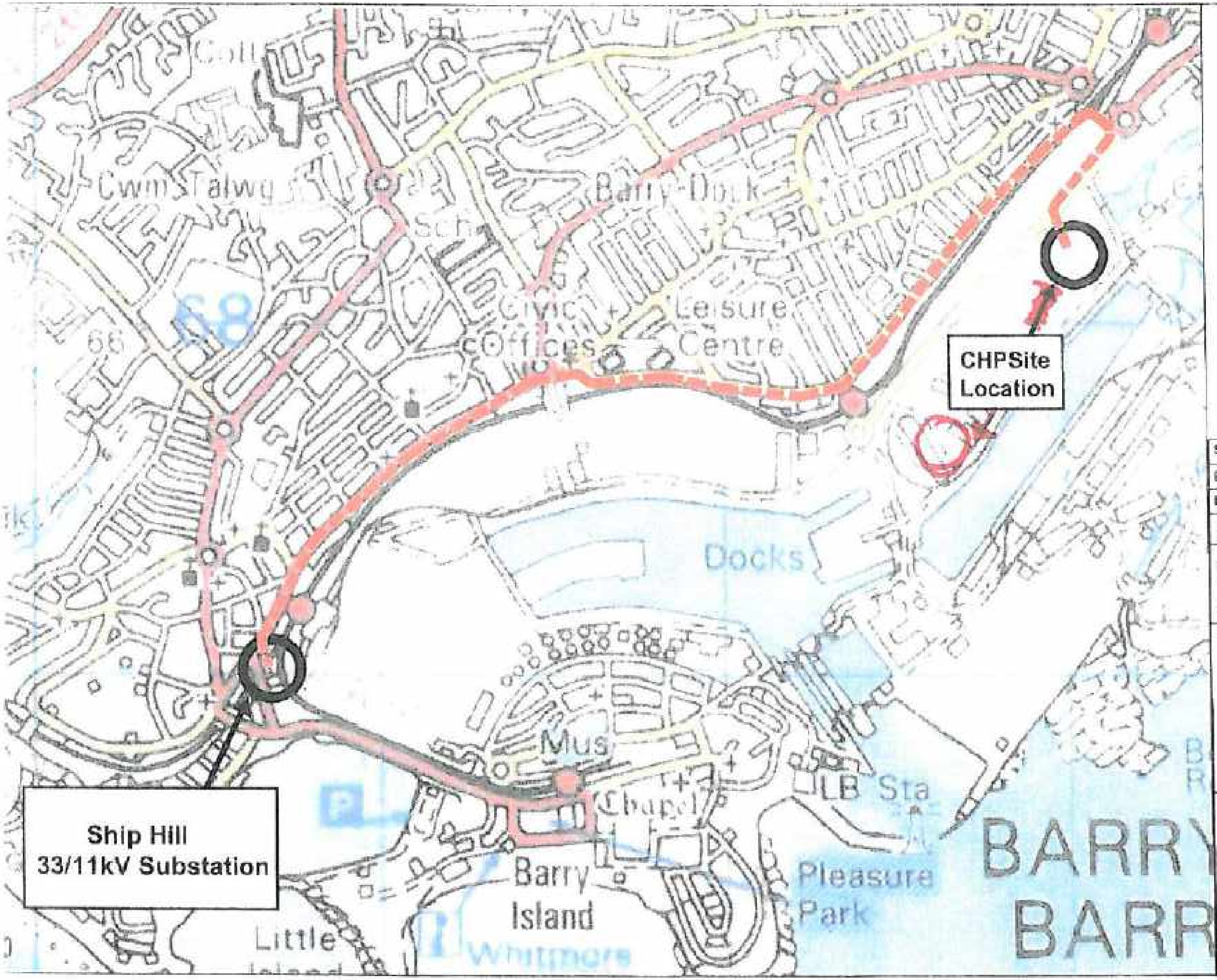
We will submit the expected further correspondence from the EA to you when available.

Yours Sincerely,

Catherine Anderson MSc
Environmental Consultant
RSK Environment Ltd
Part of the RSK Group plc
mailto:canderson@rsk.co.uk
Direct Line: 01454 227575

Enc.
Annex A: Topographic Survey and Cross Sections
Annex B: EA Correspondence, including EAW Flood Data and Welsh Assembly Government Development Advice Map (DAM) of TAN15 zones

S/6



Scale: not to scale	
Drawn: J Davies	Date: 09/01/08
Drawing No. 2007-271107-03	
Cell Site number: -	
Title: PROPOSED CABLE ROUTE	
Site Name and Address: Barry South Wales	

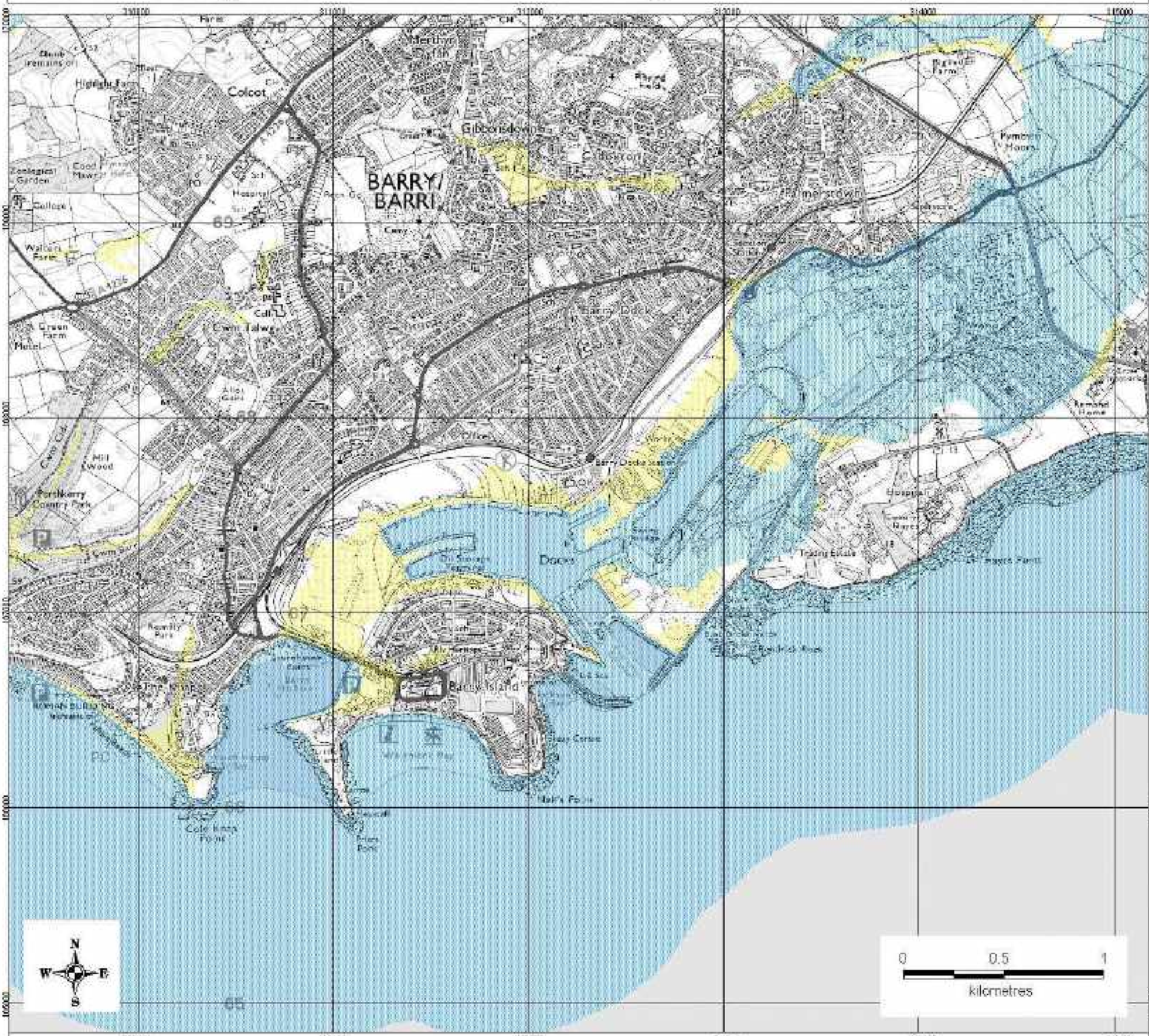
DNO CONSULTING LTD.

2 Charnwood Court
Newport Street
Swindon
tel: 0870 770 7728

LEGEND:

UNDERGROUND CABLE ROUTE

TAN15 Development and Flood Risk:Development Advice Map ST16NW



Zone A: Considered to be at little or no risk of fluvial or tidal/coastal flooding

Zone B: Areas known to have been flooded in the past

Zone C1: Served by significant infrastructure, including flood defences

Zone C2: Without significant flood defence infrastructure

Zones C1 & C2 based on Environment Agency's Extreme Flood Outline (>= 0.1% - River, Tidal or Coastal)

Rob Domeney

From: Catherine Anderson
Sent: 24 June 2008 10:30
To: Parry, Matthew; mike.walsh@environment-agency.gov.uk
Subject: Barry Sunrise CHP Plant
Attachments: EA response.pdf; P1580.dwg; P1580_Sections.dwg; barry location.pdf; Barry_ST16NW.jpg

Matthew/Mike

Please find attached the following:

* Location plan
* DAM map;
* Topographic survey and cross sections; and
* EAW food level data.

The application is for a CHP plant in Barry Docks and from the DAM is located within a zone B. However from the EAW flood map there is no underlying Q200 or Q1000. In addition, a letter from Kayna we found on the planning register states that there has been no history of flooding to an adjacent development and the EAW had no objection to the development in relation to flood risk.

We have undertaken a topographic survey of the area which shows levels to be 7.83m AOD nearest the dock rising to 9.4m AOD to the north of the site. Looking at the EAW level data, it is stated that no levels are available for the Barry area, but extrapolating the levels from the Cardiff and Porthcawl data provided would put the Q200 at approximately 7.55m AOD and Q1000 at 7.85m AOD. However this data is now over 10 years old.

This is not an exact science and I would appreciate your view on this especially when other adjacent sites have been identified as being not at risk from flooding. The intention is to raise the site approximately 300-600m to make it more level with the north of the site anyway so would this is adequate mitigation for a site in zone B?

Your comments would be most beneficial to this project so that we can progress the site appraisal.

Kind Regards
Catherine

Catherine Anderson
Environmental Consultant

RSK Environment Ltd
West Nash Road, Nash, Newport, NP18 2BZ.

A member of the **RSK** Group plc

Office: 01633 276051. Mobile: 07917 425260; email: canderson@rsk.co.uk

http://www.rsk.co.uk

creu lle gwell
creating a better place

Asiantaeth yr Amgylchedd Cymru
Environment Agency Wales

Ms Katarzyna Nowak
RSK Ltd
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

Ein cyf/Our ref: SAF12782

Eich cyf/Your ref: 080506CB027

Dyddiad/Date: 22nd May 2008

Dear Ms Nowak

Re: Flood Risk and Drainage Assessment - Barry, Viaduct Road CF63 4AB

Thank you for your enquiry with regards to obtaining flood level information for a site in Barry. Please find attached and below information that has been provided by our Flood Risk Mapping Team that should answer your enquiry in full.

> The Flood Map consists of a combination of detailed localised flood risk mapping studies, supplemented with national generalised modelling. In the absence of any localised study for the area, the flood extents shown in **Figure 1** are from generalised modelling only. These have been derived from two components; a 3D ground level map of England and Wales (referred to as the Digital Terrain Map or 'DTM') and a 2D flow / tidal modelling component.
>
> In **Figure 1**, the risk from flooding is predominantly tidal. These tidal extents have been produced using stillwater tide levels that are based upon Dixon, M.J. and Tawn, J.A. (1997) "Extreme Sea Levels at the UK A Class Sites: Optimal Site by Site Analyses and Spatial Analyses" - Proudman Oceanographic Laboratory, Internal Document No. 112. They do not take into account any wave action or climate change, and are based for the year 1997.
>
> Tide levels are available for Cardiff (approx NGR ST 18030, 74612) and Porthcawl (approx NGR SS 78544, 79401). The predicted levels are as follows:
>
> CARDIFF
> 0.5% (YEAR 1997) = 8.17mAOD
> 0.1% (YEAR 1997) = 8.40mAOD
>
> PORTHCAWL
> 0.5% (YEAR 1997) = 7.03mAOD
> 0.1% (YEAR 1997) = 7.25mAOD
>
> We are not aware of any historic flooding to the site.

I hope that this information is of use to you. Please feel free to contact me on 029 2024 5236 if you require further information.

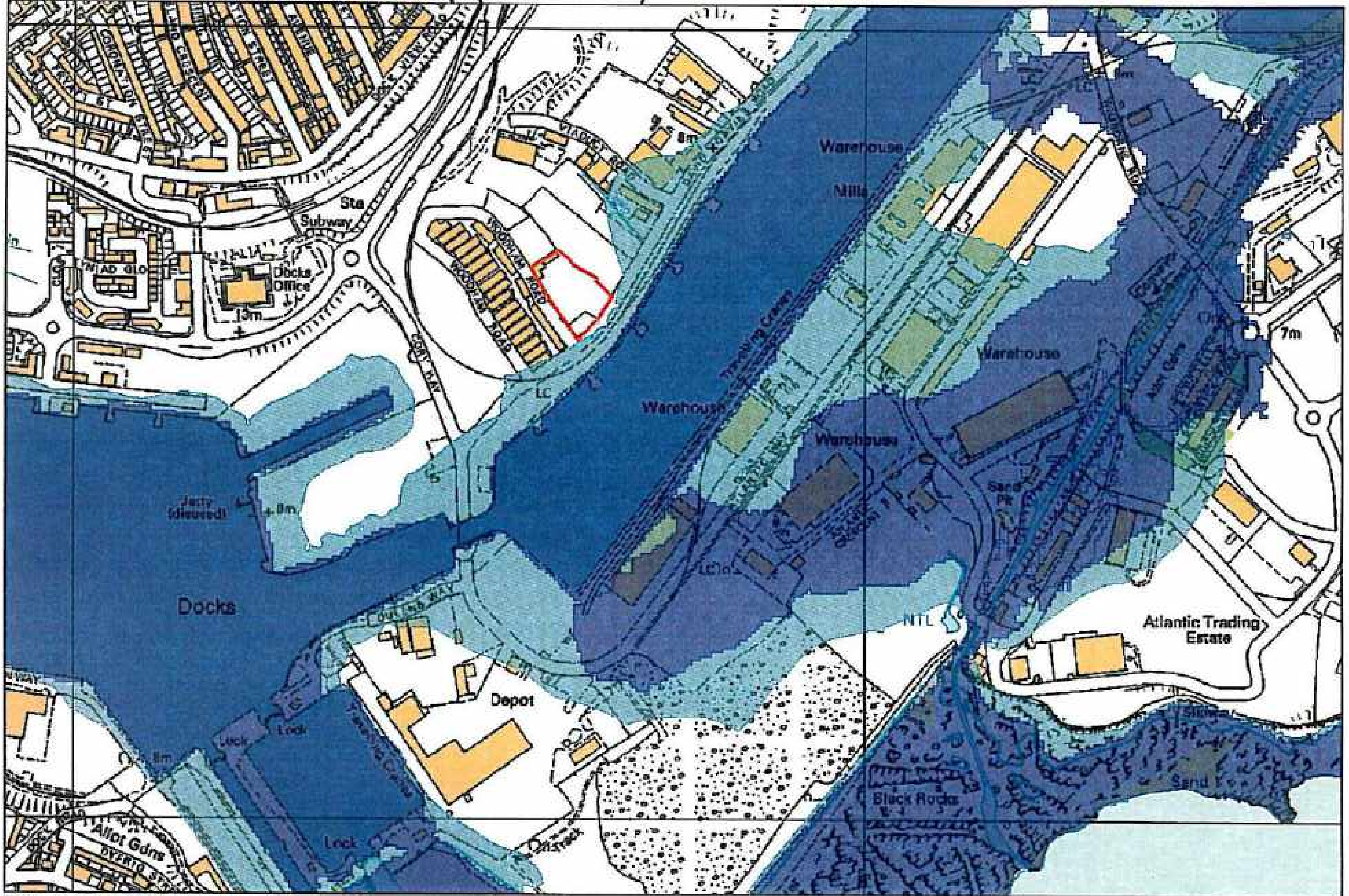
Kindest Regards

Darren Jones
External Relations Officer

Asiantaeth yr Amgylchedd Cymru
Plas-yr-Afon, Parc Busnes Llaneirwg, Llaneirwg, Caerdydd, CF3 0EY
Llinell gwasanaethau cwsmeriaid: 08708 506 506
Ebost: enquiries@environment-agency.gov.uk
www.asiantaeth-amgylchedd.cymru.gov.uk

Environment Agency Wales
Rivers House, St Mellons Business Park, St Mellons, Cardiff, CF3 0EY
Customer services line: 08708 506 506
Email: enquiries@environment-agency.gov.uk
www.environment-agency.wales.gov.uk

Figure 1: The Current Flood Map (version 3.8)



Key:

Dark Blue area : Flooding from rivers or sea without defences

Light Blue area : Extent of extreme flood

Red Boundary : Site of interest (as marked in pen on attached 'Streetmap' printout - dated 6th May 2008)

Asiantaeth yr Amgylchedd Cymru
Environment Agency Wales

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AB acoustics

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e-mail : leachabacoustics@aol.com

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Oasis Park
Road One
Winsford Industrial Estate
Winsford
Cheshire

Environmental Noise Survey
Proposed Biomass Plant
Woodham Road
Barry

AB Acoustics
Unit 8
Laurel Trading Estate
Higginshaw Lane
Royton
Oldham

23 December 2008.

Introduction

AB Acoustics were commissioned by Oaktree Environmental Ltd to undertake an environmental noise assessment the proposed site of the installation of a Biomass Gasification Plant to generate electricity from reclaimed wood (Woodham Road Barry CF63 4JE)

At the present time the site operates as a storage yard - - it is proposed to locate the proposed plant within a building on the existing site – it is understood the generator plant will operate on a 24 hour basis.

However this 24 hr operation will consist only of the operation of the generator plant and it is understood that no other equipment will be operated on a 24 hr basis – effectively the plant will be loaded with material for processing during the 'normal' hours that the plant operates and this material is then fed by means of a conveyor into the proposing plant.

The site is part of a well established industrial estate the proposed plant being housed within a purpose designed building.

Below is a plan of the site and the location of the nearest residential properties at which the existing background noise levels were measured:

Location 1 was on Dock View Road opposite the junction with Castleland Street.

Location 2 was at the entrance to the waste ground – which it is proposed to develop at some future date - on Cory Way

Location 3 was on the residential estate at Cei Dafydd

The noise level generate by the proposals is predicted for the residential properties at the three locations..

All calculated levels are FREE FIELD.

Noise Assessment Criteria

The likelihood of complaints about noise from industrial plant can be assessed where the standard is appropriate using BS 4142 – 1997. Within the standard, another standard, BS 8233- 1987 Is introduced for general guidance on acceptable nolse levels within buildings.

Guidance in BS 8233 –1987 (Sound Insulation and Noise Reduction in Buildings) provides design criteria for noise inside dwellings. These are:

Bedrooms	Laeq,T = 30 dB
Living Areas	Laeq,T = 35 to 40 dB

The 30 dB to 40dB Laeq,t level in BS 8233 – 1987 is in line with the night time internal noise criteria in PPG 24 of 30 dBA. This level is acceptable as avoiding disturbance to sleep.

An internal criteria of 35 - 40 dB Laeq,T 5 mins. Would translate to an outdoor limit of 50 - 55 dB Laeq,T 5 mins. where, by convention, an open window would provide an attenuation of 15 dBA, however an attenuation of 12 dBA is a more realistic figure.

The BS 4142 assessment method considers the likelihood of noise from specific noise sources provoking complaints from residents of nearby sensitive properties.

The Specific Noise Level is the noise level of the source or collection of sources under investigation and should exclude any other noise sources which may otherwise contribute.

The likelihood of complaints is assessed by comparing the noise level from the specific noise source(s) under investigation, against the typical prevailing background noise levels. The audible characteristics of the specific noise source(s) are also taken into account ie. If the noise contains any distinct hums, whines or bangs etc. then a correction of +5 dBA should be added to the measured level. This then becomes the Rating Level.

The margin by which the noise level due to the specific noise source under investigation exceeds the background noise level enables the likelihood of complaints to be assessed.

The greater this distance the greater the likelihood of complaints.

A difference of around +10 dB or more indicates that complaints are likely.

A difference of around +5 dB is of marginal significance.

If the rating level is more than 10 dB below the background level this is a positive indication that complaints are unlikely.

Equipment Used and Measurement Method

The noise levels were measured using a :

Norsonic Type 114 real Time Octave Band Analyser (Type 1 instrument)

Calibration was carried out prior to the measurements – and checked afterwards using a ;

Norsonic Acoustic Calibrator.

The measurements were carried out at the locations described at a height of 1500mm above the ground and away from reflecting surfaces.

The measurements were undertaken at the times stated in the results.

Results

These are tabulated below for the three locations :

Location 1 Dock View Road

The main noise sources at the time of the measurements were ;

Traffic movement along Dock View Road and Ffordd y Mileniwm together with a contribution from both passenger and freight traffic on the railway

Time	L_{Aeq}	L_{90}
18.12.08 15.30 – 16.30	62.1	55.6

Dry – westerly wind 4.3 – 5.2 m/sec – dry roads

18.12.08 22.00 – 22.30	55.8	43.1

Dry – westerly wind 3.5 – 4.4 m/sec – damp road (Measurement time reduced due to weather conditions)

18.12.08 23.10 – 23.20	48.0	44.9

Dry – westerly wind 2.7 m/sec – damp roads

19.12.08 – 00.25 – 00.35	44.4	41.6

Distance from proposed site scaled at 294 m (reference Google Earth)

Location 2 Cei Dafydd

The main noise source at the time of the measurement was traffic movement along Ffordd y Mileniwm

Time	L_{Aeq}	L_{90}
19.12.08 - 09.20 – 10.20	53.1	46.5

Dry – westerly wind 0.5m/sec – dry roads

18.12.08 21.20 – 21.50	47.1	43.4

Dry – westerly wind 3.5 – 4.4 m/sec – damp road (Measurement time reduced due to weather conditions)

18.12.08 23.25 – 23.35	41.4	41.2

Dry – westerly wind 2.7 m/sec – damp roads

19.12.08 – 00.40 – 00.50	40.5	40.1

Distance from proposed site scaled at 182 m (reference Google Earth

Location 3 Cory Way

The main noise source at the time of the measurement was traffic movement along Cory Way with cars and lorries accessing the industrial estate together with a contribution from traffic on Ffordd y Mileniwm

Time	L_{Aeq}	L_{90}
18.12.08 - 14.15 – 15.15	60.8	53.1

Dry – westerly wind 0.5m/sec – dry roads

18.12.08 20.45 – 21.15	47.1	43.4

Dry – westerly wind 3.5 – 4.4 m/sec – damp road (Measurement time reduced due to weather conditions)

18.12.08 23.45 – 23.55	41.4	41.2

Dry – westerly wind 2.7 m/sec – damp roads

19.12.08 – 00.55 – 01.05	40.5	40.1

Distance from proposed site scaled at 450 m (reference Google Earth)

Discussion of Results

These are discussed on a Location by Location basis

Internal Noise

All the proposed plant will be located internally to the proposed building – no actual measurements have as yet been undertaken on the type of plant that it is proposed to operate within the proposed building.

However the following noise levels of the various plant items are believed to be :

Engines : 85 dBA – as there are 6 of these the level will increase to 85 + 10log6 = 93 dBA

Coolers : 73 dBA

Roller Mill : 90 dBA

Grinder : 120 dBA

These levels are as yet to be confirmed by the various supplies – when more detailed information is available this will be forwarded.

However the client (Sunrise Renewables Ltd) has stipulated that the general internal level in the plant must not exceed 90 dBA (this will of course mean that internal acoustic treatments etc will be required) though this may not be the case at all locations.

This is therefore the internal level that is used in the following discussion

The internal noise from the process will be radiated by the structure of the building itself.

Location 1

The residential properties at Location 1 (Dock View Road) will look down onto the proposed plant as they are elevated above the proposed site – therefore they will have a view of both the rear facade of the building and the roof.

The area of the building that faces the residential properties = 45 * 14.08 = 633.6 sq m (rear facade)

Roof area = 60.6 * 45 = 2727 sq m

The attenuation of the building envelope would be an R_w = 25 dBA (ref : www.kingspanpanels.com) for a typical trapezoidal panel – this is the figure that is used in the following calculations.

Therefore the Specific Noise Level radiated by the building can be calculated using :

Rear Facade

$$L_2 = L_1 - 6 - R + 10 \log S - 11 - 20 \log r + DI$$

Where

L_2 = Calculated level at distance r metres

L_1 = Measured Level – 90 dBA

R = the sound reduction index of the building element which in this case is **25 dBA** – see above

S = surface Area of building facing the residential property = **633.6 sq m**

.r= distance to houses = **294m**

DI= Directivity Index = 3

L_2 = 90 – 6 – 25 + 10 log 633.6 – 11 – 20 log 294 + 3

L_2 = 30 (29.6) dBA

Roof

$$L_2 = L_1 - 6 - R + 10 \log S - 11 - 20 \log r + DI$$

Where

L_2 = Calculated level at distance r metres

L_1 = Measured Level – 90 dBA

R = the sound reduction index of the building element which in this case is **25 dBA** – see above

S = surface Area of building facing the residential property = **2727sq m**

.r= distance to houses = **294m**

DI= Directivity Index = 3

L_2 = 90 – 6 – 25 + 10 log 2727 – 11 – 20 log 294 + 3

L_2 = 36 (35.9) dBA

However the residential properties are at an angle of approximately 30^0 to the proposed plant therefore the attenuation can be calculated from A = 10 log angle / 180 = 10 log 30 / 180 = - 8 (7.77) – reducing the noise level radiated from the roof at Dock View Road to 36 – 8 = **28 dBA**

The obtain the total level these two calculated levels need to be summed – 30 + 28 = **32 (32.1) dBA**

Location 2

At the present time there is NO residential development on this site – however it is understood that there is a proposal to develop the site for residential properties – the time scale for this is unknown – if the proposed plant is installed prior to the residential development then it would seem reasonable that the possible residential development should cater for any noise that is radiated from the proposed industrial plant.

The residential properties at Location 2 (Cory Way) could only see the side facade of the proposed plant

The area of the building that faces the potential residential properties is 853.2 sq m

The attenuation of the building envelope would be an R_w = 25 dBA (ref : www.kingspanpanels.com) for a typical trapezoidal panel – this is the figure that is used in the following calculations.

Therefore the Specific Noise Level radiated by the building can be calculated using :

$$L_2 = L_1 - 6 - R + 10 \log S - 11 - 20 \log r + DI$$

Where

L_2 = Calculated level at distance r metres

L_1 = Specified Level – 90 dBA

R = the sound reduction index of the building element which in this case is **25 dBA** – see above

S = surface Area of building facing the residential property = **853.2**

.r= distance to houses = **182m**

DI= Directivity Index = 3

$L_2 = 90 - 6 - 25 + 10 \log 853.2 - 11 - 20 \log 182 + 3$

L_2 = 35 (35.1) dBA

Location 3

At the present time there is NO residential development between this location and the proposed site – however if the possible residential development does go ahead then it may be that this location will be acoustically screened from the proposed industrial site thereby attenuating the following calculated noise level.

The residential properties at Location 3 (Cie Dafydd)) at the present time see the side facade of the proposed plant

The area of the building that faces the potential residential properties 853.2sq m

The attenuation of the building envelope would be an R_w = 25 dBA (ref : www.kingspanpanels.com) for a typical trapezoidal panel – this is the figure that is used in the following calculations.

Therefore the Specific Noise Level radiated by the building can be calculated using :

$L_2 = L_1 - 6 - R + 10 \log S - 11 - 20 \log r + DI$

Where

L_2 = Calculated level at distance r metres

L_1 = Specified Level – 90 dBA

R = the sound reduction index of the building element which in this case is **25 dBA** – see above

S = surface Area of building facing the residential property = **853.2 sq m**

.r= distance to houses = **450m**

DI= Directivity Index = 3

$L_2 = 90 - 6 - 25 + 10 \log 853.2 - 11 - 20 \log 450 + 3$

L_2 = 27 (27.2) dBA

Overall Level

The predicted noise level at the various residential properties are summarised below

Location 1 = 32 dBA

Location 2 = 35 dBA

Location 3 = 27 dBA

These levels are the calculated Specific Noise Level for the various locations – with respect to BS 4142 a +5 dBA correction factor should be added to the above figures to account for the tonal character etc of the noise – therefore the resulting Rating Levels are :

Location 1 : 37 dBA

Location 2 : 40 dBA

Location 3 : 32 dBA

These are the levels that are compared to the lowest measured background (L_{90}) at the various locations :

	Difference to Rating Level
Location1 : 41.6 dBA (00.25 / 00.35)	**- 4.6 dBA**
Location 2 : 40.1 dBA (00.55 / 01.05)	**- 0.1 dBA**
Location 3 : 40.1dBA (00.40 / 00.50)	**- 8.1 dBA**

Therefore if the specified internal level of 90 dBA is achieved then the external level from the proposed plant at the various locations will be equal to or less than the measured background level – this is an indication that complaints about noise will not be received.

The following should be noted :

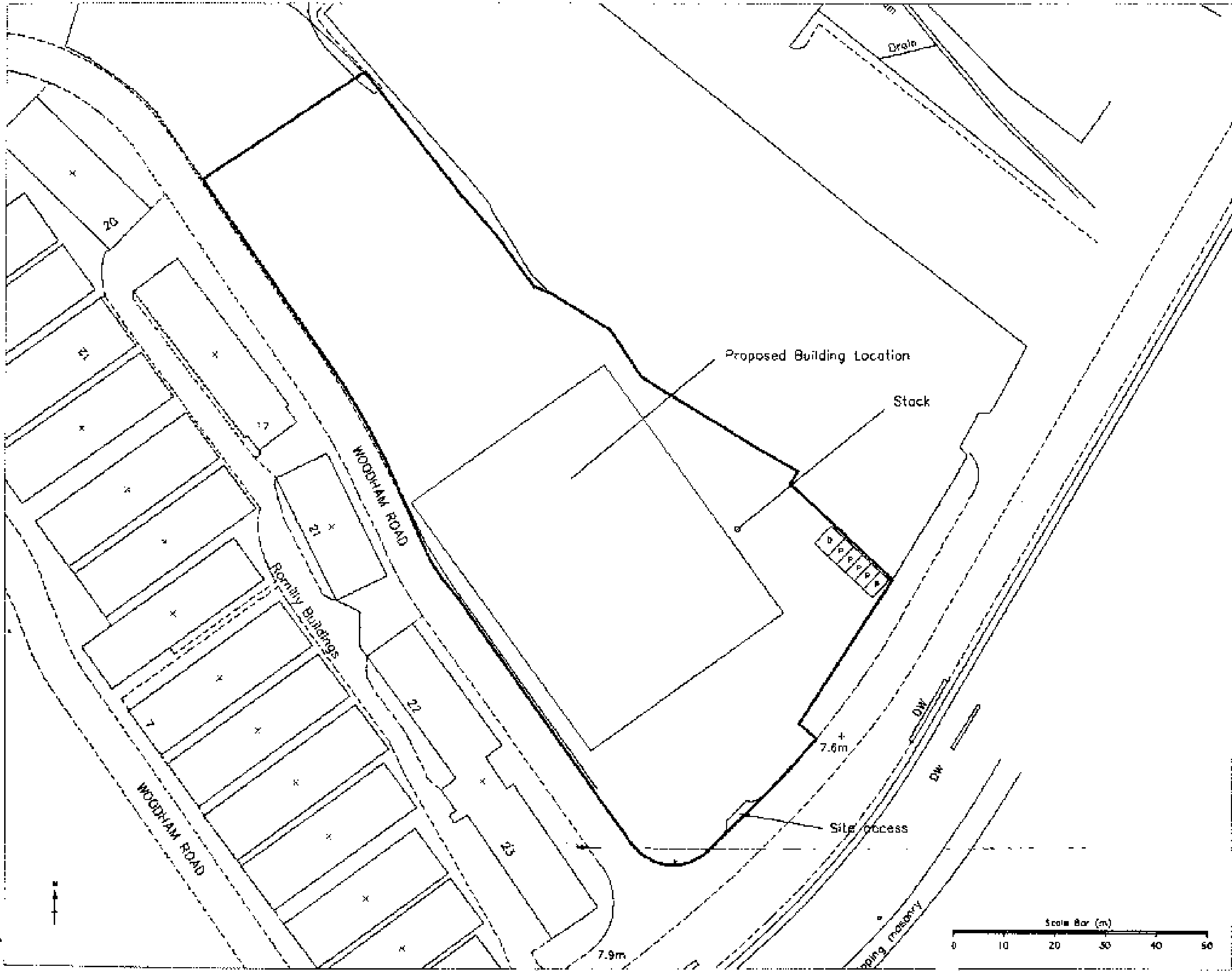
No roof lights should be fitted into the roof as these do not have as high an attenuation as the 'normal' roof panels.

If the internal level within the proposed plant is in excess of the specified 90 dBA (or is projected to be) then the attenuation of the panels forming the skin of the building must be increased to account for the increase in internal noise level – further details www.kingspanpanels.com

[redacted]

Roger Leach AMIOA

Dated : 23.12.08



Oaktree Environmental Ltd

Title:	SITE LAYOUT PLAN
Drawing No:	SRB/03
Client:	Sunrise Renewables Ltd
Site:	Woodham Road, Barry
NGR:	
Date:	5 September 2008
Scale:	1:500

Revision:	Printed At:	Drawn By:	Checked:
A	A2	RS	

KEY:

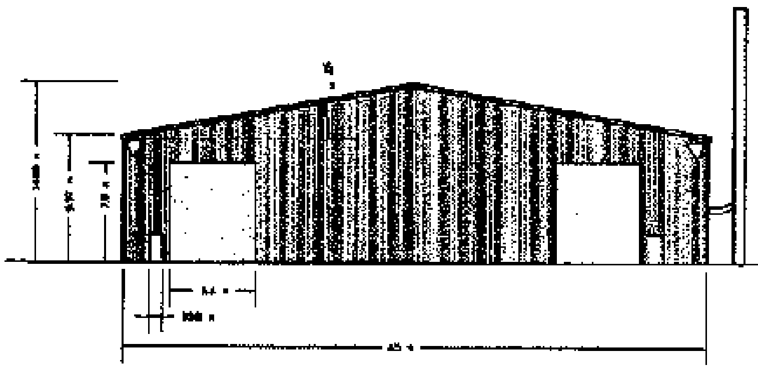
———	Site Boundary
P	Parking space
D	Disabled parking space

Notes:

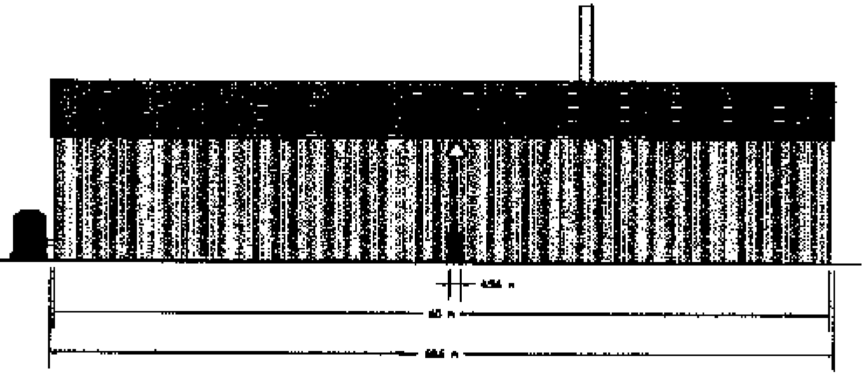
Revision Details:

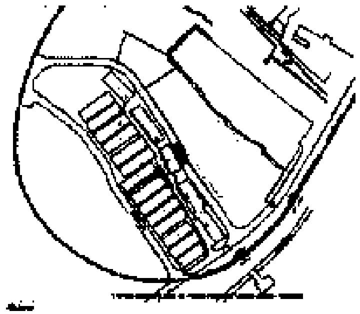
Rev	Description	Date
-	First Draft	14/08/08
-	Application copy	05/09/08

a) front elevation from the south

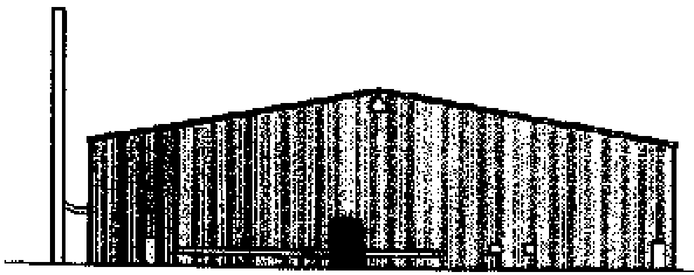


b) side elevation from the west





c) rear elevation from the north



d) side elevation from the east

Oaktree Environmental Ltd

Waste Management and Environmental Consultants

BUILDING ELEVATIONS

SR3/04

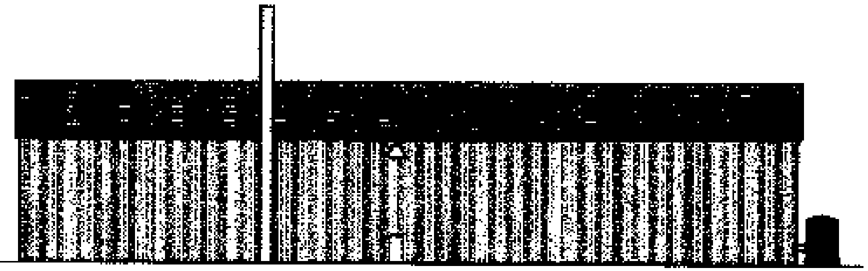
SUNRISE RENEWABLES LTD

WOODHAM ROAD, BARRY

29 AUGUST 2000

1:500

A3



Building eaves height = 10 m

Building ridge height = 14.87 m

Angle of roof pitch = 10°

Building footprint = 60 m x 45 m

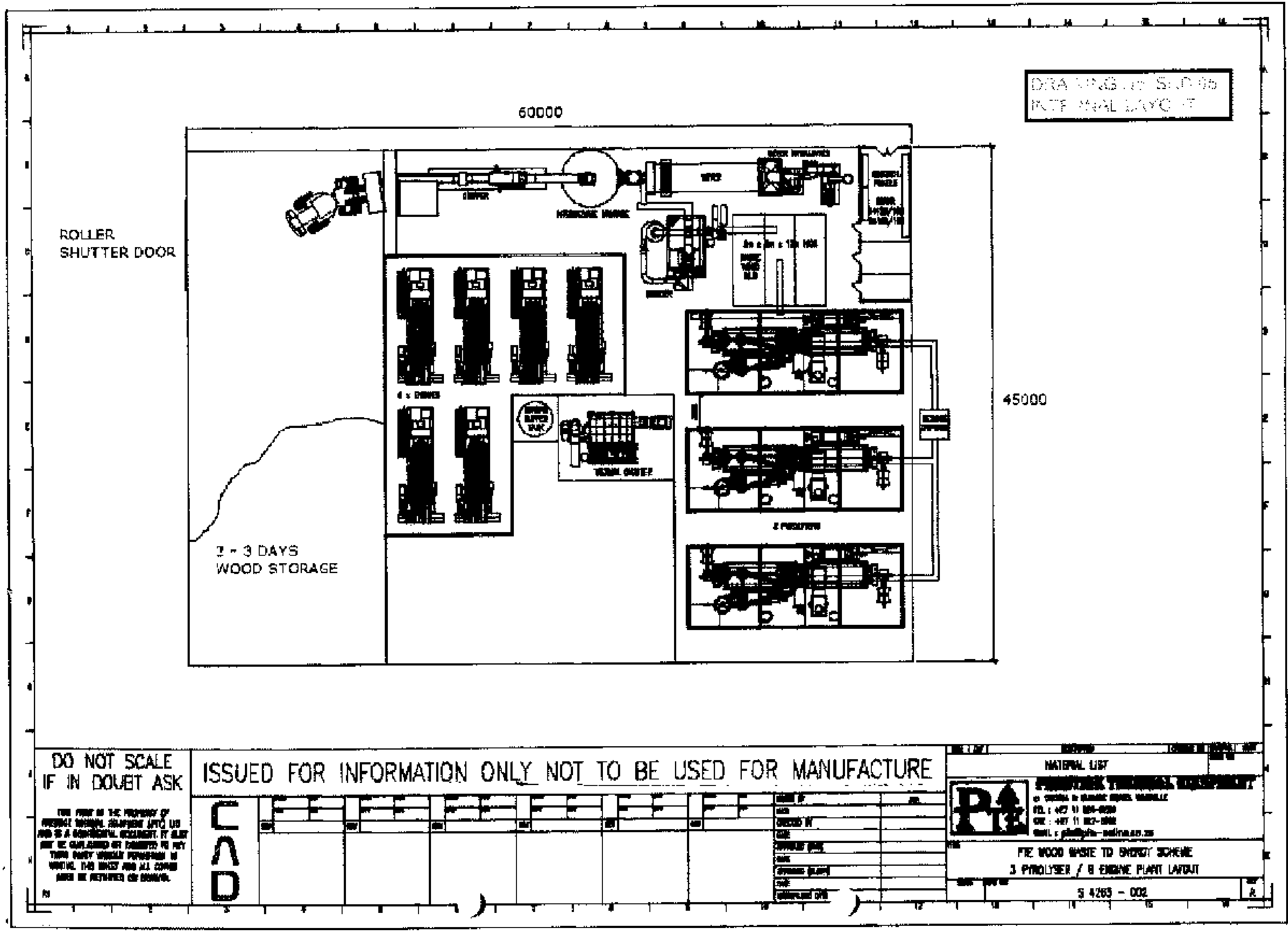
Roller shutter doors = 6 m width x 7.5 m height

Fire doors = 0.98 m width x 2.2 m height

Stack height shown is 20 m which is given for indication, actual stack height will be lower

FOR CONSULTATION ONLY

Rev	Description	Date
-	First Draft	03/07/2000
A	Application Copy	29/08/2000


DRAWING ... S... 05
INTERNAL LAYOUT
60000
45000
ROLLER
SHUTTER DOOR
2 - 3 DAYS
WOOD STORAGE
4 x ENGINES
3 PYROLYSERS
DO NOT SCALE
IF IN DOUBT ASK
ISSUED FOR INFORMATION ONLY NOT TO BE USED FOR MANUFACTURE
CAD
MATERIAL LIST
PTE WOOD WASTE TO ENERGY SCHEME
3 PYROLYSER / 8 ENGINE PLANT LAYOUT
S 4265 - 002
A

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Oaktree Environmental Ltd
Unit 5
Oasis Park Road One
Winsford Industrial Estate
Winsford
Cheshire
CW7 3PP

18 March 2009.

For the attention of Mr M Muia

Dear Sirs

Reference : Proposed Biomass Plant Barry South Wales

It is understood that in addition to the proposed Biomass Plant on Woodham Road there is a proposal to operate an Energy Recovery Facility on Atlantic Road in the Dock Area (the proposed site is approximately 350 / 400m to the south of the proposed Biomass site across the dock.

As both plants will have an impact on the environment this note considers the combined effect for a noise point of view should both plants be approved.

From the report issued by AB acoustics dated 23 December 2008 background noise levels were measured at three locations – 1 Dock View Road / Castleland Street – 2 Cory Way and 3 Cei Dafydd (Y Rhodfa) with the following results (copied from our report dated 23 December 2009).

These levels are the calculated Specific Noise Level for the various locations – with respect to BS 4142 a +5 dBA correction factor should be added to the above figures to account for the tonal character etc of the noise – therefore the resulting Rating Levels are :

Location 1 : 37 dBA

Location 2 : 40 dBA

Location 3 : 32 dBA

These are the levels that are compared to the lowest measured background (L_{90}) at the various locations :

	Difference to Rating Level
***Location1 : 41.6 dBA** (00.25 / 00.35)*	***- 4.6 dBA***
***Location 2 : 40.1 dBA** (00.55 / 01.05)*	***- 0.1 dBA***
***Location 3 : 40.1dBA** (00.40 / 00.50)*	***- 8.1 dBA***

Therefore if the specified internal level of 90 dBA is achieved then the external level from the proposed plant at the various locations will be equal to or less than the measured background level – this is an indication that complaints about noise will not be received.

The following should be noted :

No roof lights should be fitted into the roof as these do not have as high an attenuation as the 'normal' roof panels.

If the internal level within the proposed plant is in excess of the specified 90 dBA (or is projected to be) then the attenuation of the panels forming the skin of the building must be increased to account for the increase in internal noise level – further details www.kingspanpanels.com

With respect to the predicted levels for the Biogen Plant (taken from Table 9.5 – page 128 - of The Environmental Statement for the Barry Energy Recovery Facility prepared by Parsons Brinckerhoff Ltd) it is seen that the predicted Rating Level at the two common locations is calculated to be :

1) St Mary's Avenue / Dock View Road) = 24 dBA
4Y Rhodfa = 28 dBA.

Therefore to calculate the overall level of noise should both plants be approved then both these calculated Rating Levels need to be added together :

Location 1 = 37 + 24 = **37 dBA**

Location 3 = 32 + 28 = **33 (33.4) dBA**

If these new calculated Rating Levels are then compared to the lowest measured background levels above the following results :

Location 1 = - 4.6 dBA

Location 3 = - 7.1 dBA

Therefore if the specified internal level of 90 dBA is achieved for the Biomass Plant then the external level from the proposed plant and the additional Biogen Plant at the two locations will be less than the measured background level – this is an indication that complaints about noise will not be received.

However in the acoustic report for the Biogen Plant a lower background level (measured at approximately 01.40 – Y Rhodfa and at approximately 03.40 – Dock View Road) was recorded : these are quoted as 29 (28.5) dBA and 30 (29.7) dBA respectively.

If these background levels are used then the combined effect of both plants operating with respect to background levels is :

Location 1 = +8 dBA

Location 2 = + 3 dBA

Location 1 therefore results in an increase in noise level that is between that which is considered of *marginal significance* and that which *could result in complaints* with respect to BS 4142.

Therefore the external level could be reduced by either reducing the internal level within the plant to 85 dBA (rather than the 90 dBA suggested in the report dated 23 December 2009) or by increasing the attenuation offered by the building envelope.

If a 5 dBA increase in attenuation is achieved then the increase in noise level from both plants will be below that which is considered to be of *marginal significant* with respect to BS 4142.

I hope the above is sufficient for your present needs, if however you require any additional information please do not hesitate to contact us.

Yours faithfully

Roger Leach AMIOA

PLANNING APPLICATION. NO. 2008/01203/FUL

ERECTION OF NEW INDUSTRIAL BUILDING AND INSTALLATION OF 9MW WOOD FUELLED RENEWABLE ENERGY PLANT ON LAND AT WOODHAM ROAD, BARRY DOCKS ON BEHALF OF SUNRISE RENEWABLES LTD

1.0 INTRODUCTION TO CHPQA

1.1 The purpose of this document is to assess Sunrise Renewables Ltd's proposed biomass plant against the guidance entitled The CHPQA Standard (Issue 2) produced by defra in November 2007. It also considers WAG guidance on renewable energy in Section 4.0.

1.2 The guidance states that "CHPQA is an initiative by the Government to encourage the wider practical application of Good Quality Combined Heat and Power, Community Heating and Alternative Fuel technologies".

1.3 Section 2 refers to the low efficiency of traditional power stations i.e. in the range 25-50%, based on the Gross Calorific Value (GCV) of the fuel and including transmission and distribution losses. Therefore 50-75% of the energy content of the fuel is rejected as heat directly to the atmosphere or into seas or rivers. The generation of electricity and the recovery of heat in CHP Schemes typically achieve overall efficiencies of 60-80% and sometimes more. Sunrise Renewables aims to achieve an efficiency in the region of 60%+. The basic design on the plant can achieve an efficiency of almost 50%.

1.4 The aims of CHPQA are clear:

i. Define, assess and monitor the quality of CHP Schemes on the basis of energy efficiency and environmental performance.

ii. Ensure fiscal and other benefits are in line with environmental performance.

iii. Provide clear signals to users and potential users to minimise the cost of energy demands through CHP.

iv. Achieve the above at minimum cost to CHP users and to Government.

1.5 The CHPQA programme applies immediately for new schemes from January 2007.

1.6 The calculation of primary energy savings will comply with Article 12(2) of the European Union Directive 2004/008/EC – Promotion of Cogeneration based on a useful heat demand in the Internal Energy Market. Therefore, GQCHP with total installed capacity of $\geq$1MWe must provide $\geq$10% primary energy savings compared with the Directive's harmonized reference values for separate production of heat and electricity. This aspect will subject to independent review and certification.

2.0 DETAILED REQUIREMENTS

2.1 Sunrise Renewables will be the Responsible Persons operating the CHP Scheme and must demonstrate compliance with the CHPQA Standard to gain and maintain Good Quality CHP Certification.

2.2 To comply with the CHPQA Standard Sunrise Renewables Ltd's scheme will

i. Apply for Registration
ii. Install appropriate monitoring systems and maintain appropriate records
iii. Conduct a Self-Assessment and apply for Certification under CHPQA
iv. Comply with Validation and Audit obligations
v. Notify the Administrator of any changes to the Scheme relevant to the Registration and Self-Assessment.

2.3 Sunrise Renewables Ltd is aware of the role of the Administrator of the CHPQA programme set out in Section 5 of the guidance and will comply with the guidance produced to enable a certificate of Good Quality CHP to be issued to the scheme and will comply with periodic Audits by the Administrator. It will ensure that there are appropriate systems in use to monitor all energy inputs and outputs for the Scheme which are relevant to the calculation of Quality Index, Power Efficiency and other parameters. Monitoring systems will apply to both main and auxiliary fuel inputs. All monitoring systems shall be designed, installed and verified to provide the appropriate standards of accuracy as defined in the CHPQA Guidance Notes. Sunrise will maintain records of annual energy inputs and outputs and retain them for a minimum of six years.

3.0 SELF ASSESSMENT

3.1 Self-Assessment requires that the Responsible Person shall specify, determine or calculate the following (refer to Appendix A for definitions):

(i) Scheme boundary and selected QI definition
(ii) Monitoring and recording provisions
(iii) Power Efficiency
(iv) Heat Efficiency
(v) Quality Index (QI)
(vi) Qualifying Power Capacity (CHP_{QPC})
(vii) Qualifying Heat Capacity (CHP_{QHC})
(viii) Qualifying Fuel Input (CHP_{QFI})
(ix) Qualifying Power Output (CHP_{QPO})
(x) Qualifying Heat Output (CHP_{QHO})

3.2 The calculation of the above parameters will also provide evidence to the Vale of Glamorgan and the Environment Agency in support of the site's CHP status.

3.3 Self assessment will be reported to the Administrator using proformas to define the CHP Scheme, to record fuel inputs and energy outputs and to calculate the required parameters. The Administrator will validate the Self-Assessment. Validation activities shall be appropriate to the size of the Scheme. The Administrator shall determine whether the Scheme meets the Good Quality CHP Threshold Criteria, for all or part of its inputs, outputs and capacity, and issue Certification to this effect.

4.0 BIOENERGY ACTION PLAN FOR WALES CONSULTATION (CLOSES 22 MAY 2009)

4.1 Sunrise Renewables supports the Assembly Government's consultation document and considers that its proposed scheme assists in maximising carbon savings.

4.2 The consultation refers to a number of ways to achieve carbon reductions, which includes contaminated waste wood used in CHP or power stations which comply with waste incineration regulations.

4.3 The document states that schemes involving waste biomass "would be among the most cost effective means of saving carbon emissions due to the low cost of the fuel or even access to gate-fees for avoidance of landfill costs". This aspect has been detailed in the application.

4.4 Some of the Assembly Government's buildings will use biomass heating and there is no practical reason why the Vale of Glamorgan's Dock Offices cannot benefit from the use of heat in the Winter and chilling in the Summer.

4.5 The consultation states that " biomass is an internationally-traded commodity and bioenergy applications in Wales will source the raw material from various locations, inside and outside Wales. However, an attempt is made at assessing the extent to which Wales's future bioenergy needs can be met from Welsh resources, and a distinction is made between British and imported biomass". Sunrise will not use imported, non-British biomass.

4.6 The UK Biomass Strategy has assessed biomass use for energy generation in relation to the cost-effectiveness of carbon savings. The hierarchy is one of the key considerations in the development of a bioenergy action plan for Wales. The most cost-effective options are expected to include:

i. Energy from waste that would otherwise go to landfill
ii Heat or CHP generation x Electricity generation.

4.7 The document states that the WAG "is particularly keen to see schemes developed that maximise carbon savings; for example..... contaminated waste wood used in CHP or power stations which comply with waste incineration regulations". The WAG also wished to encourage Community district heating and is seeking ways to encourage more communities to adopt district heating schemes using biomass.

4.8 The application site is also very close to the Barry Waterfront development which is identified as one of WAG's Zero Carbon Development Masterplan sites 2007-11. Sunrise Renewables has obtained a letter of support from developers working on the project.

4.9 The consultation also states that " contamination precludes the wood from being recycled so most of it is currently disposed of in landfill. Recovery of the energy from the wood is far preferable provided it can be done in compliance with waste incineration regulations". The Environment Agency will be dealing with the permit application for the plant to ensure such compliance.

APPENDIX A - DEFINITIONS:

1. Administrator is that body contracted by the Government to have responsibility for the management of the CHPQA programme.

2. Alternative Fuels are fuels other than Conventional Fuels and they fall into broad categories for the purposes of CHPQA (see Table 1).

3. Audit is any activity carried out by the Administrator to confirm compliance with this Standard. It typically includes a site-based evaluation of the operation of a CHP Scheme to confirm that the Self-Assessment is founded on a correct interpretation of the CHPQA Standard and that the data and calculations submitted are corroborated by site data records.

5. Certification is the issuing by the Administrator of a certificate that a Scheme meets the criteria for Good Quality for all or part of its energy inputs, outputs and capacity, based on Validation of Self-Assessment submitted by a Responsible Person.

6. CHP (Combined Heat and Power) is defined as the simultaneous generation of heat and power in a single process. The power output is usually electricity, but may include mechanical power. Heat outputs can include steam, hot water or hot air for process heating, space heating or absorption chilling.

7. CHPQA programme is a management and administrative process under which Registration and Certification is being taken forward. It proceeds through the application for Registration and Self-Assessment of CHP Schemes by a Responsible Person to Certification in accordance with the criteria for Good Quality CHP. The Administrator will carry out Registration, Validation, Certification and Audit on behalf of the Secretary of State for the Environment.

8. CHP Scheme means the equipment and operating system for the whole Scheme, including monitoring systems, at any stage of development from design to actual operation. It will include one or more prime movers (e.g. gas turbine or reciprocating engine) driving electrical generator(s) or mechanical loads and some means of recovering waste heat, which would otherwise be released to the environment, for a useful purpose.

9. CHP Qualifying Heat Output (CHPQHO) is the registered amount of useful heat supplied annually from a CHP Scheme (MWhth). It is heat output that is demonstrably utilised to displace heat that would otherwise be supplied from other sources.

Note: CHPQHO excludes any heat rejected to the environment without any beneficial use. Examples include, inter alia, heat lost from chimneys or exhausts and heat rejected in equipment such as condensers and radiators.

12. CHP Qualifying Power Capacity (CHPQPC) is the registered power generation capacity of a CHP Scheme (MWe) that qualifies as Good Quality CHP. It is used for monitoring the installed capacity of Good Quality CHP in the UK. Most Schemes will meet the relevant Threshold QI Criterion for Good Quality CHP Capacity and therefore CHPQPC is the same value as the total power capacity (CHPTPC). For a Scheme that does not achieve the Threshold QI Criterion for Good Quality CHP,

CHPQPC is that portion of the total generation capacity that would achieve the Threshold QI Criterion, under the conditions of Maximum Heat Output under Normal Operating Conditions.

13 CHP Qualifying Power Output (CHPQPO) is the registered annual power generation from a CHP Scheme (MWhe) that qualifies as Good Quality CHP. Most Schemes will meet the relevant Threshold QI Criterion for Good Quality CHP in Annual Operation and therefore CHPQPO is the total power output (CHPTPO). For a Scheme that does not achieve the Threshold QI Criterion for Good Quality CHP, CHPQPO is that portion of the annual power output from a Scheme that would have achieved the Threshold QI Criterion, based on the actual annual heat supplied (CHPQHO).

14. CHP Total Fuel Input (CHPTFI) is the total registered annual fuel input to a CHP Scheme (MWh), based on GCV.

Who are Sunrise Renewables?

Sunrise Renewables are a group of experienced professionals committed to assisting with the delivery of biomass combined heat and power projects throughout the UK.

The directors have a proven track record in the assembly and delivery of "turnkey" Renewable Energy projects.

The directors and a number of their advisers have spent almost three years developing a number of port site projects. Each Renewable Energy plant will be owned and operated by individual companies.

How have you selected this site and why?

Sunrise Renewables objective is to invest in small-scale renewable energy projects. Four sites have been selected at docks around the UK (Barry, Sunderland, Hull and Barrow). All locations have been selected as they are vacant brownfield sites at working docks with good transport links.

Woodham Road at the Port of Barry was chosen because it meets the above criteria and is a dedicated dock which already handles wood imports and also has a rail connection.

Sunrise engaged in detailed discussions with ABP regarding available sites and Woodham Road was the best fit for their needs.

Why can't the plant be located on Atlantic Dock trading estate?

Whilst every effort has been made to source the best possible site - as discussed above - due to practical and physical site issues, some sites had to be abandoned early in the process.

The Atlantic Trading Estate was considered as a potential site, however due to other application made by Biogen, it was not practical for our site to be located there, its locations therefore were discarded at a very early stage.

Will it affect my overall amenity and enjoyment of my property?

If the Vale of Glamorgan Council is mindful to approve the proposal for a 9mw renewable energy plant at Woodham Road on Barry Docks, the planning consent may have 30+ conditions relating to matters such as limiting hours of operation, noise and lorry movements onto and leaving the site.

What assurance can you give me that lorry movements will not increase over time?

If the Vale of Glamorgan Council is mindful to approve the proposal for a 9mw renewable energy plant at Woodham Road on Barry Docks, one of the conditions may relate to traffic movements. In conditioning traffic movements the local authority are setting an enforceable condition, the breach of which could lead to legal action and prosecution. The plant can only accept a set tonnage of fuel per day so an increase in movements cannot happen in any event.

What is the gate fee and how does this relate to the proposal?

There is no gate fee, suppliers will not be paying us to off-load their wood - we will be paying them for pre-chipped fuel. The fuel supplier will be delivering biomass wood chips by sea and road to the site.

Sunrise is in the business of renewable power generation, not waste management. All fuel suppliers will enter into a legally binding fuel supply agreement and there will be strict guidelines as to what fuel will be suitable.

The site will not be open to the public and will not accept public waste; members of the public cannot bring their waste wood onto the site for disposal.

Who will you sell the energy to?

As we are at a very early stage of the project's development, Sunrise has not made any commercial decisions as to the selected energy supplier. It is common practice for energy generators sell their electricity via a power purchase agreement which is a legal agreement between the generator (Sunrise) and the energy supplier.

Will there be overhead cables to connect the Sunrise plant to the grid?

No. Sunrise Renewables (Barry) Ltd has received an interconnection offer from Western Power Distribution (South Wales) plc to connect the renewable power plant at Woodham Road via an underground cable to Broad Street substation. Approximately 1.85km of underground cable will need to be installed between this point and the Sunrise substation.

Can you guarantee that the source of wood will be clean and not hazardous?

Sunrise will be using biomass (wood chips) as a fuel, and we will be paying suppliers for this fuel. Because we will be purchasing our fuel, we will enter into legally binding Fuel Supply Agreements with suppliers which will have clear guidelines for acceptable fuel which we are willing to pay for.

Should a supplier deliver fuel that does not meet our specifications, then we will not pay for the delivery, and the supplier will be required to remove the batch of non compliant fuel.

Moreover Sunrise renewable business is to generate renewable electricity and will be regulated and monitored by the EA on emissions, therefore we cannot afford to accept hazardous material which will breach our emissions levels and result in the plant being shut down and which results in lost revenues.

Where will the 25 jobs come from?

Sunrise will provide up to 50 jobs for the local community during the build of the plant and 25 permanent jobs thereafter.

The permanent jobs will comprise of skilled and semi skilled workers who will be trained to high standards.

Is this an incinerator?

Sunrise would like to reinforce that the Woodham Road plant would be a Biomass CHP plant and not an incinerator as suggested by local media reports.

Sunrise would use Pyrolysis. Various government agencies such as DEFRA, Environment Agency and BERR clearly differentiate gasification/pyrolysis from incineration

- The key difference between gasification and incineration:
    - Incinerators are designed to dispose of waste with energy recovery being a by product
    - Gasification cracks biomass molecules to generate a clean gas that is similar to natural gas and which can have many uses
    - The purpose of our technology is to produce renewable energy and heat.

- It is regulated by the Environment Agency as an energy industry rather than waste industry

- If fuel inputs stop or gas production stops the plant shuts down automatically" - incinerators can run independently if energy generation stops

- The financial drivers for incineration plants are based on receiving a gate fee for accepting waste material, the more gate fee the more potentially hazardous the material

- Sunrise Renewables (Barry) Ltd will be using biomass as a fuel feedstock which would normally need to be purchased. We do not intend to accept waste

Why will this attract blue-chip companies to Barry?

Non domestic electricity users have to pay a climate exchange levy, which is a government tax on business and public sectors, and a driver for business's to become more energy efficient.

The principal aim of the levy is to encourage non-domestic electricity users to become more energy efficient to help reduction in carbon emissions. The levy package as a whole is expected to save at least 5 million tonnes of carbon a year by 2010.
Businesses can be incentivised to locate to Barry dock and reduce this tax by using our renewable energy and heat, because we intend to be deemed a good quality CHP plant.

Support by government?

As widely predicted the UK budget contained several measures to support a green energy revolution, including:

- £1bn to combat climate change by supporting low carbon industries and green collar jobs.

- Hints at carbon budgeting to set binding targets to reduce emissions by 34% by 2020. Details to follow at a future date.

- £405m fund to boost green manufacturing.

- £435m to support energy efficiency measures in buildings.

- £750m investment fund for emerging technologies.

The **Combined Heat and Power Association (CHPA)** called the budget a 'major step' towards establishing a low carbon industrial base in the UK.

1.0 PROCESS SUMMARY

1.1 Waste wood which is suitable for chipping to produce biomass fuel predominantly arises from construction and demolition operations, industrial processes using wood as raw materials, forestry, agriculture and composting operations (oversize materials).

1.2 Wood processed by fuel providers arises from every conceivable construction and demolition activity and can include wood with a diverse range of treatments. Difficulty in classifying waste timber is compounded by the lack of segregation by waste producers in the construction and demolition industry and there is currently no common classification system for waste wood received at transfer stations. This document details the range of fuel types that are acceptable and those that are prohibited.

1.3 The biomass plant uses a pyrolysis process which breaks up the wood, producing a gas fuel which requires cleaning. The cleaning process involves filtration of solids and cooling the gas to produce condensate. The cleaned gas is in turn used as fuel in gas engines to generate electricity.

1.4 Both the fly ash from the filters and condensate remove contaminants that may be present in the wood to leave the gas in a state suitable for combustion in the reciprocating gas engine. Heavy metals are also removed in the same way. The biomass plant is not a mass burn process which results in large volumes of emissions at the stack which require abatement. By the time the gas reaches the engines it has to be clean to ensure that the engines operate efficiently.

1.5 The plant is of a size which will require an Environmental Permit before it can operate. As part of the permit application process the Environment Agency will assess the emissions modelling carried out and set emission limits for the process. Modelling has already been carried out by RSK on behalf of the applicant which concluded that the air quality impact of the site operation was not significant. The emissions limits used for the modelling were in line with the Waste Incineration Directive limits which would be set by the Environment Agency.

1.6 The main concern from waste wood is the presence of hazardous timber treatments. The British Wood Preserving and Damp Proofing Association (BWPDA) advises its members that only 2 timber treatments are classed as hazardous, namely: Chromated Copper Arsenate (CCA) and Croesote, both of which are now restricted. The presence of small quantities of such wood would not render a load of wood hazardous and the individually treated wood would have to have CCA above specified levels to be rendered hazardous, which is often difficult to assess given the range of treatments using CCA and the fact that up to 40% of the treatment may leach over the life of the treated wood. Whole loads of fuel derived from this type of wood would not be accepted and would damage the engine catalysts.

2.0 FUEL TYPES

2.1 The plant will only gasify fuel derived from waste wood, of the specifications set out below. The designated fuel providers will be required to demonstrate that they can supply feedstock which meets the requirements of this document.

2.2 Grade A

Clean wood, relatively homogeneous (hardwood / softwood), very few 'contaminants' such as fixings, paint, coverings etc.

2.3 Mixed grade

Hard wood and softwood mix, including some minor 'contaminants' such as paint and small nails/screws but as a relatively low proportion.

2.4 Low grade

Processed wood containing contaminants such as panel board, melamine, MDF.

2.5 Prohibited feedstock

2.5.1 To exclude all metals ferrous and non-ferrous, glass, plastics, rubber, cottons, stones and soils or other physical contaminants.

2.5.2 It is acknowledged that with waste wood some minor contaminants, i.e small nails etc may pass through fuel preparation plant. Other materials are not acceptable as they reduce the quality of the gas produced.

2.5.3 Wood treated with hazardous timber preservatives such as Chromated Copper Arsenate (CCA) and Creosote. The contaminants of most concern are copper, chrome and arsenic.

2.5.4 The level of CCA in the general construction and demolition waste stream is very low. The table below shows the relationship between timber treatment chemicals in fresh treated wood and ash from burning weathered CCA timber. The long life of heavily treated timbers results in a lower rate of disposal. Furthermore the majority of wood processors do not accept loads of hazardous timber for recycling. There is also a thriving market in used railway sleepers and telegraph poles which results in a low rate of disposal. The figures below represent a fuel trial carried out on mixed waste wood from construction sites. The samples were taken from a batch of material processed by a biomass plant

Table 1: Comparison of CCA levels in treated wood and recycled wood

Preservative chemical species	**Levels of individual chemicals (total) in inputs and outputs**					
	CCA raw product	**CCA treated wood**	**CCA treated wood ash (for analysis)**	**mixed waste wood**	**bottom ash**	**fly ash**
Arsenic	34%	290 to 2,050 mg/kg	8,980 to 45,000 mg/kg	<3 mg/kg	69 mg/kg	460 mg/kg
Copper	18.5%	1,040 to 1,070 mg/kg	2,720 to 31,500 mg/kg	<6 mg/kg	1,000 mg/kg	550 mg/kg
Chrome	47.5%	1,740 to 2,360 mg/kg	1,780 to 22,500 mg/kg	<4.5 mg/kg	17 mg/kg	97 mg/kg

2.5.5 Table 2: below shows the relationship between the levels of contaminants in waste wood and the quantities removed in the bottom ash and fly ash.

Table 2 - Other significant results

Preservative chemical species	**Levels of individual chemicals (total) in inputs and outputs**		
	waste wood fuel	**bottom ash**	**fly ash**
Boron (from borate preservatives)	<3.5 mg/kg	18 mg/kg	62 mg/kg
Lead (from lead paint)	<10 mg/kg	52 mg/kg	6,900 mg/kg
mineral oil (will include natural hydrocarbons)	<3,100 mg/kg	140 mg/kg	2,200 mg/kg
polycyclic aromatic hydrocarbons	38 mg/kg	780 mg/kg	860 g/kg

2.6 Emissions monitoring.

2.6.1 The plant designers, Hudol Ltd, have a similar plant operating at Capital Valley Industrial Estate, Rhymney. The plant processes different waste types but has been designed to meet strict emission standards i.e. lower than the limits permitted under the Waste Incineration Directive requirements. Appendix A shows the monitoring required for the plant to comply with its permit.

3.0 SOURCE OF FUEL

3.1 The feedstock for the Biomass plant will be manufactured off site by designated recyclers using non-hazardous waste wood from household, commercial and industrial sources with the most significant input arising from the construction and demolition industry.

3.2 Customers are required by law to accurately describe their waste prior to transferring it to Sunrise Renewables and to complete a transfer note detailing the transaction. The legislation is known as the 'Duty of Care' and is set out in Section 34 of the Environmental Protection Act 1990 and the Environmental Protection (Duty of Care) Regulations 1991.

3.3 To accept mixed and low grade feedstock the plant will be WID compliant and be operated under the terms of an Environmental Permit, issued and regulated by the Environment Agency. The plant must meet the BAT (Best Available Technology) requirements of the permitting regime and the Agency has considerable control over the process and the implementation of BAT standards and is the most appropriate authority to control the quality of wood fuel inputs

3.4 Fuel suppliers will have a written fuel supply agreement which permits inspection of their production premises by a representative of Sunrise Renewables at any reasonable time during normal working hours, without prior notice. All fuel deliveries must be pre-booked to ensure that the load can be logged and samples taken for verification if necessary.

3.5 Fuel suppliers will be given a copy of this document and be advised that non compliance with the permitted fuel types will result in a financial penalty and that they will be liable for any loss or damages incurred as a result of the non compliance. It is the responsibility of the fuel supplier to demonstrate that fuel is not hazardous or contains levels of heavy metals which may affect the performance of the plant.

3.6 CCA or creosote treated timber or any timber classified as hazardous within the definition of the Hazardous Waste (England & Wales) Regulations 2005 must not be processed and supplied as a feedstock

3.7 The Environmental Permit will require strict monitoring of emissions. The fuel supply agreement will to have terms such that, in the event that the supplier breaches its fuel supply obligations, damages would be payable to compensate the facility for any loss of revenues (i.e. electricity and heat supply and any loss of revenues which may be payable for receiving fuel) in the event of a breakdown or shutdown through failure of emissions monitoring.

3.8 Defra have produced a document entitled t **"Waste Wood as a Biomass Fuel"** April 2008 (Crown copyright), which includes the following statements on waste wood.

i. Energy Recovery and Recycling are the main alternatives to sending waste wood to landfill;

ii. Recycling outlets currently require higher grades of waste wood than energy recovery;

iii. Recycling outlets are well developed and there is limited scope for a significant increase in recycling due to dependence on output from other industries and the contaminated nature of most waste wood;

iv. Currently energy recovery is the most likely method of diverting additional waste wood from landfill;

v. Incentives for producers to segregate waste wood are limited, but these are increasing with future landfill tax increases and requirements to pre-treat waste prior to landfill;

vi. Aggregation and waste wood supply chains are in their infancy. There are low barriers to entry so supply chains are likely to develop where demand for waste wood exists;

vii. Development of WID compliant biomass facilities for waste wood is complex and the sponsors of such plants are not obvious;

viii. Waste wood can help to diversify fuel sources away from over reliance on clean wood to create greater business model flexibility;

ix. Commercial arrangements are required with a number of parties (including fuel supply, heat offtake, electricity offtake);

x. Compliance with legislation is onerous (e.g. land use planning, WID compliance, Integrated Pollution Prevention and Control permits); and

xi. Waste wood fired biomass plants need to be carefully structured to ensure that support can be claimed (e.g. in the form of ROCs and ECAs for Good Quality CHP).

APPENDIX A - HUDOL PERMIT MONITORING REQUIREMENTS

Schedule 4 – Emissions and monitoring

Table S4.1 Point source emissions to air except during abnormal operation– emission limits and monitoring requirements

Emission point [shown as A1 on site plan HUPPC.D07 in the application]	Parameter	Source	Limit (including unit) (5)	Reference period	Monitoring frequency	Monitoring standard or method
A1	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	Emissions from burners and/or gas engines	90 mg/m³	Daily mean	Continuous	ISO 10849
A1	Oxides of Nitrogen (NO and NO_2 expressed as NO_2)	Emissions from burners and/or gas engines	100 mg/m³	Half hourly mean	Continuous	ISO 10849
A1	Carbon monoxide	Emissions from burners and/or gas engines	10mg/m³	Daily mean	Continuous (1)	ISO 12039
A1	Carbon monoxide	Emissions from burners and/or gas engines	15mg/m³	Half hourly mean	Continuous (1)	ISO 12039
A1	Gaseous and vaporous organic substances, expressed as total organic carbon	Emissions from burners and/or gas engines	7mg/m³	Daily mean	Continuous (3)	BS EN 12619
A1	Gaseous and vaporous organic substances, expressed as total organic carbon	Emissions from burners and/or gas engines	10mg/m³	Half hourly mean	Continuous (3)	BS EN 12619
A1	Sulphur dioxide	Emissions from burners and/or gas engines	20mg/m³	Daily mean	Continuous (2)	BS 6069-4.4
A1	Sulphur dioxide	Emissions from burners and/or gas engines	30mg/m³	Half hourly mean	Continuous (2)	BS 6069-4.4
A1	Total dust	Emissions from burners and/or gas engines	7mg/m³	Daily mean	Continuous (3)	BS ISO 10155
A1	Total dust	Emissions from burners and/or gas engines	10mg/m³	Half hourly mean	Continuous (3)	BS ISO 10155

Table S4.1 Point source emissions to air except during abnormal operation– emission limits and monitoring requirements						
Emission point [shown as A1 on site plan HUPPC.D07 in the application]	**Parameter**	**Source**	**Limit (including unit) (5)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1	Hydrogen chloride	Emissions from burners and/or gas engines	1mg/m^3	Daily mean	Continuous (4)	MCERTS Performance Standards for CEMs
A1	Hydrogen chloride	Emissions from burners and/or gas engines	16mg/m^3	Half hourly mean	Continuous (4)	MCERTS Performance Standards for CEMs
A1	Hydrogen fluoride	Emissions from burners and/or gas engines	1mg/m^3	Daily mean	Continuous (4)	MCERTS Performance Standards for CEMs
A1	Hydrogen fluoride	Emissions from burners and/or gas engines	4mg/m^3	Half hourly mean	Continuous (4)	MCERTS Performance Standards for CEMs
A1	Cadmium and thallium and their compounds expressed as the elements	Emissions from burners and/or gas engines	0.05mg/m^3	Average over a period of between 30 minutes and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 14385
A1	Mercury and its compounds expressed as the element	Emissions from burners and/or gas engines	0.05mg/m^3	Average over a period of between 30 minutes and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 13211

Table S4.1 Point source emissions to air except during abnormal operation– emission limits and monitoring requirements						
Emission point [shown as A1 on site plan HUPPC.D07 in the application]	**Parameter**	**Source**	**Limit (including unit) (5)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1	Antimony, arsenic, lead, chromium, cobalt, copper, manganese, nickel and vanadium and their compounds expressed as their elements	Emissions from burners and/or gas engines	0.5mg/m^3	Average over a period of between 30 minutes and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 14385
A1	Dioxins and furans (I-TEQ)	Emissions from burners and/or gas engines	0.1ng/m^3	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948
A1	Specific Polycyclic aromatic hydrocarbons	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	ISO 11338,
A1	Dioxins / furans (WHO-TEQ Humans / Mammals)	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948
A1	Dioxins / furans (WHO-TEQ Fish)	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948

Table S4.1 Point source emissions to air except during abnormal operation– emission limits and monitoring requirements						
Emission point [shown as A1 on site plan HUPPC.D07 in the application]	**Parameter**	**Source**	**Limit (including unit) (5)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
A1	Dioxins / furans (WHO-TEQ Birds)	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948
A1	Dioxins like PCBs (WHO-TEQ Humans / Mammals)	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948
A1	Dioxins like PCBs (WHO-TEQ Fish)	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948
A1	Dioxins like PCBs (WHO-TEQ Birds)	Emissions from burners and/or gas engines	No limit set	Average over a period of between 6 hours and 8 hours	Quarterly first 12 months of operation and then bi-annually	BS EN 1948

Note 1: The Continuous Emission Monitors used shall be such that the values of the 95% confidence intervals of a single measured result at the daily emission limit value shall not exceed 10%. Valid half-hourly average values shall be determined within the effective operating time (excluding the start-up and shut-down periods) from the measured values after having subtracted this value of the confidence interval (10%). Where it is necessary to calibrate or maintain the monitor and this means that data is not available for a complete half-hour period, the half-hourly average shall nonetheless be considered valid if measurements are available for a minimum of 20 minutes during the half-hour period. (The number of half-hourly averages so validated shall not exceed 5 per day). Daily average values shall be determined as the average of all the valid half-hourly average values within a calendar day. The daily average value will be considered valid if no more than five half-hourly average values in any day have been determined not to be valid. No more than ten daily average values per year shall be determined not to be valid.

Note 2: As Note 1, except that the value of the confidence interval is 20% in place of 10%.

Note 3: As Note 2, except that the value of the confidence interval is 30% in place of 10%.

Note 4 As Note 3, except that the value of the confidence interval is 40% in place of 10%.

Note 5: The limits do not apply during start-up and shut-down

Table S4.1(a) Point source emissions to air during abnormal operation of incineration plant – emission limits and monitoring requirements						
Emission point ref. & location	**Parameter**	**Source**	**Limit (including unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
-						

Table S4.2 Point Source emissions to water (other than sewer) – emission limits and monitoring requirements						
Emission point ref. & location	**Parameter**	**Source**	**Limit (incl. unit)**	**Reference Period**	**Monitoring frequency**	**Monitoring standard or method**
W1 (emission to River Rhymney)	No parameter set	Surface water run off from building roof	No limit set	-	-	-

Table S4.3 Point source emissions to sewer, effluent treatment plant or other transfers off-site– emission limits and monitoring requirements						
Emission point ref. & location	**Parameter**	**Source**	**Limit (incl. Unit)**	**Reference period**	**Monitoring frequency**	**Monitoring standard or method**
-						

Table S4.4 Process monitoring requirements				
Emission point reference or source or description of point of measurement	**Parameter**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
A1	Exhaust gas Oxygen concentration	Continuous	MCERTS performance standards for CEMS	
A1	Exhaust gas pressure	Continuous	MCERTS performance standards for CEMS	
A1	Exhaust gas temperature	Continuous	MCERTS performance standards for CEMS	
A1	Exhaust gas water vapour content	Continuous	MCERTS performance standards for CEMS	
Burner combustion chambers (close to inner wall)	Temperature	Continuous	MCERTS performance standards for CEMS	

Table S4.5 Residue quality					
Emission point reference or source or description of point of measurement	**Parameter**	**Limit**	**Monitoring frequency**	**Monitoring standard or method**	**Other specifications**
Gasification residue	TOC	3%	Monthly	Agency ash sampling protocol	
Gasification residue	Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds, dioxins/furans and dioxin-like PCBs.	No limit set	Quarterly	Sampling and analysis as per Agency ash sampling protocol.	

Gasification residue	Total soluble fraction and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) soluble fractions	No limit set	Before use of a new disposal or recycling route	Sampling and analysis as per Agency ash sampling protocol.
Syn gas filtration residue	Metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) and their compounds, dioxins/furans and dioxin-like PCBs.	No limit set	Quarterly	Sampling and analysis as per Agency ash sampling protocol.
Syn gas filtration residue	Total soluble fraction and metals (Antimony, Cadmium, Thallium, Mercury, Lead, Chromium, Copper, Manganese, Nickel, Arsenic, Cobalt, Vanadium, Zinc) soluble fractions	No limit set	Before use of a new disposal or recycling route	Sampling and analysis as per Agency ash sampling protocol.
Aqueous residue from syn gas water scrubbing	Substances listed in annex IV of the Waste Incineration Directive	No limit set	Before use of a new disposal or recycling route	Methods from section 4.5.4 of Guidance on Directive 2000/76/EC on the incineration of waste edition 3

1.0 INTRODUCTION

1.1 Nature of business and background

1.1.1 Sunrise Renewables Limited ("Sunrise") has applied to the Vale of Glamorgan Council for planning consent to install a 9MW Biomass Plant, which will generate electricity from reclaimed wood for export to the national grid.

1.1.2 Eight new local employees will be based at the plant at Woodham Road, Barry Docks, within an established industrial area. The plant has adequate parking on site for vehicles and cycles, thereby avoiding the potential for obstructive parking on the highway.

1.1.3 The site will operate on a 24 hours basis to produce electricity but it will only receive deliveries of fuel and visits from third parties and the public during the following hours:

Monday to Friday	07:00 - 22:00
Saturday	07:00 - 20:00
Sunday / Bank / Public Holidays	07:00 - 16:00

1.1.4 The installation of the new plant will have the following environmental benefits (extract from the Planning Statement):

i. Reduction in disposal of wood to landfill.
ii. Additional outlet for recycled wood as a buffer against the fluctuating board mill and animal bedding market sectors for recycled wood chip.
iii. Contributes to national and regional targets for renewable energy provision as well as providing additional energy capacity.
iv. Contributes to reduction in carbon dioxide emissions.
v. Supply of energy to the grid equivalent to the annual usage of approximately 22,000 households (average household consumption in the UK is 3,300kWh).
vi. Reduction in vehicle movements to local landfill sites.
vii. Will utilise the latest technology available for biomass energy schemes providing a source of both heat (can be used up to 1km from the site) and electricity locally (via the National Grid).

1.2 Aims and aspirations of the Travel Plan

1.2.1 The proposed Plan is designed to reflect the company's awareness of its need to promote sustainable travel, and its' responsibility in reducing the impact on the local and wider environment. It is therefore necessary for Sunrise to consider all work-related journeys, and provide a comprehensive plan for alternative travel means. As a renewable energy organisation, it is of key strategic importance to maintain sustainable activities where possible, and to minimise the environmental impact created by any part of daily working operations. The targets within this plan are for the period 2009 to 2013.

1.3 Roles and Responsibilities

1.3.1 The Travel Plan for the employees of Sunrise has thorough backing and approval from all senior management. Mr David Heath will be the dedicated Travel Plan co-ordinator, and will be the first point of contact for employees wishing to raise issues relating to travel arrangements. It will be the duty of the co-ordinator and other management figures to ensure commitment, whilst themselves undertaking where possible alternative travel. As the employee group will be less than ten in size, communication, monitoring and promotion of ideas can be easily managed.

2.0 OBJECTIVES AND MEASURES

2.1 The overall target of this Green Travel Plan is to promote, encourage and facilitate alternative travel where possible. Sunrise will refer to various policies and legislation during implementation of the Plan, including local policies.

Fig 1.0 Green Travel Plan (TP) guidance timetable

Implementation	Timing
Installation of bicycle rack/parking	**Before start of operations**
Set-up of Message board & hard-copy travel info	**Before start of operations**
Provision of travel information to individuals	**At new employee induction.**
Senior staff & TP Co-ordinator to meet & discuss plans	
TP Co-ordinator to present and introduce TP aims with employees	
Advise of web based page travel Info and permit access on work PCs	
Review and discussion of travel plan/ progress at staff and senior staff meetings	**At monthly staff meetings**
Initial formal review of TP progress, including levels of uptake and implementation of new ideas/solutions to problems encountered	**6 months after commencement of TP & every 6 months after**
Updating of travel information, new ideas and national travel events	**Ongoing and at team meetings**
Submission of new ideas/ employee to TP co-ordinator contact	
Informal TP review progress reporting/ problem solving	
Full Travel Plan review and audit, to maximize all alternative modes and subsequent uptake levels	**Every 2 Years**

3.0 PUBLIC TRANSPORT - RAIL AND BUS

3.1 Current facilities

3.1.1 Sunrise recognises the importance of utilizing public transport (where available) and has assessed the proximity of both rail and bus services to the proposed site. The primary source of information used was Vale of Glamorgan's Public Transport Guide for Winter 2008.

Rail: The nearest railway stations are Barry Island and Barry Dock..

Bus: The site is well served by bus routes with the nearest stop being the Civic Offices which is approximately 520 metres (570 yards) from the site i.e. 5 - 8 minute walk.

A map showing local bus and rail routes is attached as Appendix I, as well as other useful contact details. The Vale of Glamorgan's Public Transport Guide is Free and will be available to all staff on site.

3.2 Targets and Initiatives

3.2.1 The target aim of this part of the plan is to maximize public transport usage where reasonably possible. At this stage it would be unrealistic to list a specific target figure, especially where personal information such as employees' proximity to services is unknown. However, the following initiatives will be established once the employees begin:

i. During induction of the employees, a travel pack will be issued containing maps for local bus/ rail routes and links to timetables.

ii. A recognized and visible area of the workplace (such as the main entrance area) will be used to host travel information including timetables, route plans, the Travel Plan co-ordinators' contact details and an informative message board detailing updates, new schemes and levels of progress.

iii. Company intranet/ website could dedicate a page to include local travel information (listing direct bus service numbers/basic route guide) with additional updated links to include other local bus and rail service information. The site can be updated as necessary with any new schemes or changes to travel information.

3.3 Funding

3.3.1 This is a low-cost option to Sunrise, where most work will simply be the maintained and clear provision of bus and rail information. Timetables, routes and additional guides can be obtained in many cases for free, from the Vale of Glamorgan website. After the initial 6-month review, schemes such as subsidizing public transport costs will be considered, depending on current levels of uptake and feasibility.

3.4 Marketing

3.4.1 The Sunrise Travel Plan will be strongly marketed at employee induction, and co-ordinator presentation meeting. Hereafter, all public transport information will be kept visible and updated on the designated 'Travel Plan message board' and possibly intranet, with the focus of discussion and idea exchange to be held during team meetings. Regular reporting of progress and active problem solving will work as a marketing tool in itself, helping to maintain awareness of the Travel Plan and encourage uptake.

4.0 CYCLING

4.1 Current facilities

4.1.1 This is probably the most cost-effective and appropriate form of low-impact travel available to the future employees of Sunrise, and alongside the obvious environmental benefit, the employees' health is also improved.

4.1.2 Overall, general cycle access is good and the proximity of rail services increases the ability for incorporated rail and cycle travel (useful for employees located further away). On site, there is space for bicycle storage and the following initiatives will help to promote travel by bicycle.

4.2 Targets and Initiatives

4.2.1 This mode of transport is likely to see increased success with good weather conditions. Therefore it is vital that positive promotion takes place immediately, in order to encourage employees out as they join the company in the Spring. Again, it would be more appropriate to aim for a non-fiscal target, and instead try to get employees cycling where reasonably possible, ensuring on-site safety. The success of this mode will be helped with:

i. The construction of a secure covered bicycle-holding area. This is an economical way of assisting people who want to try cycling, and should be installed at the start of the Travel Plan

ii. Offer bicycle training to those who wish to learn

iii. At team meeting discuss the idea of government subsidized schemes (such as the Travel Wise scheme) for buying cycles and equipment

iv. At first review (6 months) review the initiative of installing shower and changing rooms if uptake is strong

v. Offer free high-visibility jacket to those wishing to cycle

vii. Provide cycle route maps at designated message board area, with induction packs and by links on company website

viii. Promote and participate where possible in national cycling events (such as bike week)

4.3 Funding

4.3.1 This promotion requires a variable budget which could change after initial response from employees. There is the cost of installing a bike 'shed', and sign costs for advising speed restrictions (which will be necessary as goods vehicles use the site). This is likely to be a popular way for employees to travel, and so any investment in schemes such as subsidizing cycles and equipment (with government support) should be strongly considered.

4.4 Marketing

4.4.1 As with public transport, there should be positive promotions carried out from induction, with clear provision of media online, on site and in discussion at team meetings. New schemes and grants will be displayed on the message board and website, with updates as necessary. The possibility of the bike-loan scheme if taken up, would give employees a sense of ownership and potentially maintain a strong routine of work-related cycling.

5.0 WALKING

5.1 Current Facilities

5.1.1 It is assumed that unless employees are located within 30 minutes' walking time of the site, this mode will more likely be incorporated with another, such as bus or rail.

5.1.2 As stated above the site is well served by bus routes with the nearest stop being the Civic Offices which is approximately 520 metres (570 yards) from the site i.e. 5 - 8 minute walk, making a combined bus/walking route the most likely option for employee travel. Lighting on site will be satisfactory and on the surrounding roads is good, with lighting along Cory Way and David Davies Road. The only area of concern is the lack of a pavement on David Davies Road. Employees can be given reflective items/clothing to ensure that they are visible on this short stretch.

5.2 Targets and Initiatives

5.2.1 As with cycling, this is a weather-influenced travel mode. So again it would be the target to maximize promotion as soon as employees begin, and encourage journeys by foot in good weather conditions. The target is to get employees to incorporate walking into their daily travel plan where possible. There are a number of provisions which will be made to help this promotion:

i. Free pedometers can be given within travel pack at induction- with possible in-house challenge event to follow

ii. Provide walking maps at designated message board area, with induction packs and by possible links on company website

iii. Promote and participate where possible in national walking events (as listed on letstravelwise website and local media) and encourage lunchtime walks

5.3 Funding

5.3.1 As walking is a no-cost form of alternative travel, walking maps and pedometers will be provided for free. Participation in any national events would also be budget-effective, and so this transport mode is very important to the Travel Plan.

5.4 Marketing

5.4.1 Walking is something which the employees could easily try, even if getting to and from work involves a car, journeys such as walking to the local sandwich bar or supermarket could be made by foot. By offering pedometers, the employees are made aware of their daily number of steps, and would be encouraged to increase their totals. This would be especially effective if plans were made to hold a 'step-challenge' event, where an incentive prize could be offered to the employee with the most steps that day or week. This will be suggested and discussed at the first team meeting. As with the other modes, promotion will begin at induction and continue with visible and updated resources online, and within the message board area.

6.0 CAR PARKING/ SHARING & REDUCING EMISSIONS

6.1 Parking

6.1.1 At present there are sufficient car parking spaces proposed for employees, and at this stage in the Plan it would not be appropriate to remove or reduce any. This would give a negative signal to non-avoidable car users and Sunrise understands the importance of freedom of choice in traveling. Employees who independently opt to use alternative travel are a lot more likely to continue doing so, rather than those who are forced.

6.1.2 There is no additional outlay needed at the site as parking is a budgeted cost and any plans for sharing rides will be best arranged by word of mouth between employees where possible. At least two car parking spaces are given priority for disabled persons or other visitors.

6.2 Car Sharing

6.2.1 Those who have to use a car will be asked to considering car sharing (although this is limited due to the shift-work nature of the new business where only two workers will be operating at any one time). As all new employees will be provided with a travel pack, they will be able to assess how to include alternative travel into their own daily routine, and the promotion of 'car-free' days or weeks will help with this.

6.3 Reducing Emissions

6.3.1 At present, there are no requirements to undertake business trips, however it is noted that any off-site visits will be planned with alternative transport in mind. Similarly, there are no company vehicles (except site duty vehicles) but should the need arise, then low-impact makes and models will be considered, such as electric-powered, and potential drivers will be informed of green driving techniques at registration. As the new employees will be working shifts, this will reduce the contribution to local congestion as traveling during peak time can be avoided.

6.3.2 Visitors to the site will be provided with information enabling them to choose alternative travel. A map detailing surrounding major roads, rail and bus stops/services could be provided, with brief information on reaching the site from the local area. Links to more detailed travel information, traffic reporting and planning longer journeys can also be provided and updated as needed.

7.0 DETAILED MARKETING

7.1 Introduction

7.1.1 Positive promotion is vital to success of this Travel Plan, and there are various ways of communicating ideas. For this size of group, speaking could prove to be the most powerful means of publicity, but written information will not be overlooked. In addition to the marketing notes given for each method, the sections below offer more details:

7.2 Induction meeting and provision of Green Travel Pack

7.2.1 The most important marketing opportunity is at induction of new employees. A section will be dedicated to providing the Green Travel Pack (see below) and briefly explaining the contents, and importance of alternative travel within the company strategy and daily operations. This will be carried out during a one-to-one induction or within a team induction meeting.

7.2.2 Induction Travel Pack contents:

- i Local public transport route map, showing road and rail services
- ii Local cycling route map
- iii Local walking route map
- iv Pedometer to use for counting steps
- v Welcome letter, outlining the main aims of the Plan and encouraging employees to use alternative transport where possible
- vi Name and contact details for TP Co-ordinator
- vii Single sheet providing links to local travel information for timetables, traffic information and a visitor area guide.

7.3 Positive Message

7.3.1 The assigned TP co-ordinator recognizes the importance of the Plan, and of creating a good first impression towards green travel. It is vital that the induction and team presentation meeting is given with enthusiasm, and that routes for contact and enquiry are kept open and inviting.

7.3.2 From the start, an area of the main entrance/ office will be designated as the point of reference for all travel information. With the following contents:

- i Reference copies of all route maps given at induction
- ii Local (direct) bus timetable
- iii Local rail timetable
- iv Copy of single info sheet with travel links & Visitor area guide
- v TP co-ordinator contact details
- vi Guidance statement, with encouraging message, reminding employees to enquire if they have any questions, queries or ideas regarding travel.

vii Promotion posters for related national events (when arising)
viii Reporting of any new schemes, ideas and progress as necessary

7.3.4 At the first team meeting employees will have had time to review the contents of their Travel Pack and will probably have questions or comments. By listening to these, Sunrise will accommodate any suitable changes or new ideas that arise, and incorporate them into the Travel Plan. This will also be a good opportunity to discuss employees' own abilities for taking alternative transport, and for the TP co-ordinator to emphasize that even a small contribution can be highly beneficial to both personal health and the environment.

Program plan for meeting:

i Confirm receipt of employees' Travel Packs
ii Ask for initial comments or questions
iii Generate discussion on employees' current travel arrangements and distance from work
iv Advise of management/key players' plans to set a good example, how they will contribute in taking on green travel
v Try to encourage employees' initial commitment by briefly discussing the possibility of future incentives, such as bike loans (the Ride2Work scheme) if uptake is good
vi Set a possible date for events such as the pedometer 'step-challenge'
vii Remind employees to keep an eye on the message board for upcoming events and new schemes
viii Ask again for questions and inform employees that progress will be informally reviewed at the next team meeting (in a month or so)

7.4 Other Marketing Tactics

7.4.1 The Sunrise Green Travel Plan is designed to be flexible and adaptable in order to meet its' aims, and so as new opportunities arise, Sunrise will endeavor to incorporate them into the Plan. Reporting good progress is a key marketing strategy, as is investigating new incentive schemes. The installation of a bike shed will the first financial investment towards the Plan, and will show Sunrises' commitment to the Plan. The possible inclusion of travel information on the company website/ intranet should also be considered if workers are permitted internet access.

7.4.2 Promoting national events, such as bike week, will bring greater awareness and meaning to the Plan, as it will involve communication outside of the company. This way, employees will be encouraged to adopt green travel into their personal routine and help the overall promotion of ideas.

8.0 MONITORING AND REVIEW

8.1.1 It is vital that all positive developments are reported back, as the most effective promotion is by word of mouth. Regular review during team meetings will help to monitor the Plans' success and tackle any problems which occur, enabling ongoing development and evolution. Most monitoring will take place informally, within the office, as employees react and respond to their new travel means. By encouraging new ideas and recognizing effort, a positive link between the Plan, Co-ordinator and employees will form.

8.1.2 At the 6-month formal review meetings, it will be the duty of the TP Co-ordinator to report progress to senior management and amend the Travel Plan where necessary. No figures will be recorded, but instead a general discussion about the level of uptake will take place. Key issues preventing people from taking alternative transport will also be raised at this point, and possible solutions generated.

8.1.3 It is important to recognize the alternative modes which do become successful, and to further facilitate and encourage their use. This will include discussing the installation of a shower/ changing room if employees agree it would be of use, as well as any other incentives which would help uptake. Up until, and in between management meetings, general staff meetings will be the location for informal review and monitoring. A short reminder for employees to consider green travel, and inviting comments from them will ensure the Travel Plan is kept open consistently. Brief progress reports will be included on the website and message boards.

8.1.4 Every two years a full travel survey and audit will be carried out. The aim of this is to undertake a major review of the Travel Plan, to ensure the key aims and objectives are being met, as well as surveying employees' travel habits and levels of uptake to alternative transport. Any changes to the company structure (such as increase in employee numbers) should be incorporated into the revised plan, with results of the employee survey and reflective comments. The survey would best be carried out by e-mail, with only a few questions to obtain data: on regularity of alternative travel types, reasons for undertaking and reasons for avoidance. The actual survey questions will be drawn up closer to the time, to best reflect the current employee situation. Before the two-year audit, there will be no figurative results to analyse, and so the most appropriate way to ensure continued effectiveness will be through discussion and debate with employees. At this stage, it is the priority for the Sunrise Green Travel Plan to remain adaptive and responsive.

APPENDIX I

Contents

Public Transport Services in the Vale of Glamorgan

Area covered by The Vale of Glamorgan Public Transport Guide

146 X91 V5 — Bus Route Network with Service Numbers

Railway line & Station

Main line Station

0 — 5km

November 2008.

Tachwedd 2008

Public Transport Services in Barry
Bus Route Network with Service Numbers
Railway line & Station
Barry
To Bonvilston & The Amelia Trust
To Wenvoe
To Dinas Powys
To Sully
Cardiff International Airport & Rhoose
Weycock Cross
Highlight Park
Colcot
Pencoedtre
Gibbonsdown
Palmerston
Cadoxton
Barry Dock
Barry
Bendricks
The Waterfront
Barry Island
Garden Suburb
The Knap
Porthkerry Country Park
Romilly Park
Barry Station
Barry Dock Station
Vale Enterprise Centre
Ty Verlon Industrial Est.
Whitmore Bay
Watch Tower Bay
Jackson's Bay
November 2008

USEFUL CONTACTS

TRAVELINE CYMRU

All Timetable Enquiries 0871 2002233

Traveline Cymru provides public transport timetable information for all services throughout Wales.

Text for Bus Times 84268

Text the individual bus stop code to the number above to receive up to the next four buses due at that particular stop. Codes can also be found by visiting the Traveline website www.traveline-cymru.info

VALE OF GLAMORGAN COUNCIL

Contact One Vale 01446 700111
to access all Council services

AIR TRAVEL

Cardiff International Airport

Customer Relations	01446 711111

BUS & COACH TRAVEL

Bus Users UK (Wales)	
All enquiries	029 20221370
Cardiff Bus	
Customer Relations	029 20666444
Caring Coaches	
All enquiries	01446 736295
EST Bus Ltd	
Customer Relations	01446 773333
Easyway	
All enquiries	01656 655655
First Cymru Buses Ltd	
Customer Relations	01792 572255
Veolia Transport Cymru	
Customer Relations	01443 215105
Timetable Enquiries	01443 407000
Megabus.com	0900 1600900
National Express	
Reservations	08705 808080
Disabled Assistance	0121 4238479
Text Phone	0121 4550086

RAIL TRAVEL

Arriva Trains Wales	
Timetable Enquiries	0845 7484950
Customer Relations	0845 6061660
Disabled Assistance	0845 3003005
Lost Property	0845 6061660
Cycling	0870 9000772
Welsh	0845 6040500
Transport Police	0800 40 50 40
Text Phone	0845 6050600
Passenger Focus (Rail)	08453 022022

COMMUNITY TRANSPORT

Dinas Powys Voluntary Concern	029 20513700
East Vale Community Transport	029 20705138
Voluntary Emergency Services Transport	029 20490325

RHIFAU FFÔN DEFNYDDIOL

TRAVELINE CYMRU

Pob Ymholiad am Amserlenni 0871 2002233

Gall Traveline Cymru ateb eich holl gwestiynau am amserlenni trafnidiaeth gyhoeddus yng Nghymru.

Txt am Amseroedd Bysys 84268

Anfonwch neges testun a chôd eich safle bws i'r rhif uchod a chewch wybod amserau'r pedwar bws nesaf. Mae codau i'w gweld ar wefan traveline sef website www.traveline-cymru.info

CYNGOR BRO MORGANNWG

Canolfan Alwadau Un Fro 01446 700111
i gysylltu â holl wasanaethau'r cyngor.

HEDFAN

Maes Awyr Rhyngwladol Caerdydd

Llinell Cwsmeriaid	01446 711111

TEITHIO [illegible] NEU GOETS

Bus Users UK (Cymru)	
Pob ymholiad	029 20221370
Bws Caerdydd	
Llinell Cwsmeriaid	029 20666444
Caring Coaches	
Pob ymholiad	01446 736295
EST Bus Cyf.	
Llinell Cwsmeriaid	01446 773333
Easyway	
Pob ymholiad	01656 655655
Bysiau First Cymru Cyf.	
Llinell Cwsmeriaid	01792 572255
Veolia Transport Cymru	
Llinell Cwsmeriaid	01443 215105
Ymholiadau am Amserlenni	01443 407000
Megabus.com	0900 1600900
National Express	
Cadw seddi ymlaen llaw:	08705 808080
Cymorth i bobl anabl	0121 4238479
Ffôn Testun	0121 4550086

TEITHIO AR DRÊN

Trenau Arriva Cymru	
Ymholiadau am Amserlenni	0845 7484950
Llinell Cwsmeriaid	0845 6061660
Cymorth i Bobl Anabl	0845 3003005
Eiddo Colledig	0845 6061660
Seiclo	0870 9000772
Llinell Gymraeg	0845 6040500
Heddlu Trafnidiaeth	0800 40 50 40
Ffôn Testun	0845 6050600
Passeger Focus (Rheilffordd)	08453 022022

TRAFNIDIAETH GYMUNEDOL

Gwasanaeth Gwirfoddol Dinas Powys	029 20513700
Trafnidiaeth Gymunedol Dwyrain y Fro	029 20705138
Trafnidiaeth Wirfoddol ar gyfer y Gwasanaethau Brys	029 20490325

Service Guide

Arweiniad i Gwasanaeth

Location / Lleoliad	Local Bus Service Number / Rhif y Gwasanaeth Bysiau Lleol
A	
Aberthaw (East)	95, 801, M1, X5, X45, X91
Aberthin	E11, V5
Amelia Trust Farm	322, V5
B	
Barry	88, 93, 94, 95, 96, 97, 97A, 98, 100, 322, 801, B1, B2, B2A, B3, M1, V5, X5, X45, X91 & Rail
Barry Island	95, 100 & Rail
Barry Town Centre	88, 93, 94, 95, 96, 97, 97A, 98, 100, 322, 801, B1, B2, B2A, B3, M1, V5, X5, X45
Bendrick	88, 94
Boverton	95, 801, M1, V2, X5, X45, X91
Bridgend (Vale services only)	145, 146, V3, V4, X2
Broughton	145, 801
C	
Cardiff Bay (Vale services only)	89, X5, (Additional Cardiff Bus service "BayCar" runs frequently from Penarth Road at the rear entrance of Cardiff Central Rail Station. Telephone Traveline 0871 200 22 33 for timetable information)
Cardiff Bay Retail Park - Asda & Ikea (Vale services only)	87, 89, X5, (Additional Cardiff Bus Services 9 & 9A run to this area every 15minutes from Cardiff. Telephone Traveline 0871 200 22 33 for timetable information)
Cardiff Bay Sports Village & Morrisons (Vale services only)	87, 89
Cardiff City Centre (Vale services only)	89, 92, 93, 94, 95, 96, 320, 321, 322, X2, X5, X45, X91
Cardiff International Airport	95, X5, X45, X91 and Airport Shuttle Bus (rail Linc trên 905)
City	V3 (Divert-a-bus, on request only)
Clawdd Coch	320, V5
Cogan	87, 88, 89, 92, 93, 94 & Rail
Colwinston	V4
Corntown	V4
Cosmeston	88, 94
Cowbridge	801, E11, V1, V2, V3, V4, V5, V6, X2
Culverhouse Cross	M&S/Tesco Xtra: 86, 322 A48: 903, X2 Rhur Cross: 86, 96 B&Q: 96, 322, X2
Craig Penllyn	V3
D	
DARA (St Athan)	95, 801, M1, V2, X5, X45, X91
Dinas Powis	86, 87, 93, 95, X5, X45 & Rail
Dropa Terrace	321, 322
Dyffryn Gardens	X2 from St Nicholas A48 bus stop
E	
Eastbrook	87, 93, 95, X5, X45 & Rail
Eglwys Brewis	95, 801, M1, X5, X45, X91
Ewenny	145, 146, V4
F	
Fferm Goch	V3
Flemingston	V2 (Divert-a-bus)
Fonmon	V5, (M1, X45 from Fonmon Cross)
Fontygary Holiday Park	95, M1, V5, X5, X45, X91, from bus stop on Fontygary Road outside main entrance

Community and Disabled Transport Information

- ## V.E.S.T.

  Voluntary Emergency Service Transport
  Unit45, Portmanmoor Industrial Estate, Cardiff, CF24 5HB

  Tel: 029 2049 0325

Provides transport provision for the elderly and people with disabilities who are unable to use local bus or train services. Service provision for the Vale of Glamorgan includes:

- A Dial-a-Bus service for 2½ days a week from anywhere in the Vale to Cardiff City Centre.
- A Saturday service from anywhere in the Vale to Barry town centre and Morrison's Store.

- ## E.V.C.T.

  East Vale Community Transport
  West House, Stanwell Road, Penarth, CF64 2YG

  Tel: 029 2070 5138

Provides community transport provision for east Vale groups and organisations.

- ## D.P.V.C.

  Dinas Powys Voluntary Concern
  Community Resource Centre
  Murchfield Hall, Sunnycroft Lane, Dinas Powys, CF64 4QQ

  Tel: 029 2051 3700

D.P.V.C. provides a support service to individuals, groups and organisations, in particular the elderly and people with disabilities who seek to improve the quality of life. Part of this service is the provision of community transport.

Can you help?
Community Transport often relies on non-paid voluntary drivers, sometimes utilising their own cars. If you feel that you can help and would like to offer your services, please contact the schemes directly on the above telephone numbers.

Taxis - Tacsi

1st Line Cars & Minibuses	Barry	01446 722888
A2B	Barry	01446 747500
Ace Travel	St Brides Major	01656 880622
Airport Direct	Llantwit Major	01446 793995
Andy Cars	Llantwit Major	01446 796777
B Line	Penarth	029 20711144
Bay Cars	Penarth	029 20353050
Business Class Executive Travel	Penarth	029 20703129
C J Contract Travel Services	Barry	01446 722296
Cardiff Airport Taxis	Penarth	01446 710693
Chauffeur Link	Cowbridge	01446 772094
Checker Cars Ltd	Cardiff Int. Airport	01446 711747
Cowbridge & Vale Cars	Cowbridge	01446 774714
Crystal Carz	Barry	01446 700100
Dragonride (Trike Motorbikes)	Barry	07840 760394
Gaynor Group Ltd	Airport Transfers	01446 719105
Hunts Private Hire	Rhoose	01446 719069
K-Tax	Penarth	029 20708525
Major Cars	Llantwit Major	01446 794545
Merricks PTC Ltd	Barry	01446 747684
Penarth Cars	Penarth	029 20701122
Rhoose Cars	Rhoose	01446 713916
Robert Evans	Penarth	029 20712138
Safe Cars	Barry	01446 737726
Standen's Contract Hire	Barry	01446 737519
Street Cars (Hackney Carriages)	Barry	01446 405918
Windsor Cars	Penarth	029 20700799

FREE CONCESSIONARY TRAVEL ON LOCAL BUSES IN WALES

If you fall into one of the following categories and are a resident in the Vale of Glamorgan, you are entitled to a Free Concessionary Bus Pass that entitles you to free travel on local bus services throughout Wales.

Categories of Person Eligible to Receive a Pass

1. Persons who are over the age of sixty years, or
2. Persons who are blind or partially sighted, or
3. Persons who are profoundly or severely deaf, or
4. Persons who are without speech, or
5. Persons who have a disability, or have suffered an injury, which has a substantial and long-term adverse effect on their ability to walk, or
6. Persons who do not have arms or have long-term loss of the use of both arms, or
7. Persons who have a learning disability, that is, a state of arrested or incomplete development of mind which includes significant impairment of intelligence and social functioning, or
8. Persons who would, if they applied for the grant of a licence to drive a motor vehicle under Part III of the Road Traffic Act 1988, have their applications refused pursuant to Section 92 of that Act (physical fitness) otherwise than on the grounds of persistent misuse of drugs or alcohol.
9. In addition, a pass issued to a person by virtue of 2 and 3 inclusive and who, in the opinion of the Council, requires the assistance of a companion in order to travel on eligible services, will be marked accordingly. Such passes will allow the pass holder to travel with a companion, whose purpose is to assist the pass holder, and both the pass holder and the companion will be entitled to travel at the concessionary rate.

In determining whether any applicant is entitled to a concessionary pass, the Council will refer to any guidance issued by the Welsh Assembly Government or any other relevant organisation, such as the Disabled Persons Transport Advisory Committee or the Welsh Local Government Association.

If you are eligible and resident in the Vale of Glamorgan telephone 01446 709224 for an application form.

Eligible persons from other areas in Wales must contact the Councils where they reside to apply.

VALE of GLAMORGAN
BRO MORGANNWG

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Oaktree Environmental Limited
North West Office
Unit 5, Oasis Park, Road One **Tel: 01606 558833**
Winsford Industrial Estate
Winsford, Cheshire CW7 3RY **Fax: 01606 861182**

Steve Ball
Principal Planning Officer
The Vale of Glamorgan Council
Development Control
Dock Office
Barry Docks
Barry CF63 4RT

Date: 31 March 2009

Our ref: 816-891-014-MM
Your ref: 2008/01203/FUL

Dear Sir,

PLANNING APPLICATION. NO. 2008/01203/FUL
PROPOSAL: ERECTION OF NEW INDUSTRIAL BUILDING AND INSTALLATION OF 9MW WOOD FUELLED RENEWABLE ENERGY PLANT
LOCATION: WOODHAM ROAD, BARRY DOCKS
APPLICANT: SUNRISE RENEWABLES LTD

Thank you for your letter dated 25 March 2009 containing additional consultation comments. I have addressed the comments below in the order raised in your letter and have also enclosed further documentation, which is referenced below.

1.0 Combined Heat and Power

1.1. Our client disagrees with the consultation comment that the application site does not represent a good quality form of CHP. It is our client's intention to meet the requirements of defra's CHPQA Standard as detailed in Issue 2 November 2007. I have enclosed a short document outlining the aspects of the Standard which will be applied to the project (SRB-R).

1.2. During several telephone conversations we discussed the heat use issue and I agreed that our client would accept a planning condition securing a commitment to use waste heat from the process. Our client's site in Hull has already received planning consent, which you have on file, in which condition 22 states:

> ***"Prior to use of the approved energy plant commencing details of the means to generate energy and recover waste heat from the operation of the plant shall be submitted to and approved in writing by the Local Planning Authority...."***

1.3 Our client would accept a condition which refers to achievement of an attainable standard such as CHPQA and I would be pleased to discuss the wording of such a condition with your energy officer. The condition would demonstrate a clear commitment to re-use waste heat and would also be enforceable.

1.4 We are awaiting a letter of support for reuse of the waste heat from developers, which should arrive this week. It is worth noting that the reuse of heat within the process to generate additional electricity, to condition the fuel and potential for evaporative chilling to cool the engine enclosure all contribute to the CHP designation of the plant and the applicant is committed to undertaking research to maximise the energy potential of the plant throughout its lifetime. The Council's Dock offices are also close enough to make use of the heat from the plant, which would help offset the Council's own carbon footprint.

1.5 The consultation makes an estimate of the heat availability without reference to the Mass and Energy Flow diagram (SRB-07) submitted with the application. I have annotated the diagram to explain my points below (SRB-07a).

a. The diagram shows the energy flow and identifies the controlled reintroduction of air and water (steam) and syngas into the process which results in additional gas production from carbon (which ultimately reduces char production). This process was explained by Robert Prigmore at the recent site meeting and is a matter which Kristian James will be able to confirm in more detail.

b. Recycled wood has a variable moisture content and at 25% moisture the energy value per tonne is approximately 3,800 kW/tonne (13.68 GJ). The figure calculated for the diagram is 126.14 GJ/hour (per annum) is based on 9 tonnes of wood with a slightly lower moisture content calculated by the manufacturer. For the purposes of conversion I have used 1 GJ = 277.8 kW/h.

c. Of the 126.14 GJ per hour available in the wood fuel approximately 113.23 GJ is converted into syngas i.e. 89.7% of the energy available in the fuel.

d. The GE Jenbacher engines have an efficiency of between 38 and 44% (reference: *http://www.clarke-energy.co.uk/gas_engines.html*). At maximum efficiency this equates to conversion of 49.82 GJ into electrical energy.

e. Of the energy recovered from the exhaust stack 8.16 GJ is used internally to condition the fuel, leaving 8.16 GJ for re-use. The low grade heat for re-use represents 6.5% of the overall energy input. Further potential for heat re-use internally will be considered in the final design and will also form part of the permit application to the Environment Agency. The Vale of Glamorgan will be a consultee to the permitting process.

1.6 I would be grateful for a copy of the full consultation response from the Council's energy manager for our records.

1.7 I also have reviewed the WAG consultation document, which forms part of the aforementioned document reference SRB-R. Comment is also made on the Renewable Energy Route Map for Wales (2008).

2. Sustainability

2.1 The fuel supply assessment does refer to waste wood in section 2.1 and then goes on to clarify precisely what is meant by waste wood for the purposes of the assessment, including clean wood (Grade A).

2.2 The Sustainability statement does not state that fuel will be used from sustainably managed forests. Paragraph 8.6 refers to the construction of the building i.e. the wood used in the construction process. This also includes the public art element which will be a wooden sculpture at the site entrance reflecting the sustainable nature of the process and using locally sourced wood. The document also refers to the potential for use of waste heat in Paragraph 8.7.

2.3 Our client would prefer not to use forestry timber as fuel as the plant is designed to cleanly process waste wood, which is also more cost effective to source. However, forests in the UK are being used extensively to provide fuel for other biomass plants. In the South of England we have a client that is considering a clean wood biomass plant close to forested areas that generate up to 5,000 tonnes of timber from management of the forest alone. Our clients plant is not dependent upon forestry wood.

2.4 The planning statement (paragraph 4.1) states that "The biomass feedstock will be provided by existing recycling and waste wood processing operations within a 15 mile radius of the site under the terms of a fuel agreement". The 15 mile radius for fuel was determined on the basis that our client wishes to reduce vehicle miles for every load delivered to the site, rather than prohibit the use of the docks for loads arriving by sea from more than 15 miles away. Fuel providers within the 15 mile radius may have a wider sphere of operation but our client wishes to encourage local re-use of wood for fuel, in contrast to the current situation where wood is travelling hundreds of miles for use as fuel for co-generation, some of which is imported.

2.5 The UK is still heavily reliant on coal power and wood based biomass represents a significant growth area in transferring demand to more sustainable energy generation. For example, the Drax Power Station (4GW) burns almost 38,000 tonnes of coal per day and accounts for 7% of the UK's power but is amongst Europe's top five industrial polluters (ENDS REPORT 409).

2.6 Our client is planning four 9MW biomass plants and although they account for only 0.063% of the UK's power, they will potentially account for 0.63% of the UK's 2010 renewable energy target (10% by 2010) which is not insignificant for a small renewables company.

2.7 Reception of fuel by train would be welcomed by our client if unloading facilities are available at the dock for wood fuel.

2.8 There are varying figures for the global warming potential of methane, ranging from 21 to 30. I have used the figure of 25 as a comparison, however, if we take the most conservative figure of 21 the relationship between methane and carbon dioxide's global warming potential is not in doubt.

2.9 The request for clarification of the benefits of the proposal in terms of carbon dioxide does not consider diversion from landfill which is encouraged not only to reduce waste disposal, methane generation and costly landfill space. The government's position is reflected in numerous biomass and energy policies.

2.10 The land use map which forms part of the Groundsure report submitted with the application shows that there is considerable development potential around the site and the potential for heat re-use could be promoted to developers interested in the sites, assuming the construction downturn is soon reversed.

3.0 Consultee responses

3.1 The EA consultation response confirms that the CHP opportunities will be covered in the permitting process, which in combination with the proposed planning condition make heat re-use an enforceable issue.

4.0 Public meeting proposal

4.1 Since you first informed me of the request for a public meeting (by email on 26/02/09) I have exchanged numerous e-mails and had conversations with Councillor Elmore to arrange the proposed meeting, which we were hoping to have before 30 March 2009. To date there has been no success with the date or venue from Councillor Elmore. Our client has therefore arranged a public meeting at the Best Western Mount Sorrell hotel for 15 April 2009 at 18:00 hours in the Conway Suite. The meeting will be advertised in the local press this week and all are welcome.

Our client and my colleagues are planning their diaries for the next month so I would be grateful if you could confirm the proposed committee date in writing.

I trust the above answers your questions. If you have any further queries please do not hesitate to contact me on 01606 558833 or 07767 761252.

Yours faithfully,

Marco Muia BSc MSc MCIWM
Director

enc. SRB-R, SRB-07a

cc D Heath - Sunrise Renewables Ltd

2008 /01203 /FUL (rec'd 8/1/09)

SUSTAINABILITY STATEMENT

Site: Barry Docks, Woodham Road, Barry
Application: Erection of New Industrial Building and Installation of 9MW Wood Fuelled Renewable Energy Plant

1.0 The purpose of this document is to demonstrate that the proposed biomass plant on land at Woodham Road contributes towards sustainable development in terms of land-use planning, accessibility, energy efficiency, drainage and water conservation, waste management, landscape and biodiversity.

2.0 The document is written with regard to The Vale of Glamorgan guidance entitled "Sustainable Development - Supplementary Planning Guidance", which gives advice on the implementation of renewable energy systems, and the planning considerations of such development, which are also considered herein.

3.0 The Brundtland Report was published by the UK Government in 1987 under the title "Our Common Future". The report defined sustainable development as:

> *"Development which meets the needs of the present without compromising the ability of future generations to meet their own needs."*

4.0 The guidance is written in keeping with the philosophy of "think globally, act locally", and steers the Council towards encouraging development which can minimise negative environmental impacts and make best use of natural resources. The use of wood based fuel for a biomass energy plant is consistent with these aims. Furthermore TAN 8 (Planning for Renewable Energy) highlights the potential for creating more sustainable developments by incorporation of renewable energy technologies.

5.0 Site Assessment and Selection

5.1 Prior to preparation of the application an initial site assessment was undertaken to gain an understanding of the site in relation to the design. The applicant has submitted applications for a further 3 sites of the same size and design at other UK ports. The application in Hull has been granted for the same site design, in a similar setting.

5.2 Numerous sites have been considered throughout the UK, with site selection being dependent upon several site specific factors i.e.

i. The applicant's preference for brownfield sites.
ii. The requirement for a cost effective/existing connection to the National Grid
iii. Availability of fuel supply, including the potential for 20 % to be delivered by boat via the port.
iv. The site being accessible to local services and public transport routes.

v. The site having reasonable highway accessibility, although it is of low impact given the number of vehicle movements required.
vi. Potential for customers nearby to utilise the waste heat generated by the plant.
vii. No impact upon the local ecology.
viii. Ability to secure a long term lease.

6.0 Site Layout and density

6.1 The site layout is constrained by the width of the site but fortunately the design of the building was able to accommodate the biomass plant whilst maintaining a orientation which provides for optimum natural lighting via rooflights.

6.2 The site will incorporate rainwater harvesting in the final design and all of the plant and equipment has been housed in a single building, maximising the use of building materials.

6.3 The development proposal will bring a part derelict, low grade site into productive use which will provide employment, renewable energy and a source of renewable heat.

6.4 The site has a low lighting requirement as most operations will be carried out in daylight hours. The proposal to cease importation of fuel by 1900 hours reduces the need to light the site after that time as the only access will be staff carrying out security checks and changes in shifts patterns.

7.0 Transport and Movement

7.1 The development provides for easy and safe movement for all modes of transport, especially pedestrians and cyclists and connections to existing public transport routes beyond the immediate development.

7.2 The site proposal promotes the transport user hierarchy stated in the guidance. Employees will be encouraged to cycle to work, which is the most realistic option given the industrial nature of the site.

7.3 The application proposals estimate that 8 jobs will be created by the development and its is anticipated that most of the job applicants will be local to the site.

7.4 The site makes provision for disabled access and parking which is demonstrated in the planning application documentation (planning statement, site layout plan and design and access statement)

7.5 The site will not create new roads and utilises an existing access. The site will have a speed limit of 5mph for all vehicles for enhanced safety.

7.6 Parking is situated to ensure that pedestrian access to the building does not cross the site frontage where vehicles and loading plant are in use. Parking provision is also open and secure.

7.7 The site is conveniently located near local bus and rail routes (Barry Dock Station).

8.0 Energy Conservation and Efficiency

8.1 The guidance states that energy use in buildings accounts for nearly 50% of carbon dioxide emissions within the UK. The biomass plant will produce renewable energy and the building will be constructed to a high standard but will not require heating as the heat produced by the process will ensure that no additional heating is required.

8.2 Rather than provide a boiler to heat water on site for the welfare facilities waste heat from the process will be used.

8.3 All electrical appliances on site will be energy efficient. If a fridge is used in staff welfare facilities it will have the lowest energy rating available and all lighting on site will be energy efficient. The building has provision for roof lights to provide natural light during day time operations. The rooflights are also a form of passive solar design being oriented to the East and West elevations of the building to receive the maximum amount of sunlight, within the constraints of the positioning of the building.

8.4 Although the technology proposed is new and innovative the overall concept is not a new one. Combined Heat and Power (CHP) has far greater efficiency than traditional power generation methods and provides for the heat produced during power generation to be captured and used in local heating applications. Wood chip and pellet stoves and boilers have been developed for domestic, agricultural and industrial uses, and have been used to heat the WAG Debating Chamber.

8.5 The site will use efficient gas combustion engines.

8.6 The site has a projected life of a minimum of 25 years. The materials to be used in construction of the building will be selected for quality and durability. Where possible materials will be selected which have low embodied energy. Where possible, timber used on site will be sourced from sustainably managed forests and carrying the Forestry Stewardship Council (FSC) logo.

8.7 The location of the site makes the reuse of waste heat possible for commercial and domestic purposes. The 23 industrial units adjacent to the site and the proposed Barry Waterfront Development could benefit from the waste heat.

9.0 Low/Zero Carbon Energy Sources and Systems

9.1 The proposed fuel for the site is a low carbon source as it contains 'new carbon' rather than carbon from fossil sources.

9.2 The proposal diverts wood away from landfill, thereby reducing methane emissions and having a net effect upon climate change as methane has 25 times the global warming potential of carbon dioxide.

10.0 Water Conservation and Sustainable Drainage

10.1 Industry is the heaviest consumer of water in the UK. Although the biomass plant has a net water requirement the majority is introduced into the process via the moisture content of the wood fuel (15-35%).

10.2 Rather than using treated drinking water on site the applicant proposes to re-use roof water and treat the water arising from the process to enable its recirculation through the process.

10.3 The applicant is willing to agree to the construction of a sustainable drainage system. Although the site is not within the floodplain but included the following sustainable drainage measures:

i. Soakaways - vegetated area proposed along the Southern site boundary.
ii. Permeable Surfacing Materials such as crushed stone/gravel or porous asphalt will also be used to encourage surface water to permeate into the ground.

11.0 Waste Management

11.1 The development provides for on-site storage of all waste generated from the process and the planning application statement (Section 9.0) lists the wastes to be generated, their volumes and intended destinations. The application document SRB-C Waste Audit and Facilities Strategy states the measures to be taken to minimise construction waste.

12. Landscape, Trees and Ecology

12.1 The site has very little in the way of vegetation on site and which is in an extremely poor condition. The site has been used for fly tipping and the storage of containers and waste on site has encroached upon the scrub vegetation present. The submission of a landscaping scheme will provide a greater density of planting than is currently present.

12.2 The developer is willing to agree to a planning condition requiring the submission of a planting scheme for the site. The agreed scheme will comprise locally sourced native species, including trees, appropriate to the local ecology.

12.3 The proposed use will not impact upon any nature sites with a local or statutory designation. There are no existing ecological features on site, however, the planting scheme will provide for greater biodiversity than the current state of the site affords.

13.0 Sustainability Checklist

13.1 The Sustainability Checklist has been completed and is appended to this document as annex A.

Sustainability Checklist

This checklist will help you to identify how your development proposal addresses the issues of sustainable development contained within this SPG. Once complete the information can be used as an aid when drafting your Statement of Sustainability. The Statement of Sustainability and the Checklist should be submitted with your planning application. This will be taken into account in considering your planning application. Please feel free to continue on separate sheets if necessary.

How to use the checklist

Each sustainability issue has at least one box to fill in. If you have included measures that address the issue, complete the box with a _ , if not mark the box with a For each response you are required to either state the measure proposed or your justification for not addressing this issue (e.g. the orientation of the site may not be suited to utilising the benefits of solar gain.) You are advised that the Council may request further information that supports your justification.

Sustainable Measure		Tick box if you have taken this into account If Yes, what measures are proposed? If NO, or not applicable, state why not
Site Assessment (pages 9 - 10)		
Accessibility to neighbouring developments, local services and facilities	✓	REFER TO TRANSPORT PLAN (SRB-K)
Connections to existing pedestrian, cycle, rights of way and public transport routes	✓	REFER TO TRANSPORT PLAN (SRB-K)
Existing infrastructure and its capacity	✓	DEVELOPMENT WILL INVOLVE CLEARING THE SITE
Topography and site orientation	✓	TOPOGRAPHY WILL NOT CHANGE
Archaeological or historic interests	✓	NONE KNOWN
Boundary features, such as hedges, stone walls and tree lines	✓	NO IMPORTANT BOUNDARY FEATURES. PLANTING SCHEME PROPOSED.
Local building characteristics and important views	✓	NO SIGNIFICANT BUILDINGS ON SITE/ADJACENT
Ecological impacts assessed	✓	SITE DISCUSSED WITH COUNCIL ECOLOGIST
Landscape/amenity impacts including trees and green spaces	✓	LANDSCAPING SCHEME
Site Layout (page 10)		
Orientation of buildings utilises the benefits solar gain	✓	ROOFLIGHTS MAXIMISE SUNLIGHT
Infrastructure layout accords to the transport user hierarchy	✓	PROVISION IS MADE FOR CYCLE PARKING
Maintains or improves existing pedestrian and cycle network	✓	SITE IS ACCESSIBLE BY CYCLE
Allow for easy and safe access to public open spaces?	✗	N/A - INDUSTRIAL AREA
Street lighting designed to reduce light pollution and other environmental impacts	✓	NO STREET LIGHTING PROPOSED. SITE FLOODLIGHTS WILL ONLY ILLUMINATE OPERATIONAL AREAS

Transport and Movement (pages 10 - 11)		
Safe movement for children, pedestrians and disabled persons	✓	DISABLED PARKING. SEE DESIGN ACCESS STATEMENT
Provisions made for cyclists e.g. secure cycle storage	✓	PROVISION SHOWN ON DRAWING No. SRB-03
Encourages public transport use	✓	CLOSE TO PUBLIC TRANSPORT (BUS ROUTE)
Maintain the transport user hierarchy	✓	EMPLOYEES WILL BE ENCOURAGED TO CYCLE TO WORK.
Sustainable Energy Use (pages 11 - 13)		
Undertake an Eco-Homes, BREAM, or NHER standards assessment to determine the overall environmental performance of the proposal	✗	NOT APPLICABLE
An EcoHomes Assessment is required for affordable housing funded through Social Housing Grant	✗	NOT APPLICABLE
BREEAM Assessment is required for WAG procured buildings	[illegible]	" "
Passive solar design	✓	FLOODLIGHTING
Natural daylighting	✓	" "
Natural ventilation	✗	NOT APPLICABLE
Reduce energy consumption e.g. installation of A rated appliances, condensing boilers etc	✓	USE LOWEST RATED FRIDGE IN CANTEEN
Provision of internal drying space or external communal drying area	✗	NOT APPLICABLE
Renewable Energy Sources (page 13 - 15)		
Solar Photovolyaics (PV's)	✗	NOT APPLICABLE
Solar Water Heating	✗	" "
Small scale wind	✗	" "
Biomas	✓	SITE IS A BIOMASS ENERGY PLANT
Combined Heat and Power (CHP)	✓	HEAT WILL BE REUSED
Geo thermal	✗	NOT APPLICABLE
Energy Efficiency and Material Choice (page 15)		
Use reclaimed or recycled materials	✓	WHERE POSSIBLE
Materials sourced from sustainable resources e.g. FSC certified timber	✓	" "
Use natural energy efficient materials e.g. timber, stone etc	✓	" "
Sustainable construction techniques e.g. straw bale, green roofing etc	✗	NOT APPLICABLE
Street Lighting (page 15)		
Low energy street and other external lighting	✓	LOW ENERGY SECURITY LIGHTING

Water Conservation (pages 15 - 16)		
Installation of dual water supplies e.g. rainwater run-off for toilets and/or grey water reuse	✓	ROOF WATER TO BE REUSED
Installation of low/dual flush toilets	✓	DUAL FLUSH USING 'GREY WATER'
Installation of rain water collectors for landscape maintenance and/or domestic garden use	✓	ROOF WATER COLLECTION TANK
Installation of water efficient A rated white goods	✗	NO WATER USAGE WHITE GOODS PROPOSED
Use natural techniques, such as a reed bed filtration system to treat waste water	✗	WASTE WATER TO BE TREATED + REUSED
Sustainable Drainage (pages 17 - 18)		
Installation of Sustainable Urban Drainage	✓	REFER TO FRA/EIA CONSULTATION
Soakaways	✓	″ ″ ″
Permeable surfacing	✓	″ ″ ″
Swales and Basins	✗	NOT APPLICABLE TO THE DEVELOPMENT
Infiltration Trenches and Filter Drains	✗	″ ″ ″
Pond and Wetlands	✗	″ ″ ″
Onsite Stormwater Detention	✗	SUSTAINABLE DRAINAGE
Green Roofs	✗	NOT APPLICABLE
Waste Management (pages 18 - 19)		
Internal recycling/separation facilities	✓	THE SITE IS AN ENERGY/RECYCLING DEVELOPMENT
Communal external recycling/separation facilites	✗	NOT APPLICABLE
Re-use/recycle existing building materials	✗	NO EXISTING MATERIALS ONSITE. REUSE WHERE AVAILABLE
Implementation of an on site waste management scheme during construction	✓	SITE WASTE MANAGEMENT PLAN
Landscape, Trees and Ecology (pages 19 - 21)		
EIA of other ecological assessment/surveys conducted	✗	THE SITE IS A PART DERELICT
Retention of existing trees as part of the site layout/landscaping scheme	✗	SITE ON MADE GROUND. THE
Incorporation of ecological mitigation or compensation measures	✗	DEVELOPMENT WILL ENHANCE
Creation of new wildlife habitats	✗	BIODIVERSITY ON SITE BY USING
Inclusion of post-development management, monitoring and review	✗	LOCAL SPECIES IN THE PLANTING
Retention/enhancement of existing landscaping features	✗	SCHEME
Plant locally sourced indigenous trees and plants	✓	PROPOSED PLANTING SCHEME
Minimise the opportunities of crime	✓	SECURE BUILDING – 24 HOUR SECURITY
Mixed use development proposed	✗	NOT MIXED USE

1.0 INTRODUCTION

1.1 Sunrise Renewables Limited ("Sunrise") has applied to the Vale of Glamorgan Council for planning consent to install a 9MW wood fuelled biomass plant, which will generate electricity from gas produced from reclaimed wood, for export to the national grid.

1.2 Eight new local employees will be based at the plant at Woodham Road, Barry Docks, within an established industrial area. The plant has adequate parking on site for vehicles and cycles and will potentially receive up to 20 HGV loads of fuel per working day, during the hours specified below, depending upon the payload of the delivery vehicles.

1.3 The site will operate on a 24 hours basis to produce electricity but it will only receive deliveries of fuel and visits from third parties and the public during the following hours:

Monday to Friday	07:00 - 22:00
Saturday	07:00 - 20:00
Sunday / Bank / Public Holidays	07:00 - 16:00

1.4 Facts relating to this document:

i. The plant has a maximum fuel requirement of 216 tonnes per day.

ii. The bulk density of waste wood varies from approximately 240 to 520 kg/m^3.

iii. Vehicle payloads range from 30 to 96 m^3.

iv. The maximum gross vehicle weight permitted is 44 tonnes for an articulated vehicle, with a maximum payload of 28 tonnes. 28 tonnes equates to a volume of between 53 and 116 m^3.

v. The applicant favours the use of walking floor trailers to deliver fuel, which reduce double handling and maximise delivery payloads. The likely payload of the walking floor trailers, taking into account varying densities, is between 20 and 25 tonnes.

vi. The payload stated in the application statement used a worst case scenario of 15 tonnes per load but that has been superceded by the figures above. At 20 to 25 tonnes per load the likely deliveries to the plant will be between 9 and 11 loads per day.

vii. 11 loads per day as the daily HGV deliveries, generating a total of 22 movements is used in this document as a worst case scenario.

1.5 Some fuel will be delivered by boat but it is likely that there will be periods when dockside deliveries do not occur, leaving the figures above unchanged. When deliveries by boat take place it is likely that the delivery will contain 3 days' fuel. The number of loads quoted also include the removal of materials off site as return loads, to maximise haulage efficiency.

1.6 Vehicle movements during the construction phase are likely to be lower than the maximum stated above. The planning application states that 8 other vehicles (employees and visitors) will arrive at/depart from the site each day, generating 16 movements. The construction phase is expected to be less than this level of usage as HGV movements will be restricted to delivery of materials and some removal of soil from the site.

1.7 The site is located off Woodham Road, with vehicular access from David Davies Road. Access on to the surrounding road network is gained via Cory Way onto Millenium Way. The proposed site location is within the area known as the Waterfront Strip. It is served by the A4050, A 4055 and A4231 local roads, providing links to the national network and Cardiff. These roads are identified as the Southern Corridor and Airport/M4 Corridor in the Vale of Glamorgan Local Transport Plan.

2.0 POLICY SUMMARY

2.1 The Vale of Glamorgan Local Transport Plan

2.1.1 The Local Transport Plan (2001-2006) outlines various key aims of delivering safer, less congested and less polluted roads. It also states that the development of the local economy is crucial to the continuing vitality and viability of the communities in the Vale of Glamorgan. The threats and weaknesses identified for the area include peak congestion on key routes, high (growing) car ownership and low public transport patronage. The applicant is aiming to tackle private car usage and comply with other policies in the plan by implementing a Green Travel Plan for the site (Document SRB-T). This assessment primarily considers the impact of HGV movements. The applicant has also agreed to provide funding for sustainable transport as a planning obligation.

2.1.2 The application proposals are consistent with the parking policies in the plan.

2.1.3 Policy 23 supports the transport of freight by rail and sea, where appropriate, which is relevant to the applicant's expectation that 20% of fuel will be delivered by boat. Policy 26 states that the continued use and consolidation of port facilities at Barry for freight distribution will be favoured.

2.2 UDP

2.2.1 The Councils UDP makes numerous references to the need for developments to be located where there is good existing or potential public transport. A specific policy on Strategic Public Transport adds that "Land will be protected and provision made for the development of facilities for bus operations including between

- Barry, Dinas Powys and Cardiff
- Cardiff International Airport, Barry, Wenvoe and Culverhouse Cross
- Penarth and Cardiff, and
- The Vale of Glamorgan and Bridgend"

2.2.2 The applicant supports this policy and as stated above will enter into a planning obligation to provide financial support for the local bus network. The applicant has also produce a Green Travel Plan which aims to reduce staff vehicle usage in favour of more sustainable forms of transport.

2.3 PLANNING POLICY WALES TECHNICAL ADVICE NOTE (TAN) 18: TRANSPORT

2.3.1 TAN 18 states that developments which attract substantial movements of freight should be located away from congested inner areas and residential neighbourhoods. The site will only attract an maximum of 2 loads or 4 movements per hour in any working day and is not therefore classed as substantial. The site has been chosen because of the proximity to the dock facility, the grid connection, potential fuel providers and the re-use of a brownfield site.

2.3.2 This assessment has been prepared to compliment the planning application. TAN18 suggests that the threshold for a transport assessment for industry is a gross floor area of >5,000 m^2, which is larger than the application building. The site in its current state is used for repair and refurbishment of containers and has no restriction on vehicle movements.

2.4 REGIONAL TRANSPORT PLAN

2.4.1 The regional transport plan contains the following priorities and objectives:

i. To improve access to services, facilities and employment, particularly by public transport, walking and cycling.
ii. To provide a transport system that increases the use of sustainable modes of travel.
iii. To develop an efficient and reliable transport system with reduced levels of congestion and improved transport links
iv. To reduce significantly the emission of greenhouse gases and air pollution from transport.
v. To ensure that land use development in south east Wales is supported by sustainable transport measures.
vi. To play a full role in regenerating South East Wales.
vii. To improve access to services and facilities, particularly by public transport, walking and cycling.
viii. To regenerate town centres, brown-field sites and local communities through appropriate transport provision.

2.4.2 The regional transport plan emphasizes and encourages the use of public transport, cycling and car sharing schemes. This emphasis is consistent with the applicant's Green Travel Plan.

3.0 TRAFFIC SURVEY

3.1 Traffic information for the local road network was obtained from The Vale of Glamorgan. The data arose from a traffic survey carried out on 30th September 2008 and is attached as Appendix 1.

3.2 The 12 hour (07:00 - 19:00) total value and the HCV (Heavy Commercial Vehicle) count focusing on both directions of travel for the 2 roundabouts near the site was used to compare and determine the vehicular movement impact for the proposed development.

3.3 Summary of results from 5 traffic counts

3.3.1 Millennium Way - Dock Entrance (Wimbourne Road-A):
The traffic flow that contained the highest vehicular movement was in the Cardiff Rd to Millennium Way direction with a total of 4,942 vehicular movements of which 91 were HCV/HGVs. The count for Atlantic Way is still relevant despite the road being closed as it reveals the vehicle numbers traveling to the docks.

3.3.2 Millennium Way - Dock Entrance (B):
The traffic flow that contained the highest vehicular movement was in the Millennium Way to Cardiff Rd direction with a total of 5,605 vehicular movements of which 100 were HCVs.

3.3.3 Millennium Way - Dock Entrance (Wimbourne Road 2way):
The two way leg on the Millennium Way road was counted at 12,541 vehicle movements in the 12 hour period of which 272 were HCVs.

3.3.4 Millennium Way - Dock Entrance (Cardiff Road 2way):
The two way leg on the Cardiff Road was counted at 12,711 vehicle movements in the 12 hour period of which 579 were HCVs.

3.3.5 Millennium Way - Dock Entrance (Wimbourne Road):
The two way leg on the Docks entrance was counted at 4,158 vehicle movements in the 12 hour period of which 469 were HCVs.

3.3.6 The results of most significance are presented in the table below, with the % increase calculations using 11 vehicles i.e. 22 movements [routes labeled A-C for ease of reference]:

Route & Direction	12 hour total vehicles	increase in total vehicle nos from HCVs	increase in HCV nos	increase in HCVs & buses
A: Millenium Way - Dock Entrance (Wimbourne Road) Millennium Way leg 2 way	12,541 vehicles 272 HCVs 459 HCVs & buses	0.18%	8.08%	4.79%
B: Millenium Way - Dock Entrance (Wimbourne Road) Cardiff Road leg 2 way	12,711 vehicles 579 HCVs 757 HCVs & buses	0.17%	3.80%	2.91%
C: Millenium Way - Dock Entrance (Wimbourne Road) Docks Entrance leg 2 way	4,158 vehicles 469 HCVs 552 HCVs & buses	0.53%	4.69%	3.99%

4.0 IMPACT OF THE DEVELOPMENT

4.1 The application proposals are to import fuel by road between the hours of 07:00 and 22:00, which is a 15 hour day. 11 deliveries per 15 hour day would average out at one every 82 minutes. If the deliveries were restricted to the times during which the survey was carried out deliveries would average out at one every 65 minutes.

4.2 The overall impact in terms of additional traffic is low and the increase in heavy vehicle traffic on the 3 routes presented in the table above range from 2.91 to an 8.08 % increase in movements. The 8.08% increase would not occur as most traffic arriving at the site would arrive from the Cardiff Road direction (route B) with the impact being an increase in HCVs of 3.8%. The increase in HCVs entering/leaving the Dock would be 4.69%. These figures are reduced further if buses are added to the heavy vehicle count.

4.3 The majority of HCV traffic coming from Cardiff Road towards Millennium Way (route B) enters the Dock so 22 additional movements added to the existing 469 is not considered significant.

4.4 A Green Travel Plan has none-the-less been developed for the site and has been submitted with the planning application.

4.5 The applicant has already indicated that a unilateral undertaking will be signed in relation to sustainable transport contributions and would also be willing to include a traffic routing agreement to ensure vehicles adhere to agreed routes.

Millennium Way - DockEntrance (Wimbourne Road-A)

30th September, 2008

Cardiff Rd to Millennium Way(2to1)
Dock Entrance to Millennium Way(3to1)
Millennium Way to Dock Entrance(1to3)

CARS	cars
LCV	light commercial vehicles
MCV	medium commercial vehicles
HCV 2 AXLE	heavy commercial vehicles - 2 axle
HCV 3 AXLE	heavy commercial vehicles - 3 axle
HCV 4+ AXLE	heavy commercial vehicles - 4 plus axles
BUSES	buses
MOTOR CYCLES	motor cycles
CYCLES	cycles - count NOT included in vehicle TOTALS

SITE Millennium Way - DockEntrance (Wimbourne Road-A) DATE: 30/09/08
DIR Cardiff Rd to Millennium Way(2to1) DAY Tuesday

	START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
	7.00	47	7	1	1	0	0	5	0	0	61
/	7.30	31	6	1	0	0	2	1	0	0	41
A|	7.45	51	6	0	0	0	1	1	1	0	60
M|	8.00	74	13	0	1	0	0	0	0	0	88
P|	8.15	84	21	1	3	1	0	0	1	1	111
E|	8.30	115	17	3	1	0	2	1	2	0	141
A|	8.45	103	7	2	0	0	1	7	1	0	121
K|	9.00	96	16	2	1	0	0	6	0	0	121
\	9.15	93	9	2	1	0	1	4	0	0	110
	9.30	137	17	3	2	0	2	5	0	1	166
	10.00	165	13	2	2	0	2	3	0	0	187
	10.30	144	21	6	0	1	0	3	0	0	175
	11.00	143	10	3	1	0	2	0	1	0	160
	11.30	162	11	5	1	2	4	0	0	0	185
	12.00	142	10	5	5	0	4	3	1	0	170
	12.30	173	10	8	2	2	3	4	1	0	203
	13.00	187	24	0	3	0	3	0	0	0	217
	13.30	186	23	1	4	0	0	3	1	0	218
	14.00	171	25	1	2	1	3	0	1	0	204
	14.30	162	27	0	3	0	1	2	0	2	195
	15.00	171	16	2	1	0	1	1	0	0	192
	15.30	209	19	5	1	1	3	3	0	0	241
/	16.00	112	13	4	1	0	2	5	1	1	138
P|	16.15	115	10	1	0	0	0	5	4	1	135
M|	16.30	110	8	1	0	0	0	1	3	1	123
P|	16.45	142	6	1	1	0	1	3	2	0	156
E|	17.00	161	6	0	0	0	1	3	0	2	171
A|	17.15	128	4	1	1	1	0	2	0	0	137
K|	17.30	138	3	0	1	1	1	0	1	0	145
\	17.45	128	3	1	0	0	0	0	0	0	132
	18.00	231	14	1	0	0	1	3	2	1	252
	18.30	177	6	1	0	0	1	1	0	3	186
PK 800 - 0900		**376**	**58**	**6**	**5**	**1**	**3**	**8**	**4**	**0**	**461**
PK 1630-1730		**541**	**24**	**3**	**2**	**1**	**2**	**9**	**5**	**3**	**587**
2 HR AM PK		**647**	**95**	**11**	**7**	**1**	**7**	**20**	**5**	**1**	**793**
2 HR PM PK		**1034**	**53**	**9**	**4**	**2**	**5**	**19**	**11**	**5**	**1137**
12 HOUR TOTAL		**4288**	**401**	**64**	**39**	**10**	**42**	**75**	**23**	**13**	**4942**
% OF TOTAL		**86.77**	**8.11**	**1.30**	**0.79**	**0.20**	**0.85**	**1.52**	**0.47**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road-A) DATE: 30/09/08
DIR Dock Entrance to Millennium Way(3to1) DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	7	0	0	0	0	0	0	1	0	8
7.30	7	0	0	0	0	0	1	0	0	8
7.45	12	1	1	1	0	0	0	0	0	15
8.00	13	2	1	1	0	0	0	0	0	17
8.15	7	7	0	0	0	0	1	0	0	15
8.30	12	5	0	0	0	2	0	0	0	19
8.45	14	5	2	1	0	0	0	1	0	23
9.00	14	3	0	0	0	0	1	0	0	18
9.15	10	8	1	0	0	1	3	0	0	23
9.30	18	7	1	1	0	3	1	0	0	31
10.00	31	6	0	2	0	0	0	0	0	39
10.30	19	5	1	2	0	1	0	0	0	28
11.00	12	11	1	0	0	2	1	0	0	27
11.30	18	4	3	0	0	0	0	0	0	25
12.00	27	3	2	1	0	0	0	0	0	33
12.30	32	7	1	1	1	2	0	0	0	44
13.00	24	7	0	1	0	0	0	0	0	32
13.30	29	10	0	2	1	1	1	0	0	44
14.00	22	5	2	0	0	3	1	0	0	33
14.30	28	6	1	0	1	0	0	2	0	38
15.00	50	11	1	0	0	0	0	2	0	64
15.30	31	10	1	0	0	1	1	0	0	44
16.00	30	2	0	0	0	1	0	0	0	33
16.15	30	4	1	0	0	0	1	0	1	36
16.30	38	3	1	0	0	1	1	0	0	44
16.45	23	3	0	0	0	0	0	1	0	27
17.00	47	3	1	1	0	0	0	0	1	52
17.15	33	4	0	0	0	0	1	1	0	39
17.30	17	1	1	0	0	0	0	0	0	19
17.45	27	0	1	0	0	0	0	0	1	28
18.00	11	1	1	0	0	0	0	0	1	13
18.30	9	0	0	0	0	0	0	0	0	9
PK 800 - 0900	**46**	**19**	**3**	**2**	**0**	**2**	**1**	**1**	**0**	**74**
PK 1630-1730	**141**	**13**	**2**	**1**	**0**	**1**	**2**	**2**	**1**	**162**
2 HR AM PK	**89**	**31**	**5**	**3**	**0**	**3**	**6**	**1**	**0**	**138**
2 HR PM PK	**245**	**20**	**5**	**1**	**0**	**2**	**3**	**2**	**3**	**278**
12 HOUR TOTAL	**702**	**144**	**25**	**14**	**3**	**18**	**14**	**8**	**4**	**928**
% OF TOTAL	**75.65**	**15.52**	**2.69**	**1.51**	**0.32**	**1.94**	**1.51**	**0.86**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road-A) DATE: 30/09/08
DIR Millennium Way to Dock Entrance(1to3) DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	38	7	3	0	0	0	1	0	2	49
7.30	40	10	1	0	0	0	1	0	1	52
7.45	53	9	2	0	0	1	7	1	0	73
8.00	47	9	6	0	0	1	0	0	0	63
8.15	55	12	0	1	0	0	0	0	0	68
8.30	43	4	0	0	0	0	1	0	0	48
8.45	29	2	0	1	0	1	1	0	0	34
9.00	21	9	0	0	0	0	1	0	0	31
9.15	17	8	1	0	1	0	2	0	0	29
9.30	22	15	1	0	0	1	0	0	0	39
10.00	18	5	1	1	0	1	0	0	0	26
10.30	23	8	1	0	0	0	1	0	0	33
11.00	25	2	3	1	1	0	0	0	0	32
11.30	16	10	1	0	0	1	0	0	0	28
12.00	25	4	2	1	0	2	0	0	1	34
12.30	28	2	0	3	0	1	0	1	0	35
13.00	30	8	0	3	1	4	1	0	0	47
13.30	22	10	2	2	0	2	1	2	0	41
14.00	22	12	1	0	1	0	1	1	0	38
14.30	17	5	0	0	1	3	1	0	0	27
15.00	23	8	1	1	0	1	1	2	0	37
15.30	37	10	3	1	0	0	0	2	0	53
16.00	11	1	1	2	0	0	0	0	0	15
16.15	13	4	0	1	0	1	0	0	0	19
16.30	12	2	1	0	0	1	0	0	0	16
16.45	14	2	1	0	0	0	1	0	0	18
17.00	16	1	0	0	0	0	1	0	0	18
17.15	12	2	0	0	0	1	0	0	0	15
17.30	16	3	0	0	0	0	0	0	0	19
17.45	4	3	0	1	0	0	0	0	0	8
18.00	7	2	0	0	0	0	0	0	0	9
18.30	11	1	0	0	0	0	0	0	0	12
PK 800 - 0900	**174**	**27**	**6**	**2**	**0**	**2**	**2**	**0**	**0**	**213**
PK 1630-1730	**54**	**7**	**2**	**0**	**0**	**2**	**2**	**0**	**0**	**67**
2 HR AM PK	**305**	**63**	**10**	**2**	**1**	**3**	**13**	**1**	**1**	**398**
2 HR PM PK	**98**	**18**	**3**	**4**	**0**	**3**	**2**	**0**	**0**	**128**
12 HOUR TOTAL	**767**	**190**	**32**	**19**	**5**	**22**	**22**	**9**	**4**	**1066**
% OF TOTAL	**71.95**	**17.82**	**3.00**	**1.78**	**0.47**	**2.06**	**2.06**	**0.84**	**---**	**100**

Millennium Way - Dock Entrance (B)

30th September, 2008

Dock Entrance to Cardiff Road(3to2)
Cardiff Road to Dock Entrance(2to3)
Millennium Way to Cardiff Road(1to2)

VALE of GLAMORGAN
BRO MORGANNWG

CARS	cars
LCV	light commercial vehicles
MCV	medium commercial vehicles
HCV 2 AXLE	heavy commercial vehicles - 2 axle
HCV 3 AXLE	heavy commercial vehicles - 3 axle
HCV 4+ AXLE	heavy commercial vehicles - 4 plus axles
BUSES	buses
MOTOR CYCLES	motor cycles
CYCLES	cycles - count NOT included in vehicle TOTALS

SITE Millennium Way - Dock Entrance (B) DATE: 30/09/08
DIR Dock Entrance to Cardiff Road(3to2) DAY Tuesday

	START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
	7.00	12	4	0	2	0	9	2	0	2	29
/	7.30	3	2	0	0	0	2	1	0	1	8
A|	7.45	9	3	0	4	0	2	1	0	0	19
M|	8.00	6	0	0	2	0	3	0	0	0	11
P|	8.15	6	4	1	2	1	1	0	0	0	15
E|	8.30	3	4	1	0	0	3	0	0	0	11
A|	8.45	4	2	1	2	2	4	0	0	1	15
K|	9.00	9	11	0	2	0	5	0	0	0	27
\	9.15	7	7	3	2	1	6	0	0	0	26
	9.30	15	14	3	1	0	6	0	0	0	39
	10.00	19	17	2	4	2	8	1	0	0	53
	10.30	22	19	6	1	0	7	0	0	0	55
	11.00	21	4	5	2	1	3	0	0	0	36
	11.30	30	8	5	2	3	5	1	0	0	54
	12.00	18	7	3	2	0	5	2	0	0	37
	12.30	31	6	5	1	2	7	0	0	0	52
	13.00	26	17	1	2	1	8	0	0	1	55
	13.30	15	6	0	1	1	11	2	0	0	36
	14.00	15	12	4	3	1	7	0	0	0	42
	14.30	23	9	0	2	1	8	4	0	0	47
	15.00	32	9	2	0	0	7	0	1	0	51
	15.30	30	20	1	1	3	8	1	0	1	64
/	16.00	24	4	0	0	0	1	0	0	0	29
P|	16.15	45	6	0	1	0	6	0	0	0	58
M|	16.30	36	8	1	0	0	2	0	0	0	47
P|	16.45	23	6	0	1	0	1	0	1	0	32
E|	17.00	34	2	0	1	0	4	0	0	2	41
A|	17.15	32	9	2	0	0	1	1	0	1	45
K|	17.30	21	4	0	0	1	0	0	1	0	27
\	17.45	27	5	0	0	1	1	0	1	0	35
	18.00	23	0	1	0	0	0	0	0	2	24
	18.30	17	1	1	0	0	0	1	0	2	20
PK 800 - 0900		**19**	**10**	**3**	**6**	**3**	**11**	**0**	**0**	**0**	**52**
PK 1630-1730		**125**	**25**	**3**	**2**	**0**	**8**	**1**	**1**	**3**	**165**
2 HR AM PK		**47**	**33**	**6**	**14**	**4**	**26**	**2**	**0**	**2**	**132**
2 HR PM PK		**242**	**44**	**3**	**3**	**2**	**16**	**1**	**3**	**3**	**314**
12 HOUR TOTAL		**638**	**230**	**48**	**41**	**21**	**141**	**17**	**4**	**13**	**1140**
% OF TOTAL		**55.96**	**20.18**	**4.21**	**3.60**	**1.84**	**12.37**	**1.49**	**0.35**	**---**	**100**

SITE Millennium Way - Dock Entrance (B) DATE: 30/09/08
DIR Cardiff Road to Dock Entrance(2to3) DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	61	23	0	1	2	4	1	0	4	92
7.30	29	9	2	2	1	2	0	0	3	45
7.45	40	18	3	2	1	2	0	1	5	67
8.00	30	16	1	1	1	1	1	0	0	51
8.15	24	14	1	1	0	1	0	0	0	41
8.30	13	8	2	0	0	3	0	0	1	26
8.45	20	10	1	2	1	7	0	0	0	41
9.00	12	3	4	1	1	8	3	0	0	32
9.15	17	9	0	0	0	1	0	0	0	27
9.30	15	12	1	2	0	7	1	0	0	38
10.00	26	5	1	3	0	4	0	0	0	39
10.30	28	7	2	1	0	5	0	0	0	43
11.00	22	7	0	0	1	11	0	0	0	41
11.30	19	11	5	2	0	6	1	0	0	44
12.00	12	7	2	3	0	8	0	0	0	32
12.30	18	5	2	1	1	9	0	0	0	36
13.00	30	19	1	2	0	7	0	0	0	59
13.30	19	11	1	3	1	8	0	0	1	43
14.00	17	5	4	2	1	4	1	0	0	34
14.30	10	5	4	2	1	6	1	0	0	29
15.00	20	7	2	2	0	7	0	0	0	38
15.30	17	4	0	1	0	7	0	0	0	29
16.00	4	0	0	1	0	3	0	0	0	8
16.15	8	0	0	0	0	3	1	0	0	12
16.30	4	3	0	0	0	1	0	0	0	8
16.45	17	2	0	1	0	1	0	0	0	21
17.00	8	1	0	0	0	1	0	0	0	10
17.15	2	1	0	1	0	2	0	0	0	6
17.30	5	0	0	1	0	1	0	0	0	7
17.45	6	0	0	1	0	2	0	0	0	9
18.00	4	0	0	0	0	1	0	0	0	5
18.30	9	1	0	1	0	0	0	0	0	11
PK 800 - 0900	**87**	**48**	**5**	**4**	**2**	**12**	**1**	**0**	**1**	**159**
PK 1630-1730	**31**	**7**	**0**	**2**	**0**	**5**	**0**	**0**	**0**	**45**
2 HR AM PK	**185**	**87**	**14**	**9**	**5**	**25**	**4**	**1**	**9**	**330**
2 HR PM PK	**54**	**7**	**0**	**5**	**0**	**14**	**1**	**0**	**0**	**81**
12 HOUR TOTAL	**566**	**223**	**39**	**40**	**12**	**133**	**10**	**1**	**14**	**1024**
% OF TOTAL	**55.27**	**21.78**	**3.81**	**3.91**	**1.17**	**12.99**	**0.98**	**0.10**	**---**	**100**

SITE Millennium Way - Dock Entrance (B) DATE: 30/09/08
DIR Millennium Way to Cardiff Road(1to2) DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	182	30	2	2	0	2	7	1	1	226
7.30	104	10	0	1	0	1	4	2	0	122
7.45	110	13	1	1	1	0	2	1	1	129
8.00	103	13	0	0	0	2	2	1	0	121
8.15	116	12	1	0	0	1	2	0	2	132
8.30	113	10	2	2	0	1	1	3	0	132
8.45	98	8	1	1	0	2	1	0	1	111
9.00	114	14	2	1	0	1	0	1	1	133
9.15	95	12	1	4	0	2	0	0	0	114
9.30	173	13	3	1	3	3	3	0	1	199
10.00	188	20	4	1	0	2	3	0	0	218
10.30	194	16	3	3	1	0	3	0	0	220
11.00	202	15	2	3	1	2	8	1	0	234
11.30	204	9	0	1	0	1	2	1	0	218
12.00	200	22	3	2	1	3	3	2	1	236
12.30	223	10	6	0	0	3	1	1	0	244
13.00	204	19	2	6	0	4	3	2	0	240
13.30	211	23	5	7	1	0	5	1	0	253
14.00	206	24	2	3	0	1	3	0	0	239
14.30	228	25	1	2	0	2	12	0	0	270
15.00	237	24	3	2	0	0	6	0	1	272
15.30	218	21	1	2	0	4	1	0	1	247
16.00	121	15	3	4	0	0	0	0	1	143
16.15	111	3	1	0	0	0	0	1	0	116
16.30	133	3	2	0	0	4	1	0	0	143
16.45	123	5	0	0	0	0	2	0	0	130
17.00	161	9	2	0	0	0	0	2	2	174
17.15	101	2	0	0	0	0	0	0	0	103
17.30	117	5	1	0	0	1	0	0	0	124
17.45	102	2	0	0	0	1	0	2	1	107
18.00	133	2	1	0	0	0	0	0	0	136
18.30	112	6	0	0	0	0	1	0	0	119
PK 800 - 0900	**430**	**43**	**4**	**3**	**0**	**6**	**6**	**4**	**3**	**496**
PK 1630-1730	**518**	**19**	**4**	**0**	**0**	**4**	**3**	**2**	**2**	**550**
2 HR AM PK	**853**	**92**	**8**	**10**	**1**	**10**	**12**	**8**	**5**	**994**
2 HR PM PK	**969**	**44**	**9**	**4**	**0**	**6**	**3**	**5**	**4**	**1040**
12 HOUR TOTAL	**4937**	**415**	**55**	**49**	**8**	**43**	**76**	**22**	**14**	**5605**
% OF TOTAL	**88.08**	**7.40**	**0.98**	**0.87**	**0.14**	**0.77**	**1.36**	**0.39**	**---**	**100**

Millennium Way - DockEntrance (Wimbourne Road)

30th September, 2008

To Millennium Way
From Millennium Way
Millennium Way leg 2way

VALE of GLAMORGAN
BRO MORGANNWG

CARS	cars
LCV	light commercial vehicles
MCV	medium commercial vehicles
HCV 2 AXLE	heavy commercial vehicles - 2 axle
HCV 3 AXLE	heavy commercial vehicles - 3 axle
HCV 4+ AXLE	heavy commercial vehicles - 4 plus axles
BUSES	buses
MOTOR CYCLES	motor cycles
CYCLES	cycles - count NOT included in vehicle TOTALS

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR To Millennium Way DAY Tuesday

	START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
	7.00	54	7	1	1	0	0	5	1	0	69
/	7.30	38	6	1	0	0	2	2	0	0	49
A|	7.45	63	7	1	1	0	1	1	1	0	75
M|	8.00	87	15	1	2	0	0	0	0	0	105
P|	8.15	91	28	1	3	1	0	1	1	1	126
E|	8.30	127	22	3	1	0	4	1	2	0	160
A|	8.45	117	12	4	1	0	1	7	2	0	144
K|	9.00	110	19	2	1	0	0	7	0	0	139
\	9.15	103	17	3	1	0	2	7	0	0	133
	9.30	155	24	4	3	0	5	6	0	1	197
	10.00	196	19	2	4	0	2	3	0	0	226
	10.30	163	26	7	2	1	1	3	0	0	203
	11.00	155	21	4	1	0	4	1	1	0	187
	11.30	180	15	8	1	2	4	0	0	0	210
	12.00	169	13	7	6	0	4	3	1	0	203
	12.30	205	17	9	3	3	5	4	1	0	247
	13.00	211	31	0	4	0	3	0	0	0	249
	13.30	215	33	1	6	1	1	4	1	0	262
	14.00	193	30	3	2	1	6	1	1	0	237
	14.30	190	33	1	3	1	1	2	2	2	233
	15.00	221	27	3	1	0	1	1	2	0	256
	15.30	240	29	6	1	1	4	4	0	0	285
/	16.00	142	15	4	1	0	3	5	1	1	171
P|	16.15	145	14	2	0	0	0	6	4	2	171
M|	16.30	148	11	2	0	0	1	2	3	1	167
P|	16.45	165	9	1	1	0	1	3	3	0	183
E|	17.00	208	9	1	1	0	1	3	0	3	223
A|	17.15	161	8	1	1	1	0	3	1	0	176
K|	17.30	155	4	1	1	1	1	0	1	0	164
\	17.45	155	3	2	0	0	0	0	0	1	160
	18.00	242	15	2	0	0	1	3	2	2	265
	18.30	186	6	1	0	0	1	1	0	3	195
PK 800 - 0900		**422**	**77**	**9**	**7**	**1**	**5**	**9**	**5**	**0**	**535**
PK 1630-1730		**682**	**37**	**5**	**3**	**1**	**3**	**11**	**7**	**4**	**749**
2 HR AM PK		**736**	**126**	**16**	**10**	**1**	**10**	**26**	**6**	**1**	**931**
2 HR PM PK		**1279**	**73**	**14**	**5**	**2**	**7**	**22**	**13**	**8**	**1415**
12 HOUR TOTAL		**4990**	**545**	**89**	**53**	**13**	**60**	**89**	**31**	**17**	**5870**
% OF TOTAL		**85.01**	**9.28**	**1.52**	**0.90**	**0.22**	**1.02**	**1.52**	**0.53**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR From Millennium Way DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	220	37	5	2	0	2	8	1	3	275
7.30	144	20	1	1	0	1	5	2	1	174
7.45	163	22	3	1	1	1	9	2	1	202
8.00	150	22	6	0	0	3	2	1	0	184
8.15	171	24	1	1	0	1	2	0	2	200
8.30	156	14	2	2	0	1	2	3	0	180
8.45	127	10	1	2	0	3	2	0	1	145
9.00	135	23	2	1	0	1	1	1	1	164
9.15	112	20	2	4	1	2	2	0	0	143
9.30	195	28	4	1	3	4	3	0	1	238
10.00	206	25	5	2	0	3	3	0	0	244
10.30	217	24	4	3	1	0	4	0	0	253
11.00	227	17	5	4	2	2	8	1	0	266
11.30	220	19	1	1	0	2	2	1	0	246
12.00	225	26	5	3	1	5	3	2	2	270
12.30	251	12	6	3	0	4	1	2	0	279
13.00	234	27	2	9	1	8	4	2	0	287
13.30	233	33	7	9	1	2	6	3	0	294
14.00	228	36	3	3	1	1	4	1	0	277
14.30	245	30	1	2	1	5	13	0	0	297
15.00	260	32	4	3	0	1	7	2	1	309
15.30	255	31	4	3	0	4	1	2	1	300
16.00	132	16	4	6	0	0	0	0	1	158
16.15	124	7	1	1	0	1	0	1	0	135
16.30	145	5	3	0	0	5	1	0	0	159
16.45	137	7	1	0	0	0	3	0	0	148
17.00	177	10	2	0	0	0	1	2	2	192
17.15	113	4	0	0	0	1	0	0	0	118
17.30	133	8	1	0	0	1	0	0	0	143
17.45	106	5	0	1	0	1	0	2	1	115
18.00	140	4	1	0	0	0	0	0	0	145
18.30	123	7	0	0	0	0	1	0	0	131
PK 800 - 0900	**604**	**70**	**10**	**5**	**0**	**8**	**8**	**4**	**3**	**709**
PK 1630-1730	**572**	**26**	**6**	**0**	**0**	**6**	**5**	**2**	**2**	**617**
2 HR AM PK	**1158**	**155**	**18**	**12**	**2**	**13**	**25**	**9**	**6**	**1392**
2 HR PM PK	**1067**	**62**	**12**	**8**	**0**	**9**	**5**	**5**	**4**	**1168**
12 HOUR TOTAL	**5704**	**605**	**87**	**68**	**13**	**65**	**98**	**31**	**18**	**6671**
% OF TOTAL	**85.50**	**9.07**	**1.30**	**1.02**	**0.19**	**0.97**	**1.47**	**0.46**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR Millennium Way leg 2way DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	274	44	6	3	0	2	13	2	3	344
7.30	182	26	2	1	0	3	7	2	1	223
7.45	226	29	4	2	1	2	10	3	1	277
8.00	237	37	7	2	0	3	2	1	0	289
8.15	262	52	2	4	1	1	3	1	3	326
8.30	283	36	5	3	0	5	3	5	0	340
8.45	244	22	5	3	0	4	9	2	1	289
9.00	245	42	4	2	0	1	8	1	1	303
9.15	215	37	5	5	1	4	9	0	0	276
9.30	350	52	8	4	3	9	9	0	2	435
10.00	402	44	7	6	0	5	6	0	0	470
10.30	380	50	11	5	2	1	7	0	0	456
11.00	382	38	9	5	2	6	9	2	0	453
11.30	400	34	9	2	2	6	2	1	0	456
12.00	394	39	12	9	1	9	6	3	2	473
12.30	456	29	15	6	3	9	5	3	0	526
13.00	445	58	2	13	1	11	4	2	0	536
13.30	448	66	8	15	2	3	10	4	0	556
14.00	421	66	6	5	2	7	5	2	0	514
14.30	435	63	2	5	2	6	15	2	2	530
15.00	481	59	7	4	0	2	8	4	1	565
15.30	495	60	10	4	1	8	5	2	1	585
16.00	274	31	8	7	0	3	5	1	2	329
16.15	269	21	3	1	0	1	6	5	2	306
16.30	293	16	5	0	0	6	3	3	1	326
16.45	302	16	2	1	0	1	6	3	0	331
17.00	385	19	3	1	0	1	4	2	5	415
17.15	274	12	1	1	1	1	3	1	0	294
17.30	288	12	2	1	1	2	0	1	0	307
17.45	261	8	2	1	0	1	0	2	2	275
18.00	382	19	3	0	0	1	3	2	2	410
18.30	309	13	1	0	0	1	2	0	3	326
PK 800 - 0900	**1026**	**147**	**19**	**12**	**1**	**13**	**17**	**9**	**4**	**1244**
PK 1630-1730	**1254**	**63**	**11**	**3**	**1**	**9**	**16**	**9**	**6**	**1366**
2 HR AM PK	**1894**	**281**	**34**	**22**	**3**	**23**	**51**	**15**	**7**	**2323**
2 HR PM PK	**2346**	**135**	**26**	**13**	**2**	**16**	**27**	**18**	**12**	**2583**
12 HOUR TOTAL	**10694**	**1150**	**176**	**121**	**26**	**125**	**187**	**62**	**35**	**12541**
% OF TOTAL	**85.27**	**9.17**	**1.40**	**0.96**	**0.21**	**1.00**	**1.49**	**0.49**	**---**	**100**

Millennium Way - DockEntrance (Wimbourne Road)

30th September, 2008

To Cardiff Road
From Cardiff Road
Cardiff Road leg 2way

VALE of GLAMORGAN
BRO MORGANNWG

CARS	cars
LCV	light commercial vehicles
MCV	medium commercial vehicles
HCV 2 AXLE	heavy commercial vehicles - 2 axle
HCV 3 AXLE	heavy commercial vehicles - 3 axle
HCV 4+ AXLE	heavy commercial vehicles - 4 plus axles
BUSES	buses
MOTOR CYCLES	motor cycles
CYCLES	cycles - count NOT included in vehicle TOTALS

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR To Cardiff Road DAY Tuesday

	START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
	7.00	194	34	2	4	0	11	9	1	3	255
/	7.30	107	12	0	1	0	3	5	2	1	130
A|	7.45	119	16	1	5	1	2	3	1	1	148
M|	8.00	109	13	0	2	0	5	2	1	0	132
P|	8.15	122	16	2	2	1	2	2	0	2	147
E|	8.30	116	14	3	2	0	4	1	3	0	143
A|	8.45	102	10	2	3	2	6	1	0	2	126
K|	9.00	123	25	2	3	0	6	0	1	1	160
\	9.15	102	19	4	6	1	8	0	0	0	140
	9.30	188	27	6	2	3	9	3	0	1	238
	10.00	207	37	6	5	2	10	4	0	0	271
	10.30	216	35	9	4	1	7	3	0	0	275
	11.00	223	19	7	5	2	5	8	1	0	270
	11.30	234	17	5	3	3	6	3	1	0	272
	12.00	218	29	6	4	1	8	5	2	1	273
	12.30	254	16	11	1	2	10	1	1	0	296
	13.00	230	36	3	8	1	12	3	2	1	295
	13.30	226	29	5	8	2	11	7	1	0	289
	14.00	221	36	6	6	1	8	3	0	0	281
	14.30	251	34	1	4	1	10	16	0	0	317
	15.00	269	33	5	2	0	7	6	1	1	323
	15.30	248	41	2	3	3	12	2	0	2	311
/	16.00	145	19	3	4	0	1	0	0	1	172
P|	16.15	156	9	1	1	0	6	0	1	0	174
M|	16.30	169	11	3	0	0	6	1	0	0	190
P|	16.45	146	11	0	1	0	1	2	1	0	162
E|	17.00	195	11	2	1	0	4	0	2	4	215
A|	17.15	133	11	2	0	0	1	1	0	1	148
K|	17.30	138	9	1	0	1	1	0	1	0	151
\	17.45	129	7	0	0	1	2	0	3	1	142
	18.00	156	2	2	0	0	0	0	0	2	160
	18.30	129	7	1	0	0	0	2	0	2	139
PK 800 - 0900		**449**	**53**	**7**	**9**	**3**	**17**	**6**	**4**	**0**	**548**
PK 1630-1730		**643**	**44**	**7**	**2**	**0**	**12**	**4**	**3**	**5**	**715**
2 HR AM PK		**900**	**125**	**14**	**24**	**5**	**36**	**14**	**8**	**7**	**1126**
2 HR PM PK		**1211**	**88**	**12**	**7**	**2**	**22**	**4**	**8**	**7**	**1354**
12 HOUR TOTAL		**5575**	**645**	**103**	**90**	**29**	**184**	**93**	**26**	**27**	**6745**
% OF TOTAL		**82.65**	**9.56**	**1.53**	**1.33**	**0.43**	**2.73**	**1.38**	**0.39**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR From Cardiff Road DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	108	30	1	2	2	4	6	0	4	153
7.30	60	15	3	2	1	4	1	0	3	86
7.45	91	24	3	2	1	3	1	2	5	127
8.00	104	29	1	2	1	1	1	0	0	139
8.15	108	35	2	4	1	1	0	1	1	152
8.30	128	25	5	1	0	5	1	2	1	167
8.45	123	17	3	2	1	8	7	1	0	162
9.00	108	19	6	2	1	8	9	0	0	153
9.15	110	18	2	1	0	2	4	0	0	137
9.30	152	29	4	4	0	9	6	0	1	204
10.00	191	18	3	5	0	6	3	0	0	226
10.30	172	28	8	1	1	5	3	0	0	218
11.00	165	17	3	1	1	13	0	1	0	201
11.30	181	22	10	3	2	10	1	0	0	229
12.00	154	17	7	8	0	12	3	1	0	202
12.30	191	15	10	3	3	12	4	1	0	239
13.00	217	43	1	5	0	10	0	0	0	276
13.30	205	34	2	7	1	8	3	1	1	261
14.00	188	30	5	4	2	7	1	1	0	238
14.30	172	32	4	5	1	7	3	0	2	224
15.00	191	23	4	3	0	8	1	0	0	230
15.30	226	23	5	2	1	10	3	0	0	270
16.00	116	13	4	2	0	5	5	1	1	146
16.15	123	10	1	0	0	3	6	4	1	147
16.30	114	11	1	0	0	1	1	3	1	131
16.45	159	8	1	2	0	2	3	2	0	177
17.00	169	7	0	0	0	2	3	0	2	181
17.15	130	5	1	2	1	2	2	0	0	143
17.30	143	3	0	2	1	2	0	1	0	152
17.45	134	3	1	1	0	2	0	0	0	141
18.00	235	14	1	0	0	2	3	2	1	257
18.30	186	7	1	1	0	1	1	0	3	197
PK 800 - 0900	**463**	**106**	**11**	**9**	**3**	**15**	**9**	**4**	**2**	**620**
PK 1630-1730	**572**	**31**	**3**	**4**	**1**	**7**	**9**	**5**	**3**	**632**
2 HR AM PK	**832**	**182**	**25**	**16**	**6**	**32**	**24**	**6**	**10**	**1123**
2 HR PM PK	**1088**	**60**	**9**	**9**	**2**	**19**	**20**	**11**	**5**	**1218**
12 HOUR TOTAL	**4854**	**624**	**103**	**79**	**22**	**175**	**85**	**24**	**27**	**5966**
% OF TOTAL	**81.36**	**10.46**	**1.73**	**1.32**	**0.37**	**2.93**	**1.42**	**0.40**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR Cardiff Road leg 2way DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	302	64	3	6	2	15	15	1	7	408
7.30	167	27	3	3	1	7	6	2	4	216
7.45	210	40	4	7	2	5	4	3	6	275
8.00	213	42	1	4	1	6	3	1	0	271
8.15	230	51	4	6	2	3	2	1	3	299
8.30	244	39	8	3	0	9	2	5	1	310
8.45	225	27	5	5	3	14	8	1	2	288
9.00	231	44	8	5	1	14	9	1	1	313
9.15	212	37	6	7	1	10	4	0	0	277
9.30	340	56	10	6	3	18	9	0	2	442
10.00	398	55	9	10	2	16	7	0	0	497
10.30	388	63	17	5	2	12	6	0	0	493
11.00	388	36	10	6	3	18	8	2	0	471
11.30	415	39	15	6	5	16	4	1	0	501
12.00	372	46	13	12	1	20	8	3	1	475
12.30	445	31	21	4	5	22	5	2	0	535
13.00	447	79	4	13	1	22	3	2	1	571
13.30	431	63	7	15	3	19	10	2	1	550
14.00	409	66	11	10	3	15	4	1	0	519
14.30	423	66	5	9	2	17	19	0	2	541
15.00	460	56	9	5	0	15	7	1	1	553
15.30	474	64	7	5	4	22	5	0	2	581
16.00	261	32	7	6	0	6	5	1	2	318
16.15	279	19	2	1	0	9	6	5	1	321
16.30	283	22	4	0	0	7	2	3	1	321
16.45	305	19	1	3	0	3	5	3	0	339
17.00	364	18	2	1	0	6	3	2	6	396
17.15	263	16	3	2	1	3	3	0	1	291
17.30	281	12	1	2	2	3	0	2	0	303
17.45	263	10	1	1	1	4	0	3	1	283
18.00	391	16	3	0	0	2	3	2	3	417
18.30	315	14	2	1	0	1	3	0	5	336
PK 800 - 0900	**912**	**159**	**18**	**18**	**6**	**32**	**15**	**8**	**6**	**1168**
PK 1630-1730	**1215**	**75**	**10**	**6**	**1**	**19**	**13**	**8**	**8**	**1347**
2 HR AM PK	**1732**	**307**	**39**	**40**	**11**	**68**	**38**	**14**	**17**	**2249**
2 HR PM PK	**2299**	**148**	**21**	**16**	**4**	**41**	**24**	**19**	**12**	**2572**
12 HOUR TOTAL	**10429**	**1269**	**206**	**169**	**51**	**359**	**178**	**50**	**54**	**12711**
% OF TOTAL	**82.05**	**9.98**	**1.62**	**1.33**	**0.40**	**2.82**	**1.40**	**0.39**	**---**	**100**

Millennium Way - DockEntrance (Wimbourne Road)

30th September, 2008

To The Docks
From The Docks
Docks Entrance leg 2way

CARS	cars
LCV	light commercial vehicles
MCV	medium commercial vehicles
HCV 2 AXLE	heavy commercial vehicles - 2 axle
HCV 3 AXLE	heavy commercial vehicles - 3 axle
HCV 4+ AXLE	heavy commercial vehicles - 4 plus axles
BUSES	buses
MOTOR CYCLES	motor cycles
CYCLES	cycles - count NOT included in vehicle TOTALS

VALE of GLAMORGAN
BRO MORGANNWG

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR To The Docks DAY Tuesday

	START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
	7.00	99	30	3	1	2	4	2	0	6	141
/	7.30	69	19	3	2	1	2	1	0	4	97
A|	7.45	93	27	5	2	1	3	7	2	5	140
M|	8.00	77	25	7	1	1	2	1	0	0	114
P|	8.15	79	26	1	2	0	1	0	0	0	109
E|	8.30	56	12	2	0	0	3	1	0	1	74
A|	8.45	49	12	1	3	1	8	1	0	0	75
K|	9.00	33	12	4	1	1	8	4	0	0	63
\	9.15	34	17	1	0	1	1	2	0	0	56
	9.30	37	27	2	2	0	8	1	0	0	77
	10.00	44	10	2	4	0	5	0	0	0	65
	10.30	51	15	3	1	0	5	1	0	0	76
	11.00	47	9	3	1	2	11	0	0	0	73
	11.30	35	21	6	2	0	7	1	0	0	72
	12.00	37	11	4	4	0	10	0	0	1	66
	12.30	46	7	2	4	1	10	0	1	0	71
	13.00	60	27	1	5	1	11	1	0	0	106
	13.30	41	21	3	5	1	10	1	2	1	84
	14.00	39	17	5	2	2	4	2	1	0	72
	14.30	27	10	4	2	2	9	2	0	0	56
	15.00	43	15	3	3	0	8	1	2	0	75
	15.30	54	14	3	2	0	7	0	2	0	82
/	16.00	15	1	1	3	0	3	0	0	0	23
P|	16.15	21	4	0	1	0	4	1	0	0	31
M|	16.30	16	5	1	0	0	2	0	0	0	24
P|	16.45	31	4	1	1	0	1	1	0	0	39
E|	17.00	24	2	0	0	0	1	1	0	0	28
A|	17.15	14	3	0	1	0	3	0	0	0	21
K|	17.30	21	3	0	1	0	1	0	0	0	26
\	17.45	10	3	0	2	0	2	0	0	0	17
	18.00	11	2	0	0	0	1	0	0	0	14
	18.30	20	2	0	1	0	0	0	0	0	23
PK 800 - 0900		**261**	**75**	**11**	**6**	**2**	**14**	**3**	**0**	**0**	**372**
PK 1630-1730		**85**	**14**	**2**	**2**	**0**	**7**	**2**	**0**	**0**	**112**
2 HR AM PK		**490**	**150**	**24**	**11**	**6**	**28**	**17**	**2**	**10**	**728**
2 HR PM PK		**152**	**25**	**3**	**9**	**0**	**17**	**3**	**0**	**0**	**209**
12 HOUR TOTAL		**1333**	**413**	**71**	**59**	**17**	**155**	**32**	**10**	**18**	**2090**
% OF TOTAL		**63.78**	**19.76**	**3.40**	**2.82**	**0.81**	**7.42**	**1.53**	**0.48**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR From The Docks DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	19	4	0	2	0	9	2	1	2	37
7.30	10	2	0	0	0	2	2	0	1	16
7.45	21	4	1	5	0	2	1	0	0	34
8.00	19	2	1	3	0	3	0	0	0	28
8.15	13	11	1	2	1	1	1	0	0	30
8.30	15	9	1	0	0	5	0	0	0	30
8.45	18	7	3	3	2	4	0	1	1	38
9.00	23	14	0	2	0	5	1	0	0	45
9.15	17	15	4	2	1	7	3	0	0	49
9.30	33	21	4	2	0	9	1	0	0	70
10.00	50	23	2	6	2	8	1	0	0	92
10.30	41	24	7	3	0	8	0	0	0	83
11.00	33	15	6	2	1	5	1	0	0	63
11.30	48	12	8	2	3	5	1	0	0	79
12.00	45	10	5	3	0	5	2	0	0	70
12.30	63	13	6	2	3	9	0	0	0	96
13.00	50	24	1	3	1	8	0	0	1	87
13.30	44	16	0	3	2	12	3	0	0	80
14.00	37	17	6	3	1	10	1	0	0	75
14.30	51	15	1	2	2	8	4	2	0	85
15.00	82	20	3	0	0	7	0	3	0	115
15.30	61	30	2	1	3	9	2	0	1	108
16.00	54	6	0	0	0	2	0	0	0	62
16.15	75	10	1	1	0	6	1	0	1	94
16.30	74	11	2	0	0	3	1	0	0	91
16.45	46	9	0	1	0	1	0	2	0	59
17.00	81	5	1	2	0	4	0	0	3	93
17.15	65	13	2	0	0	1	2	1	1	84
17.30	38	5	1	0	1	0	0	1	0	46
17.45	54	5	1	0	1	1	0	1	1	63
18.00	34	1	2	0	0	0	0	0	3	37
18.30	26	1	1	0	0	0	1	0	2	29
PK 800 - 0900	**65**	**29**	**6**	**8**	**3**	**13**	**1**	**1**	**1**	**126**
PK 1630-1730	**266**	**38**	**5**	**3**	**0**	**9**	**3**	**3**	**4**	**327**
2 HR AM PK	**136**	**64**	**11**	**17**	**4**	**29**	**8**	**1**	**2**	**270**
2 HR PM PK	**487**	**64**	**8**	**4**	**2**	**18**	**4**	**5**	**6**	**592**
12 HOUR TOTAL	**1340**	**374**	**73**	**55**	**24**	**159**	**31**	**12**	**17**	**2068**
% OF TOTAL	**64.80**	**18.09**	**3.53**	**2.66**	**1.16**	**7.69**	**1.50**	**0.58**	**---**	**100**

SITE Millennium Way - DockEntrance (Wimbourne Road) DATE: 30/09/08
DIR Docks Entrance leg 2way DAY Tuesday

START PERIOD	CARS	LCV	MCV	HCV 2 AXLE	HCV 3 AXLE	HCV 4+ AXLE	BUSES	MOTOR CYCLES	CYCLES	TOTAL
7.00	118	34	3	3	2	13	4	1	8	178
7.30	79	21	3	2	1	4	3	0	5	113
7.45	114	31	6	7	1	5	8	2	5	174
8.00	96	27	8	4	1	5	1	0	0	142
8.15	92	37	2	4	1	2	1	0	0	139
8.30	71	21	3	0	0	8	1	0	1	104
8.45	67	19	4	6	3	12	1	1	1	113
9.00	56	26	4	3	1	13	5	0	0	108
9.15	51	32	5	2	2	8	5	0	0	105
9.30	70	48	6	4	0	17	2	0	0	147
10.00	94	33	4	10	2	13	1	0	0	157
10.30	92	39	10	4	0	13	1	0	0	159
11.00	80	24	9	3	3	16	1	0	0	136
11.30	83	33	14	4	3	12	2	0	0	151
12.00	82	21	9	7	0	15	2	0	1	136
12.30	109	20	8	6	4	19	0	1	0	167
13.00	110	51	2	8	2	19	1	0	1	193
13.30	85	37	3	8	3	22	4	2	1	164
14.00	76	34	11	5	3	14	3	1	0	147
14.30	78	25	5	4	4	17	6	2	0	141
15.00	125	35	6	3	0	15	1	5	0	190
15.30	115	44	5	3	3	16	2	2	1	190
16.00	69	7	1	3	0	5	0	0	0	85
16.15	96	14	1	2	0	10	2	0	1	125
16.30	90	16	3	0	0	5	1	0	0	115
16.45	77	13	1	2	0	2	1	2	0	98
17.00	105	7	1	2	0	5	1	0	3	121
17.15	79	16	2	1	0	4	2	1	1	105
17.30	59	8	1	1	1	1	0	1	0	72
17.45	64	8	1	2	1	3	0	1	1	80
18.00	45	3	2	0	0	1	0	0	3	51
18.30	46	3	1	1	0	0	1	0	2	52
PK 800 - 0900	**326**	**104**	**17**	**14**	**5**	**27**	**4**	**1**	**2**	**498**
PK 1630-1730	**351**	**52**	**7**	**5**	**0**	**16**	**5**	**3**	**4**	**439**
2 HR AM PK	**626**	**214**	**35**	**28**	**10**	**57**	**25**	**3**	**12**	**998**
2 HR PM PK	**639**	**89**	**11**	**13**	**2**	**35**	**7**	**5**	**6**	**801**
12 HOUR TOTAL	**2673**	**787**	**144**	**114**	**41**	**314**	**63**	**22**	**35**	**4158**
% OF TOTAL	**64.29**	**18.93**	**3.46**	**2.74**	**0.99**	**7.55**	**1.52**	**0.53**	**---**	**100**

DISPERSION MODELLING OF EMISSIONS TO AIR FROM A PROPOSED BIOMASS POWER PLANT IN BARRY, SOUTH WALES

Prepared for

SUNRISE RENEWABLES

MARCH 2009

RSK GROUP PLC

RSK GENERAL NOTES

Project No:	660003
Title:	DISPERSION MODELLING OF EMISSIONS TO AIR FROM A PROPOSED BIOMASS PLANT IN BARRY, SOUTH WALES
Client:	Sunrise Renewables
Issue Date:	FINAL
Issuing Office:	Hemel Hempstead

Authorised by:		Project Author	Date:	20.03.2009
Authorised by:		Project QA Rep	Date:	20.03.2009

RSK EHS Ltd (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

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Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the Safety, Health, Environment and Quality (SHEQ) Management System of RSK.

EXECUTIVE SUMMARY

RSK EHS Ltd (RSK) were commissioned by Sunrise Renewables to undertake an air quality assessment for the proposed 9MW biomass plant located in Barry, South Wales. The plant has been designed to pyrolyse fuel derived from waste wood to produce syngas, which is turn is used as fuel in gas engines to generate electricity.

Air quality impacts in terms of key pollutant concentrations resulting from operation of the proposed biomass plant have been assessed using an advanced dispersion model ‘AERMOD’. The predictive assessment established that under the worst-case operational scenario, there will be no exceedence of relevant air quality standards designed for the protection of human health.

At all protected/designated ecological sites within 10 km of the proposed development, the annual average NO_X concentrations are predicted to meet the relevant air quality standard for the protection of vegetation and ecosystems.

The predicted nitrogen and acid deposition rates are less than 1% of the background deposition rate. Where exceedence of critical nitrogen deposition load was identified, such exceedences are due to predominant background deposition rates and the highest process contribution at such locations is less than 1% of the lower critical load.

Following the comments from the Vale of Glamorgan Council on the draft air quality assessment report for the proposed development, in-combination impacts resulting from operation of the proposed biomass plant along with the nearby proposed Biogen gasification facility have also been assessed. The cumulative assessment identified that the resulting increase in pollutant concentrations is marginal and impacts are insignificant.

Air quality impacts resulting from the operation of the proposed biomass plant are not considered to be significant.

Glossary

AQS	Air Quality Strategy
CO	Carbon monoxide
EU	European Union
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
Hg	Mercury
IPPC	Integrated Pollution, Prevention & Control
NAQS	National Air Quality Strategy
NO_x	Oxides of nitrogen
NO_2	Nitrogen dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TOC	Total Organic Carbon

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1. INTRODUCTION

1.1 Scope

RSK Environment, Health and Safety Ltd (RSK) were commissioned by Sunrise Renewables to undertake an air quality impact assessment of combustion emissions from a proposed 9 MWe biomass power plant in Barry, South Wales. The plant has been designed to pyrolyse fuel derived from waste wood to produce syngas, which is turn is used as fuel in gas engines to generate electricity. Detailed dispersion modelling of stack emissions from the proposed plant was undertaken in response to comments by the relevant local authority, the Vale of Glamorgan Council (VGC), to identify potential air quality impacts. In particular, the potential impact of operational emissions on local residential and ecological receptors, including Sites of Special Scientific Interest (SSSI).

VGC made the following comments on the air quality aspects of the proposed development.

"Specific details on the types and sources of wood to be used as fuel including details on the quality control of the feedstock (with reference to the potential impact on emissions to air).

Details of all point source and fugitive emissions to air, including stack height calculations, stack dimensions and characteristics (e.g. flow, temp, efflux velocity).

Details on the types and considerations of emissions from all sources including products of combustion and those attributable to varying wood quality sources. Details should be provided of expected emissions during abnormal operating conditions (e.g. start-up, emergency situations). This information should be combined with an impact assessment on local air quality which should include the Air Quality Objective pollutants and any other substances which have the potential to impact on the area. The assessment should take account of the elevated position of the residences on Dock View Road".

Subsequently, RSK have contacted the concerned officer on 6th January 2009 at the VGC with a proposed air quality assessment methodology. The Council's Pollution Control Officer, Mr Jon Bailes informed RSK that the proposed methodology is acceptable, subjected to the condition that additional sensitive receptor locations are included in the assessment. The abovementioned comments, along with comments on the proposed methodology from VGC have been taken into account in assessing the air quality impacts. The comments concerning the types and sources of wood have been addressed in the main application document and hence not reported here. Elevated position of the residences on Dock View Road has been taken into account by using terrain elevation data in the air dispersion modelling.

RSK have completed the air quality assessment for the proposed development after taking the aforementioned comments from the VGC and submitted the assessment report. The Principal Planning Officer (Development Control) at the VGC, Mr. Steve Ball has suggested on 13th March 2009 that in-combination impacts of operation of the proposed biomass plant along with the nearby Biogen gasification plant should also be assessed. RSK have predicted the in-combination impacts and the outcomes of this cumulative impact assessment are included in this report.

The dispersion modelling assessment, the outcomes of which are presented in this report, takes into account, and includes a discussion of, the following key parameters/elements. It should be noted that the results presented in the main report are based on a stack height of 20 m. A full stack height appraisal is presented in Appendix 1.

- Ambient/background levels;
- Assessment criteria;
- Emission parameters;
- Modelling domain/receptors;
- Meteorology/surface characteristics;
- Influence of buildings;
- Sensitivity analysis;
- Cumulative impact assessment;
- Assumptions relating to pollutant conversion processes (e.g. NO_x/NO_2 photochemistry) for different averaging periods;
- Results in tabular form, identifying environmental concentrations (process plus background) in comparison with relevant assessment criteria and locations of maximum air quality impacts and the process contribution to this; and,
- Contour plots of predicted NO_X/NO_2, SO_2 and CO ground level concentrations (GLCs).

1.2 Site Description

The proposed 9 MWe biomass power plant will be located within the administrative boundary of the Vale of Glamorgan Council (VGC). Specifically, the power plant will be situated at the junction of Woodham Road and David Davies Road, Barry Docks, Barry, South Wales, as shown below in Figure 1-1. The national grid reference for the approximate centre of the site is 312467, 167668.

Figure 1-1: Location of Proposed Biomass Plant

2. ASSESSMENT METHODOLOGY

2.1 Legislation and Assessment Criteria

UK air quality policy is published under the umbrella of the Environment Act, 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air, published in July 2007, sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2010.

The air quality standards in the UK are derived from European Commission (EC) Directives. The EU Air Quality Framework Directive (1996)[(1)] established a framework under which the EU could set limit or target values for specified pollutants. The Directive identified twelve pollutants for which limit or target values have or will be set in subsequent Daughter Directives. The first of these Daughter Directives[(2)], relating to sulphur dioxide (SO_2), fine particles (PM_{10}), oxides of nitrogen (NO_x) and lead (Pb), was formally adopted in April 1999, and was required to be implemented by all Member States by July 2001.

Relevant regulations applicable in Wales include:

- The Air Quality (Wales) Regulations 2000 (S.I. 2000/1940) (W.138);
- The Air Quality (Amendment) (Wales) Regulations 2002 (S.I. 2002/3182) (W.298);
- The Air Quality Limit Values (Wales) Regulations 2001 (S.I. 2001/2683) (W.224);
- Air Quality Limit Values (Wales) Regulations 2002 (S.I. 2002/3183) (W.299);
- The Air Quality (Ozone) (Wales) Regulations 2003 (S.I. 2003/1848) (W.198);
- The Air Quality Limit Values Regulations (2003) (S.I. 2003/2121);
- The Air Quality Limit Values (Wales) (Amendment) Regulations 2005 (S.I. 2005/1157) (W.74); and,
- The Air Quality Standards (Wales) Regulations (2007) (S.I. 2007/717) (W.63).

[1] Council Directive 1996/62/EC Framework Directive on Ambient Air Quality Assessment and Management 27 Sept 1996.

[2] Council Directive 1999/30/EC of 22 April 1999 relating to limit values for SO_2, NO_2, NO_X, particulate matter and lead in ambient air.

The primary emission components of concern resulting from the combustion of syngas in the proposed power plant are considered to be nitrogen oxides (NO_x), sulphur dioxide (SO_2), fine particles (PM_{10}) and carbon monoxide (CO). These parameters are subject to the air quality objectives set out in the UK National Air Quality Strategy (NAQS), as presented below in Table 2-1. Other emissions including dioxins, hydrogen chloride (HCl), hydrogen fluoride (HF) and mercury (Hg) are not considered to be significant.

In addition to the UK NAQS, the Environment Agency's Integrated Pollution Prevention and Control Horizontal Guidance Note 1 (IPPC H1, 2003) provides environmental benchmarks for the protection of human health for hydrogen chloride (HCl), hydrogen fluoride (HF) and mercury (Hg) as identified in Table 2-2. Both HCl and HF have the potential to contribute to acid deposition effects. No guideline level is available for dioxins.

Table 2-1: UK National Air Quality Strategy Objectives

Emission Parameter	Intention	Period of Exposure	Air Quality Objective	Attainment Date
NO_2	Protection of human health	1-hour mean	200 µg/m³ not to be exceeded more than 18 times per calendar year (99.79th percentile)	31 December 2005
	Protection of human health	Annual mean	40 µg/m³	31 December 2005
NO_x	Protection of ecosystem health	Annual mean	30 µg/m³	31 December 2000
CO	Protection of human health	Running 8-hour mean	10 mg/m³	1 December 2003
Particles PM_{10}	Protection of human health	24-hour mean	50 µg/m³	31 December 2004
	Protection of human health	Annual mean	40 µg/m³	31 December 2004
SO_2	Protection of human health	15-min mean	266 µg/m³	31 December 2005
	Protection of human health	1-hour mean	350 µg/m³	31 December 2004
	Protection of human health	24-hour mean	125 µg/m³	31 December 2004
	Protection of ecosystem health	Annual mean	20 µg/m³	31 December 2000

Table 2-2 Environmental Benchmarks for HCl and HF

Emission Parameter	Intention	Period of Exposure	Air Quality Objective
HCl	Protection of human health	1-hour mean	800 µg/m³
		Annual mean	20 µg/m³
HF	Protection of human health	1-hour mean	250 µg/m³
Hg	Protection of human health	1-hour mean	7.5 µg/m³
	Protection of human health	Annual mean	0.25 µg/m³

2.2 Baseline Air Quality

2.2.1 UK Air Quality Archive Data

The UK Air Quality Archive, which is maintained by AEA on behalf of DEFRA (Department for Environment, Food and Rural Affairs) and the devolved administrations, provides predicted background air quality maps that can be used in air quality modelling studies to represent background concentrations of pollutants of concern. The maps combine air quality monitoring data with the output from predictive modelling, which includes emissions from arterial roads and major industries, to provide predicted background pollutant concentrations on a 1 km by 1 km grid basis across the UK.

Predicted/mapped background air quality at the biomass plant site for the base case year of 2008 and the anticipated opening year of 2010 is presented below in Table 2-3. Background NO_x, NO_2 and PM_{10} data for 2008 and 2010 were appropriately adjusted from 2005 base data using the Year Adjustment Calculator (also available at the UK Air Quality Archive). Background CO concentrations for 2008 and 2010 were adjusted from 2001 base data. The background SO_2 concentration for 2008 and 2010 was obtained from 2001 base data. No year conversion factors were available for this parameter.

Background concentrations of pollutants of concern are well below the national air quality standards protective of human health. Furthermore, background concentrations are predicted to fall over time at the proposed site.

Table 2-3 Estimated/Mapped Annual Average Background Pollutant Concentrations (µg /m^3)

Pollutant	2008	2010	Air Quality Objective
Nitrogen Dioxide (NO_2)	14.7	12.1	40
Nitrogen Oxides (NO_X)	16.6	15.4	30
Carbon Monoxide (CO)	127.8	113.5	10,000
Sulphur Dioxide (SO_2)	3.6	3.6	20
Particles (PM_{10})	15.5	15.3	40

Notes: NO_X air quality objective is set for the protection of vegetation and ecosystems only; presented concentrations are for 1 km by 1 km grid square centred at grid reference: 312500, 167500 (approximate location of centre of the site: 312647, 167668).

2.2.2 Local Authority Air Quality Review and Assessment

As required by the Environment Act 1995, local authorities are obligated to review and assess air quality with respect to the standards and objectives for the pollutants specified in the Government's National Air Quality Strategy (NAQS). Local authorities are required to carry out an Updating and Screening Assessment (USA) of their area every three years. If the USA identifies potential hotspot areas where air quality objectives are likely to be exceeded, then a detailed assessment of those areas is required. Where objectives are not predicted to be met, local authorities must declare the area as an Air Quality Management Area (AQMA). In addition, local authorities are required to produce an Air Quality Action Plan (AQAP), which includes measures to improve air quality within the AQMA.

The Vale of Glamorgan Council (VGC), the relevant local authority, has reviewed air quality within its administrative boundary, and has not declared any AQMAs. Passive diffusion tube and automatic air quality monitoring is carried out within the VGC area. The nearest passive and automatic monitoring locations to the proposed biomass power plant site are described below:

- Rurally located automatic monitoring station (Vale of Glamorgan Fonmon) situated approximate 6 km west of the proposed biomass plant in a car park next to the Highwayman Inn, Rhoose. This monitoring station is part of the Welsh Automatic Rural Pollution Monitoring Network; and,

- An intermediate NO_2 diffusion tube site located at St. Teilo Avenue, Barry (approximately 1.5 km north of the proposed biomass plant).

Table 2-4 below presents 2007 annual average NO_X, NO_2, SO_2 and PM_{10} data as measured at the two monitoring stations. Relevant air quality objectives were met at both sites in 2007.

Table 2-4 2007 Annual Average Air Quality Monitoring Data from the Vale of Glamorgan Fonmon Automatic Monitoring Station and the St. Teilo Avenue Diffusion Tube Monitoring Site

Monitoring Locations	2007 Annual Average NO_x Concentration ($\mu g/m^3$)	2007 Annual Average NO_2 Concentration ($\mu g/m^3$)	2007 Annual Average SO_2 Concentration ($\mu g/m^3$)	2007 Annual Average PM_{10} Concentration ($\mu g/m^3$)
Vale of Glamorgan Fonmon Automatic Station	16.4	11.9	3.6	19.6
Diffusion Tune at St. Teilo Avenue	No Data	17.0	No Data	No Data
Air Quality Objectives	30	40	20	40

2.2.3 Background Air Quality Data Included in the Assessment

Table 2-5 below summarises the background air quality data employed in the dispersion modelling assessment. Estimated (2010) annual average pollutant concentrations are derived from a combination of sources, including the UK Air Quality Archive and the nearest automatic and diffusion tube monitoring stations to the proposed biomass plant. Where appropriate, the data have been adjusted for the future year of 2010 by applying relevant LAQM TG(03) year adjustment factors.

Table 2-5 Estimated 2010 Annual Average Pollutant Concentrations

	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	CO ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
UK Air Quality Archive	15.4	12.1	15.3	**113.5**	3.6
Vale of Glamorgan Fonmon Automatic Station	14.3	10.9	**18.5**	-	**3.6**
St. Teilo NO_2 Diffusion Tube	**19.9 (derived from NO_2 measurement)**	**15.2**	-	-	-

In this assessment, the 2010 annual average background CO concentration obtained from the UK Air Quality Archive was used. 2010 annual average background PM_{10} and SO_2 concentrations were derived from the 2007 VGC Fonmon automatic monitoring station data. The 2010 background NO_2 concentration was derived from the 2007 St. Teilo Avenue diffusion tube data. The 2010 background NO_X concentration employed in the assessment was derived from the 2007 St. Teilo Avenue NO_2 diffusion tube data by multiplying the annual average NO_2 concentration by the NO_x/NO_2 ratio from the VCG Fonmon automatic monitoring station, which is 1.31 (14.3 µg/m^3/10.9 µg/m^3). No background concentrations of dioxins, HCl, HF and Hg are available, however, background concentrations of these pollutants are considered to be negligible.

2.3 Model Description

AERMOD is a state-of-the-science dispersion modelling system that simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. It is based on atmospheric boundary layer turbulence structure and scaling concepts, including treatment of multiple ground-level and elevated point, area and volume sources. It handles flat, complex, rural or urban terrain and includes algorithms for building effects and plume penetration of inversions aloft. It uses Gaussian dispersion for stable atmospheric conditions (i.e. low turbulence) and non-Gaussian dispersion for unstable conditions (i.e. high turbulence).

AERMOD includes two data pre-processors for streamlining data input. AERMET, a meteorological pre-processor, computes boundary layer and other necessary parameters for use with AERMOD and accepts data from both on-site and off-site sources. AERMAP is a terrain pre-processor that simplifies the computation of receptor elevations and effective height scales for numerous types of digital data formats, including USGS 1 Degree and 7.5 minute digital elevation model (DEM) files and U.K. Ordnance Survey® digital elevation data.

Breeze AERMOD GIS Pro v.7.0.21 was used in this study for assessing potential air quality impacts. The model is considered by the UK Environment Agency to be appropriate for assessments of the nature described in this report.

2.4 Emission Source Parameters

The only significant source of emissions to air from:

- 1 X 9 MWe Biomass Plant (fuel: syngas derived from waste wood).

As the proposed biomass plant utilizes waste wood, emissions from the plant should be compliant of the Waste Incineration Directive (WID)[3]. The maximum emission releases stipulated by WID are identified in Table 2-6.

Table 2-6 Emission Limit Values Stipulated By the Waste Incineration Directive

Pollutant	Emission Limit Value†, mg Nm^{-3}
Nitrogen oxides (expressed as nitrogen dioxide)	200
Particulate Matter (PM10)	10
Sulphur dioxide	50
Carbon monoxide	50
Hydrogen chloride	10
Hydrogen fluoride	1
Mercury compounds (expressed as mercury)	0.05
Dioxins and Furans	0.1 ng m^{-3}

†Note: The reported values are at temperature 273°K, pressure 101.3 kPa, 11% oxygen and dry gas conditions and refer to the daily average concentration limit values.

2.4.1 Pollutant Emission Concentrations From A Similar Plant

For a similar plant of capacity 3 MW electricity generation capacity (Rhymney Organic Regeneration Facility, Hudol Thermal Treatment Unit 15, Capital Valley Industrial Estate, Rhymney, Caerphilly, NP22 5PT; The plant gasifies a range of biomass and oily sludge wastes), the Environment Agency stipulated the pollutant emission limit values identified in Table 2-7 for the key air pollutants.

Table 2-7 Pollutant Emission Concentrations Stipulated By The UK Environment Agency For Rhymney Organic Regeneration Facility

Pollutant	Pollutant Emission Concentration, mg m^{-3}	
	Daily Average Limit	Half-hourly Average Limit
Nitrogen oxides (expressed as nitrogen dioxide) (NO_X)	90	100
Particulate Matter (PM_{10})	7	10
Sulphur dioxide (SO_2)	20	30
Carbon monoxide (CO)	10	15
Hydrogen Chloride (HCl)	1	16
Hydrogen Fluoride (HF)	1	4
Mercury (Hg)	0.05 mg m-3 (Average over a period of 30 minutes and 8 hours)	
Dioxins and Furans	0.1 ng m-3 (Average over a period of 6 and 8 hours)	

Source: Draft Permit With Introductory Note (Permit Number ZP3535MW) Issued by the UK Environment Agency.

Whilst the emissions from the proposed development are similar that identified in Table 2-7 (for a similar plant), the proposed plant will be WID compliant. To conservatively assess the air quality impacts, higher of the daily average pollutant emission concentrations (that stipulated by WID as

[3] WID: The Directive on the Incineration of Waste. Also, the Environmental Permitting Guidance, Environmental Permitting (England and Wales) Regulations 2007, Department for Environment Food and Rural Affairs (DEFRA), http://www.defra.gov.uk .

identified in Table 2-6) have been included in the assessment. The emission parameters included in the dispersion modelling study are summarised below in Table 2-8.

Table 2-8: Emission Parameters for Sources Included in the Dispersion Model

Emission Source	**Biomass Plant**
Source Location (Easting, Northing)	312647, 167668
Stack Height, m (from ground level)	20
Stack Diameter, m	0.9
Efflux Temperature, deg K	598
Efflux Velocity, m/s	14
Pollutant Emission Concentrations, mg Nm^{-3}	
Nitrogen oxides NO_X (expressed as nitrogen dioxide, NO_2)	200
Particulate Matter (PM10)	10
Sulphur dioxide	50
Carbon monoxide	50
Hydrogen chloride	10
Hydrogen fluoride	1
Mercury compounds (expressed as mercury)	0.05
Dioxins and Furans	0.1 ng m^{-3}
Pollutant Emission Rates, g/s	
NO_X	0.8132
PM_{10}	0.0407
SO_2	0.2033
CO	0.2033
HCl	0.0407
HF	0.0041
Hg	0.0002
Dioxins and Furans	4.07×10^{-10}

Maintenance of a log of all abnormal operations and associated emissions to air will be a requirement of the Environmental Permit issued and regulated by the Environment Agency. The log will be completed during the operational phase of the development.

2.5 Modelled Scenario

In order to characterise potential worst-case air quality impacts resulting from emissions from the power plant stack, it was assumed that the plant was operating continuously throughout the year. This is considered appropriate to capture the variation in meteorological conditions over a given year and, therefore, worst-case dispersion profiles.

2.6 Modelled Domain

Two grid domains (far-field and near-field) were incorporated in the dispersion model to capture the coarse and fine scale variation in predicted pollutant concentrations with distance. Both domains were approximately centred on the proposed power plant site. The far-field domain covered an area of approximately 20 km by 20 km, and had a grid resolution/spacing of 250 m. The near-field domain covered an area of approximately 3 km by 3 km and had a grid resolution/spacing of 30 m. The grid reference of the southwest and northeast corner of each grid domain is identified below in Table 2-9.

Table 2-9 Extent of Modelled Grid Domains

Location	Far-field (20 km x 20 km coarse receptor grid; 250 m spacing)		Near-field (3 km x 3 km fine receptor grid; 30 m spacing)	
	x	y	x	y
Southwest corner of grid domain	302719.6	160157.8	311147	166168
Northeast corner of grid domain	322719.6	180157.8	314147	169168

2.7 Discrete Receptors

In addition to the near-field and far-field grid domains discussed above, pollutant concentrations were also predicted at all important/designated ecological sites within 10 km of the proposed power plant. The location of all assessed receptors included in the model are presented below in Table 2-10. The coordinates approximately represent the nearest point on the sensitive site to the proposed power plant. Existing and proposed residential properties close to the site were also included in the model.

Table 2-10 Discrete Receptors Included in the Dispersion Model

Receptor Name	Receptor Reference Number (As Included in Dispersion Model)	Designation	Grid Reference		Habitat for Nitrogen and Acid Deposition
Barry Island	1	SSSI	311182	166346	Carboniferous Limestone [1]
Cliff Wood - Golden Stairs	2	SSSI	309468	167132	Mixed Woodland
Coedydd Y Barri/Barry Woodlands	3	SSSI	309182	168632	Semi-natural Broadleaved woodland
Cog Moors	4	SSSI	315719	169204	Unimproved Grassland [2]
Cosmeston Park	5	SSSI	316826	169168	Open Water, Fem, Woodland and Remnant Limestone Grassland
Cwm Cydfin, Leckwith	6	SSSI	316433	173812	Mixed Woodland
East Aberthaw Coast	7	SSSI	305039	165703	Rocky and Sandy Shore, Shingle Spits, Saltmarsh, Relict sand Dunes and Liassic Limestone Cliffs
Ely Valley	8	SSSI	311436	175715	-
Flat Holm	9	SSSI	321755	164775	Coarse Grassland [2]
Hayes Point to Bendrick Rock	10	SSSI	312968	166811	Wave-Rippled Siltstones and Fine Sandstones [3]
Nant Whitton Woodlands	11	SSSI	306610	171633	Mixed Woodland

Receptor Name	Receptor Reference Number (As Included in Dispersion Model)	Designation	Grid Reference		Habitat for Nitrogen and Acid Deposition
Penarth Coast	12	SSSI	317505	167596	Calcareous Grassland and Cliff-top Scrub
Severn Estuary	13	SSSI	319626	172368	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Sully Island	14	SSSI	316540	166918	Rocks include a series of Breccias and Sands [3]
Severn Estuary	15	Ramsar Site and Special Protection Area	318851	168061	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Severn Estuary	16	Special Area of Conservation	318893	167958	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Severn Estuary - Sully Island	17	Important Bird Area	316540	166918	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Residential Receptor 1	18	Property near junction of Dock View Road and Castleland Street	312387	167970	-
Residential Receptor 2	19	Property near junction of Dock View Road and George Street	312460	168045	-
Residential Receptor 3	20	Property on Dyfrig Street	312073	166912	-
Residential Receptor 4	21	Property of Barry Docks Waterfront Development Phase 1	311975	167617	-
Residential Receptor 5	22	Proposed Property of Barry Docks Waterfront Development Phase 2	312356	167409	-
Residential Receptor 6	23	Property on Bendrick Road	313443	167554	-
Residential Receptor 7	24	Property on Hayes Road	313644	167729	-
Residential Receptor 8	25	Property at Residential area NE of Industrial Area	313380	168850	-

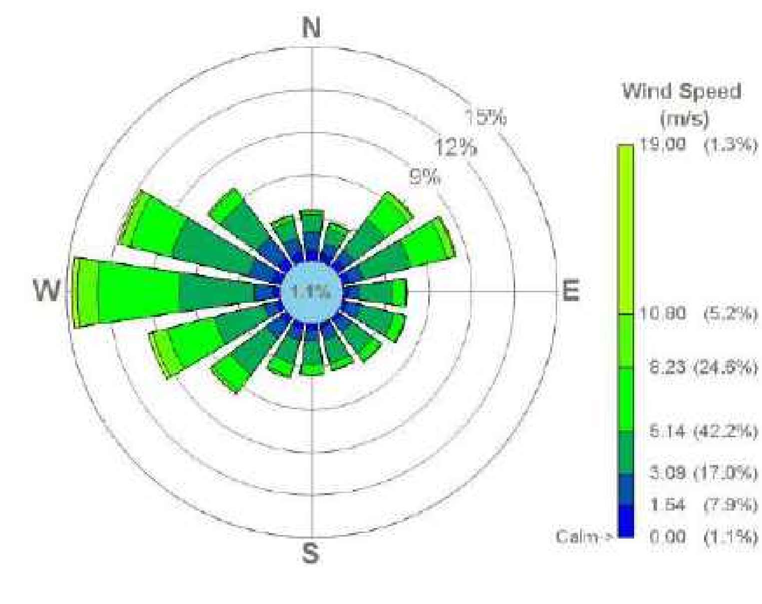
Notes: SSSI = Site of Special Scientific Interest; SAC= Special Area of Conservation; SPA = Special Protection Area.
[1]Relevant habitat not listed by Air Pollution Information Service so assumed habitat to comprise of limestone pavement.
[2]Relevant habitat not listed by Air Pollution Information Service so assumed habitat to comprise of calcareous grassland
[3]Relevant habitat not listed by Air Pollution Information Service so assumed habitat to comprise of shingle, rocks and cliffs

2.8 Meteorological Data

Five years (2003 to 2007) of hourly sequential meteorological data as measured at the Met Office's Rhoose monitoring station were employed in the dispersion model. The Rhoose monitoring station (station latitude: 51.4 N; station longitude: -3.343 W; station height: 65 m), which is approximately 7 km west of the proposed biomass plant, is the most representative monitoring station for which all meteorological parameters required for AERMOD are available.

Figure 2-1 below shows a windrose produced from data as measured at the Rhoose monitoring station between 2000 and 2007. The predominant wind direction is westerly.

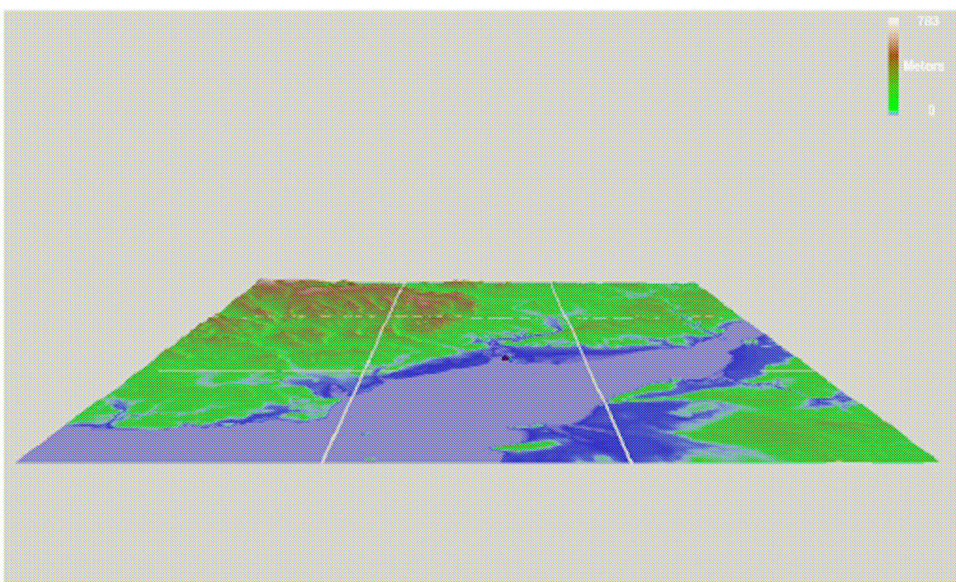
Figure 2-1: Windrose Derived from Rhoose Measurement Data (2000 to 2007)



2.8.1 Terrain

Terrain data have been included in the model to account for topographical features such as hills, which can have a significant effect on the dispersion of pollutants. Elevated position of residential properties on Dock View Road have hence been taken into account.

Figure 2-2: Terrain Included In The Dispersion Model



2.8.2 Surface Characteristics Input to the Dispersion Model

The most influential surface characteristic on pollutant dispersion is the surface roughness length. A value for surface roughness is applied to the model to characterise the effect of the surrounding terrain on the turbulence of near-surface flows. The albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of the sensible heat flux to the latent heat flux and is used for determining planetary boundary layer parameters for convective conditions. Table 2-11 identifies the surface parameters that were included in the dispersion model. These values assigned to the surface parameters take into account coastal effects on the dispersion of pollutants.

Table 2-11 Surface Characteristics Input to the Dispersion Model

Albedo	Bowen Ratio	Surface Roughness
0.2075	1.5	0.4

2.8.3 Buildings

In order to capture the potential influence of buildings/structures on the dispersion profile of combustion emissions (i.e. building downwash effects), the main building adjacent to the modelled emission source was included in the assessment. The location and height of the modelled building is presented below in Table 2-12.

Table 2-12 Buildings Details

Building	Grid Reference, X	Grid reference, Y	Height, m	Length, m	Width, m	Angle, degrees
Main Building	312584.7	167673.6	14.1	59.4	45.6	54.2

Notes: Grid reference refers to the southwest corner of building.

2.9 Nitrogen and Acid Deposition

In order to assess the potential impacts of nitrogen and acid deposition at the ecological receptors listed in Table 2-10, nitrogen and acid deposition rates were derived from predicted NO_x and SO_2 concentrations and were compared with prevailing background deposition rates and the upper and lower critical load ranges for key habitats represented at each assessed ecological receptor.

3. ASSESSMENT OF IMPACTS

For deriving long-term (annual average) NO_2 concentrations, 70% of the highest predicted annual average NO_X process contribution was assumed to be converted to NO_2, which in turn was added to the background annual average NO_2 concentration. For short-term (99.8th percentile) NO_2 concentrations, 35% of the highest predicted 99.8th percentile of 1 hour-average NO_X process contributions was added to twice the background annual average NO_2 concentration. For short-term CO, PM_{10} and SO_2, 100% of the process contribution was added to twice the background annual average concentration. Table 3-1 below presents, for the near-field domain, a sensitivity analysis of the meteorological data employed in the model. The worst-case metrological years, based on maximum predicted long- and short-term NO_X process contributions, were identified as 2003 and 2004 respectively.

Table 3-1 Sensitivity Analysis, Near-Field Model Domain (2003 to 2007 meteorological data)

Year	Maximum Annual Average NO_X Process Contribution ($\mu g\ m^{-3}$)	Maximum 99.8th Percentile of 1-hr Average NO_X Process Contribution ($\mu g\ m^{-3}$)
2003	**21.7**	243.30
2004	16.62	**250.40**
2005	13.98	210.80
2006	15.41	234.61
2007	14.37	236.44

Table 3-2 below presents, for the near-field and far-field model domains, maximum predicted off-site ground level concentrations (including background) of pollutants of concern. All relevant air quality objectives are predicted to be met across both model domains.

Dispersion profiles of predicted pollutant concentrations are illustrated in the form of contour plots in Appendix 2. The contour plots identify that pollutants generated from the operation of the proposed biomass power plant will disperse rapidly with distance from the site boundary and will reach background concentrations within a few hundred meters.

Table 3-2 AERMOD Predicted Highest Off-Site Ground Level Concentrations (Worst Year Meteorological Data: 2003 for Long-term Impacts and 2004 for Short-term Impacts)

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Far-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
NO_2 Background Concentration	Annual Average	15.20	15.20	40
NO_2 Process Contribution	Annual Average	15.20	15.20	
NO_2 Predicted Environmental Concentration	Annual Average	30.40	30.40	
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	87.63	45.71	200

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Far-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	118.03	76.11	
PM_{10} Background Concentration	Annual Average	18.5	18.5	40
PM_{10} Process Contribution	Annual Average	1.06	1.06	
PM_{10} Predicted Environmental Concentration	Annual Average	19.56	19.56	
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	2.31	2.31	50
PM_{10} Predicted Environmental Concentration	90.4th percentile of 24-hour average concentrations	39.31	39.31	50
CO Background Concentration	Annual Average	113.5	113.5	10000
CO Process Contribution	Max 8-Hour Average	52.27	30.32	
CO Predicted Environmental Concentration	Max 8-Hour Average	279.27	257.32	
SO_2 Background Concentration	Annual Average	3.6	3.6	-
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	144.77	43.27	266
SO_2 Predicted Environmental Concentration	99.9th percentile of 15-min average concentrations	151.97	50.47	
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	57.64	31.73	350
SO_2 Predicted Environmental Concentration	99.7th percentile of hourly average concentrations	64.84	38.93	350
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	21.61	21.61	125
SO_2 Predicted Environmental Concentration	99.2nd percentile of 24-hour average concentrations	28.81	28.81	
HCl Background Concentration	Annual Average	Negligible	Negligible	800
HCl Process Contribution	Annual Average	1.06	1.06	
HCl Predicted Environmental Concentration	Annual Average	1.06	1.06	
HCl Process Contribution	1-hour Average	5.48	0.46	20
HCl Predicted Environmental Concentration	1-hour Average	5.48	0.46	
HF Background Concentration	Annual Average	Negligible	Negligible	-

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Far-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
HF Process Contribution	1-hour Average	0.55	0.05	250
HF Predicted Environmental Concentration	1-hour Average	0.55	0.05	
Hg Background Concentration	Annual Average	Negligible	Negligible	7.5
Hg Process Contribution	Annual Average	0.01	0.01	7.5
Hg Predicted Environmental Concentration	Annual Average	0.01	0.01	
Hg Process Contribution	1-hour Average	0.03	0.002	0.25
Hg Predicted Environmental Concentration	1-hour Average	0.03	0.002	
Dioxins Background Concentration	Annual Average	Negligible	Negligible	-
Dioxins Process Contribution	Annual Average	$1.09E^{-8}$	$1.09E^{-8}$	
Dioxins Predicted Environmental Concentration	Annual Average	$1.09E^{-8}$	$1.09E^{-8}$	
Dioxins Process Contribution	1-hour Average	$2.64E^{-7}$	$6.93E^{-8}$	
Dioxins Predicted Environmental Concentration	1-hour Average	$2.64E^{-7}$	$6.93E^{-8}$	
Dioxins Process Contribution	24-hour Average	$5.52E^{-8}$	$4.89E^{-8}$	
Dioxins Predicted Environmental Concentration	24-hour Average	$5.52E^{-8}$	$4.89E^{-8}$	

Notes: For long-term impacts, predicted concentration = process contribution + background concentration (with an assumed 70% oxidation of NO_X to NO_2); For short-term impacts, predicted concentration = process contribution + 2 $\times$ background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration is not anticipated to vary significantly from the 8-hr rolling average. As there is no 15-min time series can be set in the model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance Note 1.

Table 3-3 below identifies maximum predicted off-site ground level pollutant concentrations at each of the discrete residential receptor locations included in the model. Pollutant concentrations are predicted to meet relevant air quality objectives.

Table 3-3 AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Residential Receptor Locations (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Pollutant	Averaging Period	Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
		Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)
NO_X Process Contribution	Annual Average	0.46	0.41	0.18	0.56	1.26	0.47	0.32	0.07
NO_X Background	-	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91
NO_X Predicted Environmental Concentration	Annual Average	20.37	20.32	20.09	20.47	21.17	20.38	20.23	19.98
NO_2 Process Contribution	Annual Average	0.32	0.29	0.13	0.39	0.88	0.33	0.22	0.05
NO_2 Background	-	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20
NO_2 Predicted Environmental Concentration	Annual Average	15.52	15.49	15.33	15.59	16.08	15.53	15.42	15.25
NO_2 Process Contribution	99.8^{th} percentile of hourly average concentrations	6.21	7.50	4.20	4.15	7.75	3.34	2.03	0.92
NO_2 Background	Twice the annual average concentration	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40
NO_2 Predicted Environmental Concentration	99.8^{th} percentile of hourly average concentrations	36.61	37.90	34.60	34.55	38.15	33.74	32.43	31.32

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration (µg m^{-3})	Residential Receptor 2 Predicted Concentration (µg m^{-3})	Residential Receptor 3 Predicted Concentration (µg m^{-3})	Residential Receptor 4 Predicted Concentration (µg m^{-3})	Residential Receptor 5 Predicted Concentration (µg m^{-3})	Residential Receptor 6 Predicted Concentration (µg m^{-3})	Residential Receptor 7 Predicted Concentration (µg m^{-3})	Residential Receptor 8 Predicted Concentration (µg m^{-3})
PM_{10} Process Contribution	Annual Average	0.02	0.02	0.01	0.03	0.06	0.02	0.02	0.003
PM_{10} Background	-	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
PM_{10} Predicted Environmental Concentration	Annual Average	18.52	18.52	18.51	18.53	18.56	18.52	18.52	18.50
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	0.07	0.06	0.03	0.05	0.13	0.08	0.05	0.01
PM_{10} Background	Twice Annual Average Concentration	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
PM_{10} Predicted Concentration	90.4th percentile of 24-hour average concentrations	37.07	37.06	37.03	37.05	37.13	37.08	37.05	37.01
CO Process Contribution	Max 8-Hour Average	2.45	2.35	2.76	2.63	3.62	1.31	0.88	0.39
CO Background	Twice the Annual Average Concentration	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00
CO Predicted Concentration	Max 8-Hour Average	229.45	229.35	229.76	229.63	230.62	228.31	227.88	227.39

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 2 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 3 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 4 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 5 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 6 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 7 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 8 Predicted Concentration ($\mu g\ m^{-3}$)
SO_2 Process Contribution	Annual Average	0.11	0.10	0.04	0.14	0.31	0.11	0.08	0.02
SO_2 Background	-	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
SO_2 Predicted Concentration	Annual Average	3.71	3.70	3.64	3.74	3.91	3.71	3.68	3.62
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	6.91	8.61	5.24	6.82	8.68	4.40	3.42	0.97
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.9th percentile of 15-min average concentrations	14.11	15.81	12.44	14.02	15.88	11.60	10.62	8.17
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	4.19	4.33	1.61	2.72	5.26	1.76	1.06	0.63
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.7th percentile of hourly average concentrations	11.39	11.53	8.81	9.92	12.46	8.96	8.26	7.83
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	0.95	0.81	0.46	0.72	1.82	0.67	0.37	0.17

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 2 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 3 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 4 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 5 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 6 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 7 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 8 Predicted Concentration ($\mu g\ m^{-3}$)
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.2nd percentile of 24-hour average concentrations	8.15	8.01	7.66	7.92	9.02	7.87	7.57	7.37
HCl Process Contribution	Annual Average	0.02	0.02	0.01	0.03	0.06	0.02	0.02	0.003
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	Annual Average	0.02	0.02	0.01	0.03	0.06	0.02	0.02	0.003
HCl Process Contribution	1-hour Average	1.87	1.96	1.31	1.74	1.87	0.92	0.69	0.25
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	1-hour Average	1.87	1.96	1.31	1.74	1.87	0.92	0.69	0.25
HF Process Contribution	1-hour Average	0.19	0.20	0.13	0.17	0.19	0.09	0.07	0.02
HF Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HF Predicted Concentration	1-hour Average	0.19	0.20	0.13	0.17	0.19	0.09	0.07	0.02
Hg Process Contribution	Annual Average	0.00011	0.00010	0.00004	0.00014	0.00031	0.00011	0.00008	0.00002
Hg Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 2 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 3 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 4 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 5 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 6 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 7 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 8 Predicted Concentration ($\mu g\ m^{-3}$)
Hg Predicted Concentration	Annual Average	0.00011	0.00010	0.00004	0.00014	0.00031	0.00011	0.00008	0.00002
Hg Process Contribution	1-hour Average	0.01	0.01	0.01	0.009	0.009	0.005	0.003	0.001
Hg Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Hg Predicted Concentration	1-hour Average	0.01	0.01	0.01	0.009	0.009	0.005	0.003	0.001
Dioxins Process Contribution	Annual Average	$2.30E^{-10}$	$2.05E^{-10}$	$9.06E^{-11}$	$2.81E^{-10}$	$6.30E^{-10}$	$2.34E^{-10}$	$1.58E^{-10}$	$3.27E^{-11}$
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	Annual Average	$2.30E^{-10}$	$2.05E^{-10}$	$9.06E^{-11}$	$2.81E^{-10}$	$6.30E^{-10}$	$2.34E^{-10}$	$1.58E^{-10}$	$3.27E^{-11}$
Dioxins Process Contribution	1-hour Average	$1.92E^{-08}$	$2.01E^{-08}$	$1.34E^{-08}$	$1.78E^{-08}$	$1.92E^{-08}$	$9.46E^{-09}$	$7.05E^{-09}$	$2.53E^{-09}$
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	1-hour Average	$1.92E^{-08}$	$2.01E^{-08}$	$1.34E^{-08}$	$1.78E^{-08}$	$1.92E^{-08}$	$9.46E^{-09}$	$7.05E^{-09}$	$2.53E^{-09}$
Dioxins Process Contribution	24-hour Average	$2.23E^{-09}$	$2.80E^{-09}$	$1.96E^{-09}$	$1.86E^{-09}$	$3.97E^{-09}$	$1.49E^{-09}$	$8.30E^{-10}$	$3.62E^{-10}$
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted	24-hour Average	$2.23E^{-09}$	$2.80E^{-09}$	$1.96E^{-09}$	$1.86E^{-09}$	$3.97E^{-09}$	$1.49E^{-09}$	$8.30E^{-10}$	$3.62E^{-10}$

Pollutant	Averaging Period	Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
		Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)
Concentration									

Notes: Reported annual average NO_X concentration = process contribution + background annual average; For short-term impacts, predicted environmental concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration not anticipated to vary significantly from 8-hr rolling average. As no 15-min time series can be set in model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance 1.

3.1.1 Nitrogen Deposition

Nitrogen deposition resulting from the operation of the proposed biomass power plant has been assessed at all ecologically sensitive receptor locations within 10 km of the site. Table 3-4 below identifies that the maximum predicted process contribution to the background nitrogen deposition rate at all of the sites designated for their ecological importance is less than 0.1% of the relevant background deposition rate. Where exceedence of critical nitrogen deposition load was identified, such exceedences are due to predominant background deposition rates and the highest process contribution at such locations is less than 1% of the lower critical load. The process related impacts on the ecologically sensitive sites are hence not considered to be significant.

Table 3-4 Maximum Predicted Nitrogen Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		($\mu g\ m^{-3}$)	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
1	Barry Island	19.989	0.008	12.9	12.908	10 to 15	0.06%	0.08%
2	Cliff Wood - Golden Stairs	19.963	0.005	25.3	25.305	10 to 15	0.02%	0.05%
3	Coedydd Y Barri/Barry Woodlands	19.937	0.003	25.3	25.303	10 to 15	0.01%	0.03%
4	Cog Moors	19.943	0.003	11.8	11.803	10 to 15	0.03%	0.03%
5	Cosmeston Park	19.933	0.002	22.5	22.502	10 to 15	0.01%	0.02%
6	Cwm Cydfin, Leckwith	19.917	0.001	26.2	26.201	10 to 15	0.003%	0.01%
7	East Aberthaw Coast	19.924	0.001	13.3	13.301	10 to 15	0.01%	0.01%
8	Ely Valley	19.916	0.001	-	-	-	-	-
9	Flat Holm	19.924	0.001	10.2	10.201	10 to 15	0.01%	0.01%
10	Hayes Point to Bendrick Rock	20.025	0.012	12.9	12.912	10 to 15	0.09%	0.12%
11	Nant Whitton Woodlands	19.919	0.001	31.2	31.201	10 to 15	0.003%	0.01%
12	Penarth Coast	19.942	0.003	11.8	11.803	10 to 15	0.03%	0.03%

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		(µg m^{-3})	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
13	Severn Estuary	19.920	0.001	14	14.001	10 to 15	0.01%	0.01%
14	Sully Island	19.954	0.004	11.8	11.804	10 to 15	0.04%	0.04%
15	Severn Estuary	19.931	0.002	11.8	11.802	10 to 15	0.02%	0.02%
16	Severn Estuary	19.931	0.002	11.8	11.802	10 to 15	0.02%	0.02%
17	Severn Estuary - Sully Island	19.954	0.004	11.8	11.804	10 to 15	0.04%	0.04%
Assessment Criteria		30	-	-	-	-	-	1%

Notes: Dry deposition velocity for NO_2 was assumed as 1.5 mm/s and NO_2 wet deposition was assumed as negligible as suggested by the UK Environment Agency for similar assessments. NO_2 wet deposition was assumed as negligible.

3.1.2 Acid Deposition

Acid deposition resulting from the operation of the proposed biomass power plant has been assessed at all ecologically sensitive receptor locations within 10 km of the site. Table 3-5 below identifies that the total process contribution to the acid deposition rate at all sites designated for their ecological importance is less than 1% of the relevant background deposition rate and the critical load identified for relevant habitat. Furthermore, the total acid deposition (process + background) was not predicted to exceed the critical load of the assessed ecological receptors. Hence the impacts of the proposed biomass plant are not considered significant.

Table 3-5 Maximum Predicted Acid Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		(µg m-3)	(µg m-3)	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
1	Barry Island	0.055	0.019	0.00057	0.0038	0.0011	0.0055	1.39	1.396	4	0.40%	0.14%
2	Cliff Wood - Golden Stairs	0.037	0.013	0.00039	0.0026	0.0008	0.0037	2.08	2.084	8.24	0.18%	0.05%
3	Coedydd Y Barri/Barry Woodlands	0.019	0.007	0.00020	0.0013	0.0004	0.0019	2.08	2.082	2.42	0.09%	0.08%
4	Cog Moors	0.023	0.008	0.00024	0.0016	0.0005	0.0023	1.07	1.072	1.5	0.22%	0.15%
5	Cosmeston Park	0.016	0.006	0.00017	0.0011	0.0003	0.0016	1.07	1.072	4	0.15%	0.04%
6	Cwm Cydfin, Leckwith	0.005	0.002	0.00005	0.0003	0.0001	0.0005	2.37	2.370	10.3	0.02%	0.004%
7	East Aberthaw Coast	0.010	0.003	0.00010	0.0007	0.0002	0.0010	-	-	-	-	-
8	Ely Valley	0.004	0.002	0.00005	0.0003	0.0001	0.0004	-	-	-	-	-
9	Flat Holm	0.010	0.003	0.00010	0.0007	0.0002	0.0010	-	-	-	-	-

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		(µg m^{-3})	(µg m^{-3})	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
10	Hayes Point to Bendrick Rock	0.081	0.028	0.00084	0.0056	0.0017	0.0081	-	-	-	-	-
11	Nant Whitton Woodlands	0.006	0.002	0.00007	0.0004	0.0001	0.0006	2.47	2.471	2.48	0.03%	0.03%
12	Penarth Coast	0.022	0.008	0.00023	0.0016	0.0005	0.0022	-	-	-	-	-
13	Severn Estuary	0.007	0.002	0.00007	0.0005	0.0001	0.0007	-	-	-	-	-
14	Sully Island	0.031	0.011	0.00032	0.0022	0.0006	0.0031	-	-	-	-	-
15	Severn Estuary	0.015	0.005	0.00015	0.0010	0.0003	0.0015	1.07	1.071	1.5	0.14%	0.10%
16	Severn Estuary	0.015	0.005	0.00015	0.0010	0.0003	0.0015	-	-	-	-	-
17	Severn Estuary - Sully Island	0.031	0.011	0.00032	0.0022	0.0006	0.0031	-	-	-	-	-

Note: NO_2 wet deposition was assumed as negligible.

4. CUMULATIVE IMPACT ASSESSMENT

At a distance of around 500 m from the proposed biomass plant, a gasification facility is proposed by Biogen. In-combination impacts on air quality when both the proposed biomass plant and the aforementioned gasification facility are in operation have been predicted using AERMOD dispersion model. Emission parameters pertaining to the proposed Biogen gasification facility have been obtained from the air dispersion modelling report prepared by Parsons Brinkckerhoff (Report Reference No: FSE97027C, dated September 2008).

4.1 Emission Parameters Used in the Cumulative Impact Assessment

The physical and emission parameters of the sources included in the cumulative impact assessment are identified in Table 4-1.

Table 4-1 Emission Parameters for Gasification Facility Included in the Dispersion Model

Emission Source	Proposed Gasification Plant (Biogen Plant)	Proposed Biomass Plant (Sunrise Renewables Plant)
Source Location (Easting, Northing)	312775, 167195	312647, 167668
Stack Height, m (from ground level)	45	20
Stack Diameter, m	1.04	0.9
Efflux Temperature, deg K	403	598
Efflux Velocity, m/s	13.03	14
Pollutant Emission Rates, g/s		
NO_X	3.69	0.8132
PM_{10}	0.1845	0.0407
SO_2	0.9225	0.2033
CO	0.9225	0.2033
HCl	0.1845	0.0407
HF	0.01845	0.0041
Hg	0.0009225	0.0002
Dioxins and Furans	1.845×10^{-8}	4.07×10^{-10}
Group 1 Metals	0.001025	0.002033
Cadmium & Thallium	0.00046125	0.000203
Total Organic carbon	0.1845	0.04066

4.2 Discrete Receptors

Table 4-2 identifies the sensitive receptors included in the cumulative impact assessment in addition to the sensitive receptors identified in Table 2-10.

Table 4-2 Additional Sensitive Receptors Included in the Cumulative Impact Assessment

Receptor	Grid Reference	
	X-coordinate	Y-coordinate
Hayes Lane	313724	167300
Hayes Point Hospital	314004	167398
Bendrick Road	313410	167478
Hayes Road	313638	167674
Southleigh home	314905	168078

Receptor	Grid Reference	
	X-coordinate	Y-coordinate
Dock View Road	312397	167944
Dyfrig Street	312109	166908
Children's hospice	314331	167685
Bendrick Rock	313076	167166
Barry Island	312226	166870

4.3 Building Downwash Effects

Table 4-3 identifies the details of the main building included in the cumulative impact assessment (in addition to that identified in Table 2-12) to account for the building downwash effects on the dispersion of emissions from the proposed Biogen gasification facility.

Table 4-3 Buildings Details

Grid Reference, X	Grid reference, Y	Height, m	Length, m	Width, m	Angle, degrees
312755	167215	20	53	79	38

Notes: Grid reference refers to the southwest corner of the building.

4.4 Assessment Results

The cumulative impact assessment outcomes along with additional contour plots are included in Appendix 3.

The highest predicted off-site ground level concentrations (including background concentrations) of pollutants when both the proposed biomass plant and Biogen gasification facility are in simultaneous operation are predicted to meet the air quality objectives. The highest off-site predicted pollutant ground level concentrations are summarised in Table A3-1.

Table A3-2 and Table A3-3 in Appendix 3 identify the highest predicted off-site ground level pollutant concentrations at each discrete receptor locations included in the assessment. Pollutant concentrations are predicted to meet the relevant air quality objectives at all sensitive receptor locations.

Table A3-4 identifies the maximum predicted process contribution from both proposed facilities towards nitrogen deposition at the sites of ecological importance. The process contribution has been predicted to be less than 1% of the background nitrogen deposition rate. Where exceedence of critical nitrogen deposition load was identified, such exceedences are due to predominant background deposition rates and the highest process contribution at such locations is less than 1% of the lower critical load. The process related impacts on the ecologically sensitive sites are hence not considered to be significant.

Table A3-5 identifies that the process contribution to the acid deposition at the sites designated for their ecological importance is less than 3% of background and less than 1% of the critical load identified for relevant habitat. Furthermore, the total acid deposition (process contribution + background acid deposition rate) was not predicted to exceed the critical load at the assessed ecological receptors. Hence the cumulative impacts of the proposed biomass plant are not considered significant.

The contour plots identify that pollutants generated from the operation of both the facilities will disperse rapidly with distance from the emission sources and will reach background concentrations within a few hundred meters.

5. SUMMARY AND CONCLUSIONS

Air quality impacts resulting from operation of the proposed 9 MWe biomass plant have been assessed using an advanced dispersion model 'AERMOD'. All predicted ground level concentrations of NO_2,SO_2, PM_{10}, HCl, HF, Hg, CO and dioxins & furans are predicted to meet relevant air quality objectives designed to protect the human health across the far-field and near-field model domains.

The annual average NO_X concentrations at all the protected/designated ecological sites within 10 km of the proposed development site are predicted to meet the relevant air quality objective for the protection of vegetation and ecosystems. The predicted nitrogen and acid deposition rates are less than 1% of the background deposition rate as well as the lower critical load.

Cumulative air quality impacts resulting from operation of the proposed biomass plant along with the nearby gasification facility have also been assessed using AERMOD. Though the in-combination impacts are marginally higher than that predicted with independent operation of the proposed biomass plant, no exceedence of air quality objectives was predicted.

Air quality impacts resulting from the operation of the proposed biomass plant are not considered to be significant.

APPENDIX 1

Stack Height Assessment of the Biomass Plant Stack

A1.1 Introduction

Air quality impacts resulting from the operation of the biomass plant have been assessed with various hypothetical heights of the emission stack to derive the optimum stack height. The stack height has been varied from 10 m to 35 m (at regular intervals of 5 m) and impacts in terms of ground level nitrogen dioxide (NO_2) concentrations has been predicted using the AERMOD dispersion model.

The predicted long- and short-term impacts are discussed in Section A1.2. The reported concentrations refer to the highest off-site ground level nitrogen dioxide (NO_2) concentrations modelled with the meteorological data for the year 2003 which has been identified as the worst meteorological year for long-term predicted impacts. Emission parameters identified in Table 2-8 of the main report have been included in the stack height assessment.

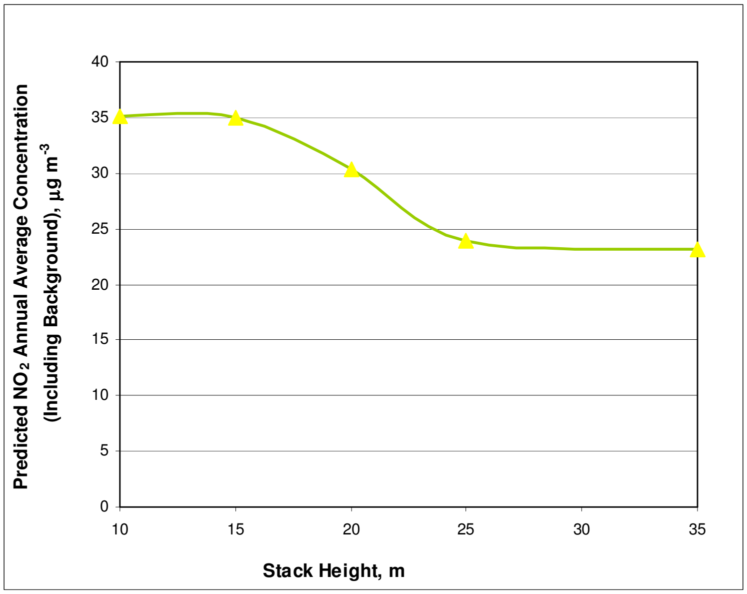
A1.2 Predicted Air Quality Impacts

Figures A1-1 and A1-2 show the variation of the highest predicted annual average and hourly-average NO_2 ground level concentrations with the height of biomass plant stack. No exceedence of long- and short-term air quality objectives have been predicted at any of the assessed stack heights. Furthermore, the stack height assessment identifies that an increase of stack height beyond 20 m will not result in any significant reduction in short-term (99.79th percentile of hourly averages) NO_2 ground level concentrations. A substantial reduction in predicted long-term average ground level concentrations was identified when the stack height is increased from 15 m to 20 m. Similar reduction in long-term impacts was identified when stack height is further increased to 25 m, but with no significant decrease in short-term impacts. A stack height of 20 m thereby provides a conservative approach to stack height design.

A1.3 Conclusions

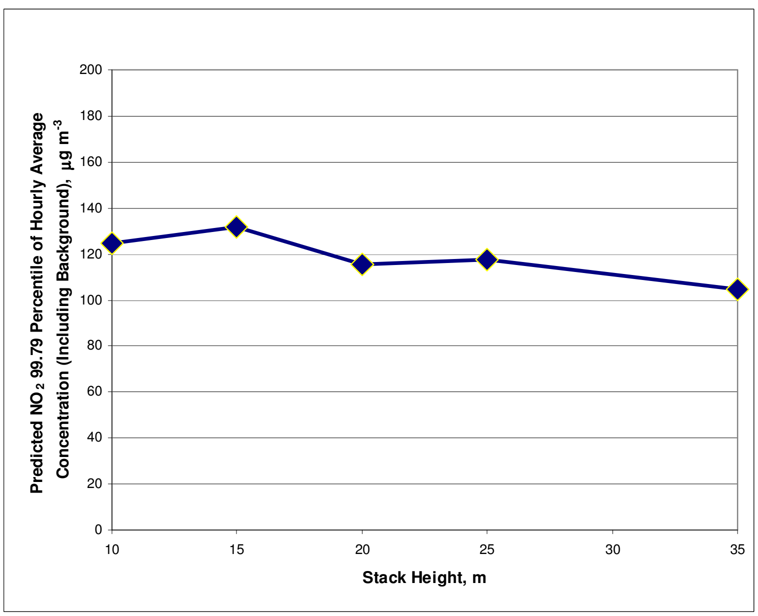
Assessment of stack height for the biomass plant identified that operation of the plant is unlikely to result in significant impacts on local air quality. A stack height of 20 m is identified to balance the costs associated with the increase in stack height against the environmental benefits. Stack height of 20 m is considered to be adequate for the proposed biomass plant.

Figure A1-1 Predicted Long-term Impacts In Terms of Ground Level NO_2 Concentrations Including Background Concentrations



Notes: For long-term impacts, predicted environmental concentration = process contribution (with an assumed 70% oxidation of NO_X to NO_2) + background concentration; The assessment criteria refers to the NO_2 concentrations designated in the UK air quality objectives to protect the human health.

Figure A1-2 Predicted Long-term Impacts In Terms of Ground Level NO_2 Concentrations Including Background Concentrations.



For short-term impacts, predicted environmental concentration = process contribution (with an assumed 35% oxidation of NO_X to NO_2) + 2 × background concentration.

APPENDIX 2

Contour Plots Showing Dispersion Profiles of Air Pollutants

Pollutant concentrations are expressed in $\mu g/m^3$.

The contour plots are arranged in the following order:

Figure A2-1: Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

Figure A2-2: 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)

Figure A2-3 : 99.73th Percentile of Hourly Average SO_2 Concentrations (Near- Field Grid Domain, 2004 Meteorological data; includes background)

Figure A2-4: 8 Hourly Maximum CO Concentrations (Near-Field Grid Domain, 2004 Meteorological data; includes background)

Figure A2-1: Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

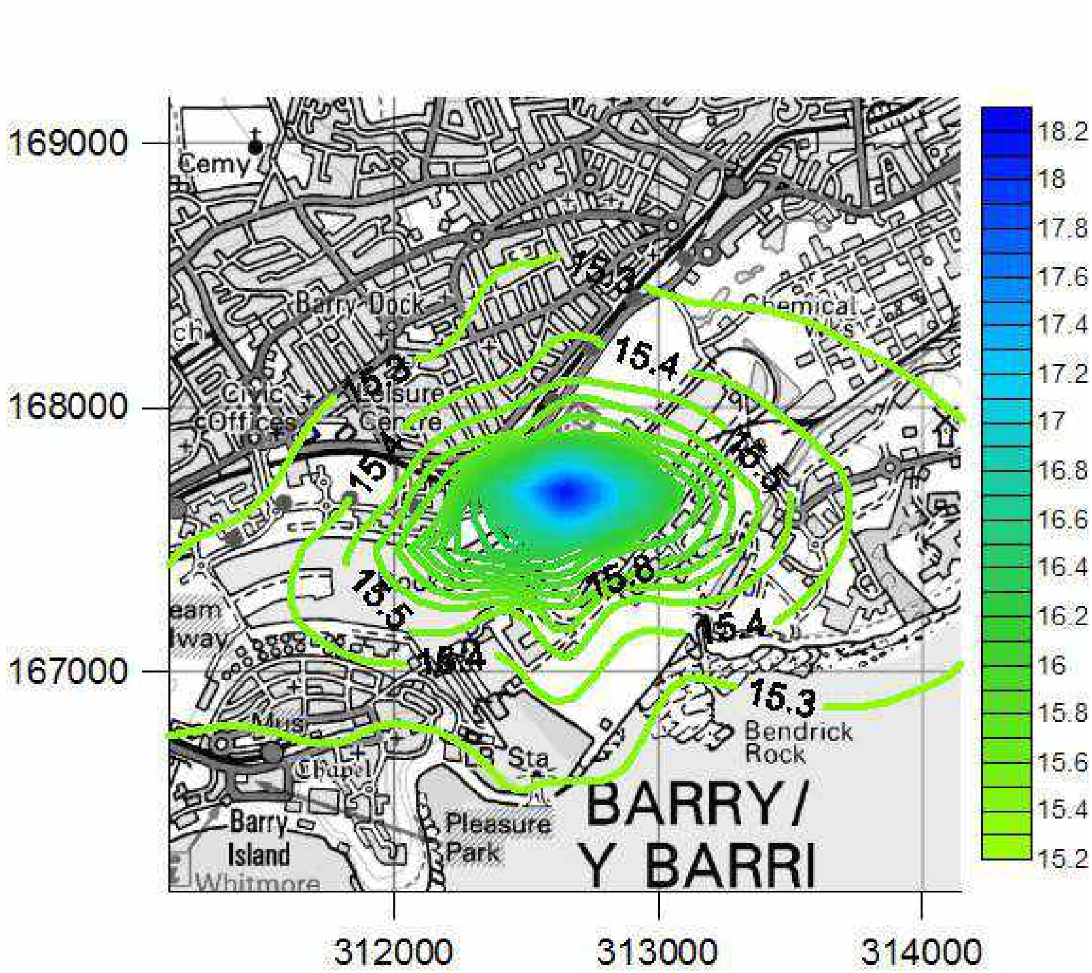


Figure A2-2: 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)

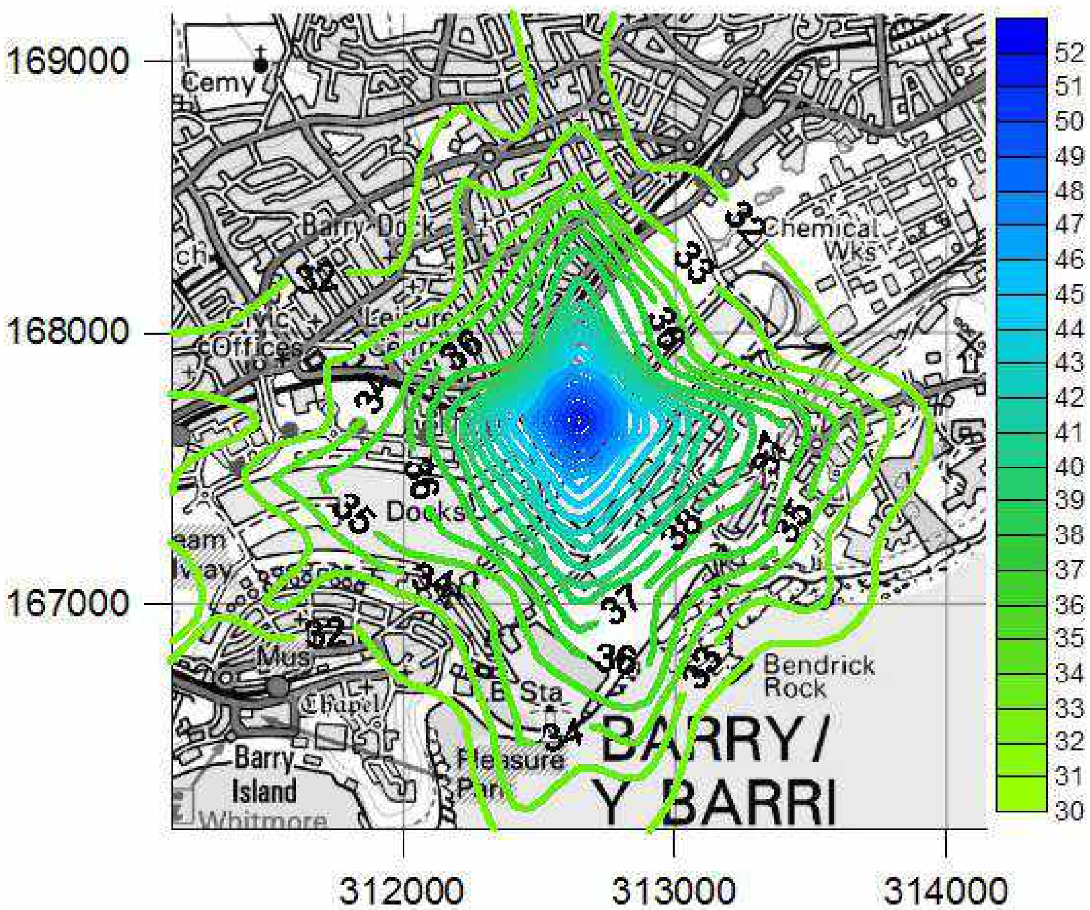


Figure A2-3: 99.73th Percentile of Hourly Average SO_2 Concentrations (Near- Field Grid Domain, 2004 Meteorological data; includes background)

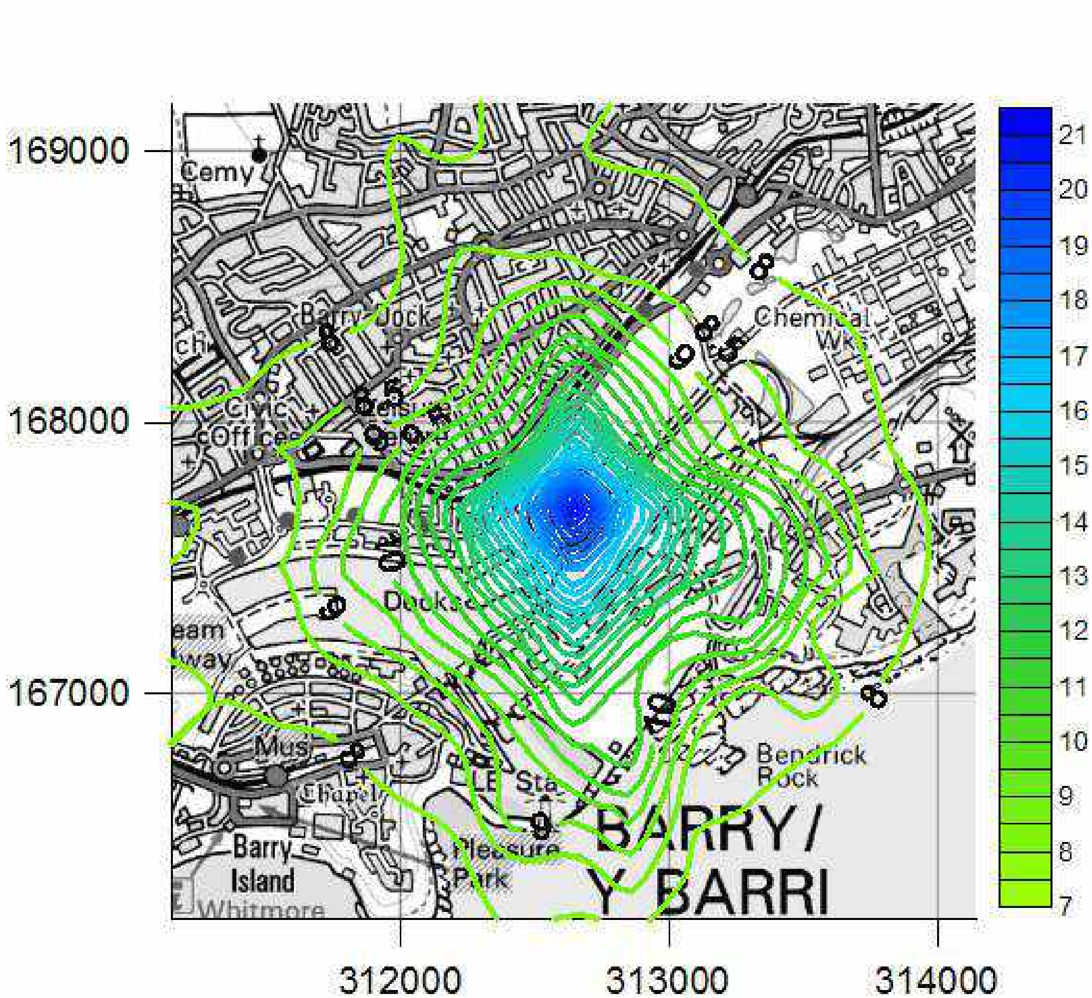
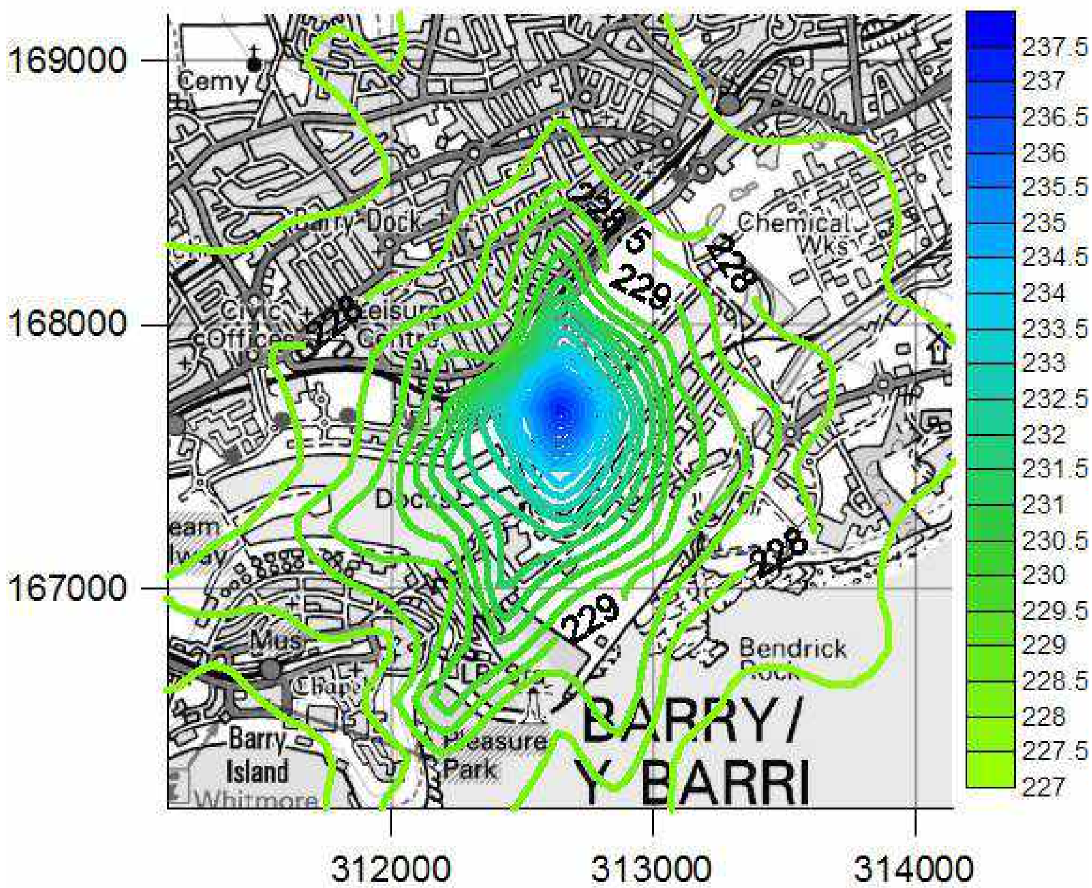


Figure A2-4: 8 Hourly Maximum CO Concentrations (Near-Field Grid Domain, 2004 Meteorological data; includes background)



APPENDIX 3

Outcomes of the Cumulative Impact Assessment

Outcomes of the in-combination impacts identified in the following tables. Pollutant concentrations are expressed in $\mu g/m^3$.

Table A3-1: AERMOD Predicted Highest Off-Site Ground Level Concentrations (Worst-case Year Meteorological Data: 2003 for Long-term Impacts and 2004 for Short-term Impacts).

Table A3-2: AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Residential Receptor Locations Close to the Proposed Sunrise Renewable Biomass Plant (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Table A3-3: AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Sensitive Receptor Locations Close to the Proposed Gasification Facility (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Table A3-4: Maximum Predicted Nitrogen Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Table A3-5: Maximum Predicted Acid Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Dispersion profiles of emission components are illustrated in the form of contour plots and are presented in the following figures.

Figure A3-1: Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

Figure A3-2: 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)

Table A3-1: In-Combination Impacts - AERMOD Predicted Highest Off-Site Ground Level Concentrations (Worst-case Year Meteorological Data: 2003 for Long-term Impacts and 2004 for Short-term Impacts)

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
NO_2 Background Concentration	Annual Average	15.20	40
NO_2 Process Contribution	Annual Average	15.80	
NO_2 Predicted Environmental Concentration	Annual Average	31	
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	45.66	200
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	76.06	
PM_{10} Background Concentration	Annual Average	18.5	40
PM_{10} Process Contribution	Annual Average	1.10	
PM_{10} Predicted Environmental Concentration	Annual Average	19.60	
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	2.34	50
PM_{10} Predicted Environmental Concentration	90.4th percentile of 24-hour average concentrations	39.34	50
CO Background Concentration	Annual Average	113.5	10,000
CO Process Contribution	Max 8-Hour Average	28.69	
CO Predicted Environmental Concentration	Max 8-Hour Average	255.69	
SO_2 Background Concentration	Annual Average	3.6	-
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	43.45	266
SO_2 Predicted Environmental Concentration	99.9th percentile of 15-min average concentrations	50.65	
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	31.74	350
SO_2 Predicted Environmental Concentration	99.7th percentile of hourly average concentrations	38.94	350
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	21.62	125
SO_2 Predicted Environmental Concentration	99.2nd percentile of 24-hour average concentrations	28.82	
HCl Background Concentration	Annual Average	Negligible	800
HCl Process Contribution	Annual Average	1.10	
HCl Predicted Environmental Concentration	Annual Average	1.10	
HCl Process Contribution	1-hour Average	6.77	20
HCl Predicted Environmental Concentration	1-hour Average	6.77	
HF Background Concentration	Annual Average	Negligible	-
HF Process Contribution	1-hour Average	0.68	250
HF Predicted Environmental Concentration	1-hour Average	0.68	

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
Hg Background Concentration	Annual Average	4.35E-04	7.5
Hg Process Contribution	Annual Average	0.01	7.5
Hg Predicted Environmental Concentration	Annual Average	0.01	
Hg Process Contribution	1-hour Average	0.03	0.25
Hg Predicted Environmental Concentration	1-hour Average	0.03	
Dioxins Background Concentration	Annual Average	Negligible	-
Dioxins Process Contribution	Annual Average	9.45E-08	
Dioxins Predicted Environmental Concentration	Annual Average	9.45E-08	
Dioxins Process Contribution	1-hour Average	5.81E-07	
Dioxins Predicted Environmental Concentration	1-hour Average	5.81E-07	
Dioxins Process Contribution	24-hour Average	4.18E-07	
Dioxins Predicted Environmental Concentration	24-hour Average	4.18E-07	
Group 1 Metals Background Concentration	Annual Average	0.04	-
Group 1 Metals Process Contribution	Annual Average	0.05	
Group 1 Metals Predicted Environmental Concentration	Annual Average	0.09	
Group 1 Metals Process Contribution	1-hour Average	0.34	
Group 1 Metals Predicted Environmental Concentration	1-hour Average	0.42	
Cadmium & Thallium Background Concentration	Annual Average	3.96E-04	0.005
Cadmium & Thallium Process Contribution	Annual Average	0.01	
Cadmium & Thallium Predicted Environmental Concentration	Annual Average	0.01	
Cadmium & Thallium Process Contribution	1-hour Average	0.03	1.5
Cadmium & Thallium Predicted Environmental Concentration	1-hour Average	0.03	

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
TOC Background Concentration	Annual Average	Negligible	-
TOC Process Contribution	Annual Average	1.12	
TOC Predicted Environmental Concentration	Annual Average	1.12	
TOC Process Contribution	1-hour Average	6.88	
TOC Predicted Environmental Concentration	1-hour Average	6.88	

Notes: For long-term impacts, predicted concentration = process contribution + background concentration (with an assumed 70% oxidation of NO_X to NO_2); For short-term impacts, predicted concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration is not anticipated to vary significantly from the 8-hr rolling average. As there is no 15-min time series can be set in the model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance Note 1. Pollutant concentrations within the boundary of Bogen gasification facility are not excluded and hence the assessment is considered to be conservative in nature.

Table A3-2: In-Combination Impacts - AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Residential Receptor Locations Close to the Proposed Sunrise Renewable Biomass Plant (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
NO_X Process Contribution	Annual Average	0.85	0.84	1.92	1.20	2.85	1.43	0.89	0.21
NO_X Background	-	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91
NO_X Predicted Environmental Concentration	Annual Average	20.76	20.75	21.83	21.11	22.76	21.34	20.80	20.12
NO_2 Process Contribution	Annual Average	0.59	0.59	1.34	0.84	1.99	1.00	0.62	0.15
NO_2 Background	-	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20
NO_2 Predicted Environmental Concentration	Annual Average	15.79	15.79	16.54	16.04	17.19	16.20	15.82	15.35
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	9.41	13.04	8.64	6.55	13.38	6.09	4.37	2.89
NO_2 Background	Twice the annual average concentration	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	39.81	43.44	39.04	36.95	43.78	36.49	34.77	33.29

Pollutant	Averaging Period	Predicted Concentration (μg m^{-3})							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
PM_{10} Process Contribution	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.011
PM_{10} Background	-	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
PM_{10} Predicted Environmental Concentration	Annual Average	18.54	18.54	18.60	18.56	18.64	18.57	18.54	18.51
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	0.12	0.12	0.14	0.15	0.37	0.18	0.11	0.03
PM_{10} Background	Twice Annual Average Concentration	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
PM_{10} Predicted Concentration	90.4th percentile of 24-hour average concentrations	37.12	37.12	37.14	37.15	37.37	37.18	37.11	37.03
CO Process Contribution	Max 8-Hour Average	3.47	4.21	4.18	2.91	5.52	3.11	2.01	1.23
CO Background	Twice the Annual Average Concentration	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00
CO Predicted Concentration	Max 8-Hour Average	230.47	231.21	231.18	229.91	232.52	230.11	229.01	228.23

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
SO_2 Process Contribution	Annual Average	0.21	0.21	0.48	0.30	0.70	0.36	0.22	0.05
SO_2 Background	-	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
SO_2 Predicted Concentration	Annual Average	3.81	3.81	4.08	3.90	4.30	3.96	3.82	3.65
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	10.45	14.17	11.23	7.13	15.12	6.08	4.30	2.94
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.9th percentile of 15-min average concentrations	17.65	21.37	18.43	14.33	22.32	13.28	11.50	10.14
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	6.45	8.91	5.83	4.40	9.20	4.31	3.09	1.97
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.7th percentile of hourly average concentrations	13.65	16.11	13.03	11.60	16.40	11.51	10.29	9.17

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentration	1.74	1.53	1.98	1.73	3.44	1.51	0.94	0.58
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.2nd percentile of 24-hour average concentrations	8.94	8.73	9.18	8.93	10.64	8.71	8.14	7.78
HCl Process Contribution	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.011
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.011
HCl Process Contribution	1-hour Average	2.44	3.56	2.78	1.74	2.82	0.99	0.98	0.61
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	1-hour Average	2.44	3.56	2.78	1.74	2.82	0.99	0.98	0.61
HF Process Contribution	1-hour Average	0.24	0.36	0.28	0.17	0.28	0.10	0.10	0.06
HF Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Pollutant	Averaging Period	Predicted Concentration (µg m^{-3})							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
HF Predicted Concentration	1-hour Average	0.24	0.36	0.28	0.17	0.28	0.10	0.10	0.06
Hg Process Contribution	Annual Average	2.10E-04	2.10E-04	4.80E-04	3.00E-04	7.00E-04	3.60E-04	2.20E-04	5.00E-05
Hg Background	-	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04
Hg Predicted Concentration	Annual Average	6.45E-04	6.45E-04	9.15E-04	7.35E-04	1.14E-03	7.95E-04	6.55E-04	4.85E-04
Hg Process Contribution	1-hour Average	0.012	0.018	0.014	0.009	0.014	0.005	0.005	0.003
Hg Background	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Hg Predicted Concentration	1-hour Average	0.013	0.019	0.015	0.010	0.015	0.006	0.006	0.004
Dioxins Process Contribution	Annual Average	3.55E-09	3.53E-09	8.02E-09	5.02E-09	1.19E-08	6.00E-09	3.71E-09	8.87E-10
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	Annual Average	3.55E-09	3.53E-09	8.02E-09	5.02E-09	1.19E-08	6.00E-09	3.71E-09	8.87E-10
Dioxins Process Contribution	1-hour Average	2.05E-07	3.01E-07	2.33E-07	1.49E-07	2.36E-07	8.28E-08	8.21E-08	5.14E-08
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Pollutant	Averaging Period	Predicted Concentration (µg m-3)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
Dioxins Predicted Concentration	1-hour Average	2.05E-07	3.01E-07	2.33E-07	1.49E-07	2.36E-07	8.28E-08	8.21E-08	5.14E-08
Dioxins Process Contribution	24-hour Average	3.07E-08	4.90E-08	5.08E-08	3.89E-08	7.52E-08	3.55E-08	2.71E-08	1.33E-08
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	24-hour Average	3.07E-08	4.90E-08	5.08E-08	3.89E-08	7.52E-08	3.55E-08	2.71E-08	1.33E-08
Group 1 Metals Process Contribution	Annual Average	0.0013	0.0011	0.0009	0.0016	0.0036	0.0014	0.0009	0.0002
Group 1 Metals Background	-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Group 1 Metals Predicted Concentration	Annual Average	0.041	0.041	0.041	0.042	0.044	0.041	0.041	0.040
Group 1 Metals Process Contribution	1-hour Average	0.10	0.10	0.07	0.09	0.10	0.05	0.03	0.01
Group 1 Metals Background	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Group 1 Metals Predicted Concentration	1-hour Average	0.17	0.17	0.14	0.16	0.17	0.12	0.10	0.08

Pollutant	Averaging Period	Predicted Concentration (µg m-3)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
Cadmium & Thallium Process Contribution	Annual Average	1.60E-04	1.60E-04	2.60E-04	2.20E-04	5.10E-04	2.40E-04	1.50E-04	3.00E-05
Cadmium & Thallium Background	-	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04
Cadmium & Thallium Predicted Concentration	Annual Average	5.56E-04	5.56E-04	6.56E-04	6.16E-04	9.06E-04	6.36E-04	5.46E-04	4.26E-04
Cadmium & Thallium Process Contribution	1-hour Average	0.0095	0.0127	0.0069	0.0088	0.0095	0.0047	0.0035	0.0017
Cadmium & Thallium Background	-	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Cadmium & Thallium Predicted Concentration	1-hour Average	0.0103	0.0135	0.0077	0.0096	0.0103	0.0055	0.0043	0.0025

Pollutant	Averaging Period	Predicted Concentration (μg m^{-3})							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
TOC Process Contribution	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.01
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.01
TOC Process Contribution	1-hour Average	2.44	3.58	2.78	1.77	2.82	0.99	0.98	0.61
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	1-hour Average	2.44	3.58	2.78	1.77	2.82	0.99	0.98	0.61

Notes: Reported annual average NO_X concentration = process contribution + background annual average; For short-term impacts, predicted environmental concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration not anticipated to vary significantly from 8-hr rolling average. As no 15-min time series can be set in model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance 1.

Table A3-3 In-Combination Impacts - AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Sensitive Receptor Locations Close to the Proposed Gasification Facility (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
NO_X Process Contribution	Annual Average	1.44	0.92	1.70	0.97	0.31	0.93	2.02	0.55	4.35	2.11
NO_X Background	-	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91
NO_X Predicted Environmental Concentration	Annual Average	21.35	20.83	21.61	20.88	20.22	20.84	21.93	20.46	24.26	22.02
NO_2 Process Contribution	Annual Average	1.01	0.64	1.19	0.68	0.22	0.65	1.41	0.39	3.05	1.47
NO_2 Background	-	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	16.20	17.20
NO_2 Predicted Environmental Concentration	Annual Average	16.21	15.84	16.39	15.88	15.42	15.85	16.61	15.59	19.25	18.67
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	6.59	3.78	7.35	4.50	2.23	9.44	8.95	2.79	14.72	10.69
NO_2 Background	Twice the annual average concentration	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	36.99	34.18	37.75	34.90	32.63	39.84	39.35	33.19	45.12	41.09
PM_{10} Process Contribution	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
PM_{10} Background	-	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	20.50

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
PM_{10} Predicted Environmental Concentration	Annual Average	18.57	18.55	18.58	18.55	18.52	18.55	18.60	18.53	19.72	20.61
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	0.21	0.13	0.21	0.13	0.04	0.13	0.14	0.08	0.69	0.20
PM_{10} Background	Twice Annual Average Concentration	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	39.00	41.00
PM_{10} Predicted Concentration	90.4th percentile of 24-hour average concentrations	37.21	37.13	37.21	37.13	37.04	37.13	37.14	37.08	39.69	41.20
CO Process Contribution	Max 8-Hour Average	2.94	2.04	3.61	2.19	0.87	3.53	4.27	1.22	7.19	8.48
CO Background	Twice the Annual Average Concentration	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00
CO Predicted Concentration	Max 8-Hour Average	229.94	229.04	230.61	229.19	227.87	230.53	231.27	228.22	234.19	235.48
SO_2 Process Contribution	Annual Average	0.36	0.23	0.42	0.24	0.08	0.23	0.50	0.14	1.09	0.53
SO_2 Background	-	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	4.60	5.60
SO_2 Predicted Concentration	Annual Average	3.96	3.83	4.02	3.84	3.68	3.83	4.10	3.74	5.69	6.13
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	7.27	4.04	7.69	4.45	2.33	9.91	11.57	3.36	14.40	12.54
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	9.20	11.20

Pollutant	Averaging Period	Predicted Concentration (µg/m³)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
SO_2 Predicted Concentration	99.9th percentile of 15-min average concentrations	14.47	11.24	14.89	11.65	9.53	17.11	18.77	10.56	23.60	23.74
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	4.50	2.65	5.11	3.15	1.53	6.55	5.77	1.97	10.42	7.11
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.7th percentile of hourly average concentrations	11.70	9.85	12.31	10.35	8.73	13.75	12.97	9.17	17.62	14.31
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	1.57	1.00	1.70	1.03	0.39	1.76	2.35	0.74	5.49	2.24
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	8.20	9.20
SO_2 Predicted Concentration	99.2nd percentile of 24-hour average concentrations	8.77	8.20	8.90	8.23	7.59	8.96	9.55	7.94	13.69	11.44
HCl Process Contribution	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
HCl Process Contribution	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33

Pollutant	Averaging Period	Predicted Concentration (µg/m³)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
HF Process Contribution	1-hour Average	0.17	0.16	0.15	0.08	0.04	0.25	0.28	0.09	0.23	0.23
HF Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HF Predicted Concentration	1-hour Average	0.17	0.16	0.15	0.08	0.04	0.25	0.28	0.09	0.23	0.23
Hg Process Contribution	Annual Average	0.0004	0.0002	0.0004	0.0002	0.0001	0.0002	0.0005	0.0001	0.0011	0.0005
Hg Background	-	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Hg Predicted Concentration	Annual Average	0.0008	0.0006	0.0008	0.0006	0.0005	0.0006	0.0009	0.0005	0.0015	0.0009
Hg Process Contribution	1-hour Average	0.0088	0.0079	0.0076	0.0039	0.0019	0.0123	0.0142	0.0046	0.0113	0.0117
Hg Background	-	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
Hg Predicted Concentration	1-hour Average	0.0097	0.0088	0.0085	0.0048	0.0028	0.0132	0.0151	0.0055	0.0122	0.0126
Dioxins Process Contribution	Annual Average	6.02E-09	3.84E-09	7.12E-09	4.06E-09	1.29E-09	3.89E-09	8.44E-09	2.32E-09	1.82E-08	8.82E-09
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	Annual Average	6.02E-09	3.84E-09	7.12E-09	4.06E-09	1.29E-09	3.89E-09	8.44E-09	2.32E-09	1.82E-08	8.82E-09
Dioxins Process Contribution	1-hour Average	1.47E-07	1.33E-07	1.28E-07	6.48E-08	3.1E-08	2.07E-07	2.39E-07	7.72E-08	1.89E-07	1.95E-07
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	1-hour Average	1.47E-07	1.33E-07	1.28E-07	6.48E-08	3.10E-08	2.07E-07	2.39E-07	7.72E-08	1.89E-07	1.95E-07
Dioxins Process Contribution	24-hour Average	3.15E-08	2.26E-08	4.17E-08	2.69E-08	1.14E-08	3.51E-08	4.99E-08	1.53E-08	1.06E-07	6.55E-08

Pollutant	Averaging Period	Predicted Concentration (µg/m³)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	24-hour Average	3.15E-08	2.26E-08	4.17E-08	2.69E-08	1.14E-08	3.51E-08	4.99E-08	1.53E-08	1.06E-07	6.55E-08
Group 1 Metals Process Contribution	Annual Average	0.0009	0.0007	0.0015	0.0010	0.0003	0.0014	0.0009	0.0005	0.0017	0.0010
Group 1 Metals Background	-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Group 1 Metals Predicted Concentration	Annual Average	0.041	0.041	0.042	0.04`	0.04	0.041	0.041	0.041	0.042	0.041
Group 1 Metals Process Contribution	1-hour Average	0.03	0.02	0.05	0.04	0.01	0.11	0.07	0.01	0.05	0.08
Group 1 Metals Background	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Group 1 Metals Predicted Concentration	1-hour Average	0.10	0.09	0.12	0.11	0.08	0.18	0.14	0.08	0.12	0.15
Cadmium & Thallium Process Contribution	Annual Average	0.0002	0.0001	0.0003	0.0002	0.0001	0.0002	0.0003	0.0001	0.0006	0.0003
Cadmium & Thallium Background	-	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Cadmium & Thallium Predicted Concentration	Annual Average	0.0006	0.0005	0.0007	0.0006	0.0005	0.0006	0.0007	0.0005	0.0010	0.0007

Pollutant	Averaging Period	Predicted Concentration (µg/m³)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
Cadmium & Thallium Process Contribution	1-hour Average	0.0044	0.0040	0.0049	0.0037	0.0010	0.0112	0.0073	0.0023	0.0056	0.0078
Cadmium & Thallium Background	-	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Cadmium & Thallium Predicted Concentration	1-hour Average	0.0052	0.0048	0.0057	0.0045	0.0018	0.0120	0.0081	0.0031	0.0064	0.0086
TOC Process Contribution	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
TOC Process Contribution	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33

Notes: Reported annual average NO_X concentration = process contribution + background annual average; For short-term impacts, predicted environmental concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration not anticipated to vary significantly from 8-hr rolling average. As no 15-min time series can be set in model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance 1.

Table A3-4 In-Combination Impacts - Maximum Predicted Nitrogen Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		(μg m^{-3})	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
1	Barry Island	0.54	0.054	12.9	12.95	10 to 15	0.42%	0.54%
2	Cliff Wood - Golden Stairs	0.18	0.018	25.3	25.32	10 to 15	0.07%	0.18%
3	Coedydd Y Barri/Barry Woodlands	0.12	0.012	25.3	25.31	10 to 15	0.05%	0.12%
4	Cog Moors	0.15	0.015	11.8	11.82	10 to 15	0.12%	0.15%
5	Cosmeston Park	0.11	0.011	22.5	22.51	10 to 15	0.05%	0.11%
6	Cwm Cydfin, Leckwith	0.03	0.003	26.2	26.20	10 to 15	0.01%	0.03%
7	East Aberthaw Coast	0.07	0.007	13.3	13.31	10 to 15	0.05%	0.07%
8	Ely Valley	0.03	0.003	-	-	-	-	-
9	Flat Holm	0.07	0.007	10.2	10.21	10 to 15	0.07%	0.07%
10	Hayes Point to Bendrick Rock	1.11	0.112	12.9	13.01	10 to 15	0.87%	1.12%
11	Nant Whitton Woodlands	0.04	0.004	31.2	31.20	10 to 15	0.01%	0.04%
12	Penarth Coast	0.15	0.015	11.8	11.82	10 to 15	0.13%	0.15%

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		($\mu g\ m^{-3}$)	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
13	Severn Estuary	0.04	0.004	14	14.00	10 to 15	0.03%	0.04%
14	Sully Island	0.23	0.024	11.8	11.82	10 to 15	0.20%	0.24%
15	Severn Estuary	0.10	0.010	11.8	11.81	10 to 15	0.08%	0.10%
16	Severn Estuary	0.10	0.010	11.8	11.81	10 to 15	0.08%	0.10%
17	Severn Estuary - Sully Island	0.23	0.024	11.8	11.82	10 to 15	0.20%	0.24%
Assessment Criteria		30	-	-	-	-	-	1%

Notes: Dry deposition velocity for NO_2 was assumed as 1.5 mm/s and NO_2 wet deposition was assumed as negligible as suggested by the UK Environment Agency for similar assessments. NO_2 wet deposition was assumed as negligible.

Table A3-5 In-Combination Impacts - Maximum Predicted Acid Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		($\mu g\ m^{-3}$)	($\mu g\ m^{-3}$)	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
1	Barry Island	0.38	0.13	0.0039	0.0269	0.0079	0.039	1.39	1.43	4	2.79%	0.97%
2	Cliff Wood - Golden Stairs	0.13	0.04	0.0013	0.0090	0.0026	0.013	2.08	2.09	8.24	0.62%	0.16%
3	Coedydd Y Barri/Barry Woodlands	0.08	0.03	0.0008	0.0058	0.0017	0.008	2.08	2.09	2.42	0.40%	0.34%
4	Cog Moors	0.10	0.04	0.0011	0.0073	0.0021	0.010	1.07	1.08	1.5	0.98%	0.70%
5	Cosmeston Park	0.08	0.03	0.0008	0.0055	0.0016	0.008	1.07	1.08	4	0.74%	0.20%
6	Cwm Cydfin, Leckwith	0.02	0.01	0.0002	0.0014	0.0004	0.002	2.37	2.37	10.3	0.09%	0.02%

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		(µg m^{-3})	(µg m^{-3})	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
7	East Aberthaw Coast	0.05	0.02	0.0005	0.0032	0.0010	0.005	NA	-	NA	-	-
8	Ely Valley	0.02	0.01	0.0002	0.0013	0.0004	0.002	-	-	-	-	-
9	Flat Holm	0.05	0.02	0.0005	0.0033	0.0010	0.005	NA	-	NA	-	-
10	Hayes Point to Bendrick Rock	0.78	0.28	0.0081	0.0553	0.0162	0.080	NA	-	NA	-	-
11	Nant Whitton Woodlands	0.03	0.01	0.0003	0.0021	0.0006	0.003	2.47	2.47	2.48	0.12%	0.12%
12	Penarth Coast	0.11	0.04	0.0011	0.0075	0.0022	0.011	NA	-	NA	-	-
13	Severn Estuary	0.03	0.01	0.0003	0.0022	0.0006	0.003	NA	-	NA	-	-

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		($\mu g\ m^{-3}$)	($\mu g\ m^{-3}$)	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
14	Sully Island	0.16	0.06	0.0017	0.0116	0.0034	0.017	NA	-	NA	-	-
15	Severn Estuary	0.07	0.02	0.0007	0.0048	0.0014	0.007	1.07	1.08	1.5	0.64%	0.46%
16	Severn Estuary	0.07	0.02	0.0007	0.0049	0.0014	0.007	NA	-	NA	-	-
17	Severn Estuary - Sully Island	0.16	0.06	0.0017	0.0116	0.0034	0.017	NA	-	NA	-	-

Note: NO_2 wet deposition was assumed as negligible.

Figure A3-1: In-Combination Impacts - Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

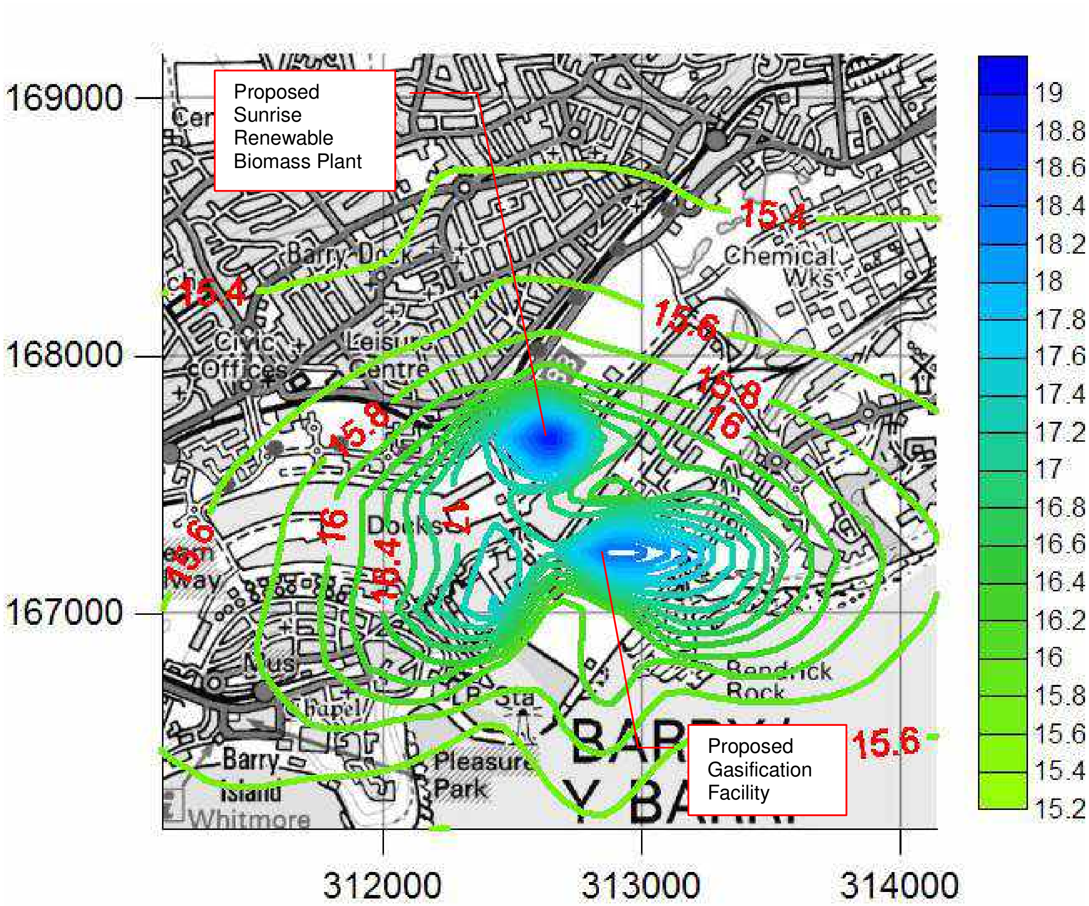
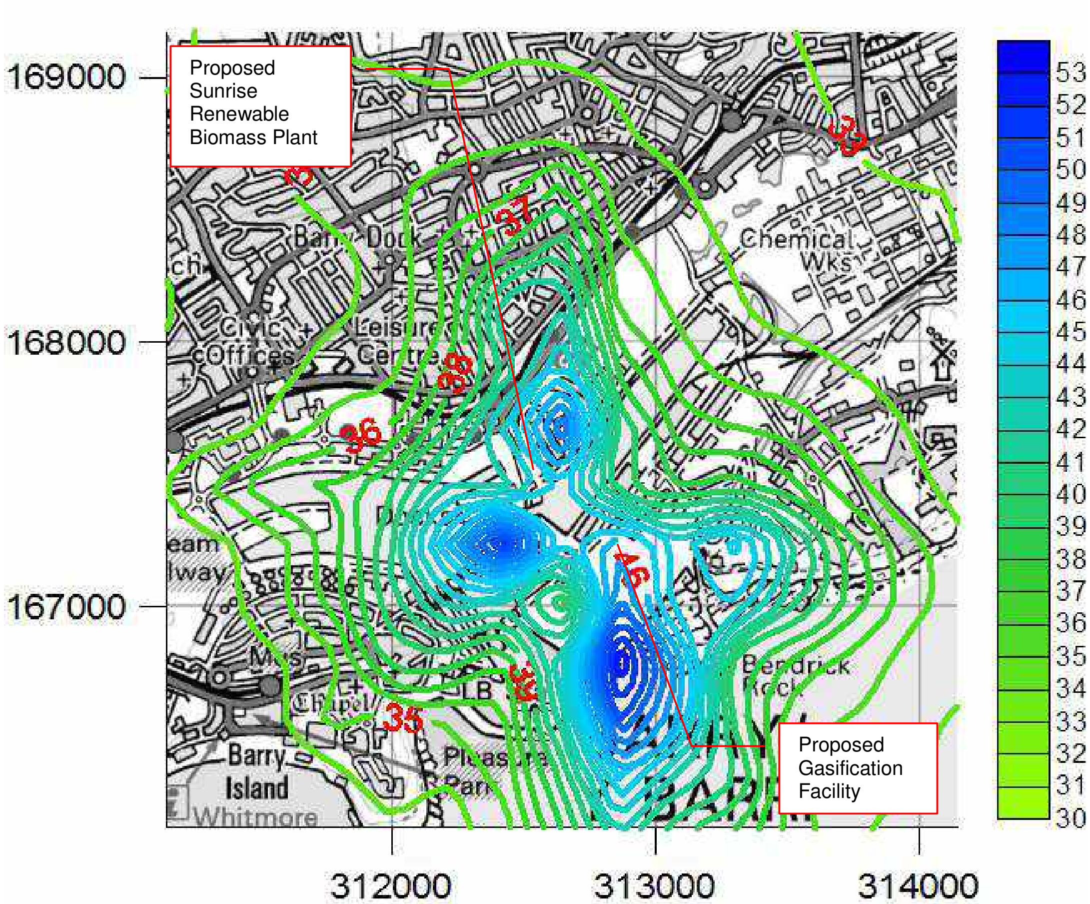


Figure A3-2: In-Combination Impacts - 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)



DISPERSION MODELLING OF EMISSIONS TO AIR FROM A PROPOSED BIOMASS POWER PLANT IN BARRY, SOUTH WALES

Prepared for

SUNRISE RENEWABLES

MARCH 2009

RSK GENERAL NOTES

Project No:	660003
Title:	DISPERSION MODELLING OF EMISSIONS TO AIR FROM A PROPOSED BIOMASS PLANT IN BARRY, SOUTH WALES
Client:	Sunrise Renewables
Issue Date:	FINAL
Issuing Office:	Hemel Hempstead

Authorised by:		Project Author	Date:	20.03.2009
Authorised by:		Project QA Rep	Date:	20.03.2009

RSK EHS Ltd (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied is made as to the professional advice included in this report.

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Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the Safety, Health, Environment and Quality (SHEQ) Management System of RSK.

EXECUTIVE SUMMARY

RSK EHS Ltd (RSK) were commissioned by Sunrise Renewables to undertake an air quality assessment for the proposed 9MW biomass plant located in Barry, South Wales. The plant has been designed to pyrolyse fuel derived from waste wood to produce syngas, which is turn is used as fuel in gas engines to generate electricity.

Air quality impacts in terms of key pollutant concentrations resulting from operation of the proposed biomass plant have been assessed using an advanced dispersion model 'AERMOD'. The predictive assessment established that under the worst-case operational scenario, there will be no exceedence of relevant air quality standards designed for the protection of human health.

At all protected/designated ecological sites within 10 km of the proposed development, the annual average NO_X concentrations are predicted to meet the relevant air quality standard for the protection of vegetation and ecosystems.

The predicted nitrogen and acid deposition rates are less than 1% of the background deposition rate. Where exceedence of critical nitrogen deposition load was identified, such exceedences are due to predominant background deposition rates and the highest process contribution at such locations is less than 1% of the lower critical load.

Following the comments from the Vale of Glamorgan Council on the draft air quality assessment report for the proposed development, in-combination impacts resulting from operation of the proposed biomass plant along with the nearby proposed Biogen gasification facility have also been assessed. The cumulative assessment identified that the resulting increase in pollutant concentrations is marginal and impacts are insignificant.

Air quality impacts resulting from the operation of the proposed biomass plant are not considered to be significant.

Glossary

AQS	Air Quality Strategy
CO	Carbon monoxide
EU	European Union
HCl	Hydrogen Chloride
HF	Hydrogen Fluoride
Hg	Mercury
IPPC	Integrated Pollution, Prevention & Control
NAQS	National Air Quality Strategy
NO_x	Oxides of nitrogen
NO_2	Nitrogen dioxide
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
TOC	Total Organic Carbon

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1. INTRODUCTION

1.1 Scope

RSK Environment, Health and Safety Ltd (RSK) were commissioned by Sunrise Renewables to undertake an air quality impact assessment of combustion emissions from a proposed 9 MWe biomass power plant in Barry, South Wales. The plant has been designed to pyrolyse fuel derived from waste wood to produce syngas, which is turn is used as fuel in gas engines to generate electricity. Detailed dispersion modelling of stack emissions from the proposed plant was undertaken in response to comments by the relevant local authority, the Vale of Glamorgan Council (VGC), to identify potential air quality impacts. In particular, the potential impact of operational emissions on local residential and ecological receptors, including Sites of Special Scientific Interest (SSSI).

VGC made the following comments on the air quality aspects of the proposed development.

"Specific details on the types and sources of wood to be used as fuel including details on the quality control of the feedstock (with reference to the potential impact on emissions to air).

Details of all point source and fugitive emissions to air, including stack height calculations, stack dimensions and characteristics (e.g. flow, temp, efflux velocity).

Details on the types and considerations of emissions from all sources including products of combustion and those attributable to varying wood quality sources. Details should be provided of expected emissions during abnormal operating conditions (e.g. start-up, emergency situations). This information should be combined with an impact assessment on local air quality which should include the Air Quality Objective pollutants and any other substances which have the potential to impact on the area. The assessment should take account of the elevated position of the residences on Dock View Road".

Subsequently, RSK have contacted the concerned officer on 6th January 2009 at the VGC with a proposed air quality assessment methodology. The Council's Pollution Control Officer, Mr Jon Bailes informed RSK that the proposed methodology is acceptable, subjected to the condition that additional sensitive receptor locations are included in the assessment. The abovementioned comments, along with comments on the proposed methodology from VGC have been taken into account in assessing the air quality impacts. The comments concerning the types and sources of wood have been addressed in the main application document and hence not reported here. Elevated position of the residences on Dock View Road has been taken into account by using terrain elevation data in the air dispersion modelling.

RSK have completed the air quality assessment for the proposed development after taking the aforementioned comments from the VGC and submitted the assessment report. The Principal Planning Officer (Development Control) at the VGC, Mr. Steve Ball has suggested on 13th March 2009 that in-combination impacts of operation of the proposed biomass plant along with the nearby Biogen gasification plant should also be assessed. RSK have predicted the in-combination impacts and the outcomes of this cumulative impact assessment are included in this report.

The dispersion modelling assessment, the outcomes of which are presented in this report, takes into account, and includes a discussion of, the following key parameters/elements. It should be noted that the results presented in the main report are based on a stack height of 20 m. A full stack height appraisal is presented in Appendix 1.

- Ambient/background levels;
- Assessment criteria;
- Emission parameters;
- Modelling domain/receptors;
- Meteorology/surface characteristics;
- Influence of buildings;
- Sensitivity analysis;
- Cumulative impact assessment;
- Assumptions relating to pollutant conversion processes (e.g. NO_x/NO_2 photochemistry) for different averaging periods;
- Results in tabular form, identifying environmental concentrations (process plus background) in comparison with relevant assessment criteria and locations of maximum air quality impacts and the process contribution to this; and,
- Contour plots of predicted NO_X/NO_2, SO_2 and CO ground level concentrations (GLCs).

1.2 Site Description

The proposed 9 MWe biomass power plant will be located within the administrative boundary of the Vale of Glamorgan Council (VGC). Specifically, the power plant will be situated at the junction of Woodham Road and David Davies Road, Barry Docks, Barry, South Wales, as shown below in Figure 1-1. The national grid reference for the approximate centre of the site is 312467, 167668.

Figure 1-1: Location of Proposed Biomass Plant

2. ASSESSMENT METHODOLOGY

2.1 Legislation and Assessment Criteria

UK air quality policy is published under the umbrella of the Environment Act, 1995, Part IV and specifically Section 80, the National Air Quality Strategy (NAQS). The latest Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air, published in July 2007, sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2010.

The air quality standards in the UK are derived from European Commission (EC) Directives. The EU Air Quality Framework Directive (1996)[(1)] established a framework under which the EU could set limit or target values for specified pollutants. The Directive identified twelve pollutants for which limit or target values have or will be set in subsequent Daughter Directives. The first of these Daughter Directives[(2)], relating to sulphur dioxide (SO_2), fine particles (PM_{10}), oxides of nitrogen (NO_x) and lead (Pb), was formally adopted in April 1999, and was required to be implemented by all Member States by July 2001.

Relevant regulations applicable in Wales include:

- The Air Quality (Wales) Regulations 2000 (S.I. 2000/1940) (W.138);
- The Air Quality (Amendment) (Wales) Regulations 2002 (S.I. 2002/3182) (W.298);
- The Air Quality Limit Values (Wales) Regulations 2001 (S.I. 2001/2683) (W.224);
- Air Quality Limit Values (Wales) Regulations 2002 (S.I. 2002/3183) (W.299);
- The Air Quality (Ozone) (Wales) Regulations 2003 (S.I. 2003/1848) (W.198);
- The Air Quality Limit Values Regulations (2003) (S.I. 2003/2121);
- The Air Quality Limit Values (Wales) (Amendment) Regulations 2005 (S.I. 2005/1157) (W.74); and,
- The Air Quality Standards (Wales) Regulations (2007) (S.I. 2007/717) (W.63).

[1] Council Directive 1996/62/EC Framework Directive on Ambient Air Quality Assessment and Management 27 Sept 1996.

[2] Council Directive 1999/30/EC of 22 April 1999 relating to limit values for SO_2, NO_2, NO_X, particulate matter and lead in ambient air.

The primary emission components of concern resulting from the combustion of syngas in the proposed power plant are considered to be nitrogen oxides (NO_x), sulphur dioxide (SO_2), fine particles (PM_{10}) and carbon monoxide (CO). These parameters are subject to the air quality objectives set out in the UK National Air Quality Strategy (NAQS), as presented below in Table 2-1. Other emissions including dioxins, hydrogen chloride (HCl), hydrogen fluoride (HF) and mercury (Hg) are not considered to be significant.

In addition to the UK NAQS, the Environment Agency's Integrated Pollution Prevention and Control Horizontal Guidance Note 1 (IPPC H1, 2003) provides environmental benchmarks for the protection of human health for hydrogen chloride (HCl), hydrogen fluoride (HF) and mercury (Hg) as identified in Table 2-2. Both HCl and HF have the potential to contribute to acid deposition effects. No guideline level is available for dioxins.

Table 2-1: UK National Air Quality Strategy Objectives

Emission Parameter	Intention	Period of Exposure	Air Quality Objective	Attainment Date
NO_2	Protection of human health	1-hour mean	200 µg/m³ not to be exceeded more than 18 times per calendar year (99.79th percentile)	31 December 2005
	Protection of human health	Annual mean	40 µg/m³	31 December 2005
NO_x	Protection of ecosystem health	Annual mean	30 µg/m³	31 December 2000
CO	Protection of human health	Running 8-hour mean	10 mg/m³	1 December 2003
Particles PM_{10}	Protection of human health	24-hour mean	50 µg/m³	31 December 2004
	Protection of human health	Annual mean	40 µg/m³	31 December 2004
SO_2	Protection of human health	15-min mean	266 µg/m³	31 December 2005
	Protection of human health	1-hour mean	350 µg/m³	31 December 2004
	Protection of human health	24-hour mean	125 µg/m³	31 December 2004
	Protection of ecosystem health	Annual mean	20 µg/m³	31 December 2000

Table 2-2 Environmental Benchmarks for HCl and HF

Emission Parameter	Intention	Period of Exposure	Air Quality Objective
HCl	Protection of human health	1-hour mean	800 µg/m³
		Annual mean	20 µg/m³
HF	Protection of human health	1-hour mean	250 µg/m³
Hg	Protection of human health	1-hour mean	7.5 µg/m³
	Protection of human health	Annual mean	0.25 µg/m³

2.2 Baseline Air Quality

2.2.1 UK Air Quality Archive Data

The UK Air Quality Archive, which is maintained by AEA on behalf of DEFRA (Department for Environment, Food and Rural Affairs) and the devolved administrations, provides predicted background air quality maps that can be used in air quality modelling studies to represent background concentrations of pollutants of concern. The maps combine air quality monitoring data with the output from predictive modelling, which includes emissions from arterial roads and major industries, to provide predicted background pollutant concentrations on a 1 km by 1 km grid basis across the UK.

Predicted/mapped background air quality at the biomass plant site for the base case year of 2008 and the anticipated opening year of 2010 is presented below in Table 2-3. Background NO_x, NO_2 and PM_{10} data for 2008 and 2010 were appropriately adjusted from 2005 base data using the Year Adjustment Calculator (also available at the UK Air Quality Archive). Background CO concentrations for 2008 and 2010 were adjusted from 2001 base data. The background SO_2 concentration for 2008 and 2010 was obtained from 2001 base data. No year conversion factors were available for this parameter.

Background concentrations of pollutants of concern are well below the national air quality standards protective of human health. Furthermore, background concentrations are predicted to fall over time at the proposed site.

Table 2-3 Estimated/Mapped Annual Average Background Pollutant Concentrations (µg /m^3)

Pollutant	2008	2010	Air Quality Objective
Nitrogen Dioxide (NO_2)	14.7	12.1	40
Nitrogen Oxides (NO_X)	16.6	15.4	30
Carbon Monoxide (CO)	127.8	113.5	10,000
Sulphur Dioxide (SO_2)	3.6	3.6	20
Particles (PM_{10})	15.5	15.3	40

Notes: NO_X air quality objective is set for the protection of vegetation and ecosystems only; presented concentrations are for 1 km by 1 km grid square centred at grid reference: 312500, 167500 (approximate location of centre of the site: 312647, 167668).

2.2.2 Local Authority Air Quality Review and Assessment

As required by the Environment Act 1995, local authorities are obligated to review and assess air quality with respect to the standards and objectives for the pollutants specified in the Government's National Air Quality Strategy (NAQS). Local authorities are required to carry out an Updating and Screening Assessment (USA) of their area every three years. If the USA identifies potential hotspot areas where air quality objectives are likely to be exceeded, then a detailed assessment of those areas is required. Where objectives are not predicted to be met, local authorities must declare the area as an Air Quality Management Area (AQMA). In addition, local authorities are required to produce an Air Quality Action Plan (AQAP), which includes measures to improve air quality within the AQMA.

The Vale of Glamorgan Council (VGC), the relevant local authority, has reviewed air quality within its administrative boundary, and has not declared any AQMAs. Passive diffusion tube and automatic air quality monitoring is carried out within the VGC area. The nearest passive and automatic monitoring locations to the proposed biomass power plant site are described below:

- Rurally located automatic monitoring station (Vale of Glamorgan Fonmon) situated approximate 6 km west of the proposed biomass plant in a car park next to the Highwayman Inn, Rhoose. This monitoring station is part of the Welsh Automatic Rural Pollution Monitoring Network; and,

- An intermediate NO_2 diffusion tube site located at St. Teilo Avenue, Barry (approximately 1.5 km north of the proposed biomass plant).

Table 2-4 below presents 2007 annual average NO_X, NO_2, SO_2 and PM_{10} data as measured at the two monitoring stations. Relevant air quality objectives were met at both sites in 2007.

Table 2-4 2007 Annual Average Air Quality Monitoring Data from the Vale of Glamorgan Fonmon Automatic Monitoring Station and the St. Teilo Avenue Diffusion Tube Monitoring Site

Monitoring Locations	2007 Annual Average NO_x Concentration ($\mu g/m^3$)	2007 Annual Average NO_2 Concentration ($\mu g/m^3$)	2007 Annual Average SO_2 Concentration ($\mu g/m^3$)	2007 Annual Average PM_{10} Concentration ($\mu g/m^3$)
Vale of Glamorgan Fonmon Automatic Station	16.4	11.9	3.6	19.6
Diffusion Tune at St. Teilo Avenue	No Data	17.0	No Data	No Data
Air Quality Objectives	30	40	20	40

2.2.3 Background Air Quality Data Included in the Assessment

Table 2-5 below summarises the background air quality data employed in the dispersion modelling assessment. Estimated (2010) annual average pollutant concentrations are derived from a combination of sources, including the UK Air Quality Archive and the nearest automatic and diffusion tube monitoring stations to the proposed biomass plant. Where appropriate, the data have been adjusted for the future year of 2010 by applying relevant LAQM TG(03) year adjustment factors.

Table 2-5 Estimated 2010 Annual Average Pollutant Concentrations

	NO_x ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	CO ($\mu g/m^3$)	SO_2 ($\mu g/m^3$)
UK Air Quality Archive	15.4	12.1	15.3	**113.5**	3.6
Vale of Glamorgan Fonmon Automatic Station	14.3	10.9	**18.5**	-	**3.6**
St. Teilo NO_2 Diffusion Tube	**19.9 (derived from NO_2 measurement)**	**15.2**	-	-	-

In this assessment, the 2010 annual average background CO concentration obtained from the UK Air Quality Archive was used. 2010 annual average background PM_{10} and SO_2 concentrations were derived from the 2007 VGC Fonmon automatic monitoring station data. The 2010 background NO_2 concentration was derived from the 2007 St. Teilo Avenue diffusion tube data. The 2010 background NO_X concentration employed in the assessment was derived from the 2007 St. Teilo Avenue NO_2 diffusion tube data by multiplying the annual average NO_2 concentration by the NO_x/NO_2 ratio from the VCG Fonmon automatic monitoring station, which is 1.31 (14.3 $\mu g/m^3$/10.9 $\mu g/m^3$). No background concentrations of dioxins, HCl, HF and Hg are available, however, background concentrations of these pollutants are considered to be negligible.

2.3 Model Description

AERMOD is a state-of-the-science dispersion modelling system that simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. It is based on atmospheric boundary layer turbulence structure and scaling concepts, including treatment of multiple ground-level and elevated point, area and volume sources. It handles flat, complex, rural or urban terrain and includes algorithms for building effects and plume penetration of inversions aloft. It uses Gaussian dispersion for stable atmospheric conditions (i.e. low turbulence) and non-Gaussian dispersion for unstable conditions (i.e. high turbulence).

AERMOD includes two data pre-processors for streamlining data input. AERMET, a meteorological pre-processor, computes boundary layer and other necessary parameters for use with AERMOD and accepts data from both on-site and off-site sources. AERMAP is a terrain pre-processor that simplifies the computation of receptor elevations and effective height scales for numerous types of digital data formats, including USGS 1 Degree and 7.5 minute digital elevation model (DEM) files and U.K. Ordnance Survey® digital elevation data.

Breeze AERMOD GIS Pro v.7.0.21 was used in this study for assessing potential air quality impacts. The model is considered by the UK Environment Agency to be appropriate for assessments of the nature described in this report.

2.4 Emission Source Parameters

The only significant source of emissions to air from:

- 1 X 9 MWe Biomass Plant (fuel: syngas derived from waste wood).

As the proposed biomass plant utilizes waste wood, emissions from the plant should be compliant of the Waste Incineration Directive (WID)[3]. The maximum emission releases stipulated by WID are identified in Table 2-6.

Table 2-6 Emission Limit Values Stipulated By the Waste Incineration Directive

Pollutant	Emission Limit Value†, mg Nm^{-3}
Nitrogen oxides (expressed as nitrogen dioxide)	200
Particulate Matter (PM10)	10
Sulphur dioxide	50
Carbon monoxide	50
Hydrogen chloride	10
Hydrogen fluoride	1
Mercury compounds (expressed as mercury)	0.05
Dioxins and Furans	0.1 ng m^{-3}

†Note: The reported values are at temperature 273°K, pressure 101.3 kPa, 11% oxygen and dry gas conditions and refer to the daily average concentration limit values.

2.4.1 Pollutant Emission Concentrations From A Similar Plant

For a similar plant of capacity 3 MW electricity generation capacity (Rhymney Organic Regeneration Facility, Hudol Thermal Treatment Unit 15, Capital Valley Industrial Estate, Rhymney, Caerphilly, NP22 5PT; The plant gasifies a range of biomass and oily sludge wastes), the Environment Agency stipulated the pollutant emission limit values identified in Table 2-7 for the key air pollutants.

Table 2-7 Pollutant Emission Concentrations Stipulated By The UK Environment Agency For Rhymney Organic Regeneration Facility

Pollutant	Pollutant Emission Concentration, mg m^{-3}	
	Daily Average Limit	Half-hourly Average Limit
Nitrogen oxides (expressed as nitrogen dioxide) (NO_X)	90	100
Particulate Matter (PM_{10})	7	10
Sulphur dioxide (SO_2)	20	30
Carbon monoxide (CO)	10	15
Hydrogen Chloride (HCl)	1	16
Hydrogen Fluoride (HF)	1	4
Mercury (Hg)	0.05 mg m-3 (Average over a period of 30 minutes and 8 hours)	
Dioxins and Furans	0.1 ng m-3 (Average over a period of 6 and 8 hours)	

Source: Draft Permit With Introductory Note (Permit Number ZP3535MW) Issued by the UK Environment Agency.

Whilst the emissions from the proposed development are similar that identified in Table 2-7 (for a similar plant), the proposed plant will be WID compliant. To conservatively assess the air quality impacts, higher of the daily average pollutant emission concentrations (that stipulated by WID as

[3] WID: The Directive on the Incineration of Waste. Also, the Environmental Permitting Guidance, Environmental Permitting (England and Wales) Regulations 2007, Department for Environment Food and Rural Affairs (DEFRA), http://www.defra.gov.uk .

identified in Table 2-6) have been included in the assessment. The emission parameters included in the dispersion modelling study are summarised below in Table 2-8.

Table 2-8: Emission Parameters for Sources Included in the Dispersion Model

Emission Source	Biomass Plant
Source Location (Easting, Northing)	312647, 167668
Stack Height, m (from ground level)	20
Stack Diameter, m	0.9
Efflux Temperature, deg K	598
Efflux Velocity, m/s	14
Pollutant Emission Concentrations, mg Nm^{-3}	
Nitrogen oxides NO_X (expressed as nitrogen dioxide, NO_2)	200
Particulate Matter (PM10)	10
Sulphur dioxide	50
Carbon monoxide	50
Hydrogen chloride	10
Hydrogen fluoride	1
Mercury compounds (expressed as mercury)	0.05
Dioxins and Furans	0.1 ng m^{-3}
Pollutant Emission Rates, g/s	
NO_X	0.8132
PM_{10}	0.0407
SO_2	0.2033
CO	0.2033
HCl	0.0407
HF	0.0041
Hg	0.0002
Dioxins and Furans	4.07×10^{-10}

Maintenance of a log of all abnormal operations and associated emissions to air will be a requirement of the Environmental Permit issued and regulated by the Environment Agency. The log will be completed during the operational phase of the development.

2.5 Modelled Scenario

In order to characterise potential worst-case air quality impacts resulting from emissions from the power plant stack, it was assumed that the plant was operating continuously throughout the year. This is considered appropriate to capture the variation in meteorological conditions over a given year and, therefore, worst-case dispersion profiles.

2.6 Modelled Domain

Two grid domains (far-field and near-field) were incorporated in the dispersion model to capture the coarse and fine scale variation in predicted pollutant concentrations with distance. Both domains were approximately centred on the proposed power plant site. The far-field domain covered an area of approximately 20 km by 20 km, and had a grid resolution/spacing of 250 m. The near-field domain covered an area of approximately 3 km by 3 km and had a grid resolution/spacing of 30 m. The grid reference of the southwest and northeast corner of each grid domain is identified below in Table 2-9.

Table 2-9 Extent of Modelled Grid Domains

Location	Far-field (20 km x 20 km coarse receptor grid; 250 m spacing)		Near-field (3 km x 3 km fine receptor grid; 30 m spacing)	
	x	y	x	y
Southwest corner of grid domain	302719.6	160157.8	311147	166168
Northeast corner of grid domain	322719.6	180157.8	314147	169168

2.7 Discrete Receptors

In addition to the near-field and far-field grid domains discussed above, pollutant concentrations were also predicted at all important/designated ecological sites within 10 km of the proposed power plant. The location of all assessed receptors included in the model are presented below in Table 2-10. The coordinates approximately represent the nearest point on the sensitive site to the proposed power plant. Existing and proposed residential properties close to the site were also included in the model.

Table 2-10 Discrete Receptors Included in the Dispersion Model

Receptor Name	Receptor Reference Number (As Included in Dispersion Model)	Designation	Grid Reference		Habitat for Nitrogen and Acid Deposition
Barry Island	1	SSSI	311182	166346	Carboniferous Limestone [1]
Cliff Wood - Golden Stairs	2	SSSI	309468	167132	Mixed Woodland
Coedydd Y Barri/Barry Woodlands	3	SSSI	309182	168632	Semi-natural Broadleaved woodland
Cog Moors	4	SSSI	315719	169204	Unimproved Grassland [2]
Cosmeston Park	5	SSSI	316826	169168	Open Water, Fem, Woodland and Remnant Limestone Grassland
Cwm Cydfin, Leckwith	6	SSSI	316433	173812	Mixed Woodland
East Aberthaw Coast	7	SSSI	305039	165703	Rocky and Sandy Shore, Shingle Spits, Saltmarsh, Relict sand Dunes and Liassic Limestone Cliffs
Ely Valley	8	SSSI	311436	175715	-
Flat Holm	9	SSSI	321755	164775	Coarse Grassland [2]
Hayes Point to Bendrick Rock	10	SSSI	312968	166811	Wave-Rippled Siltstones and Fine Sandstones [3]
Nant Whitton Woodlands	11	SSSI	306610	171633	Mixed Woodland

Receptor Name	Receptor Reference Number (As Included in Dispersion Model)	Designation	Grid Reference		Habitat for Nitrogen and Acid Deposition
Penarth Coast	12	SSSI	317505	167596	Calcareous Grassland and Cliff-top Scrub
Severn Estuary	13	SSSI	319626	172368	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Sully Island	14	SSSI	316540	166918	Rocks include a series of Breccias and Sands [3]
Severn Estuary	15	Ramsar Site and Special Protection Area	318851	168061	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Severn Estuary	16	Special Area of Conservation	318893	167958	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Severn Estuary - Sully Island	17	Important Bird Area	316540	166918	Grazing Marsh, Saltmarsh, Shingle, Rocks and Cliffs
Residential Receptor 1	18	Property near junction of Dock View Road and Castleland Street	312387	167970	-
Residential Receptor 2	19	Property near junction of Dock View Road and George Street	312460	168045	-
Residential Receptor 3	20	Property on Dyfrig Street	312073	166912	-
Residential Receptor 4	21	Property of Barry Docks Waterfront Development Phase 1	311975	167617	-
Residential Receptor 5	22	Proposed Property of Barry Docks Waterfront Development Phase 2	312356	167409	-
Residential Receptor 6	23	Property on Bendrick Road	313443	167554	-
Residential Receptor 7	24	Property on Hayes Road	313644	167729	-
Residential Receptor 8	25	Property at Residential area NE of Industrial Area	313380	168850	-

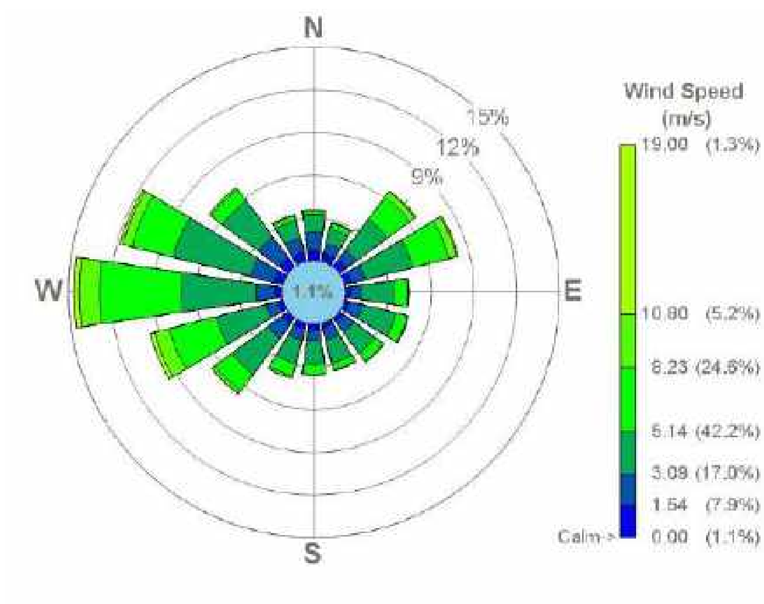
Notes: SSSI = Site of Special Scientific Interest; SAC= Special Area of Conservation; SPA = Special Protection Area.
[1]Relevant habitat not listed by Air Pollution Information Service so assumed habitat to comprise of limestone pavement.
[2]Relevant habitat not listed by Air Pollution Information Service so assumed habitat to comprise of calcareous grassland
[3]Relevant habitat not listed by Air Pollution Information Service so assumed habitat to comprise of shingle, rocks and cliffs

2.8 Meteorological Data

Five years (2003 to 2007) of hourly sequential meteorological data as measured at the Met Office's Rhoose monitoring station were employed in the dispersion model. The Rhoose monitoring station (station latitude: 51.4 N; station longitude: -3.343 W; station height: 65 m), which is approximately 7 km west of the proposed biomass plant, is the most representative monitoring station for which all meteorological parameters required for AERMOD are available.

Figure 2-1 below shows a windrose produced from data as measured at the Rhoose monitoring station between 2000 and 2007. The predominant wind direction is westerly.

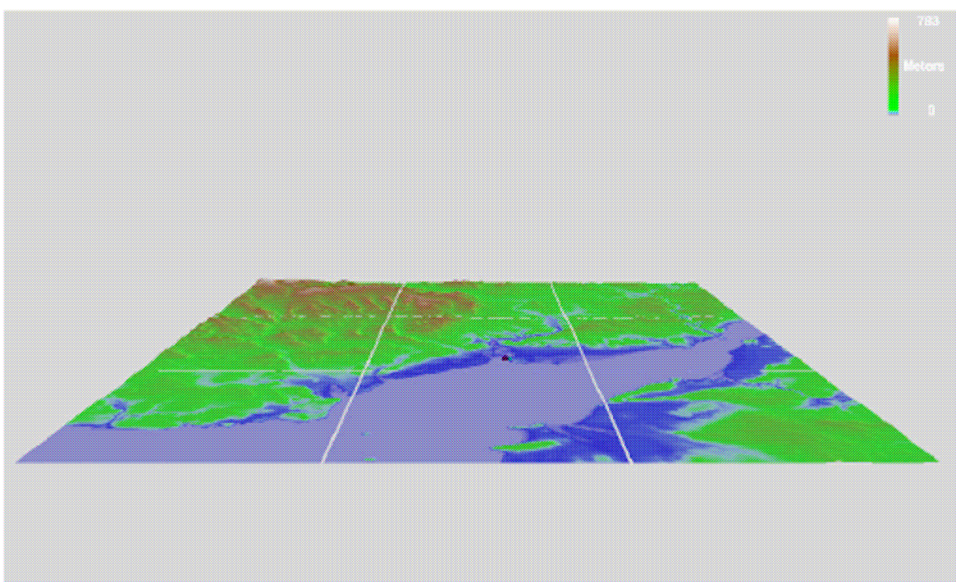
Figure 2-1: Windrose Derived from Rhoose Measurement Data (2000 to 2007)



2.8.1 Terrain

Terrain data have been included in the model to account for topographical features such as hills, which can have a significant effect on the dispersion of pollutants. Elevated position of residential properties on Dock View Road have hence been taken into account.

Figure 2-2: Terrain Included In The Dispersion Model



2.8.2 Surface Characteristics Input to the Dispersion Model

The most influential surface characteristic on pollutant dispersion is the surface roughness length. A value for surface roughness is applied to the model to characterise the effect of the surrounding terrain on the turbulence of near-surface flows. The albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of the sensible heat flux to the latent heat flux and is used for determining planetary boundary layer parameters for convective conditions. Table 2-11 identifies the surface parameters that were included in the dispersion model. These values assigned to the surface parameters take into account coastal effects on the dispersion of pollutants.

Table 2-11 Surface Characteristics Input to the Dispersion Model

Albedo	Bowen Ratio	Surface Roughness
0.2075	1.5	0.4

2.8.3 Buildings

In order to capture the potential influence of buildings/structures on the dispersion profile of combustion emissions (i.e. building downwash effects), the main building adjacent to the modelled emission source was included in the assessment. The location and height of the modelled building is presented below in Table 2-12.

Table 2-12 Buildings Details

Building	Grid Reference, X	Grid reference, Y	Height, m	Length, m	Width, m	Angle, degrees
Main Building	312584.7	167673.6	14.1	59.4	45.6	54.2

Notes: Grid reference refers to the southwest corner of building.

2.9 Nitrogen and Acid Deposition

In order to assess the potential impacts of nitrogen and acid deposition at the ecological receptors listed in Table 2-10, nitrogen and acid deposition rates were derived from predicted NO_x and SO_2 concentrations and were compared with prevailing background deposition rates and the upper and lower critical load ranges for key habitats represented at each assessed ecological receptor.

3. ASSESSMENT OF IMPACTS

For deriving long-term (annual average) NO_2 concentrations, 70% of the highest predicted annual average NO_X process contribution was assumed to be converted to NO_2, which in turn was added to the background annual average NO_2 concentration. For short-term (99.8th percentile) NO_2 concentrations, 35% of the highest predicted 99.8th percentile of 1 hour-average NO_X process contributions was added to twice the background annual average NO_2 concentration. For short-term CO, PM_{10} and SO_2, 100% of the process contribution was added to twice the background annual average concentration. Table 3-1 below presents, for the near-field domain, a sensitivity analysis of the meteorological data employed in the model. The worst-case metrological years, based on maximum predicted long- and short-term NO_X process contributions, were identified as 2003 and 2004 respectively.

Table 3-1 Sensitivity Analysis, Near-Field Model Domain (2003 to 2007 meteorological data)

Year	Maximum Annual Average NO_X Process Contribution ($\mu g\ m^{-3}$)	Maximum 99.8th Percentile of 1-hr Average NO_X Process Contribution ($\mu g\ m^{-3}$)
2003	**21.7**	243.30
2004	16.62	**250.40**
2005	13.98	210.80
2006	15.41	234.61
2007	14.37	236.44

Table 3-2 below presents, for the near-field and far-field model domains, maximum predicted off-site ground level concentrations (including background) of pollutants of concern. All relevant air quality objectives are predicted to be met across both model domains.

Dispersion profiles of predicted pollutant concentrations are illustrated in the form of contour plots in Appendix 2. The contour plots identify that pollutants generated from the operation of the proposed biomass power plant will disperse rapidly with distance from the site boundary and will reach background concentrations within a few hundred meters.

Table 3-2 AERMOD Predicted Highest Off-Site Ground Level Concentrations (Worst Year Meteorological Data: 2003 for Long-term Impacts and 2004 for Short-term Impacts)

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Far-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
NO_2 Background Concentration	Annual Average	15.20	15.20	40
NO_2 Process Contribution	Annual Average	15.20	15.20	
NO_2 Predicted Environmental Concentration	Annual Average	30.40	30.40	
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	87.63	45.71	200

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Far-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	118.03	76.11	
PM_{10} Background Concentration	Annual Average	18.5	18.5	40
PM_{10} Process Contribution	Annual Average	1.06	1.06	
PM_{10} Predicted Environmental Concentration	Annual Average	19.56	19.56	
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	2.31	2.31	50
PM_{10} Predicted Environmental Concentration	90.4th percentile of 24-hour average concentrations	39.31	39.31	50
CO Background Concentration	Annual Average	113.5	113.5	10000
CO Process Contribution	Max 8-Hour Average	52.27	30.32	
CO Predicted Environmental Concentration	Max 8-Hour Average	279.27	257.32	
SO_2 Background Concentration	Annual Average	3.6	3.6	-
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	144.77	43.27	266
SO_2 Predicted Environmental Concentration	99.9th percentile of 15-min average concentrations	151.97	50.47	
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	57.64	31.73	350
SO_2 Predicted Environmental Concentration	99.7th percentile of hourly average concentrations	64.84	38.93	350
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	21.61	21.61	125
SO_2 Predicted Environmental Concentration	99.2nd percentile of 24-hour average concentrations	28.81	28.81	
HCl Background Concentration	Annual Average	Negligible	Negligible	800
HCl Process Contribution	Annual Average	1.06	1.06	
HCl Predicted Environmental Concentration	Annual Average	1.06	1.06	
HCl Process Contribution	1-hour Average	5.48	0.46	20
HCl Predicted Environmental Concentration	1-hour Average	5.48	0.46	
HF Background Concentration	Annual Average	Negligible	Negligible	-

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Far-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
HF Process Contribution	1-hour Average	0.55	0.05	250
HF Predicted Environmental Concentration	1-hour Average	0.55	0.05	
Hg Background Concentration	Annual Average	Negligible	Negligible	7.5
Hg Process Contribution	Annual Average	0.01	0.01	7.5
Hg Predicted Environmental Concentration	Annual Average	0.01	0.01	
Hg Process Contribution	1-hour Average	0.03	0.002	0.25
Hg Predicted Environmental Concentration	1-hour Average	0.03	0.002	
Dioxins Background Concentration	Annual Average	Negligible	Negligible	-
Dioxins Process Contribution	Annual Average	$1.09E^{-8}$	$1.09E^{-8}$	
Dioxins Predicted Environmental Concentration	Annual Average	$1.09E^{-8}$	$1.09E^{-8}$	
Dioxins Process Contribution	1-hour Average	$2.64E^{-7}$	$6.93E^{-8}$	
Dioxins Predicted Environmental Concentration	1-hour Average	$2.64E^{-7}$	$6.93E^{-8}$	
Dioxins Process Contribution	24-hour Average	$5.52E^{-8}$	$4.89E^{-8}$	
Dioxins Predicted Environmental Concentration	24-hour Average	$5.52E^{-8}$	$4.89E^{-8}$	

Notes: For long-term impacts, predicted concentration = process contribution + background concentration (with an assumed 70% oxidation of NO_X to NO_2); For short-term impacts, predicted concentration = process contribution + 2 $\times$ background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration is not anticipated to vary significantly from the 8-hr rolling average. As there is no 15-min time series can be set in the model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance Note 1.

Table 3-3 below identifies maximum predicted off-site ground level pollutant concentrations at each of the discrete residential receptor locations included in the model. Pollutant concentrations are predicted to meet relevant air quality objectives.

Table 3-3 AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Residential Receptor Locations (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Pollutant	Averaging Period	Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
		Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)	Predicted Concentration ($\mu g\ m^{-3}$)
NO_X Process Contribution	Annual Average	0.46	0.41	0.18	0.56	1.26	0.47	0.32	0.07
NO_X Background	-	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91
NO_X Predicted Environmental Concentration	Annual Average	20.37	20.32	20.09	20.47	21.17	20.38	20.23	19.98
NO_2 Process Contribution	Annual Average	0.32	0.29	0.13	0.39	0.88	0.33	0.22	0.05
NO_2 Background	-	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20
NO_2 Predicted Environmental Concentration	Annual Average	15.52	15.49	15.33	15.59	16.08	15.53	15.42	15.25
NO_2 Process Contribution	99.8^{th} percentile of hourly average concentrations	6.21	7.50	4.20	4.15	7.75	3.34	2.03	0.92
NO_2 Background	Twice the annual average concentration	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40
NO_2 Predicted Environmental Concentration	99.8^{th} percentile of hourly average concentrations	36.61	37.90	34.60	34.55	38.15	33.74	32.43	31.32

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 2 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 3 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 4 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 5 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 6 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 7 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 8 Predicted Concentration ($\mu g\ m^{-3}$)
PM_{10} Process Contribution	Annual Average	0.02	0.02	0.01	0.03	0.06	0.02	0.02	0.003
PM_{10} Background	-	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
PM_{10} Predicted Environmental Concentration	Annual Average	18.52	18.52	18.51	18.53	18.56	18.52	18.52	18.50
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	0.07	0.06	0.03	0.05	0.13	0.08	0.05	0.01
PM_{10} Background	Twice Annual Average Concentration	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
PM_{10} Predicted Concentration	90.4th percentile of 24-hour average concentrations	37.07	37.06	37.03	37.05	37.13	37.08	37.05	37.01
CO Process Contribution	Max 8-Hour Average	2.45	2.35	2.76	2.63	3.62	1.31	0.88	0.39
CO Background	Twice the Annual Average Concentration	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00
CO Predicted Concentration	Max 8-Hour Average	229.45	229.35	229.76	229.63	230.62	228.31	227.88	227.39

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 2 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 3 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 4 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 5 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 6 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 7 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 8 Predicted Concentration ($\mu g\ m^{-3}$)
SO_2 Process Contribution	Annual Average	0.11	0.10	0.04	0.14	0.31	0.11	0.08	0.02
SO_2 Background	-	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
SO_2 Predicted Concentration	Annual Average	3.71	3.70	3.64	3.74	3.91	3.71	3.68	3.62
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	6.91	8.61	5.24	6.82	8.68	4.40	3.42	0.97
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.9th percentile of 15-min average concentrations	14.11	15.81	12.44	14.02	15.88	11.60	10.62	8.17
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	4.19	4.33	1.61	2.72	5.26	1.76	1.06	0.63
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.7th percentile of hourly average concentrations	11.39	11.53	8.81	9.92	12.46	8.96	8.26	7.83
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	0.95	0.81	0.46	0.72	1.82	0.67	0.37	0.17

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 2 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 3 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 4 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 5 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 6 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 7 Predicted Concentration ($\mu g\ m^{-3}$)	Residential Receptor 8 Predicted Concentration ($\mu g\ m^{-3}$)
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.2nd percentile of 24-hour average concentrations	8.15	8.01	7.66	7.92	9.02	7.87	7.57	7.37
HCl Process Contribution	Annual Average	0.02	0.02	0.01	0.03	0.06	0.02	0.02	0.003
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	Annual Average	0.02	0.02	0.01	0.03	0.06	0.02	0.02	0.003
HCl Process Contribution	1-hour Average	1.87	1.96	1.31	1.74	1.87	0.92	0.69	0.25
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	1-hour Average	1.87	1.96	1.31	1.74	1.87	0.92	0.69	0.25
HF Process Contribution	1-hour Average	0.19	0.20	0.13	0.17	0.19	0.09	0.07	0.02
HF Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HF Predicted Concentration	1-hour Average	0.19	0.20	0.13	0.17	0.19	0.09	0.07	0.02
Hg Process Contribution	Annual Average	0.00011	0.00010	0.00004	0.00014	0.00031	0.00011	0.00008	0.00002
Hg Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Pollutant	Averaging Period	Residential Receptor 1 Predicted Concentration (µg m^{-3})	Residential Receptor 2 Predicted Concentration (µg m^{-3})	Residential Receptor 3 Predicted Concentration (µg m^{-3})	Residential Receptor 4 Predicted Concentration (µg m^{-3})	Residential Receptor 5 Predicted Concentration (µg m^{-3})	Residential Receptor 6 Predicted Concentration (µg m^{-3})	Residential Receptor 7 Predicted Concentration (µg m^{-3})	Residential Receptor 8 Predicted Concentration (µg m^{-3})
Hg Predicted Concentration	Annual Average	0.00011	0.00010	0.00004	0.00014	0.00031	0.00011	0.00008	0.00002
Hg Process Contribution	1-hour Average	0.01	0.01	0.01	0.009	0.009	0.005	0.003	0.001
Hg Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Hg Predicted Concentration	1-hour Average	0.01	0.01	0.01	0.009	0.009	0.005	0.003	0.001
Dioxins Process Contribution	Annual Average	$2.30E^{-10}$	$2.05E^{-10}$	$9.06E^{-11}$	$2.81E^{-10}$	$6.30E^{-10}$	$2.34E^{-10}$	$1.58E^{-10}$	$3.27E^{-11}$
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	Annual Average	$2.30E^{-10}$	$2.05E^{-10}$	$9.06E^{-11}$	$2.81E^{-10}$	$6.30E^{-10}$	$2.34E^{-10}$	$1.58E^{-10}$	$3.27E^{-11}$
Dioxins Process Contribution	1-hour Average	$1.92E^{-08}$	$2.01E^{-08}$	$1.34E^{-08}$	$1.78E^{-08}$	$1.92E^{-08}$	$9.46E^{-09}$	$7.05E^{-09}$	$2.53E^{-09}$
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	1-hour Average	$1.92E^{-08}$	$2.01E^{-08}$	$1.34E^{-08}$	$1.78E^{-08}$	$1.92E^{-08}$	$9.46E^{-09}$	$7.05E^{-09}$	$2.53E^{-09}$
Dioxins Process Contribution	24-hour Average	$2.23E^{-09}$	$2.80E^{-09}$	$1.96E^{-09}$	$1.86E^{-09}$	$3.97E^{-09}$	$1.49E^{-09}$	$8.30E^{-10}$	$3.62E^{-10}$
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted	24-hour Average	$2.23E^{-09}$	$2.80E^{-09}$	$1.96E^{-09}$	$1.86E^{-09}$	$3.97E^{-09}$	$1.49E^{-09}$	$8.30E^{-10}$	$3.62E^{-10}$

Pollutant	**Averaging Period**	**Residential Receptor 1**	**Residential Receptor 2**	**Residential Receptor 3**	**Residential Receptor 4**	**Residential Receptor 5**	**Residential Receptor 6**	**Residential Receptor 7**	**Residential Receptor 8**
		Predicted Concentration ($\mu g\ m^{-3}$)	**Predicted Concentration ($\mu g\ m^{-3}$)**	**Predicted Concentration ($\mu g\ m^{-3}$)**	**Predicted Concentration ($\mu g\ m^{-3}$)**	**Predicted Concentration ($\mu g\ m^{-3}$)**	**Predicted Concentration ($\mu g\ m^{-3}$)**	**Predicted Concentration ($\mu g\ m^{-3}$)**	**Predicted Concentration ($\mu g\ m^{-3}$)**
Concentration									

Notes: Reported annual average NO_X concentration = process contribution + background annual average; For short-term impacts, predicted environmental concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration not anticipated to vary significantly from 8-hr rolling average. As no 15-min time series can be set in model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance 1.

3.1.1 Nitrogen Deposition

Nitrogen deposition resulting from the operation of the proposed biomass power plant has been assessed at all ecologically sensitive receptor locations within 10 km of the site. Table 3-4 below identifies that the maximum predicted process contribution to the background nitrogen deposition rate at all of the sites designated for their ecological importance is less than 0.1% of the relevant background deposition rate. Where exceedence of critical nitrogen deposition load was identified, such exceedences are due to predominant background deposition rates and the highest process contribution at such locations is less than 1% of the lower critical load. The process related impacts on the ecologically sensitive sites are hence not considered to be significant.

Table 3-4 Maximum Predicted Nitrogen Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		($\mu g\ m^{-3}$)	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
1	Barry Island	19.989	0.008	12.9	12.908	10 to 15	0.06%	0.08%
2	Cliff Wood - Golden Stairs	19.963	0.005	25.3	25.305	10 to 15	0.02%	0.05%
3	Coedydd Y Barri/Barry Woodlands	19.937	0.003	25.3	25.303	10 to 15	0.01%	0.03%
4	Cog Moors	19.943	0.003	11.8	11.803	10 to 15	0.03%	0.03%
5	Cosmeston Park	19.933	0.002	22.5	22.502	10 to 15	0.01%	0.02%
6	Cwm Cydfin, Leckwith	19.917	0.001	26.2	26.201	10 to 15	0.003%	0.01%
7	East Aberthaw Coast	19.924	0.001	13.3	13.301	10 to 15	0.01%	0.01%
8	Ely Valley	19.916	0.001	-	-	-	-	-
9	Flat Holm	19.924	0.001	10.2	10.201	10 to 15	0.01%	0.01%
10	Hayes Point to Bendrick Rock	20.025	0.012	12.9	12.912	10 to 15	0.09%	0.12%
11	Nant Whitton Woodlands	19.919	0.001	31.2	31.201	10 to 15	0.003%	0.01%
12	Penarth Coast	19.942	0.003	11.8	11.803	10 to 15	0.03%	0.03%

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		($\mu g\ m^{-3}$)	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
13	Severn Estuary	19.920	0.001	14	14.001	10 to 15	0.01%	0.01%
14	Sully Island	19.954	0.004	11.8	11.804	10 to 15	0.04%	0.04%
15	Severn Estuary	19.931	0.002	11.8	11.802	10 to 15	0.02%	0.02%
16	Severn Estuary	19.931	0.002	11.8	11.802	10 to 15	0.02%	0.02%
17	Severn Estuary - Sully Island	19.954	0.004	11.8	11.804	10 to 15	0.04%	0.04%
Assessment Criteria		30	-	-	-	-	-	1%

Notes: Dry deposition velocity for NO_2 was assumed as 1.5 mm/s and NO_2 wet deposition was assumed as negligible as suggested by the UK Environment Agency for similar assessments. NO_2 wet deposition was assumed as negligible.

3.1.2 Acid Deposition

Acid deposition resulting from the operation of the proposed biomass power plant has been assessed at all ecologically sensitive receptor locations within 10 km of the site. Table 3-5 below identifies that the total process contribution to the acid deposition rate at all sites designated for their ecological importance is less than 1% of the relevant background deposition rate and the critical load identified for relevant habitat. Furthermore, the total acid deposition (process + background) was not predicted to exceed the critical load of the assessed ecological receptors. Hence the impacts of the proposed biomass plant are not considered significant.

Table 3-5 Maximum Predicted Acid Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		($\mu g\ m^{-3}$)	($\mu g\ m^{-3}$)	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
1	Barry Island	0.055	0.019	0.00057	0.0038	0.0011	0.0055	1.39	1.396	4	0.40%	0.14%
2	Cliff Wood - Golden Stairs	0.037	0.013	0.00039	0.0026	0.0008	0.0037	2.08	2.084	8.24	0.18%	0.05%
3	Coedydd Y Barri/Barry Woodlands	0.019	0.007	0.00020	0.0013	0.0004	0.0019	2.08	2.082	2.42	0.09%	0.08%
4	Cog Moors	0.023	0.008	0.00024	0.0016	0.0005	0.0023	1.07	1.072	1.5	0.22%	0.15%
5	Cosmeston Park	0.016	0.006	0.00017	0.0011	0.0003	0.0016	1.07	1.072	4	0.15%	0.04%
6	Cwm Cydfin, Leckwith	0.005	0.002	0.00005	0.0003	0.0001	0.0005	2.37	2.370	10.3	0.02%	0.004%
7	East Aberthaw Coast	0.010	0.003	0.00010	0.0007	0.0002	0.0010	-	-	-	-	-
8	Ely Valley	0.004	0.002	0.00005	0.0003	0.0001	0.0004	-	-	-	-	-
9	Flat Holm	0.010	0.003	0.00010	0.0007	0.0002	0.0010	-	-	-	-	-

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		(µg m^{-3})	(µg m^{-3})	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
10	Hayes Point to Bendrick Rock	0.081	0.028	0.00084	0.0056	0.0017	0.0081	-	-	-	-	-
11	Nant Whitton Woodlands	0.006	0.002	0.00007	0.0004	0.0001	0.0006	2.47	2.471	2.48	0.03%	0.03%
12	Penarth Coast	0.022	0.008	0.00023	0.0016	0.0005	0.0022	-	-	-	-	-
13	Severn Estuary	0.007	0.002	0.00007	0.0005	0.0001	0.0007	-	-	-	-	-
14	Sully Island	0.031	0.011	0.00032	0.0022	0.0006	0.0031	-	-	-	-	-
15	Severn Estuary	0.015	0.005	0.00015	0.0010	0.0003	0.0015	1.07	1.071	1.5	0.14%	0.10%
16	Severn Estuary	0.015	0.005	0.00015	0.0010	0.0003	0.0015	-	-	-	-	-
17	Severn Estuary - Sully Island	0.031	0.011	0.00032	0.0022	0.0006	0.0031	-	-	-	-	-

Note: NO_2 wet deposition was assumed as negligible.

4. CUMULATIVE IMPACT ASSESSMENT

At a distance of around 500 m from the proposed biomass plant, a gasification facility is proposed by Biogen. In-combination impacts on air quality when both the proposed biomass plant and the aforementioned gasification facility are in operation have been predicted using AERMOD dispersion model. Emission parameters pertaining to the proposed Biogen gasification facility have been obtained from the air dispersion modelling report prepared by Parsons Brinkckerhoff (Report Reference No: FSE97027C, dated September 2008).

4.1 Emission Parameters Used in the Cumulative Impact Assessment

The physical and emission parameters of the sources included in the cumulative impact assessment are identified in Table 4-1.

Table 4-1 Emission Parameters for Gasification Facility Included in the Dispersion Model

Emission Source	Proposed Gasification Plant (Biogen Plant)	Proposed Biomass Plant (Sunrise Renewables Plant)
Source Location (Easting, Northing)	312775, 167195	312647, 167668
Stack Height, m (from ground level)	45	20
Stack Diameter, m	1.04	0.9
Efflux Temperature, deg K	403	598
Efflux Velocity, m/s	13.03	14
Pollutant Emission Rates, g/s		
NO_X	3.69	0.8132
PM_{10}	0.1845	0.0407
SO_2	0.9225	0.2033
CO	0.9225	0.2033
HCl	0.1845	0.0407
HF	0.01845	0.0041
Hg	0.0009225	0.0002
Dioxins and Furans	1.845×10^{-8}	4.07×10^{-10}
Group 1 Metals	0.001025	0.002033
Cadmium & Thallium	0.00046125	0.000203
Total Organic carbon	0.1845	0.04066

4.2 Discrete Receptors

Table 4-2 identifies the sensitive receptors included in the cumulative impact assessment in addition to the sensitive receptors identified in Table 2-10.

Table 4-2 Additional Sensitive Receptors Included in the Cumulative Impact Assessment

Receptor	Grid Reference	
	X-coordinate	Y-coordinate
Hayes Lane	313724	167300
Hayes Point Hospital	314004	167398
Bendrick Road	313410	167478
Hayes Road	313638	167674
Southleigh home	314905	168078

Receptor	Grid Reference	
	X-coordinate	Y-coordinate
Dock View Road	312397	167944
Dyfrig Street	312109	166908
Children's hospice	314331	167685
Bendrick Rock	313076	167166
Barry Island	312226	166870

4.3 Building Downwash Effects

Table 4-3 identifies the details of the main building included in the cumulative impact assessment (in addition to that identified in Table 2-12) to account for the building downwash effects on the dispersion of emissions from the proposed Biogen gasification facility.

Table 4-3 Buildings Details

Grid Reference, X	Grid reference, Y	Height, m	Length, m	Width, m	Angle, degrees
312755	167215	20	53	79	38

Notes: Grid reference refers to the southwest corner of the building.

4.4 Assessment Results

The cumulative impact assessment outcomes along with additional contour plots are included in Appendix 3.

The highest predicted off-site ground level concentrations (including background concentrations) of pollutants when both the proposed biomass plant and Biogen gasification facility are in simultaneous operation are predicted to meet the air quality objectives. The highest off-site predicted pollutant ground level concentrations are summarised in Table A3-1.

Table A3-2 and Table A3-3 in Appendix 3 identify the highest predicted off-site ground level pollutant concentrations at each discrete receptor locations included in the assessment. Pollutant concentrations are predicted to meet the relevant air quality objectives at all sensitive receptor locations.

Table A3-4 identifies the maximum predicted process contribution from both proposed facilities towards nitrogen deposition at the sites of ecological importance. The process contribution has been predicted to be less than 1% of the background nitrogen deposition rate. Where exceedence of critical nitrogen deposition load was identified, such exceedences are due to predominant background deposition rates and the highest process contribution at such locations is less than 1% of the lower critical load. The process related impacts on the ecologically sensitive sites are hence not considered to be significant.

Table A3-5 identifies that the process contribution to the acid deposition at the sites designated for their ecological importance is less than 3% of background and less than 1% of the critical load identified for relevant habitat. Furthermore, the total acid deposition (process contribution + background acid deposition rate) was not predicted to exceed the critical load at the assessed ecological receptors. Hence the cumulative impacts of the proposed biomass plant are not considered significant.

The contour plots identify that pollutants generated from the operation of both the facilities will disperse rapidly with distance from the emission sources and will reach background concentrations within a few hundred meters.

5. SUMMARY AND CONCLUSIONS

Air quality impacts resulting from operation of the proposed 9 MWe biomass plant have been assessed using an advanced dispersion model 'AERMOD'. All predicted ground level concentrations of NO_2,SO_2, PM_{10}, HCl, HF, Hg, CO and dioxins & furans are predicted to meet relevant air quality objectives designed to protect the human health across the far-field and near-field model domains.

The annual average NO_X concentrations at all the protected/designated ecological sites within 10 km of the proposed development site are predicted to meet the relevant air quality objective for the protection of vegetation and ecosystems. The predicted nitrogen and acid deposition rates are less than 1% of the background deposition rate as well as the lower critical load.

Cumulative air quality impacts resulting from operation of the proposed biomass plant along with the nearby gasification facility have also been assessed using AERMOD. Though the in-combination impacts are marginally higher than that predicted with independent operation of the proposed biomass plant, no exceedence of air quality objectives was predicted.

Air quality impacts resulting from the operation of the proposed biomass plant are not considered to be significant.

APPENDIX 1

Stack Height Assessment of the Biomass Plant Stack

A1.1 Introduction

Air quality impacts resulting from the operation of the biomass plant have been assessed with various hypothetical heights of the emission stack to derive the optimum stack height. The stack height has been varied from 10 m to 35 m (at regular intervals of 5 m) and impacts in terms of ground level nitrogen dioxide (NO_2) concentrations has been predicted using the AERMOD dispersion model.

The predicted long- and short-term impacts are discussed in Section A1.2. The reported concentrations refer to the highest off-site ground level nitrogen dioxide (NO_2) concentrations modelled with the meteorological data for the year 2003 which has been identified as the worst meteorological year for long-term predicted impacts. Emission parameters identified in Table 2-8 of the main report have been included in the stack height assessment.

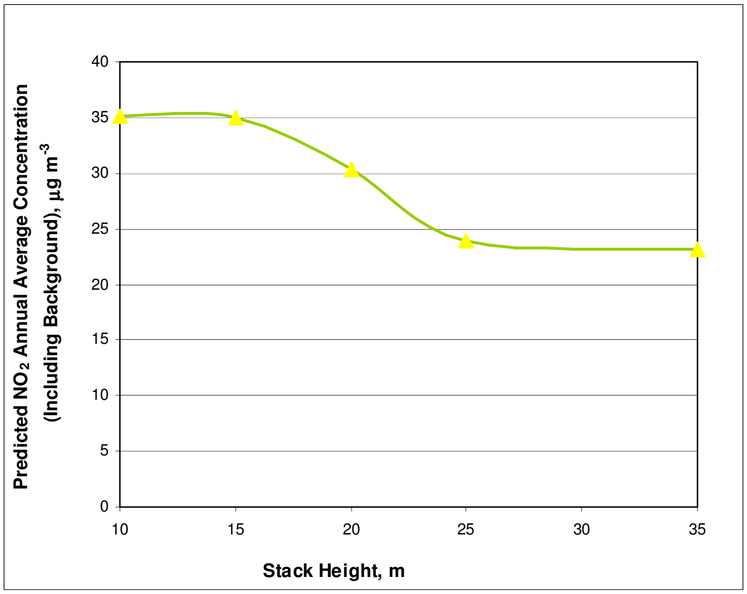
A1.2 Predicted Air Quality Impacts

Figures A1-1 and A1-2 show the variation of the highest predicted annual average and hourly-average NO_2 ground level concentrations with the height of biomass plant stack. No exceedence of long- and short-term air quality objectives have been predicted at any of the assessed stack heights. Furthermore, the stack height assessment identifies that an increase of stack height beyond 20 m will not result in any significant reduction in short-term (99.79th percentile of hourly averages) NO_2 ground level concentrations. A substantial reduction in predicted long-term average ground level concentrations was identified when the stack height is increased from 15 m to 20 m. Similar reduction in long-term impacts was identified when stack height is further increased to 25 m, but with no significant decrease in short-term impacts. A stack height of 20 m thereby provides a conservative approach to stack height design.

A1.3 Conclusions

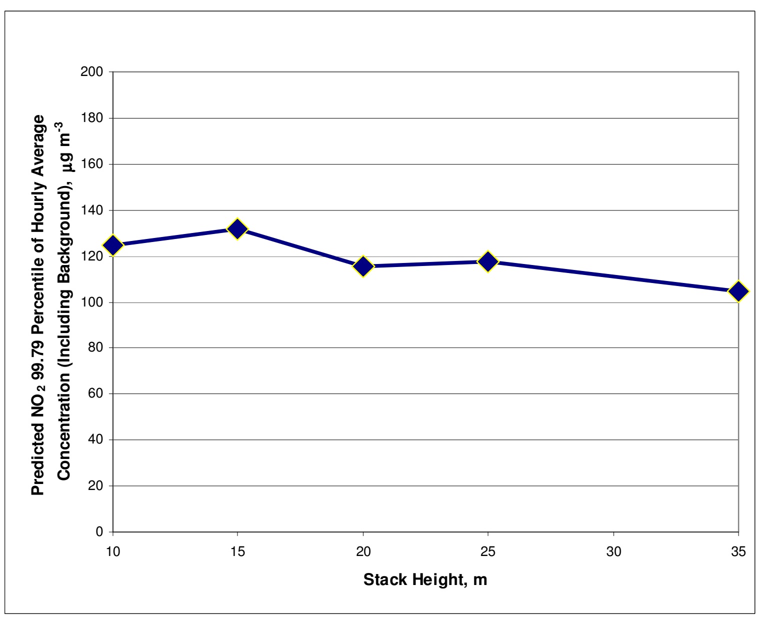
Assessment of stack height for the biomass plant identified that operation of the plant is unlikely to result in significant impacts on local air quality. A stack height of 20 m is identified to balance the costs associated with the increase in stack height against the environmental benefits. Stack height of 20 m is considered to be adequate for the proposed biomass plant.

Figure A1-1 Predicted Long-term Impacts In Terms of Ground Level NO_2 Concentrations Including Background Concentrations



Notes: For long-term impacts, predicted environmental concentration = process contribution (with an assumed 70% oxidation of NO_X to NO_2) + background concentration; The assessment criteria refers to the NO_2 concentrations designated in the UK air quality objectives to protect the human health.

Figure A1-2 Predicted Long-term Impacts In Terms of Ground Level NO_2 Concentrations Including Background Concentrations.



For short-term impacts, predicted environmental concentration = process contribution (with an assumed 35% oxidation of NO_X to NO_2) + 2 × background concentration.

APPENDIX 2

Contour Plots Showing Dispersion Profiles of Air Pollutants

Pollutant concentrations are expressed in $\mu g/m^3$.

The contour plots are arranged in the following order:

Figure A2-1: Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

Figure A2-2: 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)

Figure A2-3 : 99.73th Percentile of Hourly Average SO_2 Concentrations (Near- Field Grid Domain, 2004 Meteorological data; includes background)

Figure A2-4: 8 Hourly Maximum CO Concentrations (Near-Field Grid Domain, 2004 Meteorological data; includes background)

Figure A2-1: Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

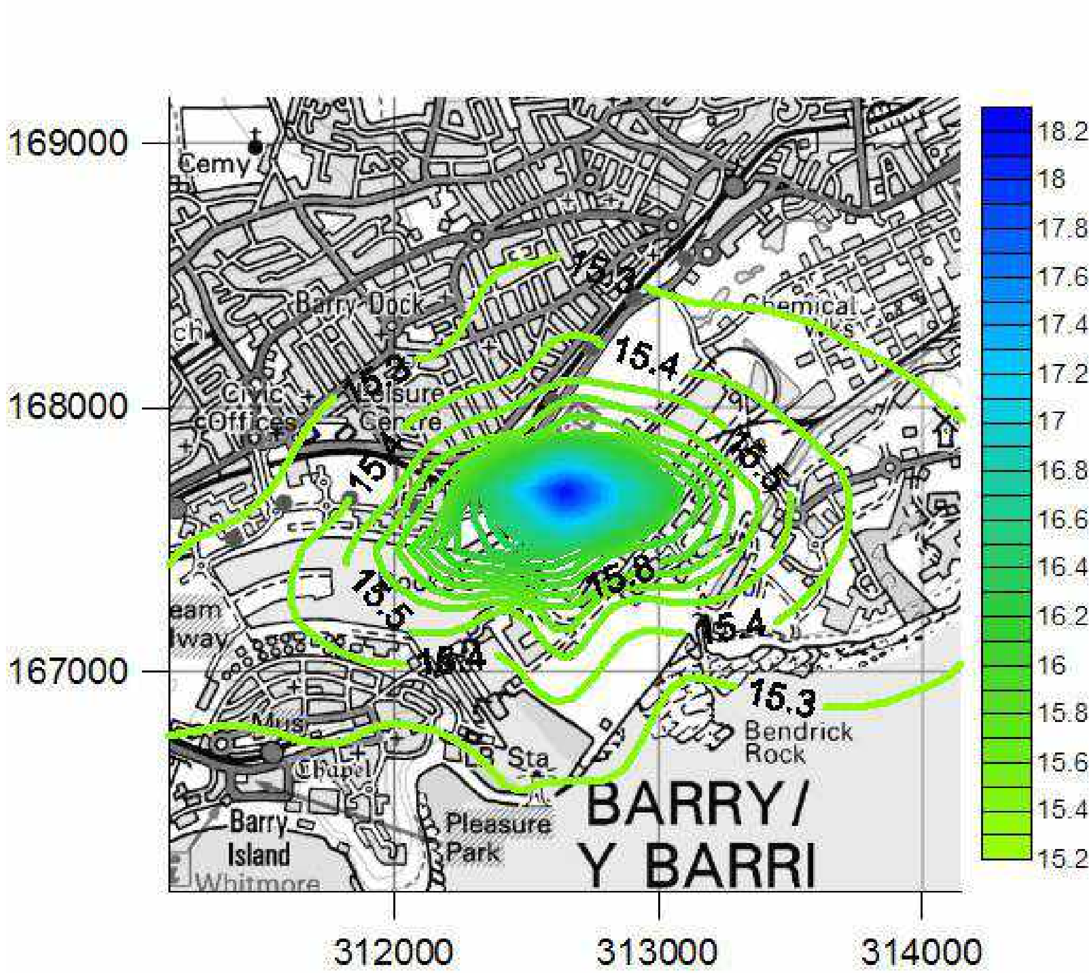


Figure A2-2: 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)

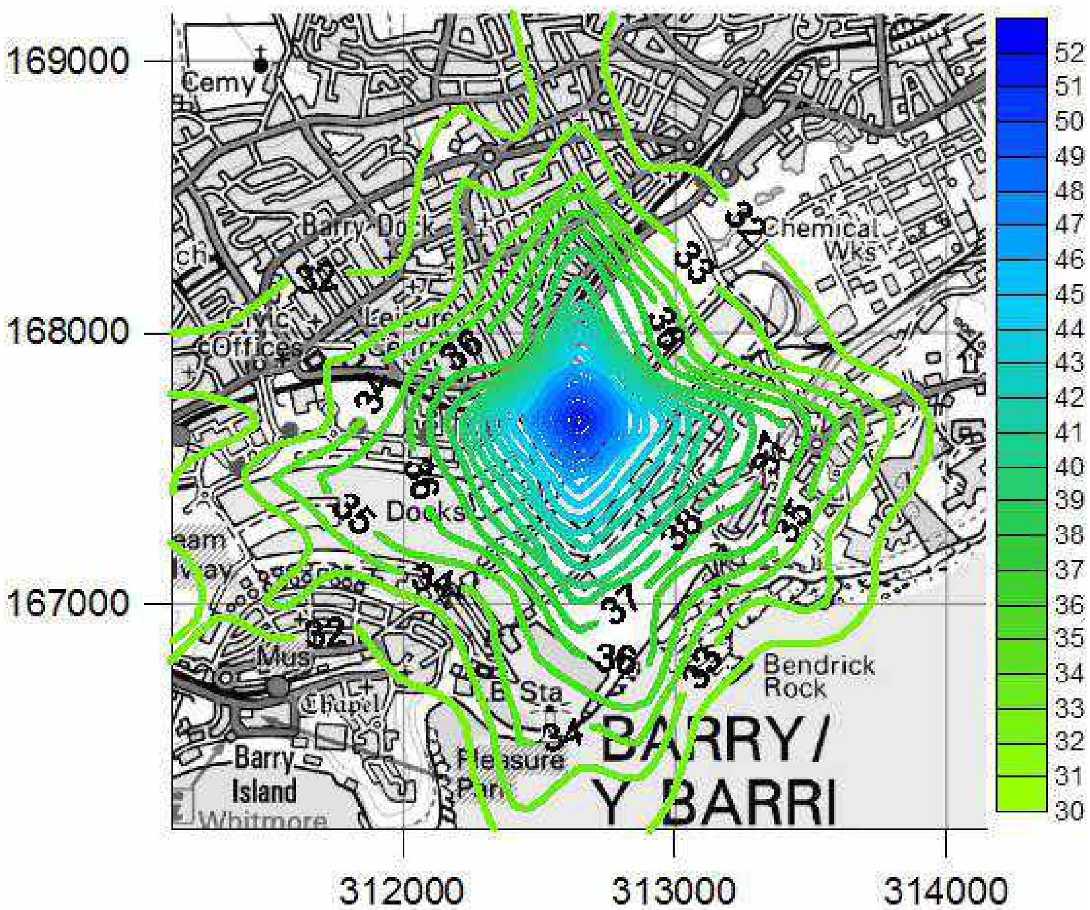


Figure A2-3: 99.73th Percentile of Hourly Average SO_2 Concentrations (Near- Field Grid Domain, 2004 Meteorological data; includes background)

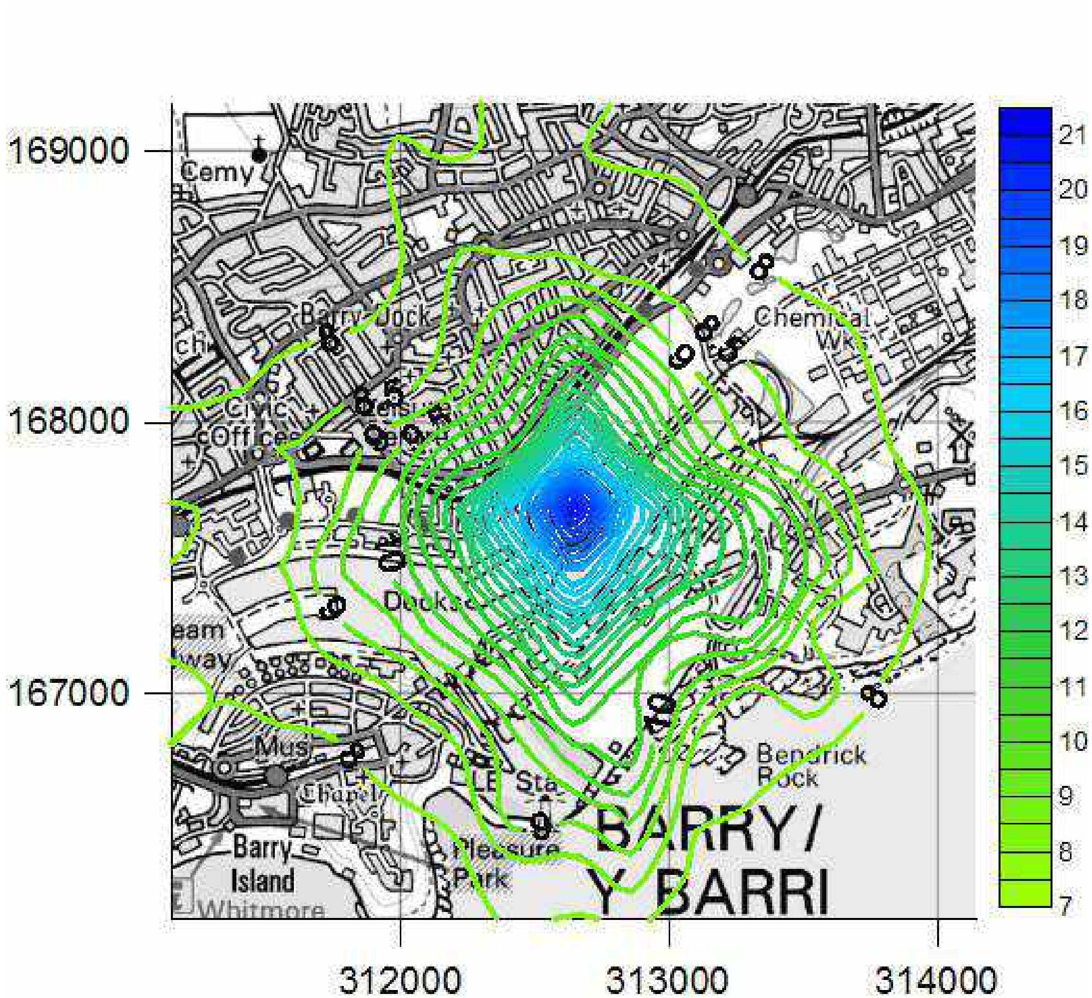
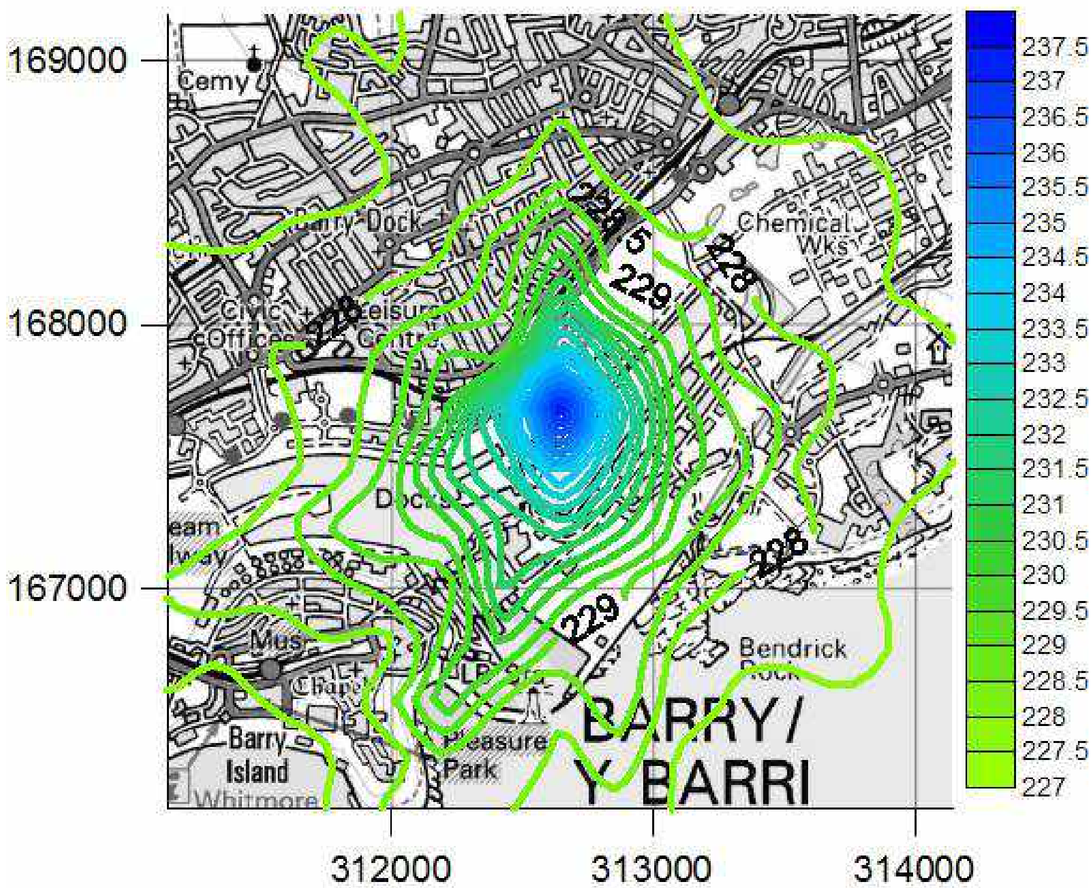


Figure A2-4: 8 Hourly Maximum CO Concentrations (Near-Field Grid Domain, 2004 Meteorological data; includes background)



APPENDIX 3

Outcomes of the Cumulative Impact Assessment

Outcomes of the in-combination impacts identified in the following tables. Pollutant concentrations are expressed in µg/m^3.

Table A3-1: AERMOD Predicted Highest Off-Site Ground Level Concentrations (Worst-case Year Meteorological Data: 2003 for Long-term Impacts and 2004 for Short-term Impacts).

Table A3-2: AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Residential Receptor Locations Close to the Proposed Sunrise Renewable Biomass Plant (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Table A3-3: AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Sensitive Receptor Locations Close to the Proposed Gasification Facility (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Table A3-4: Maximum Predicted Nitrogen Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Table A3-5: Maximum Predicted Acid Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Dispersion profiles of emission components are illustrated in the form of contour plots and are presented in the following figures.

Figure A3-1: Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

Figure A3-2: 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)

Table A3-1: In-Combination Impacts - AERMOD Predicted Highest Off-Site Ground Level Concentrations (Worst-case Year Meteorological Data: 2003 for Long-term Impacts and 2004 for Short-term Impacts)

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
NO_2 Background Concentration	Annual Average	15.20	
NO_2 Process Contribution	Annual Average	15.80	40
NO_2 Predicted Environmental Concentration	Annual Average	31	
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	45.66	200
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	76.06	
PM_{10} Background Concentration	Annual Average	18.5	
PM_{10} Process Contribution	Annual Average	1.10	40
PM_{10} Predicted Environmental Concentration	Annual Average	19.60	
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	2.34	50
PM_{10} Predicted Environmental Concentration	90.4th percentile of 24-hour average concentrations	39.34	50
CO Background Concentration	Annual Average	113.5	
CO Process Contribution	Max 8-Hour Average	28.69	10,000
CO Predicted Environmental Concentration	Max 8-Hour Average	255.69	
SO_2 Background Concentration	Annual Average	3.6	-
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	43.45	266
SO_2 Predicted Environmental Concentration	99.9th percentile of 15-min average concentrations	50.65	
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	31.74	350
SO_2 Predicted Environmental Concentration	99.7th percentile of hourly average concentrations	38.94	350
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	21.62	125
SO_2 Predicted Environmental Concentration	99.2nd percentile of 24-hour average concentrations	28.82	
HCl Background Concentration	Annual Average	Negligible	
HCl Process Contribution	Annual Average	1.10	800
HCl Predicted Environmental Concentration	Annual Average	1.10	
HCl Process Contribution	1-hour Average	6.77	20
HCl Predicted Environmental Concentration	1-hour Average	6.77	
HF Background Concentration	Annual Average	Negligible	-
HF Process Contribution	1-hour Average	0.68	250
HF Predicted Environmental Concentration	1-hour Average	0.68	

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
Hg Background Concentration	Annual Average	4.35E-04	7.5
Hg Process Contribution	Annual Average	0.01	7.5
Hg Predicted Environmental Concentration	Annual Average	0.01	
Hg Process Contribution	1-hour Average	0.03	0.25
Hg Predicted Environmental Concentration	1-hour Average	0.03	
Dioxins Background Concentration	Annual Average	Negligible	-
Dioxins Process Contribution	Annual Average	9.45E-08	
Dioxins Predicted Environmental Concentration	Annual Average	9.45E-08	
Dioxins Process Contribution	1-hour Average	5.81E-07	
Dioxins Predicted Environmental Concentration	1-hour Average	5.81E-07	
Dioxins Process Contribution	24-hour Average	4.18E-07	
Dioxins Predicted Environmental Concentration	24-hour Average	4.18E-07	
Group 1 Metals Background Concentration	Annual Average	0.04	-
Group 1 Metals Process Contribution	Annual Average	0.05	
Group 1 Metals Predicted Environmental Concentration	Annual Average	0.09	
Group 1 Metals Process Contribution	1-hour Average	0.34	
Group 1 Metals Predicted Environmental Concentration	1-hour Average	0.42	
Cadmium & Thallium Background Concentration	Annual Average	3.96E-04	0.005
Cadmium & Thallium Process Contribution	Annual Average	0.01	
Cadmium & Thallium Predicted Environmental Concentration	Annual Average	0.01	
Cadmium & Thallium Process Contribution	1-hour Average	0.03	1.5
Cadmium & Thallium Predicted Environmental Concentration	1-hour Average	0.03	

Pollutant	Averaging Period	Near-field Model Domain Predicted Concentration ($\mu g\ m^{-3}$)	Assessment Criteria/ Benchmark ($\mu g\ m^{-3}$)
TOC Background Concentration	Annual Average	Negligible	-
TOC Process Contribution	Annual Average	1.12	
TOC Predicted Environmental Concentration	Annual Average	1.12	
TOC Process Contribution	1-hour Average	6.88	
TOC Predicted Environmental Concentration	1-hour Average	6.88	

Notes: For long-term impacts, predicted concentration = process contribution + background concentration (with an assumed 70% oxidation of NO_X to NO_2); For short-term impacts, predicted concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration is not anticipated to vary significantly from the 8-hr rolling average. As there is no 15-min time series can be set in the model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance Note 1. Pollutant concentrations within the boundary of Bogen gasification facility are not excluded and hence the assessment is considered to be conservative in nature.

Table A3-2: In-Combination Impacts - AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Residential Receptor Locations Close to the Proposed Sunrise Renewable Biomass Plant (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
NO_X Process Contribution	Annual Average	0.85	0.84	1.92	1.20	2.85	1.43	0.89	0.21
NO_X Background	-	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91
NO_X Predicted Environmental Concentration	Annual Average	20.76	20.75	21.83	21.11	22.76	21.34	20.80	20.12
NO_2 Process Contribution	Annual Average	0.59	0.59	1.34	0.84	1.99	1.00	0.62	0.15
NO_2 Background	-	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20
NO_2 Predicted Environmental Concentration	Annual Average	15.79	15.79	16.54	16.04	17.19	16.20	15.82	15.35
NO_2 Process Contribution	99.8^{th} percentile of hourly average concentrations	9.41	13.04	8.64	6.55	13.38	6.09	4.37	2.89
NO_2 Background	Twice the annual average concentration	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40
NO_2 Predicted Environmental Concentration	99.8^{th} percentile of hourly average concentrations	39.81	43.44	39.04	36.95	43.78	36.49	34.77	33.29

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
PM_{10} Process Contribution	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.011
PM_{10} Background	-	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
PM_{10} Predicted Environmental Concentration	Annual Average	18.54	18.54	18.60	18.56	18.64	18.57	18.54	18.51
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	0.12	0.12	0.14	0.15	0.37	0.18	0.11	0.03
PM_{10} Background	Twice Annual Average Concentration	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00
PM_{10} Predicted Concentration	90.4th percentile of 24-hour average concentrations	37.12	37.12	37.14	37.15	37.37	37.18	37.11	37.03
CO Process Contribution	Max 8-Hour Average	3.47	4.21	4.18	2.91	5.52	3.11	2.01	1.23
CO Background	Twice the Annual Average Concentration	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00
CO Predicted Concentration	Max 8-Hour Average	230.47	231.21	231.18	229.91	232.52	230.11	229.01	228.23

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
SO_2 Process Contribution	Annual Average	0.21	0.21	0.48	0.30	0.70	0.36	0.22	0.05
SO_2 Background	-	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
SO_2 Predicted Concentration	Annual Average	3.81	3.81	4.08	3.90	4.30	3.96	3.82	3.65
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	10.45	14.17	11.23	7.13	15.12	6.08	4.30	2.94
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.9th percentile of 15-min average concentrations	17.65	21.37	18.43	14.33	22.32	13.28	11.50	10.14
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	6.45	8.91	5.83	4.40	9.20	4.31	3.09	1.97
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.7th percentile of hourly average concentrations	13.65	16.11	13.03	11.60	16.40	11.51	10.29	9.17

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentration	1.74	1.53	1.98	1.73	3.44	1.51	0.94	0.58
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.2nd percentile of 24-hour average concentrations	8.94	8.73	9.18	8.93	10.64	8.71	8.14	7.78
HCl Process Contribution	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.011
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.011
HCl Process Contribution	1-hour Average	2.44	3.56	2.78	1.74	2.82	0.99	0.98	0.61
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	1-hour Average	2.44	3.56	2.78	1.74	2.82	0.99	0.98	0.61
HF Process Contribution	1-hour Average	0.24	0.36	0.28	0.17	0.28	0.10	0.10	0.06
HF Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Pollutant	Averaging Period	Predicted Concentration ($\mu g\ m^{-3}$)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
HF Predicted Concentration	1-hour Average	0.24	0.36	0.28	0.17	0.28	0.10	0.10	0.06
Hg Process Contribution	Annual Average	2.10E-04	2.10E-04	4.80E-04	3.00E-04	7.00E-04	3.60E-04	2.20E-04	5.00E-05
Hg Background	-	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04	4.35E-04
Hg Predicted Concentration	Annual Average	6.45E-04	6.45E-04	9.15E-04	7.35E-04	1.14E-03	7.95E-04	6.55E-04	4.85E-04
Hg Process Contribution	1-hour Average	0.012	0.018	0.014	0.009	0.014	0.005	0.005	0.003
Hg Background	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Hg Predicted Concentration	1-hour Average	0.013	0.019	0.015	0.010	0.015	0.006	0.006	0.004
Dioxins Process Contribution	Annual Average	3.55E-09	3.53E-09	8.02E-09	5.02E-09	1.19E-08	6.00E-09	3.71E-09	8.87E-10
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	Annual Average	3.55E-09	3.53E-09	8.02E-09	5.02E-09	1.19E-08	6.00E-09	3.71E-09	8.87E-10
Dioxins Process Contribution	1-hour Average	2.05E-07	3.01E-07	2.33E-07	1.49E-07	2.36E-07	8.28E-08	8.21E-08	5.14E-08
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Pollutant	Averaging Period	Predicted Concentration (µg m^{-3})							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
Dioxins Predicted Concentration	1-hour Average	2.05E-07	3.01E-07	2.33E-07	1.49E-07	2.36E-07	8.28E-08	8.21E-08	5.14E-08
Dioxins Process Contribution	24-hour Average	3.07E-08	4.90E-08	5.08E-08	3.89E-08	7.52E-08	3.55E-08	2.71E-08	1.33E-08
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	24-hour Average	3.07E-08	4.90E-08	5.08E-08	3.89E-08	7.52E-08	3.55E-08	2.71E-08	1.33E-08
Group 1 Metals Process Contribution	Annual Average	0.0013	0.0011	0.0009	0.0016	0.0036	0.0014	0.0009	0.0002
Group 1 Metals Background	-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Group 1 Metals Predicted Concentration	Annual Average	0.041	0.041	0.041	0.042	0.044	0.041	0.041	0.040
Group 1 Metals Process Contribution	1-hour Average	0.10	0.10	0.07	0.09	0.10	0.05	0.03	0.01
Group 1 Metals Background	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Group 1 Metals Predicted Concentration	1-hour Average	0.17	0.17	0.14	0.16	0.17	0.12	0.10	0.08

Pollutant	Averaging Period	Predicted Concentration (μg m⁻³)							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
Cadmium & Thallium Process Contribution	Annual Average	1.60E-04	1.60E-04	2.60E-04	2.20E-04	5.10E-04	2.40E-04	1.50E-04	3.00E-05
Cadmium & Thallium Background	-	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04	3.96E-04
Cadmium & Thallium Predicted Concentration	Annual Average	5.56E-04	5.56E-04	6.56E-04	6.16E-04	9.06E-04	6.36E-04	5.46E-04	4.26E-04
Cadmium & Thallium Process Contribution	1-hour Average	0.0095	0.0127	0.0069	0.0088	0.0095	0.0047	0.0035	0.0017
Cadmium & Thallium Background	-	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Cadmium & Thallium Predicted Concentration	1-hour Average	0.0103	0.0135	0.0077	0.0096	0.0103	0.0055	0.0043	0.0025

Pollutant	Averaging Period	Predicted Concentration (μg m^{-3})							
		Residential Receptor 1	Residential Receptor 2	Residential Receptor 3	Residential Receptor 4	Residential Receptor 5	Residential Receptor 6	Residential Receptor 7	Residential Receptor 8
TOC Process Contribution	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.01
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	Annual Average	0.04	0.04	0.10	0.06	0.14	0.07	0.04	0.01
TOC Process Contribution	1-hour Average	2.44	3.58	2.78	1.77	2.82	0.99	0.98	0.61
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	1-hour Average	2.44	3.58	2.78	1.77	2.82	0.99	0.98	0.61

Notes: Reported annual average NO_X concentration = process contribution + background annual average; For short-term impacts, predicted environmental concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration not anticipated to vary significantly from 8-hr rolling average. As no 15-min time series can be set in model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance 1.

Table A3-3 In-Combination Impacts - AERMOD Predicted Maximum Off-Site Ground Level Concentrations at Discrete Sensitive Receptor Locations Close to the Proposed Gasification Facility (2003 Meteorological Data for Annual Average and 2004 for Short-term Predictions)

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
NO_X Process Contribution	Annual Average	1.44	0.92	1.70	0.97	0.31	0.93	2.02	0.55	4.35	2.11
NO_X Background	-	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91	19.91
NO_X Predicted Environmental Concentration	Annual Average	21.35	20.83	21.61	20.88	20.22	20.84	21.93	20.46	24.26	22.02
NO_2 Process Contribution	Annual Average	1.01	0.64	1.19	0.68	0.22	0.65	1.41	0.39	3.05	1.47
NO_2 Background	-	15.20	15.20	15.20	15.20	15.20	15.20	15.20	15.20	16.20	17.20
NO_2 Predicted Environmental Concentration	Annual Average	16.21	15.84	16.39	15.88	15.42	15.85	16.61	15.59	19.25	18.67
NO_2 Process Contribution	99.8th percentile of hourly average concentrations	6.59	3.78	7.35	4.50	2.23	9.44	8.95	2.79	14.72	10.69
NO_2 Background	Twice the annual average concentration	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40	30.40
NO_2 Predicted Environmental Concentration	99.8th percentile of hourly average concentrations	36.99	34.18	37.75	34.90	32.63	39.84	39.35	33.19	45.12	41.09
PM_{10} Process Contribution	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
PM_{10} Background	-	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	19.50	20.50

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
PM_{10} Predicted Environmental Concentration	Annual Average	18.57	18.55	18.58	18.55	18.52	18.55	18.60	18.53	19.72	20.61
PM_{10} Process Contribution	90.4th percentile of 24-hour average concentrations	0.21	0.13	0.21	0.13	0.04	0.13	0.14	0.08	0.69	0.20
PM_{10} Background	Twice Annual Average Concentration	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	39.00	41.00
PM_{10} Predicted Concentration	90.4th percentile of 24-hour average concentrations	37.21	37.13	37.21	37.13	37.04	37.13	37.14	37.08	39.69	41.20
CO Process Contribution	Max 8-Hour Average	2.94	2.04	3.61	2.19	0.87	3.53	4.27	1.22	7.19	8.48
CO Background	Twice the Annual Average Concentration	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00	227.00
CO Predicted Concentration	Max 8-Hour Average	229.94	229.04	230.61	229.19	227.87	230.53	231.27	228.22	234.19	235.48
SO_2 Process Contribution	Annual Average	0.36	0.23	0.42	0.24	0.08	0.23	0.50	0.14	1.09	0.53
SO_2 Background	-	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	4.60	5.60
SO_2 Predicted Concentration	Annual Average	3.96	3.83	4.02	3.84	3.68	3.83	4.10	3.74	5.69	6.13
SO_2 Process Contribution	99.9th percentile of 15-min average concentrations	7.27	4.04	7.69	4.45	2.33	9.91	11.57	3.36	14.40	12.54
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	9.20	11.20

Pollutant	Averaging Period	Predicted Concentration (µg/m³)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
SO_2 Predicted Concentration	99.9th percentile of 15-min average concentrations	14.47	11.24	14.89	11.65	9.53	17.11	18.77	10.56	23.60	23.74
SO_2 Process Contribution	99.7th percentile of hourly average concentrations	4.50	2.65	5.11	3.15	1.53	6.55	5.77	1.97	10.42	7.11
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
SO_2 Predicted Concentration	99.7th percentile of hourly average concentrations	11.70	9.85	12.31	10.35	8.73	13.75	12.97	9.17	17.62	14.31
SO_2 Process Contribution	99.2nd percentile of 24-hour average concentrations	1.57	1.00	1.70	1.03	0.39	1.76	2.35	0.74	5.49	2.24
SO_2 Background	Twice the annual average concentration	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	8.20	9.20
SO_2 Predicted Concentration	99.2nd percentile of 24-hour average concentrations	8.77	8.20	8.90	8.23	7.59	8.96	9.55	7.94	13.69	11.44
HCl Process Contribution	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
HCl Process Contribution	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33
HCl Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HCl Predicted Concentration	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
HF Process Contribution	1-hour Average	0.17	0.16	0.15	0.08	0.04	0.25	0.28	0.09	0.23	0.23
HF Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
HF Predicted Concentration	1-hour Average	0.17	0.16	0.15	0.08	0.04	0.25	0.28	0.09	0.23	0.23
Hg Process Contribution	Annual Average	0.0004	0.0002	0.0004	0.0002	0.0001	0.0002	0.0005	0.0001	0.0011	0.0005
Hg Background	-	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Hg Predicted Concentration	Annual Average	0.0008	0.0006	0.0008	0.0006	0.0005	0.0006	0.0009	0.0005	0.0015	0.0009
Hg Process Contribution	1-hour Average	0.0088	0.0079	0.0076	0.0039	0.0019	0.0123	0.0142	0.0046	0.0113	0.0117
Hg Background	-	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009	0.0009
Hg Predicted Concentration	1-hour Average	0.0097	0.0088	0.0085	0.0048	0.0028	0.0132	0.0151	0.0055	0.0122	0.0126
Dioxins Process Contribution	Annual Average	6.02E-09	3.84E-09	7.12E-09	4.06E-09	1.29E-09	3.89E-09	8.44E-09	2.32E-09	1.82E-08	8.82E-09
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	Annual Average	6.02E-09	3.84E-09	7.12E-09	4.06E-09	1.29E-09	3.89E-09	8.44E-09	2.32E-09	1.82E-08	8.82E-09
Dioxins Process Contribution	1-hour Average	1.47E-07	1.33E-07	1.28E-07	6.48E-08	3.1E-08	2.07E-07	2.39E-07	7.72E-08	1.89E-07	1.95E-07
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	1-hour Average	1.47E-07	1.33E-07	1.28E-07	6.48E-08	3.10E-08	2.07E-07	2.39E-07	7.72E-08	1.89E-07	1.95E-07
Dioxins Process Contribution	24-hour Average	3.15E-08	2.26E-08	4.17E-08	2.69E-08	1.14E-08	3.51E-08	4.99E-08	1.53E-08	1.06E-07	6.55E-08

Pollutant	Averaging Period	Predicted Concentration (µg/m³)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
Dioxins Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Dioxins Predicted Concentration	24-hour Average	3.15E-08	2.26E-08	4.17E-08	2.69E-08	1.14E-08	3.51E-08	4.99E-08	1.53E-08	1.06E-07	6.55E-08
Group 1 Metals Process Contribution	Annual Average	0.0009	0.0007	0.0015	0.0010	0.0003	0.0014	0.0009	0.0005	0.0017	0.0010
Group 1 Metals Background	-	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Group 1 Metals Predicted Concentration	Annual Average	0.041	0.041	0.042	0.04`	0.04	0.041	0.041	0.041	0.042	0.041
Group 1 Metals Process Contribution	1-hour Average	0.03	0.02	0.05	0.04	0.01	0.11	0.07	0.01	0.05	0.08
Group 1 Metals Background	-	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Group 1 Metals Predicted Concentration	1-hour Average	0.10	0.09	0.12	0.11	0.08	0.18	0.14	0.08	0.12	0.15
Cadmium & Thallium Process Contribution	Annual Average	0.0002	0.0001	0.0003	0.0002	0.0001	0.0002	0.0003	0.0001	0.0006	0.0003
Cadmium & Thallium Background	-	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004
Cadmium & Thallium Predicted Concentration	Annual Average	0.0006	0.0005	0.0007	0.0006	0.0005	0.0006	0.0007	0.0005	0.0010	0.0007

Pollutant	Averaging Period	Predicted Concentration ($\mu g/m^3$)									
		Hayes Lane	Hayes Point Hospital	Bendrick Road	Hayes Road	Southleigh Home	Dock View Road	Dyfrig Street	Children's Hospice	Bendrick Rock	Barry Island
Cadmium & Thallium Process Contribution	1-hour Average	0.0044	0.0040	0.0049	0.0037	0.0010	0.0112	0.0073	0.0023	0.0056	0.0078
Cadmium & Thallium Background	-	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Cadmium & Thallium Predicted Concentration	1-hour Average	0.0052	0.0048	0.0057	0.0045	0.0018	0.0120	0.0081	0.0031	0.0064	0.0086
TOC Process Contribution	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	Annual Average	0.07	0.05	0.08	0.05	0.02	0.05	0.10	0.03	0.22	0.11
TOC Process Contribution	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33
TOC Background	-	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
TOC Predicted Concentration	1-hour Average	1.75	1.58	1.53	0.77	0.37	2.47	2.85	0.92	2.25	2.33

Notes: Reported annual average NO_X concentration = process contribution + background annual average; For short-term impacts, predicted environmental concentration = process contribution + 2 × background concentration (with an assumed 35% oxidation of NO_X to NO_2); Maximum predicted 8-hr average CO concentration not anticipated to vary significantly from 8-hr rolling average. As no 15-min time series can be set in model, 15-min 99.9th percentile SO_2 process contribution was derived from 99.9th percentile hourly contribution by multiplying 1.34 as conversion factor suggested by IPPC Horizontal Guidance 1.

Table A3-4 In-Combination Impacts - Maximum Predicted Nitrogen Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		($\mu g\ m^{-3}$)	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
1	Barry Island	0.54	0.054	12.9	12.95	10 to 15	0.42%	0.54%
2	Cliff Wood - Golden Stairs	0.18	0.018	25.3	25.32	10 to 15	0.07%	0.18%
3	Coedydd Y Barri/Barry Woodlands	0.12	0.012	25.3	25.31	10 to 15	0.05%	0.12%
4	Cog Moors	0.15	0.015	11.8	11.82	10 to 15	0.12%	0.15%
5	Cosmeston Park	0.11	0.011	22.5	22.51	10 to 15	0.05%	0.11%
6	Cwm Cydfin, Leckwith	0.03	0.003	26.2	26.20	10 to 15	0.01%	0.03%
7	East Aberthaw Coast	0.07	0.007	13.3	13.31	10 to 15	0.05%	0.07%
8	Ely Valley	0.03	0.003	-	-	-	-	-
9	Flat Holm	0.07	0.007	10.2	10.21	10 to 15	0.07%	0.07%
10	Hayes Point to Bendrick Rock	1.11	0.112	12.9	13.01	10 to 15	0.87%	1.12%
11	Nant Whitton Woodlands	0.04	0.004	31.2	31.20	10 to 15	0.01%	0.04%
12	Penarth Coast	0.15	0.015	11.8	11.82	10 to 15	0.13%	0.15%

Receptor		Annual Average Environmental NO_X Concentration (Process + Background)	Dry Nitrogen Deposition Rate from the Process	Current Background Nitrogen Deposition Rate	Total Nitrogen Deposition Rate	Critical Load Range of Nitrogen Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Lower Critical Load
		(µg m^{-3})	(kg N/ha/yr)	kg N/ha/yr	kg N/ha/yr	kg N/ha/yr	%	%
13	Severn Estuary	0.04	0.004	14	14.00	10 to 15	0.03%	0.04%
14	Sully Island	0.23	0.024	11.8	11.82	10 to 15	0.20%	0.24%
15	Severn Estuary	0.10	0.010	11.8	11.81	10 to 15	0.08%	0.10%
16	Severn Estuary	0.10	0.010	11.8	11.81	10 to 15	0.08%	0.10%
17	Severn Estuary - Sully Island	0.23	0.024	11.8	11.82	10 to 15	0.20%	0.24%
Assessment Criteria		30	-	-	-	-	-	1%

Notes: Dry deposition velocity for NO_2 was assumed as 1.5 mm/s and NO_2 wet deposition was assumed as negligible as suggested by the UK Environment Agency for similar assessments. NO_2 wet deposition was assumed as negligible.

Table A3-5 In-Combination Impacts - Maximum Predicted Acid Deposition Rate at Ecological Receptors (maximum across all five years of meteorological data)

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		($\mu g\ m^{-3}$)	($\mu g\ m^{-3}$)	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
1	Barry Island	0.38	0.13	0.0039	0.0269	0.0079	0.039	1.39	1.43	4	2.79%	0.97%
2	Cliff Wood - Golden Stairs	0.13	0.04	0.0013	0.0090	0.0026	0.013	2.08	2.09	8.24	0.62%	0.16%
3	Coedydd Y Barri/Barry Woodlands	0.08	0.03	0.0008	0.0058	0.0017	0.008	2.08	2.09	2.42	0.40%	0.34%
4	Cog Moors	0.10	0.04	0.0011	0.0073	0.0021	0.010	1.07	1.08	1.5	0.98%	0.70%
5	Cosmeston Park	0.08	0.03	0.0008	0.0055	0.0016	0.008	1.07	1.08	4	0.74%	0.20%
6	Cwm Cydfin, Leckwith	0.02	0.01	0.0002	0.0014	0.0004	0.002	2.37	2.37	10.3	0.09%	0.02%

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		(µg m^{-3})	(µg m^{-3})	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
7	East Aberthaw Coast	0.05	0.02	0.0005	0.0032	0.0010	0.005	NA	-	NA	-	-
8	Ely Valley	0.02	0.01	0.0002	0.0013	0.0004	0.002	-	-	-	-	-
9	Flat Holm	0.05	0.02	0.0005	0.0033	0.0010	0.005	NA	-	NA	-	-
10	Hayes Point to Bendrick Rock	0.78	0.28	0.0081	0.0553	0.0162	0.080	NA	-	NA	-	-
11	Nant Whitton Woodlands	0.03	0.01	0.0003	0.0021	0.0006	0.003	2.47	2.47	2.48	0.12%	0.12%
12	Penarth Coast	0.11	0.04	0.0011	0.0075	0.0022	0.011	NA	-	NA	-	-
13	Severn Estuary	0.03	0.01	0.0003	0.0022	0.0006	0.003	NA	-	NA	-	-

Receptor		Annual Average Process NO_2 Contribution	Annual Average Process SO_2 Contribution	Dry NO_2 Acid Deposition from the Process	Dry SO_2 Acid Deposition from the Process	Wet SO_2 Acid Deposition from the Process	Total Acid Deposition from the Process	Current Background Acid Deposition	Total Acid Deposition	Critical Load of Acid Deposition	Process Contribution as a Percentage of Background Deposition	Process Contribution as a Percentage of Critical Load
		($\mu g\ m^{-3}$)	($\mu g\ m^{-3}$)	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	keq/ha-yr	%	%
14	Sully Island	0.16	0.06	0.0017	0.0116	0.0034	0.017	NA	-	NA	-	-
15	Severn Estuary	0.07	0.02	0.0007	0.0048	0.0014	0.007	1.07	1.08	1.5	0.64%	0.46%
16	Severn Estuary	0.07	0.02	0.0007	0.0049	0.0014	0.007	NA	-	NA	-	-
17	Severn Estuary - Sully Island	0.16	0.06	0.0017	0.0116	0.0034	0.017	NA	-	NA	-	-

Note: NO_2 wet deposition was assumed as negligible.

Figure A3-1: In-Combination Impacts - Annual Average NO_2 Concentrations (Near-Field Grid Domain with 2003 Meteorological Data Including Background)

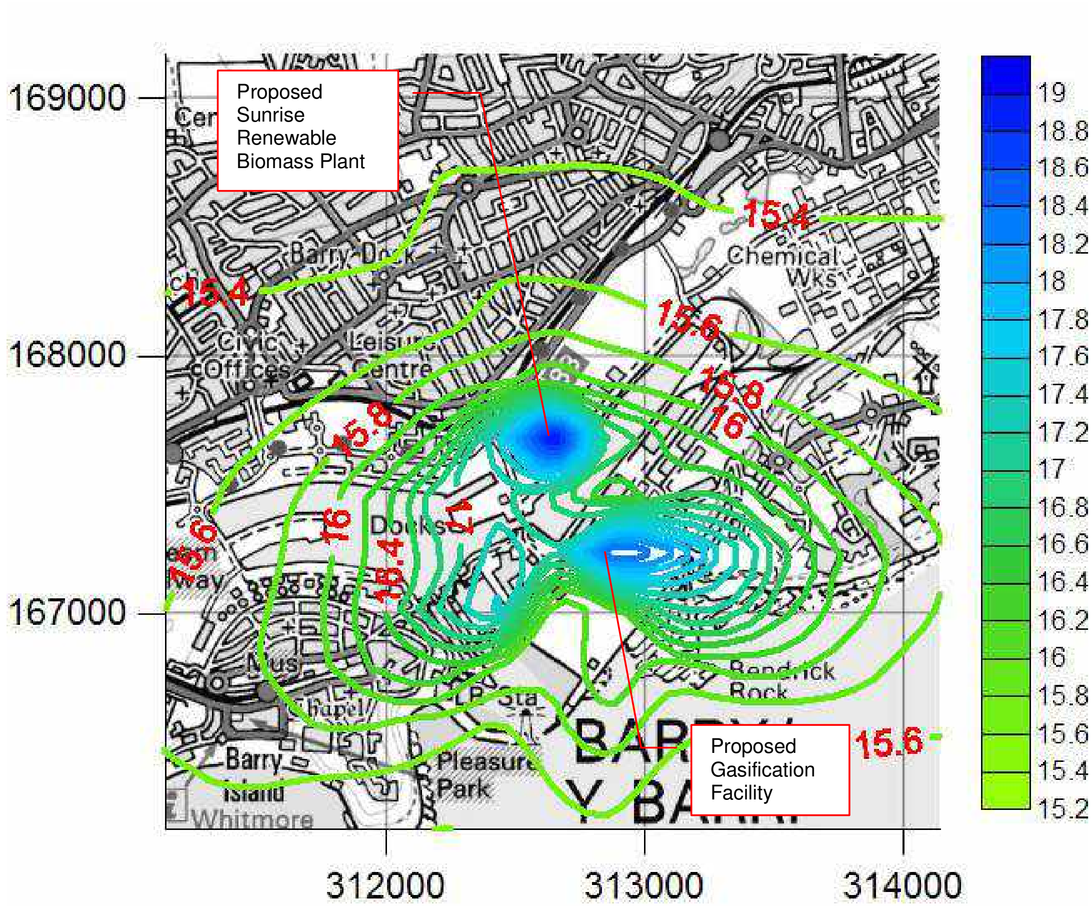
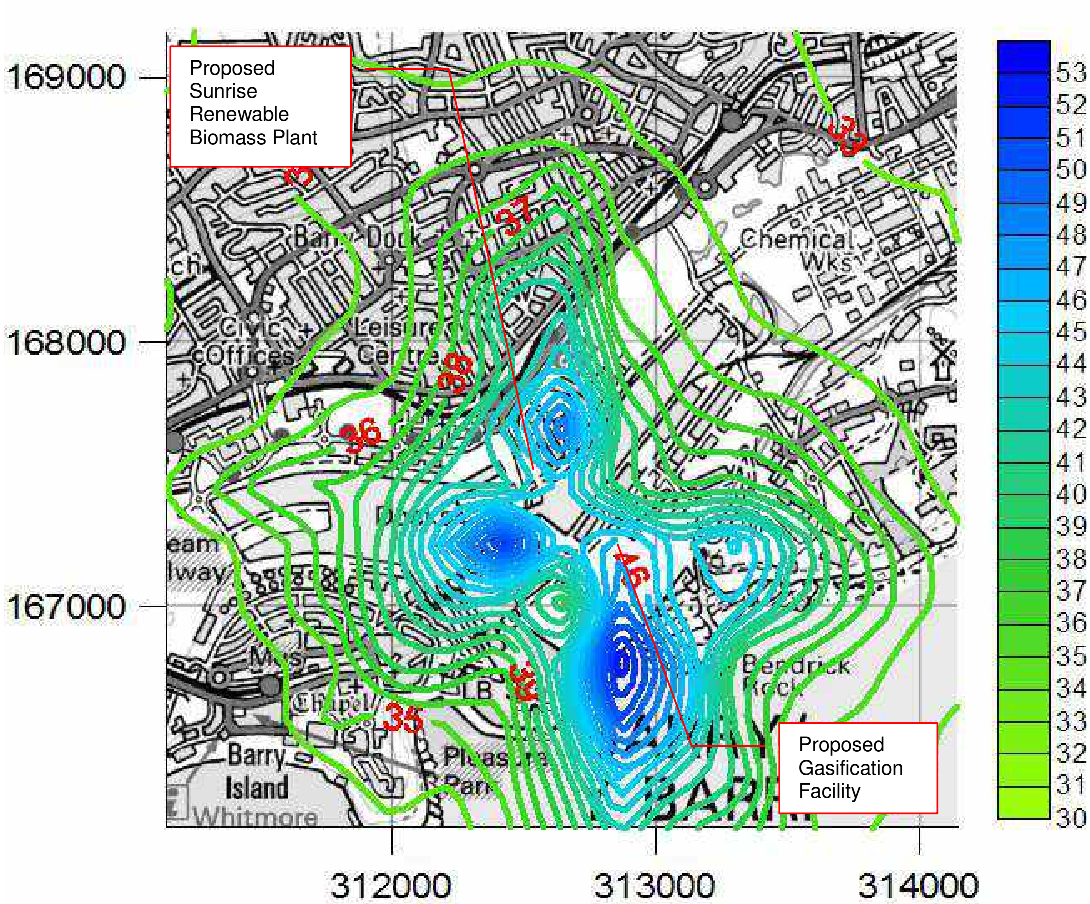


Figure A3-2: In-Combination Impacts - 99.8th Percentile of Hourly Average NO_2 Concentration (Near-Field Grid Domain, 2004 Meteorological data; includes background)



PROPOSED BIOMASS POWER PLANT, BARRY, SOUTH WALES

SURVEY FOR ALTHAEA HIRSUTA (ROUGH MARSH-MALLOW)

Prepared for Sunrise Renewables

January 2009

RSK GENERAL NOTES

Project No:	**P660003**
Title:	**Proposed Biomass Power Plant, Barry, South Wales Survey for Althaea Hirsuta (Rough Marsh-mallow)**
Client:	**Sunrise Renewables**
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Authorised by:	**Sarah Harmer**	**Project QA Rep**	**Date:**	**23/12/08**

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1 INTRODUCTION

1.1 Purpose of the Report

This report details a survey of a land-parcel at Barry Docks (OS Grid Reference ST 126 676) to assess its suitability for a legally protected plant species, *viz*. *Althaea hirsuta* (Rough Marsh-mallow), which has been recorded in the ten-kilometre grid-square. It provides background information on the species (hereafter generally referred to as *Althaea*), describes the site and its vegetation, and evaluates the likelihood of *Althaea* being present.

The survey was commissioned by Sunrise Renewables Ltd and carried out by a botanist from RSK Carter Ecological Ltd on 12th January 2009.

1.2 Site Context

The site comprises a roughly rectangular parcel of derelict land on the north side of Barry Docks bordered by Woodham Road and David Davies Road to the west and south, and areas of derelict land to the east and north (containing hard standing and rough grassland with scattered scrub). A strip of grassland and a railway line separate the site from the wet dock to the south and there is a row of commercial buildings to the west. The wider landscape features a mixture of industrial and post-industrial habitats including a large expanse of newly colonising grassland on derelict land to the west.

1.3 Contents of the Report

This report is set out as follows:

- *Section 1* provides introductory material;
- *Section 2* describes the desk-study and survey methods;
- *Section 3* presents and discusses the results;
- *Section 4* gives references;
- *Section 5* (*Appendix A*) gives a plant species list; and
- *Section 6* (*Appendix B*) contains plates.

Plant nomenclature in this report follows Stace (1997). Plant names in the text are given with scientific names first, followed by the English name in brackets. Doubtful identifications are preceded by ‘cf.’ placed before the specific epithet where the plant is very probably the species indicated, but it is impossible to distinguish it from similar members of the genus with certainty.

2 METHODS

2.1 Background Data Search and Site Visit

Prior to the site visit, a brief desk-based data-search of published sources was carried out to obtain information on *Althaea hirsuta* (Rough Marsh-mallow).

The site was thoroughly searched for evidence of *Althaea* and the habitat and vegetation types were described. Vascular plant species were listed (*Appendix A*). Subjective estimates of their relative abundance were added using a modified DAFOR scale, which ranks species according to their relative abundance in a given parcel of land as follows: d – dominant, a – abundant, f – frequent, o – occasional, r – rare. In addition, the following prefixes are used: l – locally, v – very. The terms 'abundant' and 'rare' are used by convention, and apply only to relative-abundance within the recorded area. It does not mean that species are 'rare' in the general sense.

January is a poor time of year for most botanical recording purposes. Some species are minimally in evidence as leaves only, and some can be identified from the previous year's dead remains. But - leaving aside trees, shrubs and large winter-green perennials - many species are not in evidence at all, and whether leaves and dead remains adequate for identification are to be found at a given location is for many species a matter of serendipity. Where these signs are to be found, the presence of a species can often be confirmed, but absence is generally impossible to prove. In January 2009 all this was to some extent exacerbated by cold and frosty weather in the preceding six weeks (as it hastens deterioration of remains and delays development of leaves).

This means that the species list (*Appendix A*) cannot be regarded as exhaustive; many more species would be found in a summer survey. It does, however, adequately indicate the character of the vegetation. The *Althaea* itself normally behaves as a summer- or autumn-germinating winter-annual (*Section 3*), and it is therefore reasonable to expect that leaves would be in evidence in mid-winter. A January survey cannot absolutely prove absence of the *Althaea*, but the likelihood is that it if it were present then it could in fact be found.

3 RESULTS AND EVALUATION

3.1 Background information on **Althaea hirsuta** *(Rough Marsh-mallow)*

Althaea hirsuta (Rough Marsh-mallow) is listed on *Schedule 8* of the *Wildlife and Countryside Act 1981* giving it legal protection in England and Wales against intentional picking, uprooting and destruction. It was listed as 'Endangered' in Wiggingon (1999), but it is not listed as threatened in the most recent IUCN Red List (Cheffings & Farrell 2005).

Althaea is an annual, or rarely biennial, herb with erect to decumbent stems up to 60 cm; it is coarsely hairy (hispid) and has shallowly lobed (palmate) lower leaves, and deeply divided upper leaves, all with 3-5 lobes (Stace 1997). The flowers are lilac in colour and have five petals 12 to 16 mm in length. In general appearance, it resembles other British species of the Malvaceae such as *Malva moschata* (Musk Mallow).

Althaea behaves mainly as a winter annual in Britain (rarely as a summer annual in wet seasons), flowering from May to early July and setting seed in July and August (Wiggington 1999). It is a poor competitor and requires bare soil for germination and seedling establishment. If conditions are right, germination may follow shortly after seed-set so that identifiable plants are likely to be in evidence by January.

Althaea is considered by many to be an introduced species in Britain, *e.g.* Stace (1997), Pearman *et al* (2002). However, in Oxfordshire, Somerset and especially in Kent (where it has been known since 1792) it occurs in open, semi-natural vegetation on dry calcareous soils (especially on south-facing slopes), which suggests that it may be native there. From Wigginton (1999) it seems that it usually occurs with at least some distinctly calcicolous associates, either grassland plants or arable weeds, and not with species typical of strongly ruderal or brown-field sites. However, this author does not really discuss the more casual occurrences of *Althaea*.

It also occurs as a casual on waste ground, and as such has been recorded from scattered localities, mostly in southern England and Wales. The most recent county Flora for Glamorgan (Wade *et al.* 1994) listed no recent records, but it has since been recorded from the 10 km square covering Barry Docks (Pearman *et al* 2002).

3.2 *Field Survey Results*

No evidence of *Althaea hirsuta* (Rough Marsh-mallow) was recorded. Species recorded from the site are listed in *Table 1* in *Appendix A*.

The site largely comprises bare soil or concrete without vegetation. Much of the ground is heavily rutted by vehicles and there is an abundance of fly-tipped rubbish throughout (*Plate 1* in *Appendix B*). Vegetation is confined to scattered, semi-ruderal scrub and grassland along the boundary fences, in the north-east corner, and more particularly at the southern end of the site.

The scattered scrub along the boundary fences mainly consists of *Buddleja davidii* (Butterfly-bush), although there are smaller amounts of *Rosa* species (a Rose) and *Rubus fruticosus* agg. (Bramble). There are small patches of rough grassland with a more or less closed sward alongside scrub in the north-eastern corner of the site and on the verge of David Davies Road. These are dominated by coarse grasses such as *Elytrigia repens* (Common Couch) and also feature the tall umbellifer *Pastinaca sativa* (Wild Parsnip).

The only substantial area of vegetation is at the southern end of the site, where it consists of open, semi-ruderal grassland colonising a substrate of spoil, gravel and concrete (*Plate 2* in *Appendix B*). The sparse sward includes the grasses *Agrostis stolonifera* (Creeping Bent) and *Festuca rubra* (Red Fescue) together with a range of herbs typical of disturbed sites such as *Daucus carota* (Wild Carrot), *Medicago lupulina* (Black Medick), *Senecio erucifolius* (Hoary Ragwort) and *Tripleurospermum inodorum* (Scentless Mayweed). Tall ruderals and garden escapes are also frequent, especially on piles of spoil, and include *Conyza* species (a Fleabane), *Hirschfeldia incana* (Hoary Mustard) and a species of *Salvia* or *Teucrium*.

3.3 *Discussion*

The strongly ruderal character of this site makes it an unlikely place for *Althaea hirsuta* (Rough Marsh-mallow). If it were present then it could only be so as a passing casual. It is generally accepted that little nature conservation value attaches to such casual occurrences of rare species in atypically ruderal sites (as compared to that attaching to them in semi-natural sites). However, to the best of our understanding, that does not derogate from the legal protection attaching to *Althaea*, which would be just as protected as a casual in this site as it would be as a permanent denizen in a semi-natural site, except in so far as mitigation for development, *e.g.* transplantation, might be much easier to agree with planning authorities and Countryside Council for Wales.

The species list for the site is typical for a disturbed, more-or-less eutrophic, and neutral to perhaps marginally calcareous ruderal site. Though the substrates contain some calcareous materials, *e.g.* concrete, mortar from building rubble, this is not very distinctly reflected in the species list, there being no strong calcicoles except for the woody climber *Clematis vitalba* (Traveller's Joy). Species such as *Centranthus ruber* (Red Valerian), *Daucus carota* ssp. *carota* (Wild Carrot), *Foeniculum vulgare* (Fennel), *Fragaria vesca* (Wild Strawberry) and *Pastinaca sativa* (Wild Parsnip) are suggestive of very mildly calcicolous tendencies in the flora, but the great majority of the species listed are widespread on normal ruderal sites across lowland Britain. For vegetation suitable for *Althaea* the species list is not encouraging, but neither is it prohibitive; the species named above could just be congeners of *Althaea*.

The greater part of the site has been so disturbed by vehicles (or by some other previous use) that it supports no vegetation at all, while the rather limited areas of scrub and rough grassland can be discounted as potential habitat for *Althaea* because it would not persist amongst the closed vegetation.

By contrast, the area at the southern end of the site appears to provide good conditions for the germination and establishment of *Althaea*. The vegetation is open and the substrate is free-draining, relatively infertile and perhaps mildly calcareous. Furthermore, similar early-successional grassland not surveyed in surrounding sites could perhaps support *Althaea*, and in that case might act as a seed-source for *Althaea*.

Althaea mainly behaves as a winter annual, and on the balance of probabilities it ought to be in evidence in January, though spring germination (and thence summer annual behaviour) is not unknown in Britain. No *Althaea* or superficially similar species of the Malvaceae were recorded in this survey. Because of the limited area of suitable habitat, it is very unlikely that even poorly-developed specimens would have been missed if they were present.

For the reasons explained above, the absence of *Althaea* cannot absolutely be ruled out from a January survey, and it is always possible that there might be dormant seeds that could germinate in the future. But the failure to find *Althaea* or similar malvaceous species, considered together with the strongly ruderal character of the site and the lack of previous records, make it very unlikely that *Althaea hirsuta* (Rough Marsh-mallow) is present.

4 *REFERENCES*

Cheffings, C.M. & Farrell, L. (eds), Dines, T.D., Jones, R.A., Leach, S.J., McKean, D.R., Pearman, D.A., Preston, C.D., Rumsey, F.J. & Taylor, I. (2005). The vascular plant Red Data list for Great Britain. *Species Status*, **7**, 1-116.

Pearman, D.A., Preston, C.D. & Dines, T.D. (2002). *New Atlas of the British and Irish Flora*. Oxford University Press, Oxford.

Stace, C.A. (1997). *A New Flora of the British Isles*, 2nd edition. Cambridge University Press, Cambridge.

Wade, A.E., Kay, Q.O.N., Ellis, R.G. & The National Museum of Wales (1994). *Flora of Glamorgan.* HMSO, London.

Wiggington, M.J. (1999). *British Red Data Books 1 – 3rd edition.* JNCC, Peterborough.

5 *APPENDIX A – SPECIES LIST*

Table 1. Vascular plant species recorded from the site on 12/01/2009.

a) Shrubs and woody climbers	
Buddleja davidii (Butterfly-bush)	f
Clematis vitalba (Traveller's-joy)	r
Rosa species (a Rose)	r
Rubus fruticosus agg. (Bramble)	lf
Salix cinerea (Grey Willow)	vr
Sambucus nigra (Elder)	vr
b) Herbaceous species	
Agrostis stolonifera (Creeping Bent)	la
Anagallis arvensis (Scarlet Pimpernel)	vr
Arrhenatherum elatius (False Oat-grass)	r
Artemisia vulgaris (Mugwort)	r
Bromus hordeaceus (Soft-brome)	r
Cardamine hirsuta (Hairy Bitter-cress)	r
Centranthus ruber (Red Valerian)	r
Chamerion angustifolium (Rosebay Willowherb)	vr
Cirsium arvense (Creeping Thistle)	r
Cirsium vulgare (Spear Thistle)	vr
Conyza species (a Fleabane)	o
Dactylis glomerata (Cock's-foot)	vr
Daucus carota (Wild Carrot)	o
Dipsacus fullonum (Teasel)	vr
Dryopteris filix-mas (Male-fern)	vr
Elytrigia repens (Common Couch)	la
Epilobium ciliatum (American Willowherb)	r
Epilobium parviflorum (Hoary Willowherb)	vr
Eupatorium cannabinum (Hemp-agrimony)	r
Festuca rubra (Red Fescue)	o
Foeniculum vulgare (Fennel)	vr
Fragaria vesca (Wild Strawberry)	vr
Galium aparine (Cleavers)	vr
Galium mollugo (Hedge Bedstraw)	r
Geranium dissectum (Cut-leaved Crane's-bill)	vr
Geranium lucidum (Shining Crane's-bill)	vr
Geranium robertianum (Herb-Robert)	r
Geranium rotundifolium (Round-leaved Crane's-bill)	r
Hirschfeldia incana (Hoary Mustard)	f
Hypericum humifusum (Trailing St John's-wort)	r
Leucanthemum vulgare (Oxeye Daisy)	r
Linaria vulgaris (Common Toadflax)	r
Lotus corniculatus (Common Bird's-foot-trefoil)	r
Medicago lupulina (Black Medick)	o
Melilotus species (a Melilot)	r
Myosotis sylvatica (Wood Forget-me-not)	vr
Oenothera species (an Evening-primrose)	r

Pastinaca sativa (Wild Parsnip)	vlf
Picris echioides (Bristly Oxtongue)	r
Picris hieracioides (Hawkweed Oxtongue)	r
Plantago lanceolata (Ribwort Plantain)	r
Poa annua (Annual Meadow-grass)	r
Potentilla reptans (Creeping Cinquefoil)	vr
Prunella vulgaris (Selfheal)	vr
Pulicaria dysenterica (Common Fleabane)	vr
Ranunculus repens (Creeping Buttercup)	vlf
Reseda luteola (Weld)	r
Rumex crispus (Curled Dock)	r
Rumex obtusifolius (Broad-leaved Dock)	r
Salvia or *Teucrim* species (a Clary or Sage)	lf
Senecio erucifolius (Hoary Ragwort)	o
Senecio jacobaea (Common Ragwort)	r
Senecio vulgaris (Groundsel)	vr
Sonchus oleraceus (Smooth Sow-thistle)	vr
Sisymbrium officinale (Hedge Mustard)	r
Taraxacum sect. *Ruderalia* (Common Dandelion)	r
Trifolium medium (Zigzag Clover)	vr
Trifolium pratense (Red Clover)	vr
Trifolium repens (White Clover)	r
Tripleurospermum inodorum (Scentless Mayweed)	o
Vicia sativa (Common Vetch)	r

6 APPENDIX B – PHOTOGRAPHS

Plate 1. Looking from west to east across the site.

Plate 2. Open semi-ruderal grassland colonising the southern corner of the site.