ENVIRONMENTAL SCOPING REPORT
HUMBER RENEWABLES PROJECT

April 2010

DONG energy

ATKINS

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Glossary of Terms and Abbreviations

Acronyms and Terms

Term	Meaning / Definition
1D	One Dimensional
2D	Two Dimensional
3D	Three Dimensional
90th percentile	For a set of values the 90th percentile value is the value that 90% of the values in the set are less than or equal to
AAP	Area Action Plan
AADT	Annual Average Daily Traffic
AAWT	Annual Average Weekday Traffic
aep	Annual Exceedance Probability
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BAT	Best Available Techniques. BAT includes both the technology used and the way in which the installation is designed, built operated and decommissioned. It is defined as, "*the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole.*"
BGL	Below Ground Level
BGS	British Geological Survey
BOD	Biochemical Oxygen Demand
CD	Chart Datum
CFB	Circulating Fluidised Bed
CLR	Contaminated Land Report
CORMIX	A semi-empirical hydrodynamic and transport model for addressing discharges from outfalls of all types and sizes into fluvial, estuarine or coastal waters which can be stratified but which are treated as steady state
COSHH	Control of Substances Hazardous to Health
CSM	Conceptual Site Model
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs

Term	Meaning / Definition
DHI	Danish Hydraulic Institute
DMRB	Design Manual for Roads and Bridges
DPD	Development Plan Document
EIA	Environmental Impact Assessment
EMS	European Marine Site
ES	Environmental Statement
EQS	Environmental Quality Standard
EU	European Union
GB	Great Britain
GQA	General Quality Assessment
HDF	Hull Development Framework
HDV	Heavy Duty Vehicle
HGV	Heavy Goods Vehicle
HRBT	Hull Riverside Bulk Terminal
Humber Renewables Project	Overall proposed development project, including the biomass power station and its supporting buildings
IBA	Important Bird Area
IEMA	Institute of Environmental Management and Assessment
IPC	Infrastructure Planning Commission
IPD	Interim Planning Document
IPPC	Integrated Pollution Prevention and Control
IRS	Integrated Regional Strategy
JRB	Joint Regional Board
JSP	Joint Structure Plan
LAQM TG	Local Air Quality Management Technical Guidance
LCA	Landscape Character Area
LCPD	Large Combustion Plant Directive (Directive 2001/80/EC on the limitation of emissions of certain pollutants into the air from large combustion plants)
LCT	Landscape Character Type
LDD	Local Development Document
LDF	Local Development Framework
LFO	Light Fuel Oil
LGV	Light Goods Vehicle
MAGIC	Multi-Agency Geographic Information System

Term	Meaning / Definition
MIKE 3 FM	Three Dimensional Hydrodynamic Model
MPS	Marine Policy Statement
NCA	National Character Area
No.	Number
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
Ofgem	Office of the Gas and Electricity Markets
PEC	Predicted Environmental Concentration
PNEC	Predicted No Effect Concentration
PPG	Planning Policy Guidance
PPL	Potential Pollution Linkage
PPS	Planning Policy Statement
Ramsar site	Wetland of International Importance
RSS	Regional Spatial Strategy
RPG	Regional Planning Guidance
SAC	Special Area of Conservation
SINC	Site of Importance for Nature Conservation
SNIC	Site for Nature Conservation Interest
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
SSSI	Site of Special Scientific Interest
Study area	This is defined for each topic of the EIA and reflects the area considered in the impact assessment for the topic area. In many cases the study area extends beyond the site for the Humber Renewables Project and is prefixed by the EIA topic e.g. ecology study area, noise study area.
Survey area	The area over which surveys have been carried out for the collection of baseline data. This is defined for each topic of the EIA and is usually prefixed by the EIA topic e.g. ecological survey area, noise survey area.
TPO	Tree Preservation Order
UK	United Kingdom
Vibration	A to and fro motion; a motion which oscillates about a fixed equilibrium position
WMP	Waste Management Plan
WeBS	Wetland Bird Survey
ZTV	Zone of Theoretical Visibility

Chemical Symbols

Symbol	Definition
CO_2	carbon dioxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
PM	particulate matter
PM_{10}	particulate matter with a diameter of less than 10 µm
$PM_{2.5}$	particulate matter with a diameter of less than 2.5 µm
SO_2	sulphur dioxide

Units

Unit	Definition
%	percent (per one hundred) (concentration)
µg	microgramme (1 x 10^{-6} g) (mass)
µg/m^3	microgramme per cubic metre (concentration)
°C	degree centigrade (temperature)
dB(A)	Decibel is the unit of sound with 0 dB(A) being the threshold of hearing and 140 dB(A) being the threshold of pain. The (A) denotes that it is 'A' weighted which is a frequency weighting which approximates to the human response to sound. Human hearing is not equally sensitive at all the frequencies being less sensitive at the low frequencies (<125 Hz) and high frequencies (>8,000 Hz). (sound)
g	gramme (mass)
GW	gigawatt (power)
GWh	gigawatt hour (energy)
h	hour (time)
ha	hectare, equivalent to 10,000 m^2 (area)
Hz	Hertz (unit of frequency; the number of cycles per second)
kg	kilogramme (mass)
km	kilometre (length)
knot	Nautical mile per hour (speed)
kph	kilometres per hour (speed)
kt	kilotonne (mass)
kV	kilovolt (electrical potential)
kW	kilowatt (power)
l	litre (volume)
J	joule (energy)

Unit	Definition
$L_{Aeq, t}$	continuous equivalent noise level of a time-varying noise; the steady noise level (in dB(A)) which, over the period of time under consideration, contains the same amount of (A-weighted) sound energy as the time-varying noise over the same period of time (t) (sound)
L_{A90} (dB)	background noise level, the noise level exceeded for 90% of the measurement time (sound)
L_{AFmax} (dB)	maximum noise level (in dB(A)) with a FAST time weighting in a stated interval (sound)
m	metres (length)
m^2	square metres (area)
m^3	cubic metres (volume)
m/s	metres per second (velocity)
m^3/s	cubic metres per second (flow rate)
mg	milligramme (1×10^{-3} g) (mass)
mg/Nm^3	milligramme per Normal cubic metre (concentration)
mm	millimetre (length)
mm/s	millimetres per second (velocity)
mph	miles per hour (velocity)
MW	megawatt (power)
Nm^3	Normal cubic metre (i.e. m^3 expressed at 273K and 101.3 kPa) (volume)
s	second (time)
t	metric tonne (= 1,000 kg) (mass)
V	volt (electrical potential)
TJ	terajoule (energy)
W	watt (power)

Prefix Symbols and Multiples

Symbol	Definition
T	tera ($\times 10^{12}$)
G	giga ($\times 10^{9}$)
M	mega ($\times 10^{6}$)
k	kilo ($\times 10^{3}$)
m	milli ($\times 10^{-3}$)
µ	micro ($\times 10^{-6}$)

1. Introduction

Background

1.1 DONG Energy (or a subsidiary company) is seeking to develop the Humber Renewables Project. The Project consists of a biomass fuelled power station and its supporting buildings located near Queen Elizabeth Dock within the eastern part of Associated British Ports' port estate at Hull on the northern shore of the Humber Estuary (see Figure 1.1). The proposed site for the Humber Renewables Project is located approximately 6 km east south east of Hull city centre. The site lies within Hull City Council's administrative area, but is adjacent to the boundary with the East Riding of Yorkshire Council's administrative area.

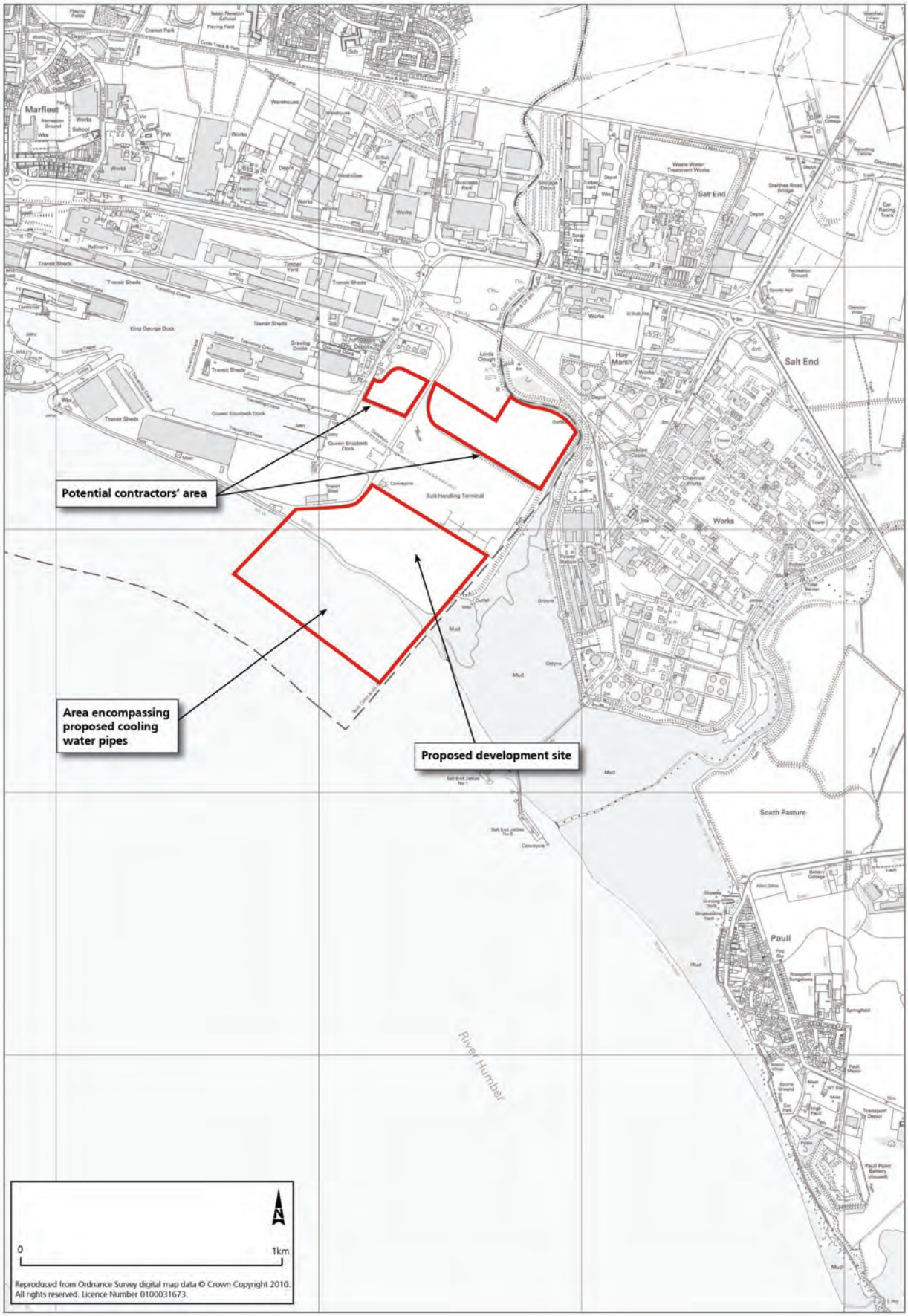
1.2 The proposed development site for the biomass fuelled power station is located within the southern area of land bounded in red in Figure 1.1. This will also be the location for the contractors' area, providing there is sufficient available space. If the available space is not sufficient then the contractors' area will be located on one or potentially both of the northern areas of land bounded in red in Figure 1.1.

1.3 The biomass for the power station is intended to be a combination of wood chips, wood pellets and wood briquettes which will be sustainably sourced. The biomass will be a combination of wood grown for a specific purpose (e.g. energy production), wood from cultivated forests (e.g. wood from thinnings) and residual biomass products from agriculture, timber and forestry operations (e.g. branches, tops, bark, shavings, chippings and sawdust). The net power output of the power station will be up to 285 megawatt (MW) with the generation rated capacity being just below 300 MW. The Humber Renewables Project will generate enough electricity to meet the average needs of up to half a million homes.

1.4 As a nationally significant infrastructure project (NSIP), the development will require a Development Consent Order (DCO) from the Infrastructure Planning Commission (IPC) under the provisions of The Planning Act 2008. In support of the application for a DCO, an Environmental Statement (ES) will be produced which will present the findings of an independent Environmental Impact Assessment (EIA) undertaken within the framework of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009. The development falls within Paragraph 2(a) of Schedule 1 of these regulations as a thermal power station with a heat output of 300 MW or more, for which an Environmental Impact Assessment (EIA) is mandatory. Prior to The Planning Act 2008 consent was covered by Section 36 of the Electricity Act 1989 granted by the Department of Energy and Climate Change (DECC) and associated deemed planning permission under the Town and Country Planning Act 1990.

1.5 Amongst other permits and consents, the development will require an Environmental Permit from the Environment Agency to operate. Therefore the power station will need to comply with the requirements of best available techniques (BAT). The application for the Environmental Permit is not addressed within this document.

Figure 1.1 - Location of Proposed Development Site and Potential Contractors' Area



Developer Profile

1.6 DONG Energy is an integrated energy company with leading market positions in Denmark and other key areas of northern Europe. With a headquarters in Denmark, Dong Energy's business is based on procuring, producing, distributing and trading in energy and related products in northern Europe. In 2009 the average number of employees at DONG Energy was 5,820.

1.7 Of DONG Energy's 18,074 gigawatt hours (GWh) of power generation, 84% is provided by thermal power stations whilst the remainder is provided by wind and hydro. Most of the thermal power stations combine heat and power generation in order to attain greater efficiency. In 2009 the thermal power generation amounted to 15,264 GWh, equivalent to 55% of Denmark's power. Heat generated amounted to 46,686 terajoules (TJ) in 2009, equivalent to 38% of the total heat generated in Denmark. DONG Energy's primary strategy is to maintain and optimise the current thermal based generation in the Nordic power market. In order to capitalise further on these core competencies, DONG Energy is exploring opportunities outside Denmark.

1.8 DONG Energy aspires to be one of Europe's leading energy companies with a reputation for converting profound knowledge into enduring solutions. DONG Energy is focused on:

- guaranteeing a reliable energy supply;
- minimising environmental impact as natural resources are transformed into energy for customers;
- acting responsibly to ensure sufficient energy supplies, not only for current generation requirements but also for future generations; and
- maintaining accountability in strategies, ongoing decision making and day-to-day conduct.

1.9 Currently approximately 15% of DONG Energy's power and heat generation is based on renewable energy, especially wind, and 85% is based on fossil fuels. DONG Energy has a goal to reduce its level of carbon dioxide (CO_2) emissions by 85% by 2040. As a result of progress to date DONG Energy is aiming to be in a position in 2020 to reduce its level of CO_2 emissions by 50%. The goal for 2040 must be achieved through investment in renewable energy, changing existing power stations to biomass and gas, and with help from new technologies. The Humber Renewables Project will assist DONG Energy achieve that goal.

Purpose of Scoping Report

1.10 Under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 a developer may ask the IPC for a formal scoping opinion on issues to be addressed during the independent EIA, and the content and scope of the ES. In arriving at its opinion, the IPC will consult with a number of consultation bodies and incorporate their views within the formal scoping opinion. This scoping report provides the necessary background information for the IPC and the consultation bodies to prepare a formal scoping opinion on the Humber Renewables Project, including:

- a plan sufficient to identify the land involved in the proposed development;
- a description of the nature and purpose of the proposed development;
- the methodology to be adopted when undertaking the EIA;
- the potential impacts of the development, including those that may be significant and those that are considered to be insignificant and can therefore be scoped out of the EIA; and
- the proposed structure of the ES.

1.11 A key objective of this scoping report is to identify the issues that are considered to be insignificant and therefore do not need to be addressed during the EIA. This ensures that the EIA focuses on the important issues associated with the development. In responding to this scoping report, the IPC and the consultation bodies are invited to identify any sources of information which may be of interest during the course of the EIA.

1.12 On receipt of the request for a scoping opinion and this scoping report the IPC will consult with DONG Energy and the consultation bodies. Provided the IPC considers that it has been provided with sufficient information, within 42 days of the date of receipt of the scoping request it will adopt a scoping opinion and send a copy to DONG Energy.

1.13 It is important to note that the submission of a request for a scoping opinion is a precursor to an intensive and detailed independent assessment of the environmental impact of the proposed development.

Consent Application Process

1.14 Permission is required under Sections 15 and 31 of the Planning Act 2008 for development of NSIPs and associated development. For the Humber Renewables Project it is currently envisaged that there will be no associated development within the meaning of Section 115 of The Planning Act 2008. The IPC has been ready to receive applications for DCOs from the Energy sector from 1st March 2010 but will only determine applications where there is a relevant National Policy Statement (NPS) in effect. Where the relevant NPS is not in effect, the IPC will examine the application and make a recommendation to the Secretary of State (in this case, for Energy and Climate Change) who will take the decision. The DCO granted by the IPC will draw together in a single document the consents and powers that are currently required by or give under a number of different legal regimes. At this stage it is intended that as many of these regimes as possible are covered by the DCO.

1.15 On receipt of the application for the DCO for the Humber Renewables Project and the associated ES, the IPC will have 28 days to decide whether the application can be accepted as being valid. Once the application has been accepted the process will move on to the pre-examination stage during which the procedure and timetable will be set for examination of the application. The IPC will have a maximum of six months to carry out the examination of the application. After this the IPC will have a maximum of three months to issue a decision whether or not to grant a DCO for the proposed development, with a statement providing the reasons for the decision. If the relevant NPS is not in effect the IPC must make a recommendation to the Secretary of State, who makes the final decision in the light of that recommendation.

Consultation for Scoping Environmental Impact Assessment

1.16 Consultation is an important component of the EIA process; it allows the views of the consultation bodies to be incorporated into the ES. As part of the process of producing this scoping report contact has been made with the following consultation bodies:

- Hull City Council;
- East Riding of Yorkshire Council;
- Local Government Yorkshire and Humber;
- Health and Safety Executive;
- Natural England;
- English Heritage;

- Environment Agency; and
- Maritime and Coastguard Agency.

Report Contents and Structure

1.17 Chapter 2 of this report provides information on the Humber Renewables Project and is divided into the following sections:

- rationale and need;
- description of development site;
- description of development site surroundings;
- description of proposed development;
- construction logistics;
- development programme; and
- decommissioning.

1.18 An overview of the plans and policies that are relevant to the development is provided in Chapter 3. Chapter 4 provides information on the EIA methodology and is divided into the following sections:

- objectives of an EIA;
- stages of an EIA; and
- EIA scope and assessment methods.

1.19 Chapters 5 to 16 cover the individual EIA topics. For each topic the relevant chapter is divided into the following sections:

- overview;
- baseline description and sensitivity;
- potential impacts (addressing both construction and operation);
- assessment methodology (addressing both construction and operation); and
- potential mitigation measures.

1.20 Chapters 17 and 18 provide a summary of the EIA topics and a draft outline of the ES respectively. References are listed in Chapter 19.

2. Proposed Development

Rationale and Need

2.1 Climate change as a result of global warming is one of the most serious global challenges facing mankind today. In order to control and reduce the release of CO_2 and other greenhouse gases to the atmosphere there have been initiatives developed at both international and national levels. An example of the former is the Kyoto Protocol to the United Nations Framework Convention on Climate Change which sets legally binding targets to limit or reduce greenhouse gas emissions. This initiative led the European Union (EU) to introduce legislation which commits the United Kingdom (UK) to reduce greenhouse gas emissions by 12.5% compared to 1990 levels by 2008 to 2012. At a national level the UK Government has passed the Climate Change Act[1] which requires reductions in greenhouse gas emissions of at least 80% by 2050, and reductions in CO_2 emissions of at least 26% by 2020 compared to a 1990 baseline.

2.2 Against this background of reducing greenhouse gas emissions there is still the need to meet energy demands. The European Commission introduced the Renewable Energy Directive[2] which requires 20% of the EU's energy consumption to come from renewable resources by 2020. In addition this directive requires 15% of the UK's energy consumption to come from renewable resources by 2020. At a regional level the statutory Regional Spatial Strategy (RSS) for Yorkshire and Humber, the Yorkshire and Humber Plan, specifies renewable energy targets for 2010 and 2021 of 708 MW and 1,862 MW respectively. The targets for the Humber sub-region are 124 MW for 2010 and 350 MW for 2021.

2.3 The UK is facing a potential energy gap, as by 2018 it is anticipated that approximately 18 gigawatt (GW) of UK generating capacity will have been lost through closure of power stations. This loss is equivalent to approximately 25% of the present capacity. The establishment of the EU's Emissions Trading Scheme[3], which introduced greenhouse gas emission quotas, and the effects of the Large Combustion Plant Directive[4] (LCPD), which introduced more stringent emission limits, will lead to the closure of a number of older, less efficient coal and oil fuelled power stations. There is therefore a need for new power stations to bridge the shortfall in generating capacity.

2.4 The Government's overall energy policy is guided by the UK Low Carbon Transition Plan[5]. This sets out the UK's approach to becoming a low carbon country which includes cutting emissions and maintaining secure energy supplies. In parallel with the use of low carbon technologies the UK needs to have secure and reliable supplies of energy. The need arises from the fact that there is a decline in the UK's indigenous energy supply with a corresponding increase in energy imports. The UK will be moving towards becoming a net importer of energy at a time when many power stations are approaching the end of their operational lives. The Government is taking action to ensure reliable energy supplies and replacement power stations otherwise there will be a shortfall in energy capacity. This shortfall could present risks to UK energy security which could have significant implications for the UK economy.

2.5 The Humber Renewables Project will make a positive contribution towards combating climate change by reducing greenhouse gas emissions from UK energy generation. In addition it will provide enough renewable energy to power approximately half a million homes and thus help to ensure security and reliability of supply.

Description of Development Site

2.6 The development site lies adjacent to the northern shore of the Humber Estuary near to Queen Elizabeth Dock within the eastern part of Associated British Ports' port estate at Hull (see Figure 1.1). The proximity to the Humber Estuary will allow direct access to vessels for transporting

materials to and from the site. The eastern part of Associated British Port's port estate has been reclaimed from the Humber Estuary since the 1960s, mainly during the construction of the Queen Elizabeth Dock, although the land closest to the Humber Estuary was reclaimed during or since 1999.

2.7 The development site has a frontage on to the Humber Estuary and mainly consists of hardstanding, poor quality grassland and scrub. A footpath crosses the development site, following the pre-1999 route of the estuary bank and the western edge of Old Fleet Drain. The north western corner of the development site is currently used for container storage. The development site is on a low lying area and is considered to be at high risk of flooding according to published Environment Agency data.

Description of Development Site Surroundings

2.8 Kingston Terminal (dry bulk area) is immediately to the north of the development site and Queen Elizabeth Dock is to the north west (see Figure 1.1). Further parts of Associated British Ports' port estate, which include docks, terminals and port buildings, lie to the west north west. The Humber Estuary is immediately south of the development site. To the north beyond the A1033 Hedon Road are industrial and business estates. The nearest housing is on the A1033 approximately 1 kilometre (km) north east of the site. Salt End lies to the north east of the development site, whilst International Power's Saltend Power Station and BP's Saltend Chemicals Works lie to the east. Salt End Jetties, which are also part of the port estate, lie to the south east. Beyond Salt End are the settlements of Hedon (approximately 2.2 km to the east of the development site) and Preston (approximately 4 km to the north east of the development site). To the south east of the development site at a distance of approximately 1.6 km is the coastal village of Paull. Hull city centre is approximately 6 km to the west north west of the development site.

2.9 Access to the port estate is from the A1033. The Hull Docks Branch Line railway enters the port estate from the north west. The Humber Estuary is a key transport route and is an area designated for its nature conservation importance at local, national, European and international levels. The estuary is a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA) and Wetland of International Importance (Ramsar site). Old Fleet Drain joins the Humber Estuary between the Kingston Terminal (dry bulk area) and Saltend Power Station.

Description of Proposed Development

2.10 The Humber Renewables Project will consist of the biomass fuelled power station and its supporting buildings. This will include enclosed conveyors, transfer towers, fuel reception and storage facility, boiler house, abatement plant, stack, once-through cooling water system, turbine building, transformers, a 400 or 275 kilovolt (kV) substation with grid connection yard, auxiliary boiler, auxiliary systems building, a control room, administration and workshop building, fly ash silo, bottom ash silo, oil tanks, water tanks, storage tanks for chemicals, bed sand silo, limestone silo, sedimentation reservoir, gas cylinder building, access roads and parking areas. The main buildings will be no higher than 100 metre (m) and will require a footprint of approximately 92,000 m^2.

2.11 At present the number of permanent full time employees working at the power station is expected to be approximately 60, of which approximately 50 are expected to work on the day shift (08.00 to 16.00) and four on each of the other two shifts (16.00 to 24.00 and 24.00 to 08.00). In addition to this a number of contractors and guests are expected on the site, bringing the daily average number of people on site to approximately 75 during normal operation.

2.12 Associated British Ports has applied to develop the Hull Riverside Bulk Terminal (HRBT) on the port estate by means of a Harbour Revision Order. An ES has been produced to support this application[6]. The HRBT will include a jetty suitable for use by large bulk carriers up to the

Capesize class, cranes for unloading the vessels and a conveyor linking the jetty to storage facilities on land. The HRBT development is not part of the Humber Renewables Project. DONG Energy, as one of the users of the HRBT, will utilise some of the HRBT facilities for the Humber Renewables Project.

Fuel Use, Delivery and Storage

2.13 The power station is designed for 100% biomass fuel and will use approximately 2 million tonnes (t) per year. The primary fuel for the power station is intended to be a combination of wood chips, wood pellets and wood briquettes which will be sustainably sourced. The biomass for the power station will be a combination of wood grown for a specific purpose (e.g. energy production), wood from cultivated forests (e.g. wood from thinnings) and residual biomass products from agriculture, timber and forestry operations (e.g. branches, tops, bark, shavings, chippings and sawdust). Supplies of biomass from abroad will be used in the power station, whilst indigenous supplies are currently being considered as an option.

2.14 The biomass will be transported to the site by vessels of various sizes up to the Capesize class, which have a capacity of up to 100,000 t of biomass. The vessels will dock at the jetty that forms part of the HRBT. The biomass will be off loaded from the vessels by cranes that form part of the HRBT and / or cranes on the vessels themselves. From the jetty the biomass will be transferred to the fuel reception and storage facility at the power station by enclosed conveyors. The first conveyor will be part of the HRBT whilst the second conveyor, which will be linked to the first conveyor at a transfer tower, will be part of the Humber Renewables Project. As the use of indigenous biomass is currently only being viewed as an option, the infrastructure to cater for the delivery of fuel from indigenous sources is not included in this EIA.

2.15 At the power station the biomass will be stored in an enclosed storage facility which will be designed to hold sufficient biomass for approximately 20 days of operation of the power station. From the storage facility the biomass will be conveyed via a system of enclosed conveyors to the boiler house.

2.16 Fossil fuel in the form of light fuel oil (LFO) will be used during start up. Up to 750 t of LFO will be consumed per year dependent on the number of start ups. On average the power station will have a maximum of five start ups per year. The on-site storage capacity for LFO is envisaged to be approximately 500 t.

Power Generation

2.17 The power station is intended to operate as a base load plant with an efficiency of approximately 35 to 40%. The operational hours will be up to 8,760 per year, which is equivalent to up to 8,500 hours at maximum continuous rating. The power station will be prepared with steam off-takes so that in the future steam or heat could be supplied to customers in the nearby industrial area. The supply of steam or heat to nearby customers could potentially increase the overall efficiency of the power station.

2.18 It is envisaged that the power station will employ circulating fluidised bed (CFB) technology as this is a proven design of boiler that is suitable for the proposed type of biomass fuel. The bed of the furnace within the CFB boiler is typically made of sand and this is fluidised by the injection of combustion air upwards from the base of the bed. The biomass in the furnace is carried to the top of the combustion chamber within the boiler by the hot combustion gases. From here the heavier particulates are recirculated back into the furnace whilst the finer particulates, i.e. the fly ash, pass out of the top of the combustion chamber with the flue gases. The heat from the combustion process produces high pressure steam in the boiler.

2.19 Proposed abatement techniques for sulphur dioxide (SO_2), oxides of nitrogen (NO_x) and particulates will employ BAT in order to ensure that the concentrations of these pollutants in the flue gases are in compliance with the applicable achievable concentrations specified by the

Environment Agency. For biomass with high sulphur content the possibility of injecting limestone into the boiler furnace for SO_2 abatement is envisaged. The emission concentration for SO_2 will be no greater than 200 mg/Nm^3.

2.20 Abatement of NO_x will be carried out in two stages. The first of these will be primary abatement measures during the combustion process, such as the use of good combustion control. Secondary abatement measures involve the reduction of NO_x to molecular nitrogen by the use of a nitrogen based chemical. The emission concentration of NO_x will be no greater than 150 mg/Nm^3.

2.21 The vast majority of the particulates that will be carried out of the top of the combustion chamber with the flue gases will be captured when the flue gases pass through a high efficiency filter system in the particulate abatement plant. The filter system will consist of either a bag filter or electrostatic precipitators. The emission concentration for particulates will be no greater than 20 mg/Nm^3. After abatement the flue gases will be discharged to atmosphere via the stack. The exact height of the stack will be determined by dispersion modelling during the EIA process and by discussion with the Environment Agency and the local planning authority, but it is currently anticipated that it will be between 80 and 120 m.

2.22 The particulate collected in the high efficiency filter system, the fly ash, will be conveyed pneumatically to the fly ash silo. The quantity of fly ash produced each year will be between 65,000 and 90,000 t. Bottom ash from the base of the combustion chamber will be transferred to the bottom ash storage silo. The quantity of bottom ash produced each year will be between 8,600 and 10,000 t.

2.23 The high pressure steam that is produced in the boiler will pass through the steam turbine and electricity will be produced by the generator. The steam turbine will be of a conventional design with high process efficiency.

2.24 The intention is to use a once-through cooling condenser to cool the steam once it has passed through the turbine. Other options such as air cooled condensers or hybrid solutions could be considered. The cooling water system will employ BAT. Water will be abstracted from the Humber Estuary, chlorinated by addition of hypochlorite in pulse dosage, passed through the cooling water system and then discharged to the Humber Estuary. The addition of hypochlorite will be optimised by targeted dosing in combination with monitoring of the behaviour of macrofouling species in the estuary. The cooling water intake will be designed to reduce potential entrainment of fish, fish larvae and other marine organisms. The quantity of water used in the cooling system will be between 10 and 12 m^3/s. The temperature rise for the cooling water will be up to 8°C during normal operation.

Infrastructure and Ancillaries

2.25 The power station will use up to 250,000 m^3 of potable water from the municipal water supply. This water will be for use in the boiler water system, as flushing water for cleaning and dust prevention purposes, and as sanitary and drinking water. Discharges from the boiler water system and the flushing water system are proposed to be routed to the Humber Estuary in conjunction with the cooling water discharge. Discharges from the sanitary and drinking water system are proposed to be routed to the local sewerage system.

2.26 The power station will have an auxiliary boiler which will operate for only a few hours at a time using LFO, typically during start up. There will also be an auxiliary systems building and a control room, administration, workshop and storage building. The development will include access roads and parking areas.

Electricity Export

2.27 An application for a grid connection has been submitted to National Grid, but DONG Energy has not received or accepted a formal offer of a grid connection from National Grid at the present time. There is no obvious reason why a grid connection will not be possible and it is anticipated that National Grid will be responsible for the grid connection.

2.28 The electricity produced by the power station will be routed through the transformers and then transferred by either underground cable or overhead line to a 400 or 275 kV sub station and grid connection yard which may be located either on-site or in close proximity to the site. From here the electricity will be transferred to the national grid by underground cable or overhead transmission line.

Ash Disposal

2.29 Fly ash stored in the fly ash silo and bottom ash stored in the bottom ash silo will be removed from the site by road, rail or ship. If possible the intention is to use the ash for a beneficial use either as fertiliser or in the building industry, subject to complying with statutory requirements. The least preferred option will be to landfill the ash.

Construction Logistics

2.30 The development site for the power station (see Figure 1.1) will also provide the location for the contractors' area, providing there is sufficient available space. If the available space is not sufficient then the contractors' area will be located on one, or potentially both of the northern areas of land shown bounded in red in Figure 1.1.

2.31 The manning level during the construction period will be nominally 500 with a maximum of 800. It is assumed that a maximum of 75 heavy goods vehicles (HGVs) and light goods vehicles (LGVs) will visit the construction site on a daily basis. In addition it is assumed that 30 abnormal indivisible loads will be delivered during the construction period, the majority of which will arrive by sea. The estimated construction working hours are 07:00 to 23:00 but there are occasions when night time working may be required.

2.32 Piling is likely to be required for the foundations for the majority of the power station buildings including in particular the boiler house, turbine building and fly ash silo. The piling method will be either driven or drilled piles. It is likely that the construction method for the cooling water pipes will be horizontal directional drilling.

Development Programme

2.33 It is expected that an application for the DCO will be submitted before the end of 2010. This will be followed by an evaluation period on the part of the IPC. The Engineering Procurement and Construction process is not likely to start before the end of 2011 and is likely to last until 2016. Construction of the power station is likely to take approximately 40 months commencing at the earliest by 2012 and completing at the earliest in 2016. The last six months of the construction period will include commissioning.

Decommissioning

2.34 The biomass power station is expected to operate for 20 to 50 years. If operation after this period is not feasible, the power station will be required to close and be decommissioned.

Sustainable Sourcing of Biomass

2.35 The European Commission has published a report on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling[i]. The report makes recommendations to the Member States as to which requirements should be implemented in local legislation to ensure sustainable sourcing of solid biomass.

2.36 The recommended criteria in the report relate to:

- a general prohibition on the use of biomass from land converted from forest, other high stock carbon areas and highly biodiverse areas;
- a common greenhouse gas calculation methodology which could be used to ensure that minimum greenhouse gas savings from biomass are at least 35% (rising to 50% in 2017 and 60% in 2018 for new installations) compared to the EU's fossil fuel mix;
- the differentiation of national support schemes in favour of installations that achieve high energy conversion efficiencies; and
- monitoring of the origin of biomass.

2.37 EU Member States will use this report to develop national policy and regulation setting out the requirement for sustainable sourcing of biomass to power stations. The Commission recommends that national sustainability schemes should closely resemble the sustainability criteria in the Renewable Energy Directive.

2.38 DONG Energy welcomes the report's recommendations and undertakes to meet the sustainability requirements when implemented in both national and international legislation, policy and framework. In addition, DONG Energy is a signatory of the United Nations Global Compact[ii], which asks businesses to commit to ten principles covering human rights, labour, anti-corruption and the environment. DONG Energy therefore upholds the fundamental principle that business and industry can play a major role in reducing impacts on resource use and the environment.

2.39 DONG Energy expects its suppliers, whether signatories or not, to share the ethos of the United Nations Global Compact. Since 2007, DONG Energy has operated a supplier Code of Conduct which states what DONG Energy expects of its suppliers on social, ethical, environmental, and health and safety issues. The code has reference to the eight fundamental International Labour Organisation Conventions, the United Nations Declaration on Human Rights and the United Nations Global Compact.

[i] Report from the Commission to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling was adopted by the European Commission on 25th February 2010.
[ii] The United Nations Global Compact asks companies to embrace, support and enact, within their sphere of influence, a set of core values in the areas of human rights, labour standards, the environment and anti-corruption. Its ten principles enjoy universal consensus and are derived from: the Universal Declaration of Human Rights; the International Labour Organisation's Declaration on Fundamental Principles and Rights at Work; the Rio Declaration on Environment and Development; and the United Nations Convention Against Corruption.

3. Plans and Policies

Statutory Context

3.1 The legislative context for the DCO application will be set out fully in the ES and is summarised here.

National Infrastructure Projects

3.2 The Humber Renewables Project will be considered under the new planning regime for NSIPs, which is administered by the IPC. Accordingly this scoping study is undertaken within the framework of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009.

3.3 Permission is required under Sections 15 and 31 of The Planning Act 2008 for development of NSIPs (which include onshore generating stations above 50 MW) and associated development. Prior to The Planning Act 2008 consent was covered by Section 36 of the Electricity Act 1989 granted by the DECC and associated deemed planning permission under The Town and Country Planning Act 1990.

3.4 The IPC has been ready to receive applications from the Energy Sector from 1st March 2010 but it will only decide applications where there is a relevant NPS in effect. Where the relevant NPS is not in effect, the IPC will examine the application and make a recommendation to the Secretary of State (in this case, for Energy and Climate Change) who will take the decision.

3.5 Under the IPC regime, there is the ability to draw together in one document the consents and powers which are currently required by, or given under a number of different legal regimes. This enables the consenting of a project to be streamlined, at the discretion of the applicant. Some consents can only be included within a DCO with the agreement of the body that would otherwise grant consent. This is provided for under Section 150 of The Planning Act 2008 in relation to the list of consents specified in the schedule to the Infrastructure Planning (Miscellaneous Prescribed Provisions) Regulations 2010.

3.6 The DCO for the Humber Renewables Project will apply for consent for the development described in Section 2 under Sections 15 and 31 of The Planning Act 2008, being an electricity generating station in excess of 50 MW. The DCO is expected to cover the following:

- deemed marine licence under the Marine and Coastal Access Act 2009 for the water intake and outfall pipes in the Humber Estuary below mean high water springs (assuming the relevant provisions are in force, otherwise deemed consents under the Food and Environment Protection Act 1985 and the Coast Protection Act 1949 will be sought);
- disapplication of Section 9(ii) of the Humber Conservancy Act 1899 and section 6(2) of the Humber Conservancy Act 1905, which contain restrictions on pipes installed below river lines of the Humber Estuary; and
- diversion or earlier termination of the public footpath crossing the development site.

3.7 Other consents likely to be applied for separately include those set out below. Subject to discussion with the relevant consenting bodies, it is possible that some of these may in fact be included in the DCO if the relevant bodies agree to this under section 150 of The Planning Act 2008:

- electricity generation licence under Section 6 of The Electricity Act 1989, issued by Ofgem;
- Environmental Permit under the Environmental Permitting (England and Wales) Regulations 2007, issued by the Environment Agency;

- water abstraction licence to abstract cooling water for the Humber Estuary, issued by the Environment Agency;
- hazardous substances consent under The Town and Country Planning (Hazardous Substances) Act 1990 for the storage of certain quantities of hazardous substances which are needed for the normal operation of the power station, issued by Hull City Council as hazardous substances authority;
- consent under Section 28E of The Wildlife and Countryside Act 1981 for works within a SSSI (being the installation of the water intake and outfall pipes in the Humber Estuary) issued by Natural England; and
- consent under Section 109 of The Water Resources Act 1991 for carrying out works in a main river (being the installation of the water intake and outfall pipes in the Humber Estuary) issued by the Environment Agency.

National Energy Policy

3.8 Government policy on energy is guided by the UK Low Carbon Transition Plan – National Strategy for Climate and Energy[6], which provides a detailed low carbon transition plan to 2020. The plan sets out the UK's approach to becoming a low carbon country: cutting emissions; maintaining secure energy supplies; maximising economic opportunities; and protecting the most vulnerable.

3.9 The Government's five point plan to tackle climate change is:

- protecting the public from immediate risk: tackling flood protection; developing a heat wave plan in the National Health Service; and helping communities affected by coastal erosion;
- preparing for the future: using the UK Climate Projections to help plan for a changing climate;
- limiting the severity of future climate change: through international agreements;
- building a low carbon UK: through legally binding 'carbon budgets', and investment in energy efficiency and clean energy technologies such as renewables, nuclear and carbon capture and storage; and
- supporting individuals, communities and businesses to play their part.

3.10 To drive the needed transition the Government has put in place a legally binding target to cut emissions by 80% by 2050, compared to 1990 levels, and a set of five year carbon budgets to 2022. The Transition Plan includes the policies and proposals for how the first set of three carbon budgets, covering the period 2008 to 2022, will be met. Within the electricity generation sector, this is through the cap set under the EU Emissions Trading System, and a range of additional policies to incentivise the development and use of low carbon technologies.

3.11 In parallel with the use of low carbon technologies is the need for the UK to have secure and reliable supplies of energy. Gas and oil (which currently supply 75% of the UK's primary energy needs) will remain key sources of energy in the UK but, in the longer term the UK must reduce its dependence on fossil fuels. The Government plans to do this through reducing the need for gas by improving energy efficiency and pursuing its objectives for renewables and nuclear power.

3.12 The 2009 Low Carbon Transition Plan sets out how the Government intends to meet energy needs in the coming decades. It assumes the need for about 43 GW net of new generating capacity by 2020 and about 60 GW by 2025/6, much of which has yet to be consented. Of this capacity, some 30% of electricity generation is expected to be from renewable sources by 2020. This provides the wider context for planning policy on energy infrastructure projects in the UK.

Planning Policy

National Planning Policy

3.13 National policy for electricity generation from biomass for NSIPs is contained in the Draft Renewable Energy Infrastructure NPS (EN-3), which should be read in conjunction with the Draft Overarching Energy NPS (EN-1). Both documents were issued for consultation on 9th November 2009. The consultations closed on 22nd February 2010 and the Government is considering the feedback with a view to publishing a formal response document later in 2010, together with the final NPSs. These NPSs provide the primary basis for decisions on the Humber Renewables Project.

3.14 The Planning Act 2008 requires that the IPC must decide an application for energy infrastructure in accordance with NPSs except to the extent it is satisfied that to do so would:

- lead to the UK being in breach of its international obligations;
- be in breach of any statutory duty that applies to the IPC;
- be unlawful;
- result in adverse impacts from the development outweighing the benefits; or
- be contrary to regulations about how its decisions are to be taken.

3.15 Primacy in policy consideration in the ES will, therefore, be given to the consistency of the development with NPS (EN-1) and NPS (EN-3).

3.16 The Government's wider objectives for energy infrastructure include contributing to sustainable development and ensuring that energy infrastructure is safe. Sustainable development is relevant not just in terms of addressing climate change but because the way energy infrastructure is deployed affects the well being of society and the economy. Government policies such as those for the environment, economic development, health and transport are primarily contained in Planning Policy Statements (PPSs) and Planning Policy Guidance notes (PPGs). Of particular relevance to the Humber Renewables Project is PPS 1: Delivering Sustainable Development which requires that the impact of climate change and promotion of renewable energy resources be addressed in development plans and development decisions; a supplement to PPS 1 on Planning and Climate Change was published in December 2007. In addition, PPS 22: Renewable Energy sets out the Government's planning policy on renewable energy and promotes renewable energy development in suitable locations.

3.17 On 9th March 2010 the Department for Communities and Local Government began a consultation seeking views on its proposal to combine the two PPSs referred to above and update existing planning policy on climate change and renewable energy. New policy in the consultation Planning Policy Statement: Planning for a Low Carbon Future in a Changing Climate reflects the latest legislative and policy context. The PPS will be a supplement to PPS 1.

3.18 In the event of a conflict between any of these other documents or a development plan and a NPS, the NPS prevails for purposes of NSIP decision making given the national significance of the infrastructure. The policy within PPSs and PPGs will, therefore, be considered on a topic by topic basis in the ES to highlight any such issues of conflict.

Overarching National Policy Statement for Energy (EN-1) and National Policy Statement for Renewable Energy Infrastructure (EN-3)

3.19 The Draft Overarching NPS for Energy (EN-1) sets out, in Part 4, the assessment principles and generic impacts that apply to NSIPs. These principles, in summary, are:

- consent should be granted if the development is in accord with relevant NPSs unless there are exceptional circumstances (see paragraph 3.14 above);
- to have regard to any local impact report submitted by a relevant local authority; any matters prescribed in relation to development of the description to which the application relates; any Marine Policy Statement (MPS) or marine plan; and any other matters which the IPC considers to be both important and relevant to its decision;
- to take into account the national, regional and local benefits (environmental, social and economic) including the contribution to the need for energy infrastructure, job creation and any long-term or wider benefits;
- to take into account adverse impacts (environmental, social and economic) including those identified in this NPS and the relevant technology specific NPS, as well as local impacts identified in the application or otherwise; and
- if satisfied that adverse impacts (including any cumulative adverse impacts) outweigh the benefits of the development (taking into account measures to avoid, reduce or compensate for those adverse impacts) consent should be refused.

3.20 The information that will be supplied in the ES and supporting documents is aimed at ensuring that the IPC has sufficient understanding of the project to conform to its determining principles and address those matters set out in Part 4 which are applicable, potentially including:

- Appropriate Assessment;
- alternatives;
- good design;
- combined heat and power;
- climate change adaptation;
- grid connection;
- pollution control;
- safety;
- hazardous substances;
- health;
- nuisance; and
- security.

3.21 The ES, in particular will address the generic impacts specified in Part 4, dealt with in subsequent sections of this scoping report:

- air emissions;
- biodiversity and geological conservation;
- coastal change;
- odour, dust, light etc.;

- flood risk;
- historic environment;
- landscape and visual impacts;
- land use;
- noise;
- socio-economic impacts;
- traffic and transport impacts;
- waste management; and
- water quality and resources.

3.22 Technology specific information, relevant to the combustion of biomass for electricity generation is contained in Part 2.5 of NPS EN-3. This focuses on such specific impacts as transport movements, air emissions, visual impacts and management of residual wastes. The ES will, similarly, concentrate on those effects which are associated with, or perceived to be associated with, biomass power stations.

Regional Planning Policy

Yorkshire and Humber Plan, May 2008

3.23 The Yorkshire and Humber Plan, May 2008 is the statutory RSS for Yorkshire and Humber, setting out the strategy to 2026. It comprises the strategic level document which together with adopted local documents, make up the applicable Development Plan. The Yorkshire and Humber Plan replaces the RSS for Yorkshire and the Humber (based on a selective review of Regional Planning Guidance (RPG) 12) which was published in December 2004. The ES will consider relevant planning policies of the current RSS, including those retained from the Hull and East Riding Joint Structure Plan (JSP) 2005.

3.24 The RSS (adopted in May 2008) sets out the region's commitment to sustainable development, with a twin policy of reducing greenhouse gas emissions and adapting to the predicted impacts of climate change. Policy YH2A in particular addresses the issue of reduction of greenhouse gas emissions, with a target of reducing emissions by at least 20 to 25% below 1990 levels by 2016. Policy YH2B addresses adaptation to the effects of climate change.

3.25 In addition, Policy ENV5 Energy states that: "*The Region will maximise improvements to energy efficiency and increases in renewable energy capacity*", specifying renewable energy capacity targets for 2010 and 2021 of 708 MW and 1,862 MW respectively, and 124 MW and 350 MW in the Humber sub-region respectively. The accompanying text to the policy envisages much of this capacity being provided by wind energy and biomass developments but taking "*into account the fact that wind energy developments within internationally important biodiversity sites are very unlikely to be acceptable. Renewable energy development elsewhere will need to avoid having an adverse effect on the integrity of internationally important biodiversity sites, which could arise for example by affecting bird movements or affecting water quality.*"

3.26 In addition to policies YH2 and ENV5, the RSS includes various policies that seek to balance the need for development over the next 15 to 20 years with those to protect the natural and built environment and the quality of life. Policy ENV10, for instance, seeks to safeguard the region's important distinctive landscape characters, ENV9 seeks to protect the historic environment and ENV8 seeks to safeguard and enhance elements of biodiversity importance.

3.27 Policy HE1: Humber Estuary sub-area policy recognises the importance of the Humber ports and the need to accommodate additional 'estuary-related uses'. Accompanying text states that "*Development land close to the ports and estuary is a valuable and limited resource, and it is*

important that it is available for uses that genuinely need to be located there, for example because of the need for access or proximity to the deep water or economic clusters that already exist".

3.28 The sub-area's dominant feature is the Humber Estuary. The estuary is internationally significant in terms of its environment and biodiversity. Environmental designations (SPA, SAC and Ramsar site) include the whole of the Humber Estuary, its habitats and wildlife, and developing economic potential should not compromise its environmental and biodiversity qualities. Many areas around the estuary are low lying and measures to minimise risk need to be developed as sea levels rise over and beyond the plan period.

3.29 The RSS recognises that the Humber Estuary sub-area has a major role to play in terms of the region's renewable energy generation requirement. This has largely been due to planned and / or proposed offshore wind farms but may take other forms. That care needs to be taken to protect the area from over-development by wind turbines to the detriment of the area's character and amenity is integral to plan policy and objectives.

3.30 It is noted that, as part of the Implementation Plan for the RSS Yorkshire and Humber Plan local authorities were invited to raise issues on particular policies that they were finding challenging to deliver. Policy on delivering decentralised, renewable and low carbon energy developments was found to be particularly challenging for the following reasons:

- it is a relatively new area of policy;
- Government guidance is changing;
- the requirements of the policy overlap with other regulatory functions e.g. Building Control;
- many officers do not yet have the necessary technical skills to implement the policy;
- there is a lack of evidence at the local level; and
- preparing Core Strategy policies is challenging and slow.

3.31 As a result local planning authorities are increasingly relying on Policy ENV5 in their decision making. Local Government Yorkshire and Humber together with Yorkshire Forward (the Regional Planning Body, see paragraph 3.33) have prepared a Renewable Energy Toolkit to help clarify Policy ENV5 and help local authority planning policy and development control officers in Yorkshire and Humberside. It introduces the legal requirements, national and regional policy, and the implications for local planning policy and development control.

3.32 The ES will consider the extent of compliance with the policies of the adopted RSS and, as appropriate, will look into the interpretations provided by the Renewable Energy Toolkit.

Integrated Regional Strategy

3.33 The Yorkshire and Humber Assembly was responsible for spatial planning at the regional level and preparing the RSS (the Yorkshire and Humber Plan). Since May 2008 the Yorkshire and Humber Assembly had been working on a review of the RSS. On 1st April 2009, the Yorkshire and Humber Assembly took the decision to handover its functions to the new Joint Regional Board (JRB). The JRB is made up of eight local authority leaders and eight Yorkshire Forward board members. The JRB is now the Regional Planning Body and is supported in this function by officers from Local Government Yorkshire and Humber. An indicative timetable envisages a Draft Integrated Regional Strategy (IRS) being produced in late 2010 and a final IRS before the end of 2011. The IRS is not likely to be available during preparation of the ES.

Local Planning Policy

3.34 The development site lies within the administrative area of Hull City Council, but is adjacent to the boundary with the East Riding of Yorkshire.

Hull City

3.35 At present the Development Plan for Hull comprises the City Plan (May 2000) and the JSP for Hull and East Riding of Yorkshire (June 2005). These plans contain policies, proposals and land allocations used to decide planning applications for development.

3.36 The existing plans remain in use until they are replaced by the Local Development Documents (LDDs) which make up the new Local Development Framework (LDF) brought in under The Planning and Compulsory Purchase Act, 2004. The LDF for Hull together with the RSS for Yorkshire and the Humber will form the new Development Plan for Hull.

3.37 The following parts of the Hull LDF are proposed, and a timetable has already been agreed and is set out in the Local Development Scheme:

- Core Strategy LDD;
- City Policies LDD, which includes detailed economic, social, environmental and movement policies linked to a Proposals Map;
- Joint Waste LDD (prepared jointly with the East Riding of Yorkshire Council, with Hull taking the lead);
- Joint Minerals LDD (prepared jointly with the East Riding of Yorkshire Council, with East Riding taking the lead);
- City Centre Area Action Plan (AAP);
- Newington and St Andrews AAP; and
- Holderness Road Corridor AAP.

3.38 The Hull Core Strategy is central to the Hull Development Framework (HDF). It will set the overall vision and key development principles and investment priorities in the city up to 2026. The Core Strategy is of particular importance for this site; it is currently the subject of consultation (closing end of March). The Holderness Road Corridor AAP involves land to the north of the development site and is due to be submitted for examination on the 22nd March 2010.

East Riding

3.39 The existing statutory development plan for the East Riding consists of the JSP, four Local Plans, and the RSS. The LDF will eventually replace the JSP and four Local Plans. The four local plans comprise:

- Beverley Borough Local Plan 1996;
- Boothberry Borough Local Plan 1999;
- East Yorkshire Boroughwide Local Plan 1997; and
- Holderness District Wide Local Plan 1999.

3.40 The development site is adjacent to the boundary of the Holderness Local Plan / Policy Area.

3.41 An Interim Planning Document (IPD) on Planning for Renewable Energy Developments was published by the East Riding in April 2009. It provides advice in respect of proposals for grid-installed on-shore renewable energy developments below 50 MW, namely those within the development jurisdiction of local authorities. The IPD focuses on the siting of wind farms and biomass plants.

3.42 The LDF will comprise a number of documents, including:

- Core Strategy;
- Allocations Development Plan Document (DPD);

- Bridlington AAP;
- Joint Minerals LDD (prepared jointly with the East Riding of Yorkshire Council, with East Riding taking the lead); and
- Joint Waste LDD (prepared jointly with the East Riding of Yorkshire Council, with Hull taking the lead).

3.43 The Core Strategy Preferred Approach is due to be reported to Cabinet in March 2010 and will be followed by a period of public consultation. Examination is timetabled for 2011 and adoption in early 2012.

Joint Structure Plan for Hull and East Riding of Yorkshire, June 2005

3.44 A number of policies within the Yorkshire and Humber Plan (RSS) replace policies in the JSP. Policy NAT11 on Renewable Energy in the JSP has been superseded by RSS policy ENV5. 'Saved' JSP policies relevant to the assessment of renewable energy developments include:

- Policy ENV4, integrity of strategic habitat corridors along the River Derwent, River Hull, Humber Estuary and the coastline; and
- Policy SP4, protection of the distinctive character of the Yorkshire Wolds, Jurassic Hills, Vale of York, Holderness, Humber Estuary, and Ouse and Trent Levels' Regional Landscape Character Areas.

3.45 The ES will consider those saved policies of the JSP which are applicable.

Hull City Plan, May 2000

3.46 The principal spatial policy of the Local Plan, governing development at Queen Elizabeth Dock is Policy D8:

> *"D8 Port-related development at King George / Queen Elizabeth Docks will be supported. Appropriate development will take into account the following:*
>
> *(i) protecting the nature conservation value of the Humber Estuary;*
>
> *(ii) protecting and enhancing Urban Greenspace;*
>
> *(iii) improving access to the Humber Estuary waterfront without compromising port security;*
>
> *(iv) providing a well designed frontage to Hedon Road; and*
>
> *(v) the need for flood defences."*

3.47 Relevant explanatory text in support of Policy D8 includes:

> *"15.34 The area is likely to play a vital role in the City's economy and the future growth of the Dock is encouraged. The area includes 90 ha of vacant land available for port-related uses over the plan period. Development fronting or near to Hedon Road should relate to proposed modifications to Hedon Road;*
>
> *15.35 The whole area is operational port land on which development, for port-related uses, can take place without normal planning controls. All development, including port-related uses, should have regard to existing housing areas and protecting the integrity of the mud flats and Humber Estuary;*
>
> *15.37 Over the Plan period, development adjacent to the Humber Estuary needs to take into account the predicted rise in sea levels. Development proposals affecting land or buildings adjacent to the Humber need to contribute to appropriate flood defence measures; and*
>
> *15.38 A public footpath runs along the Humber Estuary but there is no right of way beyond Lord's Clough. Improving public footpaths, to and along the Humber waterfront, will be encouraged, provided the security needs of the Port area are not compromised."*

3.48 Consideration will be given in the ES to the objectives of Policy D8 and all other relevant saved policies of the Hull City Plan.

Hull Core Strategy Preferred Approach

3.49 To realise the spatial vision of the Core Strategy and to guide its policies, eight strategic objectives are proposed:

"1. Implement major physical renewal projects;

2. Place the city centre at the heart of the City Region;

3. Provide a sufficient range, mix, type and affordability of housing, in locations where people want to live;

4. Realise economic growth in the city by supporting identified growth sectors and existing businesses by providing the necessary land and infrastructure;

5. Protect and enhance Hull's network of open spaces and important natural assets;

6. Promote a city that is able to mitigate against and adapt to the effects of climate change;

7. Create sustainable neighbourhoods where people have easy access to a full range of facilities; and

8. Make the most of Hull's distinct character based on its history, location and townscape."

3.50 The development can contribute to Core Strategy objectives and this will be addressed in the ES. Of the policies in the Core Strategy, Policy CS9: Renewable and Low Carbon Energy is particularly relevant to the development:

- *"Installations of renewable and low carbon energy generation and related infrastructure will be supported where environmental, economic and social impacts can be addressed satisfactorily; and*
- *On-site renewable or low carbon energy production will be required for new developments. This will be to reduce the estimated carbon dioxide emissions to a level deemed appropriate by the renewable energy study."*

3.51 The accompanying text at paragraph 7.40 of CS9 identifies possible locations for large-scale renewable energy installations, including the docks due to their accessibility by road, sea and rail. The location is felt particularly suitable for technologies, such as biomass combustion, that involve industrial processes and can fit in better with the industrial nature of the docks area. As stated at paragraph 7.43 of CS9, proposals would be expected to satisfactorily address:

- *"the effect on national and international designations;*
- *the effect on local priority habitat and species;*
- *the effect of noise, visual effects, odour and traffic on local residents;*
- *visual intrusion; and*
- *public safety."*

Draft Holderness Road Corridor Area Action Plan, November 2009

3.52 The area for the Draft Holderness Road Corridor Action Plan lies adjacent to the docks on the opposite side of Hedon Road. Consideration will be given in the ES to area objectives and policies and any potential interaction with the development.

Holderness Local Plan

3.53 The East Riding of Yorkshire generally lies to the east of Old Fleet Drain but the boundary straightens in the area of former mudflats, with the proposed development site lying to the west. The jetties and industrial area of Salt End lie to the east.

3.54 Policy U16 of the Local Plan states that "*Proposals for the generation of power from renewable energy sources will generally be encouraged provided the proposed development accords with the environmental and other policies in this Plan*".

3.55 Other policies of the plan with relevance are those relating to the ecologically protected sites of the Humber Estuary. All relevant saved policies of the Holderness Local Plan will be considered in the ES.

Interim Planning Document, Planning for Renewable Energy Developments, April 2009

3.56 The IPD identifies the policy framework, key issues relevant to different renewable technologies and gives guidance to developers regarding planning applications to the local planning authority. Regard will be had to the issues identified therein; particularly those set out in Appendices 2 and 4 of Volume 2 of the IPD.

East Riding Core Strategy

3.57 The LDF Core Strategy Preferred Approach is to be considered by the East Riding of Yorkshire Council Cabinet on 16th March 2010 for subsequent release for consultation in May 2010.

3.58 Proposed policy SS1: Promoting Sustainable Patterns of Development and Addressing Climate Change provides the strategic guidance for the LDF as a whole as well as for individual development decisions. It is split into two parts, where part A considers measures to support a reduction in greenhouse gas emissions and part B sets out the measures required to adapt to the expected impacts of climate change. The policy is likely to be used to guide planning applications and development decisions.

3.59 Proposed policy HQE7: Renewable Energy will be used to make decisions on all types of renewable energy development, including grid connected developments. The LDF Core Strategy indicates that developments will be supported providing there is no evidence to suggest that they are likely to cause adverse environmental, social or economic impacts that outweigh the benefits of renewable energy created by the development. The policy highlights the main likely considerations, as identified in the IPD. The decommissioning of renewable energy developments will be required at the end of their use with minimum impact to the landscape and biodiversity.

3.60 Appropriate consideration will be given to emerging plans and policies of the East Riding of Yorkshire Council as they might apply to the proposed biomass power station.

Site Planning History

3.61 Consultations to date have not identified any relevant planning history on the site. The last known use, conducted under permitted development rights, is understood to have been coal storage. Any further information about the planning history of the site, having relevance to the DCO will be presented in the ES.

Relevant Applications and Consents

3.62 Developments which are already consented but not operational and / or those currently applied for and being processed, may give rise to cumulative environmental impacts and these, amongst other matters, are the subject of ongoing consultations with the local and regional planning

bodies. Presently known developments which will or may have relevance are set out below and may be added to during the EIA.

Hull City

Deep Water Berth

3.63 Associated British Ports has recently applied for permission, by means of a Harbour Revision Order submitted to the Department for Transport, to develop a new deep water berth (the HRBT) that will be located adjacent to the proposed biomass power station. The HRBT would handle the biomass fuel for the Humber Renewables Project but would also have capacity for other dry bulk customers. The berth itself would be capable of handling ships up to 300 m in length.

3.64 The ES for the Humber Renewables Project will consider the cumulative effect of the two developments together.

Hull Riverside Container Terminal

3.65 The Hull Riverside Container Terminal, formerly Quay 2005, received Government approval in 2006. The current status of this project remains to be determined.

Energy from Waste Plant

3.66 Planning permission (Planning Reference 00029745) was granted in 2007 to the Waste Recycling Group for an Energy from Waste plant on land to the north of the development site. Enabling works commenced in October 2009 and it is anticipated that the development will take three years to complete. The main plant is in Hull but the ancillary plant / bulking plant and offices are in the East Riding of Yorkshire on the opposite side of Old Fleet Drain from the development site at Salt End.

Wood Fuelled Energy Plant

3.67 A small biomass plant (9 MW) was been permitted in December 2008 at King George Dock (Planning Reference 30735).

East Riding

Bioethanol Facility

3.68 Planning permission was granted in May 2008 for construction of a Bioethanol Facility at the BP Chemicals Works, Saltend Lane, Preston (Planning Reference 07/07450/STPLFE). Vivergo Fuels Ltd, a joint venture company, which was established to build and operate a wheat to bioethanol plant, is a collaboration between BP, British Sugar and DuPont. Presently under construction, the bioethanol plant is expected to begin producing bioethanol in summer 2010 and provide around 80 full time jobs.

Grid Connection

3.69 As set out in EN-1 (see paragraphs 3.19 to 3.22), an application must include information on how the plant is to be connected to the national grid network and whether there are any particular environmental issues likely to arise with that connection. The grid connection is not intended to be included in the DCO as associated development because it is anticipated that National Grid will be responsible for consenting the connection from the 400 or 275 kV sub station (which may be either on-site or in close proximity to the site) to the connection point with the national grid. In accordance with normal practice and to comply with the requirements of EN-1 (see paragraph 4.9.3 of EN-1) sufficient information will be provided in the ES "*to comply with the EIA Directive including the indirect, secondary and cumulative effects, which will encompass information on grid connections.*"

Consultations

3.70 The following planning bodies have been contacted as part of the EIA scoping exercise as part of the preliminary pre-application consultation:

- Hull City Council;
- East Riding of Yorkshire Council; and
- Local Government Yorkshire and Humber.

3.71 The principal purpose was to acquire relevant technical information and, in particular, to seek agreement on those policy documents which are believed to have most relevance to consideration of the DCO for the Humber Renewables Project, together with any current planning consents which might have a bearing on the impact assessment, either interactively or cumulatively. The information presented above, reflects the outcome of these consultations.

4. Environmental Impact Assessment Methodology

Objectives of an Environmental Impact Assessment

4.1 The main objectives of an EIA are to:

- describe the development in sufficient detail to allow any interactions between the development and the environment to be determined;
- identify environmental constraints and opportunities within the study area, taking account of the characteristics of the development and the sensitivities of the local environment;
- identify potential impacts and interpret the nature and significance of these impacts;
- describe the mitigation measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment; and
- determine the significance of any residual environmental effects following mitigation measures.

Stages of an Environmental Impact Assessment

4.2 The EIA process typically follows a number of stages:

- development initiation;
- screening (decision as to whether an EIA is required);
- pre-application discussions;
- **scoping (consultation on proposed scope and methodology of the EIA, including preparation of a Scoping Report, submission to the IPC and a request for a Scoping Opinion);**
- data collection and the undertaking of environmental baseline studies;
- assessment of potential environmental effects;
- modification of proposals to incorporate mitigation measures;
- re-assessment to determine residual impact significance;
- production of an ES;
- submission of the ES (in this case to the IPC as part of the application for a DCO);
- determination of the application by the IPC and consultation bodies;
- decision to refuse or grant consent (with or without conditions); and
- implementation and monitoring.

4.3 The stage fulfilled by this report is shown in bold on the list.

4.4 EIA should be considered as an iterative process rather than a one off, ‘static’ environmental appraisal. The findings of the EIA are fed into the design process. Where potential adverse effects are identified, the design of the development can be adjusted and / or appropriate

mitigation measures proposed. Early consultation is a crucial component throughout the EIA process, and one which contributes to both the identification of potential effects and the requirement for, and design of, mitigation measures.

Environmental Impact Assessment Scope and Assessment Methods

General Approach

4.5 The EIA will be carried out taking into consideration the Scoping Opinion received from the IPC and responses from consultation bodies. In addition, the preparation of the ES will take into account relevant regulations and general advice / guidance relating to good practice, including:

- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009;
- The Conservation (Natural Habitats &C.) (Amendment) (No. 2) Regulations 2009;
- Preparation of Environmental Statements for Planning Projects that require Environmental Assessment, A Good Practice Guide (Department of the Environment, 1995); and
- Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Impact Assessment, 2004, as updated.

4.6 Wherever possible, accepted impact assessment standards and guidelines will be followed in the EIA. The specific methodologies proposed for use in the assessment process are provided in detail for each of the EIA topic areas (see Chapters 5 to 16).

4.7 The EIA process will also be informed by the representations received in due course from the consultation bodies and the local community as part of the consultations under Section 42 and 47 of The Planning Act 2008 during the pre-application period.

Assessment of Construction and Operational Phases

4.8 Each impact assessment chapter within the ES will address the construction / commissioning and operational phases of the Humber Renewables Project. Where feasible each of the assessment chapters will follow a standard structure, which (as relevant for each environmental topic) typically follows the process steps outlined in steps 1 to 9 in Table 4.1. Steps 1 to 3 in Table 4.1 will generate the general methodology and background information for the assessment process. Steps 4 to 8 are the main stages of the assessment process. For most EIA topic areas steps 4 to 8 will be repeated twice, once for the construction / commissioning phase and once for the operational phase of the Project. The final step of the assessment process (step 9) will provide a summary of the key findings and conclusions for each EIA topic area.

Table 4.1 – EIA Assessment Stages

	Assessment Step	Description
1	Legislative and policy context	An overview description of the key legislation, policies and guidance notes etc. that are applicable to the EIA topic.
2	Assessment methodology and significance criteria	A description of how the assessment has been undertaken, where data have been sourced, what consultations have been held, what surveys may have been undertaken and what criteria / thresholds will be used to evaluate the significance of any impacts. Significance criteria or thresholds relate to the amount or type of impact or effect which constitutes a substantial or potentially substantial adverse or beneficial change in the environment.

	Assessment Step	Description
		Some thresholds can be quantitative (e.g. for air quality) whilst others are qualitative (e.g. for visual effects). Thresholds are used to provide the basis behind the conclusions reached regarding the significance of a particular impact or effect. The specific methodologies, baseline surveys, data sources and the criteria to be used in the assessment process are provided in detail for each of the environmental topic.
3	Environmental baseline	A discussion of the existing conditions, services and physical / natural environment of the site and its surroundings. This includes consideration of sensitivity and importance of the existing environmental conditions (as appropriate).
4	Potential impacts	Identification and evaluation of the proposed Humber Renewables Project's potential impacts in quantitative and qualitative terms. Impacts will be considered in terms of direct or indirect, short-term, medium-term or long-term, permanent or temporary, positive or negative effects.
5	Assessment and significance of effects	Following the identification of potential impacts (Step 4), the environmental baseline data (Step 3) is used to predict any changes to the existing conditions and to allow an assessment of these changes. The assessment of a potential impact takes into account any methods to reduce the impact that are already incorporated into the design and assumes that 'good practice' will be applied. For impacts relating to emissions (e.g. noise, stack gases), a 'source-pathway-receptor'[iii] approach will be taken to determine whether the identified potential impacts could result in an environmental effect. The effect that a project may have on each type of environmental receptor is influenced by the sensitivity of the baseline environment and the predicted degree of alteration from the baseline state. Significance of an impact will be evaluated in terms of the magnitude of impact and sensitivity of the receptor. For impacts / effects where an assessment of significance cannot be determined (e.g. for reasons of uncertainty) this issue will be highlighted and an explanation given as to why significance cannot be determined. Criteria (as identified in Step 2) will be used in the assessment process to define the significance of effects. Specific criteria will be defined in each impact assessment chapter but are generally considered as: Major: substantial / fundamental changes in an ecosystem[iv], society, or economy. Changes are well outside the range of natural variation and unassisted recovery could be protracted. Moderate: a material but non-fundamental change in an ecosystem, society, or economy. Changes may exceed the

[iii] The source-pathway-receptor approach typically involves an estimate of the quantity and composition of material which could escape (source), the routes by which it could travel off site (pathways) and the environmental sensitivity of the receiving environment (receptors). For there to be an environmental effect all three linkages must be present. If connecting source-pathway-receptor linkages can not be identified then there is no environmental effect and no need to progress further with the environmental assessment.

[iv] The term 'ecosystem' can be taken to mean the physical environment and the biological communities that live within that environment. Typically impacts to biological populations and communities are considered rather than impacts to individuals.

	Assessment Step	Description
		range of natural variation. Recovery could occur in the long-term. Minor: a detectable but non-material change in an ecosystem, society or economy. Changes might be noticeable, but fall within the range of normal variation. Negligible: changes in an ecosystem, society, or economy that are unlikely to be noticeable (i.e. well within the scope of natural variation). In general, impacts that are assessed to be major or moderate are considered to result in significant effects; impacts assessed as negligible are considered to result in insignificant effects; and minor impacts may result in significant / insignificant effects. This will be discussed as relevant in each EIA chapter.
6	Mitigation measures	Where, even after the application of 'good practice', a significant adverse effect is identified, specific / specialist mitigation measures to minimise, reduce, offset or avoid such effects will be proposed. In general, mitigation measures will not be proposed for beneficial impacts or those of negligible significance.
7	Residual impacts	Determination of the proposed development's remaining significance of effects after mitigation measures are implemented. Where no mitigation measures are required or proposed the residual impact will be the same as that determined through step 5 above.
8	Recommendations	A summary of any recommendation that have been identified within the assessment process. Recommendations will differ from mitigation measures in that it will not be assumed that these will necessarily be adopted and hence they will not be included / accounted for in the assessment of residual impacts. Recommendations are generally suggestions, or measures that could be considered further.
9	Summary and conclusions	A summary of the assessment and key conclusions.

4.9 The proposed structure of the ES is provided in Chapter 18.

4.10 The Humber Renewables Project is planned to operate for 20 to 50 years. If operation after this period is not feasible, the biomass power station will be required to close and be decommissioned. At this early stage in the Project, no further information is available relating to the decommissioning phase. However, as a guideline, it is anticipated that decommissioning activities will be similar to those that could occur during the construction phase of the Project. At the end of the life of the Humber Renewables Project, and prior to decommissioning, a detailed assessment will be undertaken to address environmental impacts associated with decommissioning, thus, decommissioning will not be discussed in any further detail in this report, or in the ES.

Assessment of Cumulative / Combined Impacts

4.11 For impacts associated with the Humber Renewables Project that are assessed to be of a significant adverse nature, the EIA will consider, so far as is possible, the potential for cumulative impacts arising in relation to the combined environmental effects from other planned developments.

4.12 The assessment of cumulative impacts is an integral part of the EIA process and ensures that all aspects of potential impacts from the proposed development have been addressed to ensure minimum impact on communities and the natural environment.

4.13 The assessment will consider the potential for impacts to arise through incremental (cumulative) increase, or by combined impacts. Incremental impacts can occur when an impact from one project occurs at the same time as that from another project in the vicinity (for example, two concurrent construction projects). Combined impacts may arise when an operation (or operations) gives rise to several impacts on a single receptor (e.g. the combination of air quality, noise and traffic impacts at a particular residential property).

4.14 The combined impacts of existing operational facilities will be accounted for through the baseline studies (as described in Chapters 5 to 16). Thus, only proposed developments will be considered in the assessment of cumulative / combined impacts.

4.15 Planned developments will be identified through consultation and will only include known developments (i.e. those that have already applied for planning consent).

4.16 The assessment of cumulative / in combination impacts will be presented as a standalone Chapter of the ES.

5. Air Quality

Overview

5.1 This chapter presents the proposed approach to the air quality assessment for the Humber Renewables Project. It includes a discussion of baseline conditions and sensitivity, preliminary identification of potential effects on air quality, and the proposed methodology for assessment of the construction and operational phases of the Project. The approach to mitigation measures is also discussed.

5.2 Cumulative impacts and potential combinations of various effects due to other planned developments are not discussed herein; however these will be identified and considered in the EIA.

Baseline Description and Sensitivity

5.3 The proposed development site lies within the industrial dockside developments in Hull. The nearest residential areas with community facilities (e.g. schools) are located 1.6 km to the south east in Paull, 1.8 km to the north in Greatfield, 2 km north west in Marfleet and 2.2 km north east in Hedon. Other residential receptors are located along the A1033 dual carriageway that runs between Marfleet in the west and Hedon in the east. A public footpath currently runs through the site.

5.4 The site lies within the boundary of Hull City Council, adjacent to its eastern border with East Riding of Yorkshire Council. Hull City Council has declared an Air Quality Management Area (AQMA) for nitrogen dioxide (NO_2) on the A63, approximately 5 km west of the development site.

5.5 Concentrations of NO_2, SO_2 and particulate matter with a diameter of less then 10 µm (PM_{10}) are measured continuously at four sites within Hull City Council's area, including one site in Marfleet which began operating in February 2009. The Updating and Screening Assessment[7] for 2009 reports that none of these sites provided measured concentrations above the air quality strategy objectives (see Table 5.1) in 2008. Concentrations continue to exceed the annual mean objective for NO_2 within the AQMA. Diffusion tube monitoring data for the Marfleet area show however, that roadside concentrations of NO_2 were below the objective of 40 µg/m^3 in 2008.

Table 5.1 - National and European Air Quality Criteria

Pollutant	Objective	Compliance Date
Oxides of nitrogen	Annual mean concentrations should not exceed 30 µg/m^3 for the protection of vegetation and ecosystems	31st December 2000 [1st January 2001]
Nitrogen dioxide	Hourly average concentration should not exceed 200 µg/m^3 more than 18 times a year Annual mean concentration should not exceed 40 µg/m^3	31st December 2005 [1st January 2010]
PM_{10}	24-hour mean concentration should not exceed 50 µg/m^3 more than 35 times a year Annual mean concentration should not exceed 40 µg/m^3	31st December 2004 [1st January 2005]
Particulate matter with a diameter of less than 2.5 µm ($PM_{2.5}$)	UK (except Scotland): annual mean concentration should not exceed 25 µg/m^3 EU Stage 1 Limit Value: annual mean concentration should not exceed 25 µg/m^3 EU Stage 2 Limit Value[a]: annual mean concentration should not exceed 20 µg/m^3	2020 [1st January 2015] [1st January 2020]
Sulphur dioxide	15-minute average concentration should not exceed 266 µg/m^3 more than 35 times a year Hourly average concentration should not exceed 350 µg/m^3 more than 24 times a year 24-hour mean concentration should not exceed 125 µg/m^3 more than 3 times a year	31st December 2005 31st December 2004 31st December 2004
Notes: [ ] denotes EU Limit Value compliance date in UK Regulations [a] indicative EU Limit Value to be reviewed in 2013		

5.6 East Riding of Yorkshire Council undertakes continuous monitoring at four locations across the authority area. The nearest to the development site is located at Preston, a kerbside location approximately 4 km to the north east of the proposed development. The Updating and Screening Assessment[8] for 2009 reports that air quality objectives for NO_2, PM_{10} and SO_2 were met at all locations in 2008. Diffusion tube monitoring of NO_2 in Hedon shows concentrations below 30 µg/m^3.

5.7 Further consultation with the local authorities will be undertaken during the EIA to review their most recently available Review and Assessment studies and air quality monitoring data.

5.8 A review statutory ecological designations within a 10 km radius of the project site has identified the Humber Estuary SSSI, SAC, SPA and Ramsar site to be the only relevant location. The estuary comprises component habitats of intertidal mudflats and sandflats and coastal saltmarsh. In consultation with the ecological specialist, the EIA will consider the sensitivity of the habitats adjacent to the site to air pollutants and a quantitative assessment of potential effects will be undertaken as appropriate. There are two other SSSIs within 10 km, however these have been designated for geological purposes and hence are not relevant as they are not sensitive to changes in air pollutant concentrations. The locations of non-statutory (locally important) sites within a 2 km radius of the site have been identified. These include four Sites for Nature

Conservation Interest (SNCI) in Hull and four Sites of Importance for Nature Conservation (SINC) in the East Riding of Yorkshire. The requirement to assess these sites within the stack emissions study is dependent upon the presence of species within these sites that are potentially sensitive to air pollution. This will be confirmed during the EIA.

5.9 Saltend Power Station is less than 1 km to the east of the proposed development site and three Part A industrial processes regulated by the Environment Agency have been identified using the online 'What's in your backyard' mapping facility'[9] within a 1 km radius of the site. These three Part A processes are the BP Chemicals Works, Yorkshire Water Sewage Treatment Works and a food oil plant. The most recent available data (2008) indicate that none had notifiable releases to atmosphere.

5.10 The 2009 Updating and Screening Assessment for Hull reports no industrial installations with substantially increased emissions or new relevant source of exposure within the local authority area or in a neighbouring authority area. It notes that an Energy from Waste facility has been approved in the Marfleet area and is currently awaiting a Part A1 permit, but this facility is not planned to be operational until 2012. The air quality assessment produced for the Energy from Waste facility concluded that there would be no significant impact due to the operation of the site. As part of the planning conditions for the development, an air quality monitoring station was set up which is to be maintained throughout the lifetime of the facility. Information from this monitoring station will be sought from the local authority. An application for a 9 MW biomass combustion plant on the Hull Docks has been granted planning permission. The data provided with the application for the plant concluded that there would no significant air quality impact.

Potential Impacts

Construction

5.11 During the construction phase of the Humber Renewables Project, there may be potential effects on local air quality as a result of site construction activities, and as a result of vehicle movements on-site and on the local road network.

Dust

5.12 The construction works are expected to take place over a 40 month period starting no earlier than the end of 2011. The construction of the facility will entail civil engineering ground works which have the potential to generate dust. There would be no demolition required on-site. Piling (driven or drilled) is likely as part of the construction of the foundations for the majority of the power station buildings, in particular the turbine and boiler house buildings and the fly ash silo.

5.13 The Humber Estuary designated ecological site is within 500 m of the development site, therefore a qualitative assessment of the potential impacts of construction dust will be required. The potential effects on all other receptors are likely to be negligible due to their distance from the site. The assessment will assume that standard construction industry good practice will be followed during the works.

Transport

5.14 Exhaust emissions from construction traffic vehicles have the potential to affect local air quality at properties close to haul routes. From an air quality perspective, sensitive receptors include residential properties and locations where there are likely to be vulnerable occupants such as hospitals, nursing homes and schools.

5.15 The Highways Agency's Design Manual for Roads and Bridges (DMRB) Volume 11.3.1 (Air Quality)[10] provides criteria for identifying whether an assessment of the effect of a road scheme on air quality is required. The criteria are:

- road alignment changes by 5 m or more;

- daily traffic flows change by 1,000 annual average daily traffic (AADT) or more;
- heavy duty vehicle (HDV) flows change by 200 AADT or more;
- daily average speed change of 10 kilometres per hour (kph) or more; or
- peak hour speed change of 20 kph or more.

5.16 It is currently considered that the number of vehicles associated with the construction phase would be 75 HGVs and LGVs per day, with manning levels of 500 to 800 staff. In combination with the HRBT development and assuming no restrictions on traffic movements, it is possible that the two-way daily traffic flow could exceed 1,000 therefore air quality screening calculations should be undertaken to assess the effect on local air quality in the EIA. The approach to assessment will be confirmed following the outcome of the traffic assessment, in consultation with the local authority.

Operation

5.17 The Project consists of a biomass fired power station with a net power output of up to 285 MW. The biomass will consist of clean wood chips, wood pellets and wood briquettes. The power station will employ CFB technology. At base load operation, it will operate continuously for up to 8,760 hours per year, or up to 8,500 hours at maximum continuous rating. On average there will be up to five start ups per year, which will use LFO.

5.18 The main air quality impact of the power station will be that associated with the discharge of emissions to atmosphere from the main stack. The minimum acceptable stack height will be determined through a stack height calculation using the Technical Guidance Note D1[11].

5.19 The power station will comply with the requirements of the LCPD (2001/80/EC) and the Environment Agency Sector Guidance Note for Combustion Activities (EPR 1.01)[v] which set limits on emissions of certain pollutants into the air. As such the Humber Renewables Project will be subject to strict limits on emissions of NO_x, SO_2 and dust (particulate matter, PM_{10}). These pollutants are contained in the UK Air Quality Strategy[12] due to their potential effect on human health and the environment, and objectives to be met have been set both at national and European level. The relevant air quality criteria are presented in Table 5.1 while the emission limits and achievable concentrations are shown in Table 5.2. Owing to the size of the facility, a detailed dispersion modelling study of the regulated stack emissions should be undertaken during the EIA.

5.20 During start up an auxiliary boiler will be employed. The emissions from the start up periods, which will last just a few hours, are considered to be negligible compared with the main stack emissions. No further assessment of these is recommended as part of the EIA.

Table 5.2 - Emission Limits and Achievable Concentrations for Humber Renewables Project

Pollutant	LCPD Limit for New Solid Biomass Plant (mg/Nm^3)	Achievable Concentration for Biomass Plant (mg/Nm^3)
Oxides of nitrogen	200	150
Sulphur dioxide	200	200
Dust (particulate matter)	30	20

[v] Achievable concentrations for emissions to air are provided as emission benchmarks in Environment Agency Sector Guidance Notes.

Materials Handling and Storage

5.21 The power station will consume approximately 2 million t of biomass per year. The biomass will be transferred to the power station via an enclosed conveyor system and will be stored on-site in an enclosed facility. On this basis, the potential for fugitive emissions of dust or odour from the handling and storage of biomass is considered to be negligible and no further assessment is required.

5.22 Fly ash produced by the power station will be held in an enclosed silo which will be fitted with a bag filter. The operation of fly ash silos with bag filters is a well known and proven system and thus the potential for fugitive emissions of dust from the handling and storage of fly ash is considered to be negligible and no further assessment is required.

Transport

5.23 Post commissioning, the number of road vehicle movements is expected to be much lower than that during construction. It is therefore considered unlikely that the DMRB criteria for affected roads will be met, however this will be confirmed during the EIA in light of the results of the traffic assessment.

5.24 The Project proposals include for delivery of fuel to the power station by ship at the HRBT. As discussed previously, DONG Energy is intended to be only one of the users of the HRBT. Therefore the air quality chapter of the EIA will set the Humber Renewables Project in context in relation to the HRBT development as concerns potential air quality impacts from shipping. However, the Department for Environment, Food and Rural Affairs' (Defra) Local Air Quality Management Technical Guidance (LAQM TG(09))[13] (Box 5.4, B.3 and paragraph A2.165) states that assessment of air quality effects from shipping (SO_2 emissions) can be excluded from further assessment where there are less than 5,000 shipping movements per year. Hull City Council's Updating and Screening Assessment (2009) states that the total annual shipping movements are below this threshold. Therefore, no further assessment is required. This will be confirmed in the EIA given the actual likely numbers of shipping movements.

Assessment Methodology

Construction

Dust

5.25 The construction works are not thought likely to generate substantial quantities of dust. Offsite sensitive receptors are some distance from the proposed power station, however due to the development site's location adjacent to the Humber Estuary designated site, this aspect of the construction work will be addressed in the EIA. This will comprise a qualitative evaluation of the proposed works, their location and duration, in the context of nearby sensitive receptors and prevailing wind direction.

Traffic

5.26 Simple quantitative assessment of the effect on local air quality of construction traffic may be required as the affected roads criteria set out in the DMRB may be exceeded. The effect of the additional traffic on local air quality will be assessed using the Highways Agency's DMRB air quality screening tool, and the change interpreted in accordance with Defra's LAQM TG(09) and Environmental Protection UK's Draft Development Control Guidance (2010 update)[14].

5.27 The assessment will comprise a review of background local air pollutant concentrations, identification of affected roads and sensitive receptors (residential properties, schools, nursing homes, ecological receptors) within 200 m of those roads, assessment of changes in traffic flow

and speed as a result of the construction traffic, and estimates of the resulting change in pollutant concentrations at receptor locations due to vehicle emissions.

Operation

Stack emissions

5.28 A detailed dispersion modelling study of the power station's emissions of NO_x, SO_2 and particulate matter will be undertaken using the United States Environmental Protection Agency regulatory model AERMOD. Hourly sequential meteorological data from the nearest suitable meteorological station for a five year period will be used in the model. The modelling grid will be designed such that the maximum area of ground level concentrations and concentrations at sensitive receptors will be adequately covered. The modelling study will consider base load continuous operation throughout the year using 100% biomass fuel.

5.29 The dispersion model results will be presented as contour plots of short-term and long-term average pollutant concentrations overlain on a suitable base map. The maximum modelled concentrations at residential properties and other potentially sensitive receptors will be evaluated in terms of existing concentrations and the air quality strategy objectives, in accordance with Environment Agency Technical Guidance H1[15].

5.30 Certain types of designated ecological sites may contain vegetation that could be adversely affected by air pollution. The effects of the NO_x and SO_2 emissions from the power station on these sites will be assessed. This will include all Ramsar sites, SPAs, SACs and SSSIs within a 10 km radius of the development site and locally important sites within a 2 km radius, where these contain species sensitive to air pollutants. The modelled annual average NO_x concentrations will be evaluated in the context of critical levels, and nitrogen and sulphur deposition rates will be compared with critical loads for the relevant habitat types.

Traffic

5.31 It is unlikely that further assessment of the effect on local air quality of operational traffic will be required as the total number of movements is likely to be below the assessment criteria set out in the DMRB. This will be confirmed in the EIA following the outcome of the traffic assessment. In the event that the change does trigger the need for an assessment, the methodology would follow that for the assessment of construction phase traffic as described above.

Potential Mitigation Measures

5.32 The results of the detailed modelling study to be undertaken during the EIA will be compared with national and European air quality criteria. The need for further mitigation of stack emissions will be considered on this basis. However further mitigation is unlikely to be required as the power station will meet the stringent emission concentration limits set in the LCPD and the achievable concentrations set in the Environment Agency Sector Guidance Note on Combustion Activities.

6. Land Quality, Geology and Hydrogeology

Overview

6.1 This chapter presents the proposed approach to the land quality assessment for the Humber Renewables Project. It includes a discussion of baseline conditions, preliminary identification of potential impacts, proposed impact assessment methodology for consideration of the construction and operational phases of the Project and potential mitigation measures.

6.2 Cumulative / in-combination impacts arising from other planned developments are not discussed herein. However, these will be identified and considered in the EIA.

Baseline Description and Sensitivity

Information Sources

6.3 Sources of information consulted to inform the baseline description and sensitivity include:

- Landmark Information Group Envirocheck Report (Envirocheck), dated April 2008;
- British Geological Survey (BGS) Geology Map number 81 of Patrington (Scale 1:50,000) dated 1991;
- BGS Archive borehole records number TA12NE200, TA12NE 216 and TA12NE 217;
- National Rivers Authority Groundwater Vulnerability Sheet No. 13 of the Humber Estuary, dated 1994;
- consultation with Hull City Council and East Riding of Yorkshire Council Contaminated Land Officers and the Environment Agency; and
- a site visit by Atkins on Thursday 8th March 2010.

Site Location and Setting

6.4 The development site is located to the south east of Queen Elizabeth Dock and approximately 1 km to the south west of Salt End in Hull. It is bounded to the north by the Kingston Terminal (dry bulk area - coal), south east by Old Fleet Drain and mud flats, south by the Humber Estuary and the north west by a north east to south west running road with open ground beyond and Queen Elizabeth Dock approximately 250 m to the north west.

6.5 The western potential contractors' area (the western of the two northern areas bounded in red in Figure 1.1) is approximately 300 m to the north north west of the development site and is bounded to the north east by a storage area (with tanks). The north east to south west running road is to the south east, open land to the south west and another north east to south west running road to the north west with the Graving Dock approximately 200 m beyond to the north west.

6.6 The eastern potential contractors' area (the eastern of the two northern areas bounded in red in Figure 1.1) is approximately 300 m to the north east of the development site. It is bounded to the north east and south east by Old Fleet Drain, to the south west by the Kingston Terminal (dry bulk area - coal) and the north west by open land.

Current Site Use

6.7 Currently the development site appears to be unused, apart from a container storage area in the north west corner. The storage area is surrounded by a low concrete wall with iron railings above and the internal surfacing is hardstanding. Remaining areas across the development site are a mixture of hardstanding (former roadways); mounds of gravel, block paving, concrete blocks, ballast and tarmac, especially in the west; poor grass; scrub; waterlogged areas; and the estuary foreshore. There were areas of surface staining noted during the site visit, which is possibly coal dust from adjacent areas. Visual evidence indicates that some parts of the development site have been reclaimed using waste material from highways in the area, for example, concrete and tarmac.

6.8 The western potential contractors' area is unused with a rough gravel surfacing, areas of tarmac and concrete hardstanding, a concrete / gravel bund, areas of fly tipping and localised waterlogged areas with stained water. The eastern potential contractors' area is also unused, predominantly grass and scrub with some evidence of localised fly tipping, and past timber storage (and burning) in the west. There are waterlogged areas with stained water.

Site History

6.9 The earliest map (1855) shows the development site as part of the Humber Estuary with the two potential contractors' areas just above the High Water Mark and called 'The Growth' (saltings). Old Fleet Drain is to the north east and east, and land to the north, north west and south east is marsh. The development site appears to be mud by 1892.

6.10 King George Dock was constructed to the north west / west between 1911 and 1929, together with west / east railway lines to the north, Half Tide Wall along the south west boundary of the development site (low water mark) and Salt End Jetties to the south east. The development site is still shown as mud.

6.11 Land to the south east was developed between 1952 and 1965. Part of the development site and the two potential contractors' areas appear to have been reclaimed between 1965 and 1971, together with construction of Queen Elizabeth Dock. However, the land is shown as unused. The Kingston Terminal (dry bulk area) which is adjacent and to the north of the development site, was constructed between 1971 and 1993, along with a conveyor running north west into Queen Elizabeth Dock. The development site and the two potential contractors' areas are still shown as open land.

Geology

6.12 Published geology shows the development site and the two potential contractors' areas to be underlain by Quaternary Tidal Flat Deposits resting on Glacial Till. These are underlain by the Cretaceous Flamborough and Burnham Chalk Formations. BGS archive borehole records indicate that up to 2.8 m of Made Ground is present to the north of the eastern potential contractors' area, described as silty clay. The Tidal Flat Deposits comprise silt, with thin bands of peat and sand to approximately 8.1 to 10.3 m below ground level (bgl), underlain by firm and stiff clay interbedded with sand and gravel. Solid strata (Chalk) are from 32 m bgl.

Hydrogeology

6.13 The development site is underlain by a non-aquifer. These formations are generally regarded as containing insignificant quantities of groundwater. However, groundwater flow through such rocks, although imperceptible, does take place and needs to be considered in assessing the risk associated with persistent pollutants. BGS archive borehole records indicate groundwater in the Tidal Flat Deposits, probably in hydraulic continuity with the Humber Estuary and the Chalk. The

development site does not lie within a groundwater source protection zone and there are no current, licensed groundwater abstractions within 500 m.

Sensitivity

6.14 A preliminary conceptual site model (CSM) has been prepared to aid in identification of the sensitivity of the development site and receptors of change for the construction and operational phases of the proposed development. A CSM describes the relationship between potential sources of contamination (resulting from both on-site and offsite historical and recent activities) and receptors to the potential contamination. As part of the CSM development, three elements: the source of contamination and associated contaminants; receptors to that contamination; and the pathways by which such contact can take place, are identified and assessed. Where all three elements are present or are likely to be present, they are described as potential pollutant linkages (PPLs).

6.15 Potential sources of contamination identified by this scoping study include:

- contaminants in materials used to raise levels / reclaim the land from the sea, especially the development site;
- contaminants in the fly tipped / tipped material across the development site and the two potential contractors' areas; and
- naturally occurring sources including ground gas from the decomposition of organic rich material in the Tidal Flat Deposits and from the Chalk.

6.16 Receptors and pathways to such sources of contamination during both construction and operational phases include:

- human receptors both on and off the development site, by dermal contact with and ingestion of contaminants, and inhalation of contaminants, vapours and ground gas;
- groundwater in the Tidal Flats Deposits / Chalk by leaching and downward migration of contaminants;
- surface water (Humber Estuary / Old Fleet Drain) by discharge of contaminants in surface water run-off and groundwater; and
- property, both on and off the development site, by direct contact with contaminants and migration and accumulation of vapours and ground gas.

6.17 A comprehensive assessment of the baseline cannot be made at present because of insufficient data / information.

Completion of Baseline Description

6.18 Additional baseline information will be collated for the EIA to enable the baseline CSM to be developed. This will include requesting currently confidential BGS archive borehole records across parts of the development site and further consultation with the Environment Agency, Hull City Council and Associated British Ports to identify whether there are any quantitative data on the soil and groundwater quality beneath the development site. A qualitative or semi-quantitative assessment of any identified PPLs will then be carried out and the baseline CSM confirmed.

Potential Impacts

Construction

6.19 Potential impacts during construction result from the change in contamination sources, receptors (construction workers and visitors) and pathways compared to the baseline. Construction of the

proposed development could include the following potential activities which could influence contamination sources and pathways:

- vegetation clearance, excavation and removal of the ground which would potentially remove contaminants (if present) but could also release and mobilise contaminants (if present) during the clearance / excavation process;
- redistribution of the ground and contaminants (if present), which could increase the potential for leaching of contaminants from the ground to the controlled waters receptors or introduce contaminants into new areas of the development site and thus to additional receptors;
- stockpiling of excavated material prior to either re-use or removal which could release contaminants (if present) in the stockpile by entrainment in surface water run-off and increased leaching to groundwater;
- use of plant and equipment on the development site which could accidentally leak fuels and oils, and introduce contaminants into the ground;
- storage of fuel and oils on the development site which could again leak / spill and introduce contaminants into the ground;
- importation and placement of fill which could include contaminants;
- placement of clean fill, foundations and hardstanding which would potentially act as pathway barriers to human receptors and reduce the potential for infiltration of rainfall and reduce leaching to the controlled waters receptors;
- temporary dewatering of the excavations which could potentially alter the groundwater flow direction for a short time and draw groundwater and contaminants into the excavation; and
- installation of service trenches which can act as preferential pathways for migration of vapours and contaminants in groundwater.

Operation

6.20 Potential impacts during operation result from the change in contamination sources, receptors and pathways compared to the baseline and could include:

- changes to receptors which will now comprise site occupants / visitors;
- storage and handling of materials on the development site which could again leak / spill and introduce contaminants into the ground;
- changes to contamination sources, which could include removal or volatilisation of contaminants (source removal) during construction;
- importation of ‘clean’ material which would present pathway barriers to human receptors and reduce infiltration of rainfall and likelihood of leaching of contaminants from the unsaturated ground to the groundwater;
- changes to pathways which could include placement of large areas of hardstanding acting as pathway barriers to human receptors and reducing contaminant leaching and run-off to surface water and groundwater receptors; and
- installation of vapour membranes in infrastructure preventing accumulation of vapours and ground gas.

Assessment Methodology

Construction

Legislative Guidance for the Assessment

'Contaminated Land'

6.21 Part 2A of the Environmental Protection Act 1990[16] introduced a statutory regime for the identification and remediation of 'Contaminated Land'. It introduced, for the first time in the UK, a statutory definition of 'Contaminated Land' based on significant harm or the likelihood of significant harm (including risks to human health) or the pollution or likely pollution of controlled waters (all groundwater, inland waters and estuaries but excluding groundwater perched above the zone of saturation).

6.22 Local authorities are the primary regulators under the Part 2A regime with a duty to determine whether the land in their area is 'Contaminated Land', although provision is made for consultation and co-ordination with the Environment Agency in situations when pollution of controlled waters is an issue.

6.23 Government objectives with respect to 'land contamination' are also set out as part of the Environmental Protection Act 1990 in the Defra Circular 01/2006[17] as:

- to identify and remove unacceptable risks to human health and the environment;
- to seek to bring damaged land back into beneficial use; and
- to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

6.24 These three objectives underlie the 'suitable for use' approach to the assessment and remediation of 'land contamination'. This approach recognises that the risks presented by any given level of land contamination will vary greatly according to the use of the land and a wide range of other factors, such as the sensitivity of the underlying geology and the receptors which may be affected.

6.25 The 'suitable for use' approach consists of three elements:

- ensuring that land is suitable for its current use;
- ensuring that land is made suitable for any new use; and
- limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land.

6.26 Primary guidance for assessing and managing land contamination is presented in Contaminated Land Report (CLR) 11[18]. This provides a technical framework for identifying and remediating contamination through the application of a risk management process. The question of whether risk is unacceptable in any particular case involves not only scientific and technical assessments, but also appropriate criteria by which to judge the risk and conclude exactly what risk would be unacceptable.

Legislation Relating to Controlled Waters

6.27 Protection of groundwater from new developments is regulated by the Groundwater Directive[19]. The aim of the Groundwater Directive is to protect groundwater by preventing or limiting the discharge of a range of potentially harmful substances into groundwater. This is enacted in the UK by the Groundwater Regulations 1998[20] which predominantly control the acceptability of discharge of certain chemical species into groundwater from new activities, especially where the activities are not covered by other regimes.

6.28 The Water Framework Directive 2000[21] aims to provide a comprehensive and holistic water policy for Europe by establishing a consistent legal framework for the protection, improvement and sustainable use of water. The overarching objective is to protect aquatic ecosystems by ensuring that all surface, transitional, coastal and groundwater across Europe should reach good ecological, chemical and quantitative status by 2015.

6.29 In addition, the Water Resources Act 1991 as amended by the Water Act 2003[22] aims to improve the management of water resources and protection to the environment by changing the way that water abstraction and impoundment is regulated.

6.30 The Groundwater Daughter Directive[23], which has evolved from the Water Framework Directive, is due to come into effect shortly. It will regulate the following areas:

- criteria for assessing good groundwater status;
- identification and reversal of trends of chemical groundwater pollutants; and
- measures to prevent or limit pollutant inputs into groundwater.

6.31 It is not known with any certainty how the details of the Groundwater Daughter Directive will affect groundwater protection policy in the future.

Environmental Permitting and Pollution Control for Contamination

6.32 There are a wide range of legal requirements that address Environmental Permitting and pollution control for contamination. Best practice guidance documents have been produced by the Environment Agency and organisations such as the Construction Industry Research and Information Association which are designed to prevent pollution during construction.

Building Control and Contamination

6.33 Building work is subject to Building Control under the Building Regulations 1991[24]. Schedule 1 of these Regulations (Requirement C2) states that "*precautions shall be taken to avoid danger to health and safety caused by substances found on or in the ground covered by the building*". It should be noted that if contaminating substances in the ground have the potential to attack building materials, this may lead to a breach of Part A of these Regulations which relate to structural safety. Approved Document C[25] sets out how contamination should be addressed in building control:

- site investigations should be carried out to determine the extent and nature of any contamination;
- any ground covered by the building must be reasonably free from any material that might damage the building or affect its stability;
- reasonable precautions must be taken to avoid danger to health and safety caused by contaminants on or in the ground covered by the building and any land associated with the building; and
- precautions must be taken against ground gases such as landfill gases, radon, vapours.

Exposure of Construction Workers to Contamination

6.34 The Contaminated Land Regime, as implemented through Part 2A and planning, does not explicitly address the risks to construction workers or other occupational groups that may have direct exposure to 'contaminated land', such as people employed to carry out environmental monitoring on such sites. The risks to these human receptors are managed through health and safety legislation, such as the Control of Substances Hazardous to Health (COSHH) Regulations[26] that require the employer to carry out an assessment of the risks associated with exposure to hazardous substances and then to prevent and if this is not reasonably practicable, adequately control such exposures.

Planning Policies and Guidelines

6.35 PPS 23[27] addresses contamination as a material planning consideration in the context of the redevelopment of a site or other alterations which fall under the planning regime. As a component of these considerations, the planning authority may require investigation that may lead to the identification of the need for remediation works as part of the redevelopment of the land. Remediation is often secured via planning conditions. PPS 23 makes it clear that in the context of dealing with land contamination, the developer is responsible for ensuring that development is safe and suitable for use for the purpose for which it is intended. In particular, the developer should carry out an adequate investigation to inform a risk assessment and remediation. PPS 23 recommends the phased approach outlined in CLR 11 for assessment of land affected by contamination.

Assessment Methodology

Introduction

6.36 The Government's Good Practice Guide for environmental impact assessment[28] states that the following potential environmental effects should be considered:

- physical effects of the development: for example changes in topography, soil compaction, soil erosion and ground stability;
- effects on geology as a valuable resource, for example mineral resource sterilisation, loss or damage to regionally important geological sites;
- effects on soils as a valuable resource, for example, loss or damage to soils with good agricultural quality;
- effects associated with land contamination that may already exist;
- effects associated with the potential for polluting substances that are used (during construction / operation) to cause new ground contamination issues on a site, for example introducing / changing the source of contamination; and
- impacts associated with re-use of soils and waste soils, for example, re-use of site-sourced materials on-site or offsite, disposal of site-sourced materials offsite, importation of materials to the site, etc.

Land Contamination Risk Assessment

6.37 The process of contamination risk assessment as defined in CLR 11 will be adopted as follows:

- hazard identification (establishing contaminant sources) and hazard assessment (establishing pathways and receptors and identifying PPLs). Both the hazard identification and assessment stages conclude in development of the CSM;
- risk estimation which predicts the likelihood (probability assessment) and degree (consequence assessment) of harm / pollution occurring. Risk estimation has two components: firstly probability assessment which relates to whether pollution / harm will occur in the short- and / or long-term (risk estimation is only undertaken when a PPL exists); and secondly consequence assessment which is the magnitude of harm that would occur because of the PPL, that is, the degree of harm / pollution considering the sensitivity of the receptor. Therefore, the consequence is whether the PPL would be a significant pollutant linkage; and
- risk evaluation which is the process of deciding whether a risk is acceptable or not and entails the application of evaluation criteria. These evaluation criteria are set in relation to a level of harm or pollution to the specific receptor. They may be absolute standards or recommended limit values, for example, a health criterion value for the intake of a substance.

6.38 CIRIA guidance C552[29] and National House Building Council / Environment Agency R&D66[30] provide general guidance on the development and application of the consequence and probability 'matrix approach' to contamination risk assessment.

6.39 The approach to the assessment will develop a CSM for each stage of the proposed development, identify potential receptors to existing land contamination that could be changed by the proposed development and carry out a contamination risk assessment for the following:

- baseline condition: development of the baseline CSM based on current use and identification and assessment of baseline PPLs; and
- construction phase: development of the construction phase CSM, addressing the potential for new sources of contamination to be introduced and the change in pathways and receptors, identification and risk assessment of PPLs.

6.40 The impact assessment will be carried out by comparing the construction phase CSM and risk assessment with the baseline. This CSM comparison approach allows the changes in land contamination status during the construction phase of the proposed development to be divided into major, moderate, minor or negligible impact (or change) which can be positive, neutral or negative. Determination of effect significance consists of comparing the magnitude of the hazard/source and sensitivity of the receptor for each potential impact.

Operation

6.41 The assessment for the operational phase is the same as that described above for the construction phase but involving the development of an operational phase CSM for the developed site, reflecting final site conditions including the status of contamination sources, changes in the receptors and pathways, and identification and assessment of PPLs. The impact assessment is carried out by comparing the operational phase CSM and risk assessment with the baseline.

Potential Mitigation Measures

6.42 Mitigation measures cannot be identified based on the information available to date. Identification of mitigation measures will be addressed in the EIA, as applicable, based on the outcome of the impact assessment.

7. Hydrology and Water Quality

Overview

7.1 This chapter addresses hydrology and water quality, and presents the proposed approach to the water quality assessment for the Humber Renewables Project. It includes a discussion of baseline conditions, preliminary identification of potential impacts, proposed impact assessment methodology for consideration of the construction and operational phases of the Project, and potential mitigation measures. Cumulative / in-combination impacts due to other planned developments are not discussed herein; however, these will be identified and considered in the EIA.

7.2 It has been assumed that foul water will be sent directly to the sewerage undertaker and therefore the disposal of foul water has been excluded from this scoping study.

Baseline Description and Sensitivity

Hydrology

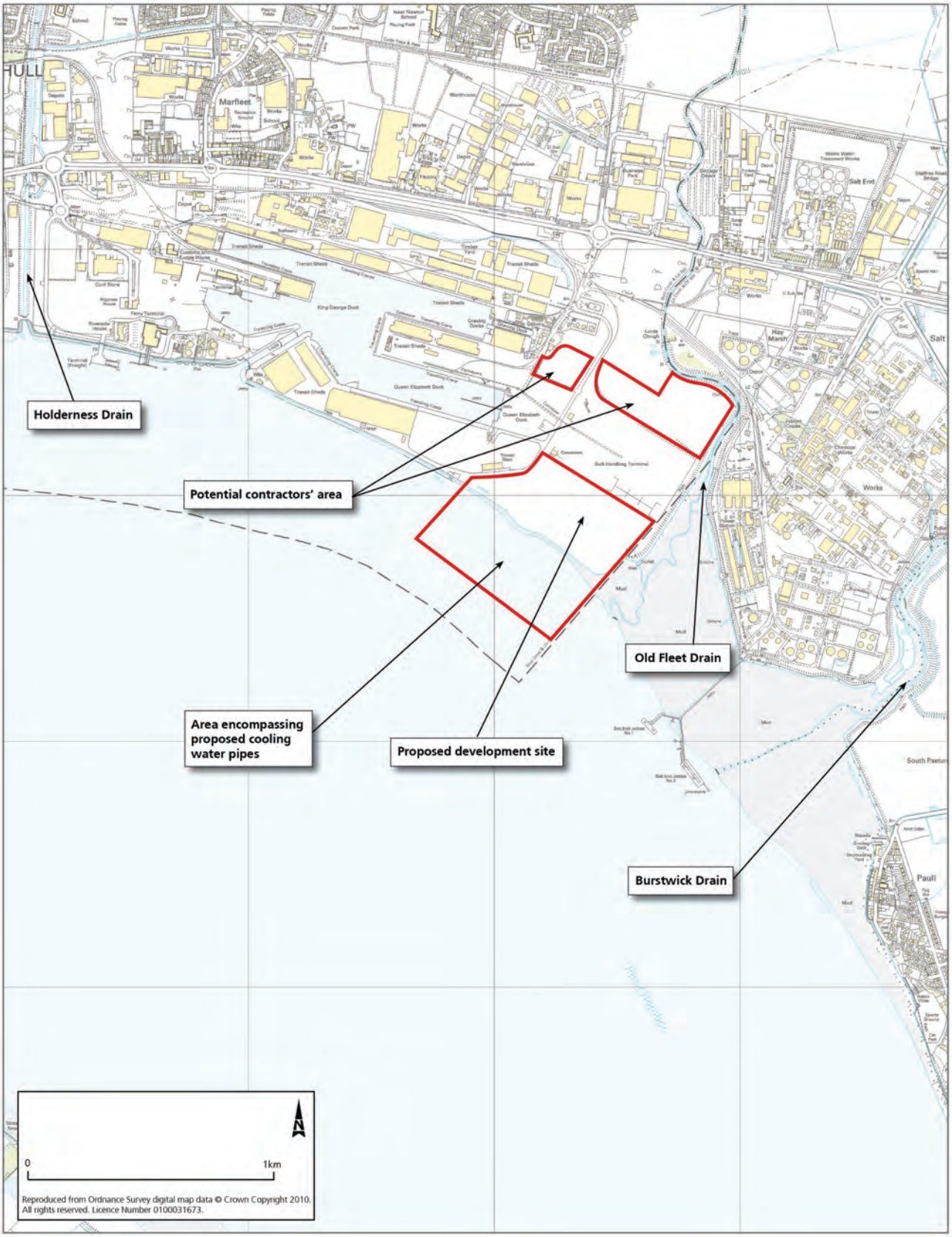
7.3 The Humber Estuary forms the southern boundary of the proposed development site; this is adjacent to recently reclaimed land in the south of the site. The section of the estuary adjacent to the site has a tidal influence. The tidal stretch of Old Fleet Drain (also referred to as Wyton Drain and Sproatley Drain) is located along the eastern boundary of the site (see Figure 7.1). Old Fleet Drain issues into the Humber Estuary. Sluice gates at Lord's Clough prevent the tide moving upstream in Old Fleet Drain and these are therefore defined as the upstream point of influence[6].

7.4 Approximately 2 km west of the site Holderness Drain (also referred to as Foredyke Stream) enters the Humber Estuary, to the west of King George Dock. Sluice gates are located 50 m upstream of where Holderness Drain meets the Humber Estuary, therefore limiting the potential for the proposed development to have an impact on the non-tidal section of Holderness Drain[6].

7.5 Other surface watercourses in the vicinity of the site include Burstwick Drain, which enters the Humber Estuary approximately 1 km east of the proposed development site. Burstwick Drain has a cloud gate 900 m upstream which is defined as the upstream point of influence[6].

7.6 Several additional surface water features, such as ponds, are located on the land adjacent to the proposed development site near Lord's Clough. This area includes two rainwater-fed, semi-ephemeral ponds. Adjacent to Old Fleet Drain to the north of the development site is a disused drainage feature. This drainage feature has no visible connection to Old Fleet Drain and has become choked with common reed[6]. With the exception of this disused drainage feature, there is no existing formal surface water drainage system within the boundary of the proposed development site. There is a sewer beneath the site constructed by Yorkshire Water in 2001 which outfalls into the Humber Estuary beyond the south west corner of the site.

Figure 7.1 - Watercourses in Vicinity of Development Site



7.7 Eleven discharge consents were reported in the HRBT ES[6] which are in close proximity to the development site (see Table 7.1). The effluent type is undefined for many of these discharges, but three are related to the sewerage network and one is an industrial discharge.

Table 7.1 - Discharge Consents within Close Proximity to the Development Site

Discharge	National Grid Reference	Effluent Type
Hull Waste Water Treatment Works	514844 428101	Sewage Disposal
ETA Transport and Trading Group Ltd	515910 429326	Undefined or Other
Hairsine Trailers	516049 429316	Undefined or Other
Tower House Lane SPS	515812 428960	Sewerage Network – Pumping Station – water company
Salt End North 275 kV Electric S/STN	516483 428694	Undefined or Other
King George Dock	514537 428249	Undefined or Other
BP Chemicals Ltd	516552 427745	Basic Ind. Chemicals Organic
Saltend Works	516869 427834	Undefined or Other
Battery Cottage	516918 426708	Undefined or Other
Paull SPS	516809 426491	Sewerage Network – Pumping Station – water company
Back Road	516641 426382	Sewerage Network – Pumping Station – water company

7.8 Five surface water abstraction licences were reported in the HRBT ES[6] which are in close proximity to the development site (see Table 7.2). None of these licences is for public water supply. Four of the abstraction licences are for cooling, but it is not known whether there are associated thermal discharges. It is uncertain whether the abstraction at Marfleet is from the Humber Estuary or from Old Fleet Drain.

Table 7.2 - Abstraction Licences within Close Proximity to the Development Site

Licence Holder	National Grid Reference	Abstraction Point	Abstraction Use
B P Chemicals (UK) Ltd	514100 428400	Saltend and King George Dock	General Cooling
Saltend Cogeneration Company	514990 428740	King George Dock	General Cooling
Aarhuskarlshamn Plc	514270 429060	King George Dock	Non-Evaporative Cooling
Seven Seas Ltd	514800 429400	Marfleet	General Cooling
Hull Bulk Handing	515080 428410	Queen Elizabeth Dock	Dust Suppression

7.9 The information reported in this section will be verified and investigated further during the EIA.

Water Quality

7.10 A preliminary assessment of baseline conditions has been made based on water quality data available from existing reports (HBRT ES[6], Envirocheck report[31]) and a range of information from the Environment Agency[9] website.

7.11 The General Quality Assessment (GQA) scheme provides water quality classifications for rivers throughout England and Wales, based on thresholds relating to a number of key water quality parameters. This classification system has now been superseded by the Water Framework Directive but provides historical context for baseline water quality. Environment Agency GQA water quality monitoring stations have been identified on Burstwick Drain, Old Fleet Drain and Holderness Drain close to the proposed site of the power station[6]. One further monitoring location has been identified north west of the site on Lambwath Stream, which flows into Holderness Drain[9].

7.12 GQA data covering the nineteen year period 1990 to 2008 (no data were recorded in 1991 and 1992) for these four monitoring locations have been reviewed. Note that 2007 is the latest year for which data are available in the HBRT ES[6] and the Environment Agency website has been used to obtain the 2008 data[9]. Classifications were available for the categories 'chemistry'[vi], 'nitrates' and 'phosphates'. The data are presented in Table 7.3 to Table 7.5. Phosphate concentrations were not reported for Old Fleet Drain.

[vi] This assigns a classification with regards to dissolved oxygen, ammonia and biochemical oxygen demand (BOD) concentrations; the worst of the three classifications provides the overall 'chemistry' classification.

Table 7.3 - Old Fleet Drain, Holderness Drain and Burstwick Drain Chemical GQA Grades[a]

Site	1990	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Old Fleet Drain[6]	N/A	C	N/A	D	F	F	F	E	E	E	E	E	E	E	N/A	N/A	N/A
Holderness Drain[6]	D	D	E	E	E	E	D	D	C	C	D	E	E	D	D	D	N/A
Burstwick Drain[6]	E	E	E	D	D	D	E	E	E	E	E	E	E	E	D	E	N/A
Lambwath Stream[9]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	C

Note:
[a] N/A means not available; chemical GQA grade A is 'very good'; B is 'good', C is 'fairly good', D is 'fair', 'E is 'poor' and F is 'bad'

Table 7.4 - Old Fleet Drain, Holderness Drain and Burstwick Drain Nitrate GQA Grades[a]

Site	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
Old Fleet Drain[6]	N/A	3	6	6	6	5	6	6	4	N/A	N/A
Holderness Drain[6]	4	6	6	5	5	4	4	4	4	5	N/A
Burstwick Drain[6]	5	6	6	6	6	6	6	6	6	5	N/A
Lambwath Stream[9]	N/A	6	5	5	4	5	5	5	5	4	4

Note:
[a] N/A means not available; nitrate GQA grade 1 is 'very low'; 2 is 'low', 3 is 'moderately low', 4 is 'moderate', '5 is 'high' and '6 is 'very high'

Table 7.5 - Holderness Drain and Burstwick Drain Phosphate GQA Grades[a]

Site	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
Holderness Drain[6]	N/A	5	5	5	5	4	4	4	4	N/A
Burstwick Drain[6]	N/A	5	5	5	5	5	5	5	5	N/A
Lambwath Stream[9]	5	5	5	5	5	5	5	5	5	5

Note:

[a] N/A means not available; phosphate GQA grade 1 is ‘very low’; 2 is ‘low’, 3 is ‘moderate’, 4 is ‘high’, ‘5 is ‘very high’ and ‘6 is ‘excessively high

7.13 In summary, the GQA classification data for Old Fleet Drain indicate that:

- the GQA chemistry classification was mostly 'poor' ('fairly good' in 1993 only). Post 2005, only limited data were available, therefore it is not possible to determine whether water quality has improved[6];
- nitrate concentrations were mostly classified as 'very high' ('moderately low' and 'moderate' in 1995 and 2007 respectively); and
- phosphate concentrations were not reported[6].

In summary, the GQA classification data for Holderness Drain indicate that:

- the GQA chemistry classification was mostly 'fair' or 'poor' ('fairly good' in 2000 and 2001 only) [6];
- whilst nitrate concentrations between 1995 and 2002 were 'high' or 'very high', concentrations between 2003 and 2006 were classified as 'moderate'. However, in 2007 they were again classified as 'high'; and
- phosphate concentrations were classified as 'high' from 2004 to 2007 but 'very high' before then.

In summary, the GQA classification data for Burstwick Drain indicate that:

- the GQA chemistry classification was mostly 'poor' ('fair' in 1995, 1996, 1997 and 2006 only)[6];
- nitrate concentrations were mostly classified as 'very high' ('high' in 1990 and 2007 only); and
- phosphate concentrations were consistently classified as 'very high'.

In summary, the GQA classification data for Lambwath Stream indicate that:

- the GQA chemistry classification was reported as 'fairly good' in 2008[9]. No data were available for BOD. The overall chemistry grade (classified by the poorest scoring component determinand) was determined by dissolved oxygen percentage saturation, while the ammonia classification was slightly better;
- nitrate concentrations were mostly classified as 'high' ('moderate' in 2002, 2007 and 2008; but 'very high' in 1995); and
- phosphate concentrations were consistently classified as 'very high'.

7.14 The Environment Agency reports on estuarine water quality every five years. A score is allocated for each category according to set criteria on the biological, aesthetic and chemical quality. Estuarine water quality between Thorngumbald Drain and Spurn Point has been consistently classified as A (good quality) since 1985[6]. It should be noted that this is not the same as 'good' quality freshwater, as estuaries naturally have a higher level of organic pollution and therefore cannot be assessed using the same standards.

7.15 The Water Framework Directive has an overarching approach to water management throughout Europe, with a multi-targeted methodology which needs careful consideration at each stage. The Water Framework Directive not only deals with the standards of receiving water bodies, but encompasses catchment management and sets broader environmental objectives for entire aquatic ecosystems. River Basin Management Plans prepared as part of the Water Framework Directive look not only at the chemical status of surface water bodies but also their ecological status. The ecological status is an integrated assessment which includes biology, chemistry (physico-chemical and specific pollutants), hydrology and morphology.

7.16 The three watercourses entering the Humber Estuary in close proximity to the proposed development site (Old Fleet Drain, Holderness Drain and Burstwick Drain) are all classified as heavily modified water bodies and therefore the status of chemical quality does not require assessment. The Humber Estuary in the vicinity of the proposed development site fails the current chemical status and is expected to fail the predicted (2015) chemical quality[6,9]. The ecological status of the three watercourses has been classified as 'moderate' in terms of the physico-chemical quality. Old Fleet Drain was classified as 'high', Holderness Drain was 'moderate' and Burstwick Drain was 'good' in terms of specific pollutants. The lower Humber Estuary has been classified as having a 'moderate' current and predicted (2015) ecological status. In terms of the physico-chemical and specific pollutants it was classified as 'moderate' in both cases due to nitrogen and zinc respectively. The lower Humber Estuary has been classified as 'fail' for the current and predicted (2015) chemical status.

7.17 The information reported in this section will be verified and investigated further during the EIA.

Receptors

7.18 Based on the available baseline information, it is believed that the potential receptors of changes in water quality due to construction and operational activity are the Humber Estuary, Old Fleet Drain, Burstwick Drain and the disused drainage ditch. The ponds near to Lord's Clough are also potential receptors of changes in water quality due to construction activity. The upstream point of influence will be limited in Old Fleet Drain and Burstwick Drain by the presence of sluice gates that define the tidal limit.

Completion of Baseline Description

7.19 A range of baseline information will be collated for the EIA in order to obtain a comprehensive picture of current water quality and to assess the sensitivity of receptors. Ecological receptors will be identified in the ecology chapter of the ES.

7.20 Some Environment Agency water quality data are already available for Old Fleet Drain, Holderness Drain and Burstwick Drain, but these are largely in the form of GQA classifications. The raw water quality data sets for the assessment area from Queen Elizabeth Dock to Paull have been requested from the Environment Agency, these will include temperature and chlorine concentration data. These data will be used to look at levels of key parameters with respect to relevant Environmental Quality Standards (EQSs), e.g. those relating to the Freshwater Fish Directive, Shellfish Directive and Dangerous Substances Directive, and the over-arching Water Framework Directive.

7.21 Other information relating to wider water quality issues has been discussed with the consultation bodies (Environment Agency, Hull City Council and East Riding of Yorkshire Council). No specific issues of concern relating to water quality were raised, for example, no abstractions were identified in the vicinity of the site that depend on a particular level of water quality[32].

7.22 Water quality modelling of the operational phase of the Project will be required to characterise the cooling water plume extent and characteristics under a range of tidal conditions. More details of the assessment methodology can be found below. The following additional baseline data are required to complete the water quality modelling of the operational impacts of the proposed development:

- bathymetric survey data;
- River Ouse and River Trent (major tributaries to the River Humber) discharge data;
- current and level measurements such as those from the one-off survey in September 2006[6]. Actual measured tidal data for the same time period as for the current measurements are also required;

- details of the existing discharge and abstraction consents; and
- a georeferenced map of the proposed HRBT development including dredging locations for Halton Middle.

Potential Impacts

7.23 The power station will use up to 250,000 m^3 of potable water from the municipal supply. This water will be used in the boiler water system, as flushing water for cleaning and dust prevention, and as sanitary and drinking water. The intention is to use a once-through cooling water system. Cooling water will be abstracted from the Humber Estuary, chlorinated by addition of hypochlorite, passed through the cooling water system and then discharged to the Humber Estuary. At present the abstraction and discharge of cooling water is expected to be 10 m^3/s under normal conditions, up to a maximum of 12 m^3/s. It is proposed that discharges from the boiler water system and the flushing water system will, after appropriate treatment, be routed to the Humber Estuary in conjunction with the cooling water discharge. The maximum flow rate for the discharge from the boiler water system and the flushing water system is likely to be 0.4 m^3/s. It is proposed that surface and roof water run-off will be treated and re-used as flushing water.

7.24 A preliminary assessment of potential water quality impacts relating to the proposed development has been undertaken, taking into account the Pollution Prevention Guidelines published by the Environment Agency, Scottish Environment Protection Agency, and Environment and Heritage Service[33], and guidance from the Highways Agency[10]. Potential impacts are divided into impacts arising during the construction phase and impacts during the operational phase. These impacts will be investigated further during the EIA.

7.25 Potential impacts during construction and operation have been considered in terms of the activity, resultant source, potential effects and receptors.

Construction

7.26 Potential impacts during construction may include, but are not limited to:

- deterioration in water quality owing to sediment disturbance and release of contaminants as a result of drilling activities to install the cooling water intake and outfall pipes, and position the discharge diffusers in the Humber Estuary. This disturbance may lead to a higher suspended solids load and possibly the release of contaminants from the estuarine sediment or may affect ecological receptors through disturbance of habitat, feeding or spawning grounds (see Chapter 11);
- deterioration in water quality owing to an increased potential for contaminants from accidental spillages to reach the receptor water bodies. These spillages could occur during transport of material to or from storage areas on-site, as a result of inappropriate storage facilities, as a result of boat and construction activities in the Humber Estuary or because of poor construction practice on-site. Depending on their nature, contaminants could settle / bind in the estuarine sediment and potentially be released at a later time in a more biologically active soluble form, or be dispersed in the water and reach receptors further downstream;
- deterioration in water quality owing to higher fine sediment delivery, as a result of increased traffic on-site and in the Humber Estuary, movement of construction machinery and excavation activities, temporary stockpiling of material or wheel washing. Increased sedimentation would lead to a higher suspended solids load in the receptor water bodies, which could eventually cause silting up of the disused drainage ditch or ponds. In the ditch this would restrict flow, leading to stagnant water conditions and potential algal proliferation, smothering habitats and causing damaging effects to aquatic organisms;

- deterioration in water quality owing to an increased potential for hydrocarbons from spillages (e.g. from fuels) to reach the receptor water bodies as a result of an increase in traffic activity on-site and in the Humber Estuary. These spillages could be harmful to aquatic ecology and affect the aesthetic water quality of the receptor water bodies;
- deterioration in water quality as a result of the exposure of potentially contaminated land and subsequent run-off of pollutants into the receptor water bodies. The history of the site will be taken into account when further considering this potential impact;
- deterioration in water quality as a result of other discharges from the site during construction (for example following plant washing). Discharge of any contaminated waters (including silted waters) would require permission from the Environment Agency, which must be requested well in advance of the start of construction activities. Any such discharges could potentially increase the concentrations of pollutants in the receptor water bodies; and
- deterioration in aesthetic water quality, as a result of litter accumulation, due to increased activity on the site.

Operation

7.27 Potential impacts during operation may include, but are not limited to:

- deterioration in water quality owing to consented regular discharges of cooling water, and discharges from the boiler water system and the flushing water system from the site into the Humber Estuary. The magnitude and nature of this impact will depend on the characteristics of the discharge. The cooling water discharge is expected to have a temperature uplift of up to 8 ^{o}C, therefore the potential for effects on the Humber Estuary arising from an increase in temperature will be examined. The cooling water will be treated with a chlorine based disinfectant (sodium hypochlorite) in pulse dosage. Chlorine can form toxic compounds with amines and other organic by-products (the major degradation products may include trihalomethanes, chlorophenols), which may bioaccumulate. The sensitivity of aquatic organisms to chlorine is increased at higher temperatures[38]. It is planned that the waste streams from the boiler water system and the flushing water system will pass through a sand and oil trap and sedimentation tank, and in the case of the discharge from the boiler water system a neutralisation plant, before joining the cooling water discharge. Any contaminants in this stream that are present at concentrations greater than the background levels in the Humber Estuary will be investigated in the modelling to be undertaken for the EIA;
- deterioration in water quality owing to the increase in potential for contaminants from accidental spillages (e.g. LFO) to reach the receptor water bodies. These spillages could occur during transport of material to or from storage areas on-site;
- deterioration in water quality owing to higher fine sediment delivery, as a result of increased traffic on-site. Increased sedimentation would lead to a higher suspended solids load in the water, which could eventually cause silting up of the disused drainage ditch. In the ditch this would restrict flow, leading to stagnant water conditions and potential algal proliferation, smothering habitats and causing damaging health effects to aquatic organisms. Depending on their nature, contaminants could settle / bind in the estuarine sediment, potentially being released at a later time in a more biologically active soluble form, or be dispersed in the water and reach receptors further downstream;
- deterioration in water quality owing to an increased potential for hydrocarbons from spillages (e.g. from fuels) as a result of increased traffic on-site to reach the receptor water bodies. These spillages could be harmful to aquatic ecology and affect the aesthetic water quality of the receiving watercourses; and

- deterioration in water quality owing to an increase in hardstanding areas, causing increased run-off, higher sedimentation rates and hence a higher suspended solids load in the receptor water bodies. As noted above, high suspended solids loads could eventually cause silting up of the disused drainage ditch. In the ditch this would restrict flow, leading to stagnant water conditions and potential algal proliferation, smothering habitats and causing damaging health effects to aquatic organisms. Sediment is also a vector for particulate-bound contaminants which could be released at a later date in a more biologically active soluble form.

7.28 The once-through cooling water system that is proposed for the development, should result in no net loss of water between abstraction and discharge, therefore it is believed that there will be no impact on the levels of water in the estuary and the watercourses in the vicinity in the development site.

Assessment Methodology

7.29 The Environment Agency, English Nature, Hull City Council and East Riding of Yorkshire Council have been contacted during the scoping study. The discussion with consultation bodies will continue throughout the EIA.

7.30 This section provides a preliminary outline of the proposed assessment methodology for the EIA, with regards to water quality. The assessment will be based on quantitative thresholds and the methodology will be finalised during the EIA. A conceptual model will be used to assess the potential construction impacts. For the operational phase of the development three dimensional (3D) hydrodynamic modelling is the recommended standard method to assess the impact of thermal plumes from discharge of cooling water to the marine environment and this approach will be applied in the EIA.

7.31 The outcome of the water quality assessment will need to be viewed in parallel with the assessment carried out for other aspects of the EIA, in particular sediments (see Chapter 8), flood risk (see Chapter 9), ecology (see Chapter 11), land quality (see Chapter 6) and waste (see Chapter 10). Any inter-linkages between these disciplines (e.g. temperature changes and potential effects on protected fish species) will need to be investigated to consider potential wider scale environmental impacts as a result of the development.

Construction

7.32 The baseline information including data, literature, site specific construction activities and their spatial distribution will be reviewed. To support the assessment a conceptual model of the predicted chemical load based on literature values will be used to indicate the magnitude of the impact. The water quality data will be used to calculate the baseline chemical load using a conceptual model with respect to key parameters, such as: BOD, total ammonia, unionised ammonia, dissolved copper, total zinc, suspended solids and polynuclear aromatic hydrocarbons[vii]. A range of factors (such as estimated changes in run-off volume, chemical content of soils on the site and literature derived information) will be taken into account to assess changes to chemical loads in surface waters through the construction phase and hence produce an estimated chemical load. The required information should be available from the flood risk and land quality assessments.

7.33 Results from the construction conceptual model (converted to concentrations) will subsequently be assessed against relevant EQSs and compared to baseline conditions. The percentage reduction in contaminant load will be calculated following the application of mitigation measures if required / applicable. A limitation for the assessment methodology is that the conceptual model of the chemical load is a semi-quantitative approach to indicate the magnitude of impact.

[vii] This is an indicative list. The list of key parameters for the EIA will depend on the data availability and specific water quality issues/areas of concern that may be identified.

Operation

7.34 Three dimensional hydrodynamic modelling will form a key aspect of the assessment for the operational phase. The application of a 3D hydrodynamic numerical simulation model of water flow and heat exchange to assess the impact of the thermal plume from the discharge of cooling water on the marine environment is a recognised and recommended standard method[34]. The 3D hydrodynamic model MIKE 3 FM developed by the Danish Hydraulic Institute (DHI) will be applied to simulate the thermal plume and re-circulation of heat, and concentrations of chlorine and its major degradation products from dosage of chlorine to the cooling water system. If necessary, concentrations of contaminants in the waste steams from the boiler water system and the flushing water system will also be addressed.

7.35 MIKE 3 solves the Reynolds-averaged Navier-Stokes equations for conservation of mass and momentum in three dimensions, is based on an unstructured flexible mesh and uses a finite volume solution technique. The unstructured flexible mesh consists of triangles of varying size and form in the horizontal plane. This approach allows for a variation of the horizontal resolution of the model grid mesh within the model area to allow for a finer resolution of selected sub-areas; in this case in the area of the cooling water outfall and intake. In the vertical, a structured mesh is applied, based on a sigma-coordinate transformation. The water column is divided into a fixed number of equidistant layers varying in thickness with total water depth.

7.36 The flow in the near field around the discharge point will be highly influenced by the strong tidal flow in the Humber Estuary. It is therefore difficult to separate the near field flow from the far field where the flow conditions are solely determined by the estuarine flow. Under such circumstances the best modelling approach is to integrate the near and far field, and describe both by the 3D model. This usually requires application of a relatively high resolution in the order of 10 to 20 m horizontally around the outfall and works best for surface discharges. For submerged outfalls arranged with diffusers, the immediate near flow field determines the dilution and thus the buoyancy and depth below the surface to which the effluent stream will rise. The calculation of the initial dilution is best simulated by CORMIX or a similar type of model.

7.37 The Predicted Environmental Concentration (PEC) for chlorine will be derived on the basis of chlorine dosage data, emission rates and the modelling of fate processes in the environment, e.g. abiotic degradation reactions, volatilisation. Also, the formation and environmental impact of the major degradation products, e.g. trihalomethanes, chlorophenols will be accounted for. All relevant fate processes will be described and programmed in the ECOlab template, which is a module fully integrated with the hydrodynamic model (MIKE 3 FM). The output from the modelling is the spatially distributed concentrations of chlorine and its major degradation products varying in time. For the EIA, the 90th percentile concentrations will be used to assess potential short-term effects and the average concentration will be used to assess potential long-term effects. The PECs will strongly depend on the assumed dosage plan.

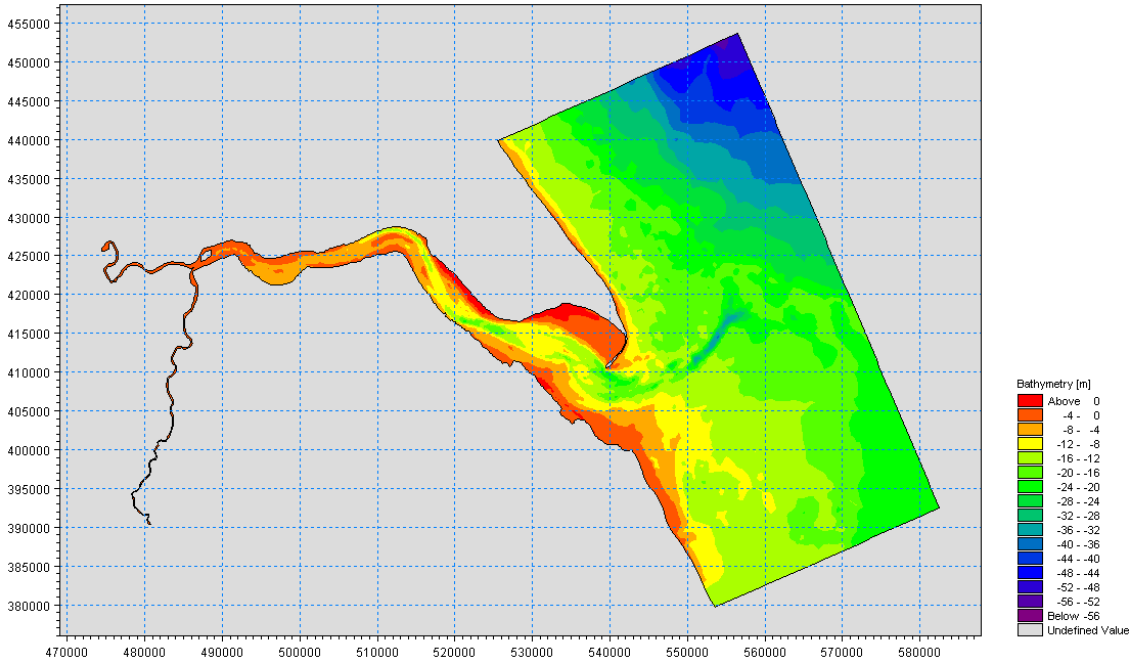
7.38 The Predicted No Effect Concentration (PNEC) is the highest concentration of the considered substance in the environment for which no effects on ecosystems are expected. The PNEC is derived on the basis of data on the ecotoxicity of the substance. The method to be applied for the derivation of PNECs will be based on the principles specified in the new European Chemicals Agency guidance document[35]. Both short-term and long-term PNECs will be derived for the substances in question, i.e. chlorine and its major degradation products.

7.39 The zone of potential impact of the use of chlorine ('chlorine impact plume') will be identified by a comparison of the PEC values with the PNEC values. If PEC exceeds PNEC, environmental impact cannot be excluded.

Model Set Up

7.40 The 3D model will be set up for the entire Humber Estuary with open boundaries towards the North Sea and upstream towards the Rivers Trent and Ouse, see Figure 7.2.

Figure 7.2 - Model Bathymetry (Present Situation) Showing Depth Relative to Mean Sea Level on National Grid Projection



7.41 The horizontal spatial resolution of the calculation mesh will vary from approximately 1 km near the open boundaries to 30 m or less near the outfall and intake structures. The vertical model resolution is based on a discretisation in layers of varying thickness, so called sigma layers. The number of layers is the same all over the model area, disregarding variations in water depth. The choice of model resolution / mesh is a compromise between accuracy and calculation central processing unit time.

Open Boundary Conditions

7.42 At the open boundaries towards the North Sea the astronomical tide (water level elevations) will be prescribed whilst the freshwater run-off from the rivers will be applied as upstream boundaries.

Salinity and Temperature

7.43 The effect of freshwater flow on currents in the Humber Estuary is relatively small compared to the main flow dominated by the tide. The Humber Estuary is considered to be well mixed in the lower and middle sections. However, salinity variations may be important as they can impact the buoyancy stability of the thermal plume and thermal stratification and thus will be taken into account. The sea water temperature is a prognostic variable in the numerical model and it is assumed that warm summer water temperatures will be most critical from a thermal plume point of view.

Calibration and Validation

7.44 The 3D hydrodynamic model will be calibrated against predicted tidal elevation within the Humber Estuary for a two week period that covers both neap and spring tide. The following tidal stations will be considered for model calibration: Bull Sand Fort, Immingham, Hull (King George Dock), Hull (Albert Dock), Humber Bridge, Burton Stather, Blacktoft and Goole.

7.45 For the HRBT ES[6], tidal current measurements were collected on the 22nd September 2006 in five positions between the Salt End Jetties and King George Dock. The measurements that were taken as part of the HRBT ES in the vicinity of the proposed site for the Humber Renewables Project, or other tidal current data collected in the vicinity of the proposed site will be applied for validation of the 3D model.

Bathymetric Conditions at Development Site

7.46 The HRBT development will be built into the 3D hydrodynamic model. With respect to water depths the HRBT development assumes dredging to approximately 13.5 and 7.5 m chart datum (CD) at the jetty and approach area respectively, and dredging to 7 m CD through Halton Middle. Reference is made to Chapter 2, Figures 2.2 and 2.3 of HRBT ES[6].

Scope of Simulations

7.47 The scope of the simulations is to delineate the extent of the thermal plume and potential impact of chlorine during operation of the power station, and determine the best possible location of the intake and outfall. Two dimensional results of thermal plume and chlorine impact extents in the form of horizontal temperature plots and vertical cross sections will be prepared.

Assessment of Impact

7.48 A MapInfo-based Geographic Information System will be used to summarise the key results of the water quality modelling, including the extent of the thermal and chlorine plume.

7.49 Guidance documents will be used to identify assessment criteria based on EQSs or PNECs as appropriate. These will be used for evaluating impact (sensitivity and significance) and will be suitable for the derived water quality modelling outputs. These criteria will depend on the sensitivity of ecological receptors (see Chapter 11). The assessment will be based on the final design for the development, including concentrations and conditions of the combined cooling water discharge and discharge from the boiler water and the flushing water systems.

7.50 Guidance documents that will be referred to during the assessment of impact include:

- Environmental Standards and Conditions; 2008; UK Technical Advisory Group on the Water Framework Directive[36];
- proposals for EQSs for Annex VIII substances; 2008; UK Technical Advisory Group on the Water Framework Directive[37];
- European Marine Sites: Toxic Substances and Associated Mixing Zones; 2005; Habitats Directive Technical Advisory Group on Water Quality[38]; and
- Guidance on Assessing the Impact of Thermal Discharges on European Marine Sites; 2006; Habitats Directive Technical Advisory Group on Water Quality[39].

7.51 The assessment of impact will generally look for inter-linkages with other disciplines, for example the output from the assessment of impact on water quality will be used to address aquatic ecological effects.

7.52 Limitations for the assessment methodology are:

- the complexity in separating the near field flow from the far field flow where the flow conditions are solely determined by the estuarine flow; and
- the number of model layers is the same throughout the model area, regardless of the water depth.

Potential Mitigation Measures

7.53 Mitigation measures cannot be identified based on the information available to date. These will be addressed in the EIA, as applicable, based on the outcome of the impact assessment.

8. Sediment and Geomorphology

Overview

8.1 This chapter presents the proposed approach to assessing the impact of the Humber Renewables Project on the existing estuarine sediment and geomorphology. It includes a discussion of the existing baseline conditions, preliminary assessment of potential impacts, the proposed impact assessment methodology for the construction and operational phases of the Project, and potential mitigation measures.

Baseline Description and Sensitivity

8.2 The Humber Estuary is a heavily studied water body with respect to many natural processes, but in particular sediments and geomorphology. Government funded research into estuarine processes has often focused on the Humber Estuary due to the complex dynamic system, its size, environmental designation and the large population / port industry located in the immediate environs. The estuary is dominated by the suspended sediment load which is derived from eroding cliffs offshore and from river borne sediment. The balance of sediment in the system has an associated effect on the coastal geomorphology.

8.3 In understanding the sedimentary and geomorphological baseline in the estuary it is important to consider the key physical drivers, principally the bathymetry of the tidal basin, the water surface elevation due to the tide and any alterations to this from fluvial inputs. The bathymetry of the Humber Estuary is characterised by a main meandering ebb channel with a depth of 10 to 15 m at the mouth reducing to 5 to 10 m upstream of the Humber Bridge. In addition to the main ebb channel there are a small number of flood channels. The ebb-flood channel system is not very stable, and has been said to oscillate in position at a frequency of 10 to 20 years.

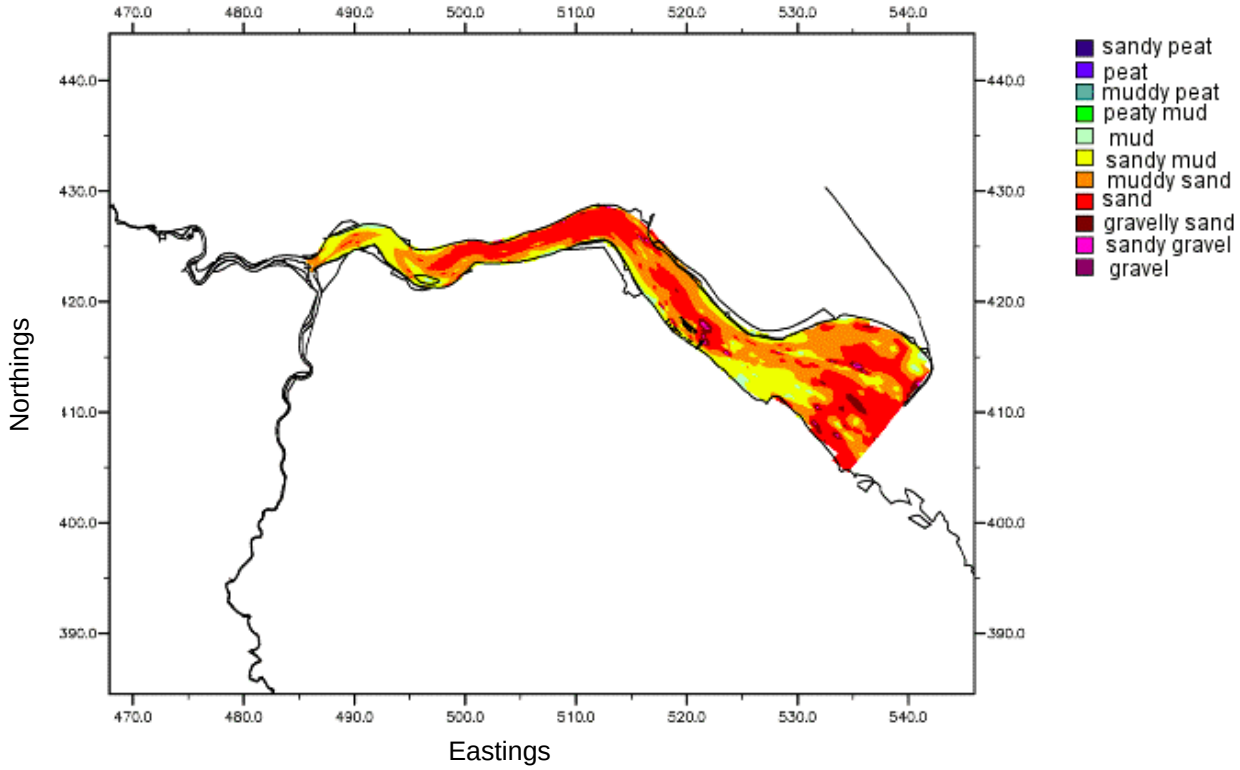
8.4 The Humber Estuary is macro-tidal with a typical tidal range of 6 m at spring tides and current speeds that can exceed 3 m/s (6 knots) in some locations. The tide in the Humber Estuary is semi-diurnal with the residual flow being the subject of discussion. Simple assessments[43] suggest that the estuary is flood dominant for fine suspended material but numerical modelling assessments[40] have suggested the opposite with transport towards the outer estuary. The work of Brown[41] suggests that the reason for this is related to the interaction of intertidal sandbank width to ebb tidal channel size. As the tide drops it is suggested that the concentration of flow into the ebb tidal channels by the sand banks leads to a net ebb flow.

8.5 The tidal prism (the volume of tidal water between high and low water) is 1.5 $x10^9$ m^3 for spring tides and 0.8 $x10^9$ m^3 for neap tides with a total estuary volume of 2.5 $x10^9$ m^3 at high water[46]. The larger fluvial inputs consist of the Rivers Trent, Ouse, Don and Aire with combined average freshwater flow inputs[46] of 250 m^3/s and high flows of approximately 1,600 m^3/s. The spring tidal prism as a rate of flow equates to approximately 35,000 m^3/s, several orders of magnitude larger then the freshwater flow, highlighting the tidal dominance.

Sediment

8.6 Bed sediment types in much of the Humber Estuary consist of sand / muddy sand in both the intertidal and subtidal zones as shown in Figure 8.1. The principal mud areas are located in relatively low energy environments near Burcom Sand and the intertidal areas upstream of the Humber Bridge at Read's Island and Whitton Sand.

Figure 8.1 - Existing Sediment Distribution in Humber Estuary (from EstProc 2003[42])



8.7 Coarser materials, such as gravels are likely to remain from the Holocene evolution of the estuary, when the glacial retreat and marine transgression led to the deposition of large quantities of gravel material. These coarser materials are typically found in the higher energy environments towards the mouth of the estuary and as such are not considered further in this baseline assessment owing to sediment process disconnection at such a distance from the proposed development site.

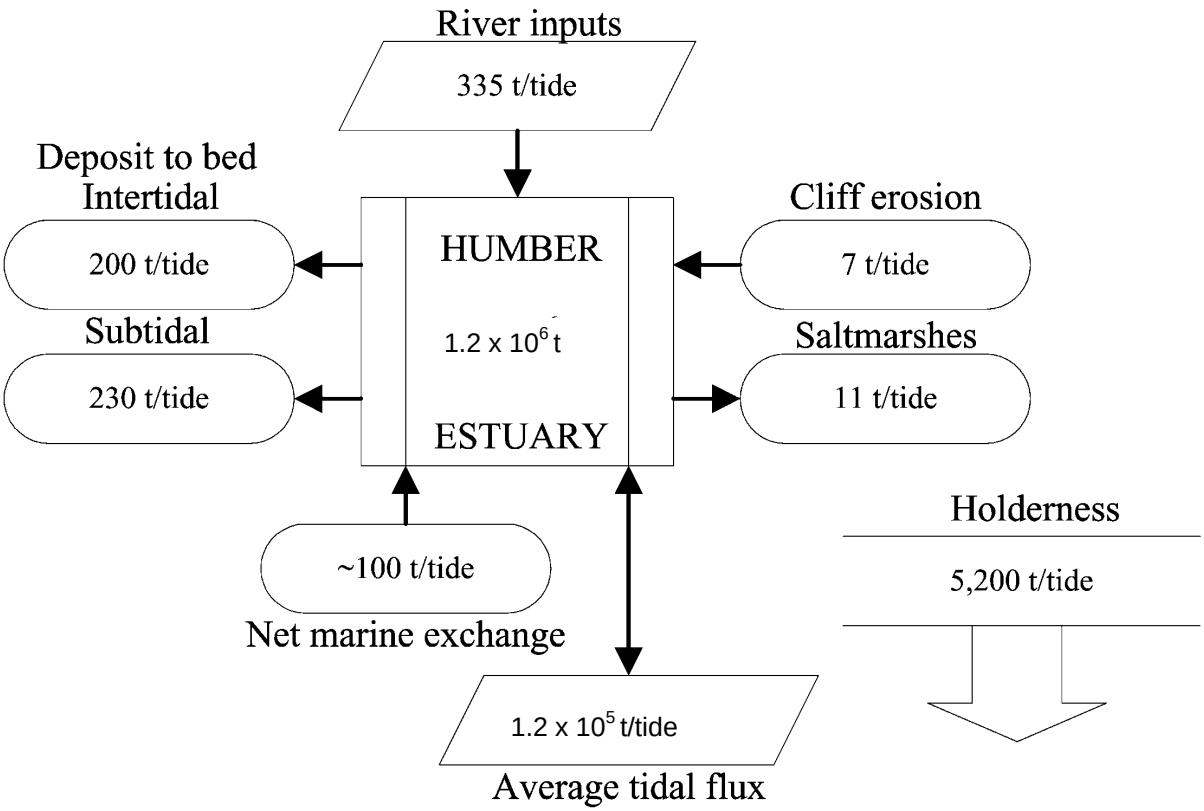
8.8 The suspended load of finer sediment in the Humber Estuary originates from two sources: terrestrial input via the rivers; and marine input via exchange at the mouth. The riverine input is estimated[43] at 300 to 500 kt/year, i.e. 430 to 710 t/tide. Marine input originates mainly from erosion of Holderness Cliffs on the open coast to the north of the Humber Estuary with estimates ranging between 1,440 kt/year i.e. 2,000 t/tide[43] and 3,300 to 4,400 kt/year i.e. 4,400 to 6,300 t/tide[46]. Investigation[45] has shown that this material enters the estuary though it has not been possible to determine its specific contribution to the estuary budget. Notwithstanding, it implies that riverine and marine input of fine sediment would be of similar magnitude.

8.9 Data on the suspended sediment concentration (SSC) in the Humber Estuary are available from a range of survey campaigns. Values range from an annual mean of 100 mg/l[43] to average values ranging from 300 to 1,900 mg/l[45] dependent on the tidal cycle and time of year. Of note is the range of natural variability in SSC for much of the estuary. In the lower reaches of the River Ouse SSC values have been recorded as high as 10,000 mg/l[44]. From these studies of SSC a turbidity maximum has been observed, the position of which varies dependent on the balance of freshwater / tidal water flows and the availability of sediment with which to form the turbidity maximum. This availability is governed by the hydrodynamic sediment transport processes, amongst which is tidal asymmetry and salinity-induced gravitational circulation. The turbidity maximum is typically found upstream of the Humber Bridge[45] however it has also been observed to be removed following times of high freshwater flow, re-establishing itself following these periods[43].

8.10 Of importance to understanding the impact of these sources is consideration of the exchange of material[46]. This is done at two levels, firstly marine exchange through flux at the mouth (drawing in some material from the along-coast erosion of Holderness Cliffs) and secondly through exchanges in the estuary. In the estuary the exchanges consist of: maintained suspended sediment load; deposition to the bed; and the export of material through dredging.

8.11 It should be noted that dredge material has typically been redistributed inside the estuary and therefore has not been considered as an additional item in the indicative sediment budget, see Figure 8.2 which shows the interaction of the sources / sinks with the exchanges.

Figure 8.2 - Schematic Net Sediment Budget for Humber Estuary (from Townend 2003[45])



8.12 Of primary importance to this baseline assessment is the balance of this sediment budget. The conclusions proposed by Townend[46] suggest the following:

- sources and sinks are considerably smaller than the maintained suspended load in the water column; and
- the fluvial and marine exchanges are several orders of magnitude smaller than the flux through the mouth.

8.13 In addition it was noted that the system is a net importer of material with the maintenance of the present dynamic equilibrium reliant on both the fluvial and marine sources. The route of net import is mainly over the intertidal sand banks and consists of finer material, whilst export is in the ebb tidal channels and consists of the coarser sand materials. The evidence suggests that the two critical pathways of sediment in the vicinity of the development site for the Humber Renewables Project are in the suspended load across the intertidal flats and to a lesser extent the bed load of coarser material. Consequently any impact assessment should consider alterations to these pathways.

8.14 Recently, additional effort has been expended on understanding the impact of the HRBT development[6], in particular the impact on sediments was assessed through detailed two dimensional (2D) numerical modelling. This suggested that the capital dredging would have a minimal effect on the SSC in the estuary and at the site itself there would be a small variation in the accretion erosion pattern local to the site. The dredging was considered to be the major impact of the HRBT development.

Additional Works to Inform Sediment Baseline

8.15 The HRBT ES added to the understanding of sediment transport in the Humber Estuary and has provided the foundation for a robust assessment of the existing baseline. In addition, it is proposed that further data are collated for the vicinity of the Humber Renewables Project development site to inform the baseline, in particular this involves reviewing:

- additional studies and reports identified at the scoping stage that could not be collected at that time;
- bathymetry, side scan sonar and shallow seismics of the immediate development site areas to understand the sediment make up of the site; and
- data from bed load sediment samples at the development site location and suspended sediment load over a period of a spring / neap cycle, including flow measurement.

8.16 If the existing data are not adequate then sampling may need to be carried out to obtain the required data. From these additional data in conjunction with the initial results of the hydrodynamic model runs from the proposed DHI hydrodynamic modelling (see below) it will be possible to define the likely baseline sediment erosion and accretion patterns and the expected natural variability. The geographical extent of the sediment assessment will be defined following the initial existing condition model runs, as it is likely that the bedload conditions will be proximal to the site and suspended load could be distal from the site.

8.17 It is considered important that key stakeholders and knowledge holders are consulted to provide a consensus on the baseline conditions. Consequently additional interaction is envisaged with the key stakeholders such as the Port Authorities (Associated British Ports and Port of Hull) and knowledge holders including the University of Hull and local coastal groups. This consultation will continue through the impact assessment stage of the EIA.

Coastal Geomorphology

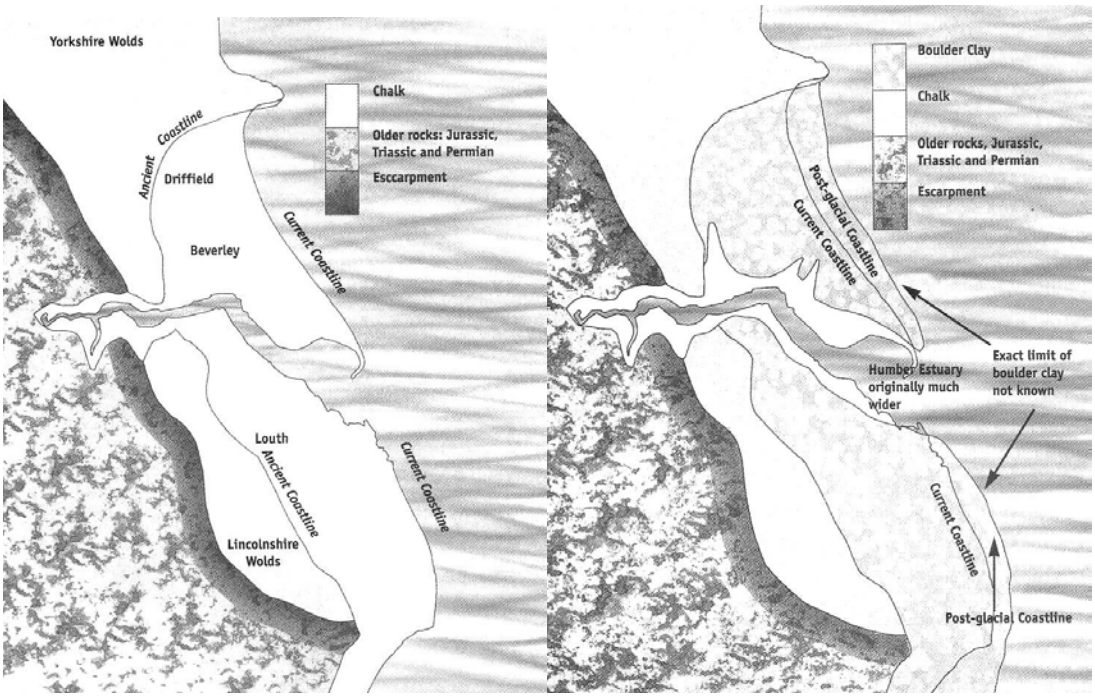
8.18 Coastal geomorphology is the study and classification of topographic features and landforms. In estuaries this typically comprises the following:

- immobile elements: controlling geology; and
- mobile elements: intertidal sandbanks; coastline features such as spits; and ebb / flood channels.

8.19 Understanding the geomorphology is a critical indicator in understanding the potential impacts of changes to the hydrodynamic regime of an estuary and the associated variation in sediment concentrations.

8.20 The immobile geology of the area is based on the evolution of the estuary over the last 100,000 years[46]. At this time the mouth of the Humber Estuary was located around the site of the present Humber Bridge, with the total length much reduced (see Figure 8.3). This was due to sea levels being considerably higher than in the present day. The last glaciation then led to a drop in sea levels and the formation of a large ice sheet over the area of the estuary. At the end of this glaciation approximately 10,000 years ago the ice melted and the outflow of water led to the deposition of the sediments that now form the key features of Spurn Head and the coastline around the mouth of the estuary.

Figure 8.3 - The Coastline Before the Last Ice Age (left), and After the Last Ice Age and Retreat to the Present Position (right) (from Hull University[47])



8.21 The immobile elements of the present day system consist of the chalk ridges of the Yorkshire and Lincolnshire Wolds. These form a control over the larger scale change in position that can take place in the estuary.

8.22 For the mobile elements Townend[46] defined the Humber Estuary as consisting of three morphological areas:

- the Outer Humber (Grimsby to Spurn Point);
- the Inner Humber (Trent Falls to Humber Bridge); and
- the Middle Humber (Humber Bridge to Grimsby).

8.23 In the Outer Humber, the principal geomorphological features are the three tidal channels of the Hawke Channel, Bull Channel and Haile Channel with associated sandbanks and the large spit feature of Spurn Head. This spit is comprised of material deposited from the last ice age and consists in large part of boulder clay, which can control the morphological development of this part of the Outer Humber. The channels are artificially maintained with progression upstream, with the Sunk Dredged Channel forming the principal navigation route. Dredging of this channel highlights the variability in the Outer Humber, with dredging requirements varying from 5,000,000 m^3 to zero between years[46].

8.24 In the Inner Humber, the main features are the large intertidal sand / silt banks. This is the most prolific area of mud flat in the estuary, linked to the lower energy environment and the typical location of the turbidity maximum. This leads to the deposition of finer silt / mud material. Anthropogenic alteration of the River Trent through construction of training walls has altered the morphological response of the banks in this area.

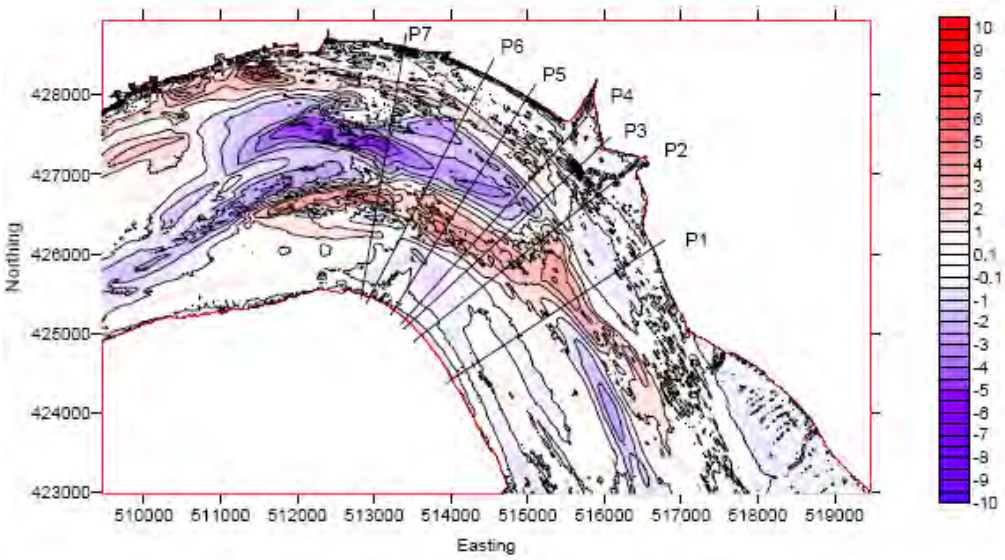
8.25 The work of Gameson[48] highlighted two geomorphological features. Firstly prior to the training walls, the channel here was seen to oscillate across the estuary in relation to the freshwater inflow from the rivers. Secondly there has been considerable variation in the position of channels and shoals around Read's Island related to a combination of freshwater inflow, tidal asymmetry (linked with channel / shoal interaction) and gravitational circulation (due to salinity gradients)[43].

8.26 In the Middle Humber, the morphology is dominated by the geological control of the chalk ridge at the Humber Bridge, leading to the position of the bend in the estuary at Hull. Within this area the main channel is adjacent to the north bank at Hull, with a secondary channel between Hull Middle and Skitter Sand to the south. To the south east is Halton Middle, a shallower and wider section of the main channel. Dredging of the south east corner of Halton Middle took place once in 1994, removing approximately 100,000 m^3 of material. Since this time there has been no need to dredge the area suggesting the area is currently self cleansing.

8.27 Detailed morphological studies of the Humber Estuary have been conducted as part of the works for the HRBT, which assessed the development in the Middle Humber. These studies[6] suggest that the estuary has been 'morphologically dynamic' in the period of record between the Hull Bend and Halton Middle, evidenced through bathymetric charts since 1936. The trend is one of infill in the subtidal zones and erosion of the intertidal banks. In more recent times, (1990s onwards) there has been a trend of net loss in volume.

8.28 Detailed analysis of the data between 2000 and 2005 is shown in Figure 8.4. This indicates that in the period, the area of main channel on the outside of the Hull Bend has been relatively stable, however the area of Skitter Sand and Hull Middle have undergone significant changes in the period with translation of the banks northwards narrowing the main channel. At Halton Flats there has been an extension south east of the Skitter Sands.

Figure 8.4 - Change in Bathymetry (m) at Hull Bend between 2000 and 2005 (after HBRT ES[6])



8.29 This baseline assessment highlights that the Humber Estuary is highly dynamic in terms of geomorphology with a high natural variability in the size and position of sub and intertidal topographic features. In contrast, many of the main channels are self-sustaining, particularly where they have not been over-deepened. The extent of the geomorphology assessment can be reduced to consider the Middle Humber only, due to the relatively limited extent of the morphological changes.

Additional Works to Inform Coastal Geomorphology Baseline

8.30 Additional work to develop the baseline during the EIA will include:

- reviewing additional studies and reports identified at the scoping stage that could not be collected at that time;
- analysis of additional time periods of survey data to assess potential for cyclic trends in geomorphology;

- collection of additional information on bedforms in the Humber Estuary;
- interpretation of the bathymetry, side scan sonar and shallow seismics obtained for the sediment analysis to assess the impact on geomorphology;
- development of a conceptual geomorphological model of the Middle Humber in accordance with FD2116[49]; and
- assessment of existing hydrodynamics from DHI modelling.

8.31 Documents identified in this scoping stage include a significant geomorphology study held by the Environment Agency. Within the timeframes of the scoping stage it has not been possible to obtain this document but this will provide a valuable addition to the knowledge base. In addition it is considered important that key stakeholders and knowledge holders are consulted to provide a consensus on the baseline conditions for geomorphology.

Potential Impacts

8.32 The components of the Humber Renewables Project that could impact on the sediment and coastal geomorphology are limited to the construction and operation of the proposed intake and outfall structures and pipes. The power station will use a once-through cooling water system with the water being obtained from the Humber Estuary. The nominal quantity of water used in this system will be 10 m^3/s with a maximum flow of 12 m^3/s. The assumed nominal pipe diameter is approximately 5 m.

8.33 It is assumed that the construction method for the cooling water pipes will be horizontal directional drilling and that the intake and the outfall for the cooling water will be positioned in the deep water channel in the estuary.

Construction

8.34 Potential short-term impacts on the sediment / morphology of the system include:

- suspended sediment plume during drilling / placement of outfall / intake pipes with associated impact on geomorphology and sensitive environmental receptors; and
- requirements for disposal of drill arisings.

Operation

8.35 Potential long-term impacts on the sediment / morphology of the system include:

- removal of sediment from the estuarine system / large volumes of sediment requiring repatriation to the estuary;
- impact on estuary morphology and navigation through alteration of sedimentation patterns;
- effect of temperature differential on sediment transport and deposition;
- changes in tidal velocities local to the site;
- scour around the inlet / outfall structure; and
- impact of 50 years of sea level rise on the estuary with respect to the sediment / geomorphology balance.

8.36 The impact on sediment and geomorphology will depend on the location of the cooling water intake and outfall. It is assumed that the intake head will be of a peppermill type and will be located near or close to the estuary bed while the outfall will be at or near the surface to ensure that the lower colder intake water can be separated from the warmer plume surface water.

8.37 Such an arrangement, however, poses some sediment impacts, namely the removal of suspended sediment from the Humber Estuary. In most power station cooling water systems fine sediment is transported around the system and then allowed back into the source. If this is the case the impact is likely to be low. If however settling basins are required to treat the cooling water and sediment is allowed to settle out there is the potential for removal of sediment from the system.

8.38 In addition the outfall location needs to be assessed for suitability with respect to environmental impact if there is a significant difference in the receiving waters' suspended sediment concentration, e.g. if the outfall is located in a relatively low suspended sediment environment and the intake in an area with a relatively high concentration

8.39 A submerged intake near the estuary bed could also lead to local alteration of the morphology and lead to scour. This scour could remove material from the local site in the form of both bedload and suspended load, and deposit it in other locations, potentially to sensitive environmental receptors. In addition the morphological consequences of local changes to flow patterns could be observed at distance from the structure. Consequently long-term scour potential and extent should be considered based on the proposed design layout to assess impact on geomorphology and sediment transport.

8.40 The potential temperature differential between the discharge and the receiving waters could alter the settling velocity of suspended sediment, with impacts on sedimentation. The effect of this is likely to be relatively confined in the immediate environment around the outfall, however this should be assessed with the results of the flow model.

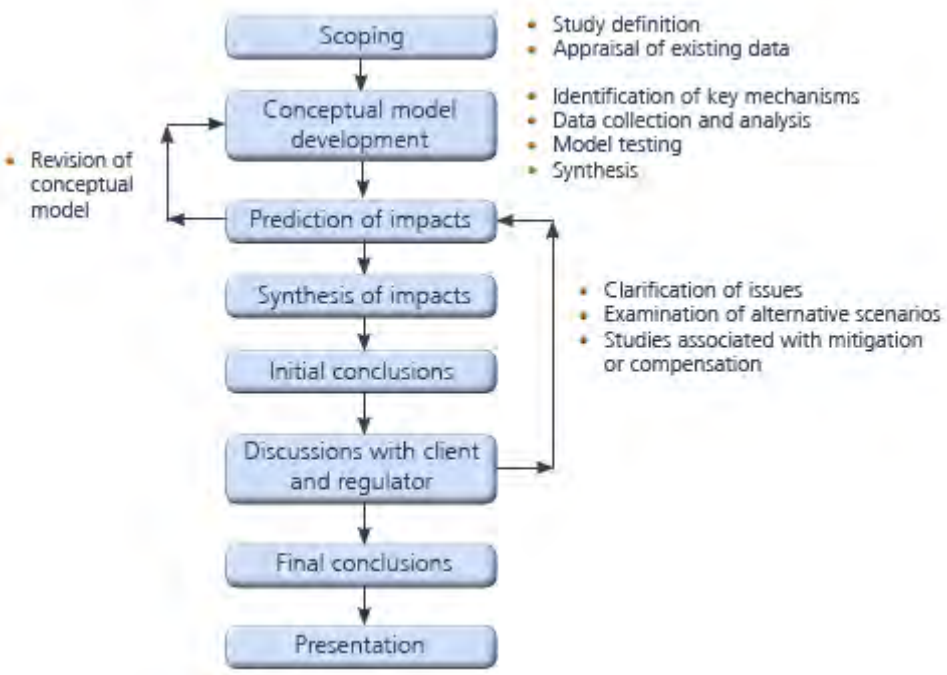
8.41 There is potential for sea level rise and climate change to alter the morphological and sediment transport baseline over the over the operational life of the proposed development. Whilst the existing baseline is the baseline for assessment of the impact, it is considered important to assess the relative impact with respect to the potential variability over time.

Assessment Methodology

8.42 For the impact assessment, it is assumed that the baseline conditions for the Humber Renewables Project will be defined as the situation after the implementation of the HRBT.

8.43 The overall approach is to assess the impact on sediment through the use of changes in hydrodynamics and on morphology through the use of Expert Geomorphological Assessment as defined in FD2116[50]. The approach for this site is shown in Figure 8.5.

Figure 8.5 - Summary of Stages in Expert Geomorphological Assessment Studies (from FD2116/TR2)



8.44 The basis for the development of the conceptual model will be the studies undertaken to date on the Humber Estuary and the outputs of the DHI hydrodynamic model. It is considered that this can be applied for both the construction and operational phases, as the bulk of the impacts on sediment and morphology are anticipated to come from the operational phase.

8.45 It is critical that the key stakeholders agree with the proposed assessment methodology, therefore as part of the scoping EIA, consensus will be obtained. The key stakeholders with respect to sediment and geomorphology identified at this stage include:

- Marine Management Organisation (including The Crown Estate);
- Humber Estuary Management Scheme;
- Humber Estuary Coastal Authorities Group;
- Environment Agency Shoreline Management Team;
- Natural England;
- English Heritage;
- East Riding of Yorkshire Council; and
- Hull City Council

8.46 The primary basis for the assessment of impacts will be the DHI hydrodynamic model currently being re-developed for the site. This model is being re-developed for the dual purposes of the water quality assessment and the sediment dynamics of the system.

8.47 The DHI hydrodynamic model can be applied to describe the hydrodynamics in the area with the implementation of the HRBT but before the introduction of the Humber Renewables Project cooling water intake and outfall. Following this, the intake and outfall will be introduced in the DHI model and the current fields will be compared and discussed with respect to possible impact on sediment transport patterns and morphology. Provided the impact from the cooling water is small and local, the conclusions with respect to large-scale estuary morphology reported in the HRBT ES[6] remain valid.

8.48 The assessment will be based on a combination of the results from the DHI hydrodynamic model and interpretation of the results of the morphodynamic impact assessment study in the ES for the HRBT. The study in the HRBT ES provides important information about the sediment transport in the project area and the estuary as a whole. Thus the HRBT ES study[6] can also be used as a basis to assess the impact on sediment transport arising from the Humber Renewables Project. The working hypothesis is that the intake / outfall arrangement flow neither changes the estuary flow conditions significantly nor the overall morphodynamics.

8.49 The DHI hydrodynamic model can supply simulated currents for the baseline conditions as defined above and with the cooling water system in operation. The differences in currents will be calculated and discussed with respect to impact. In order to estimate impact on sediment transport the bed shear stress can be calculated to extend the discussion of the impact.

8.50 Based on the HRBT ES study[6] and other information that may be available (field data in particular), typical sediment concentrations of suspended load can be estimated and be applied to evaluate sediment intrusion. Information on sediment bed composition and grain size characteristics can together with the hydrodynamic results be applied to assess the intake of sand. The occurrence of sand waves will be evaluated from the HRBT ES study and DHI interpretation of the potential sediment transport conditions. Other aspects of sediment transport such as bend scour will also be based on the HRBT ES study.

Construction

8.51 For the construction phase it is envisaged that the sediment transport module of the DHI suite of hydrodynamic models will be also be used to assess the potential fate of material disturbed as part of the construction method.

Operation

8.52 For operational considerations it is considered that there is no need for additional effort with respect to the sediment transport module. For the assessment of scour at the structure, simple empirical estimates of scour around similar shaped structures will be utilised, based on the alteration in flow field observed from the model results.

8.53 The long-term geomorphology for the life of the Project will be considered. The proposed approach is to utilise the conceptual model developed as part of the EIA baseline and assess a range of scenarios, including climate change. This approach can be validated against the one dimensional (1D) morphological model utilised in the HRBT ES study. It is considered unnecessary to utilise either a full morphological model or a 1D model, owing to the large uncertainty that remains in both instances. This uncertainty can be dealt with qualitatively in an Expert Geomorphological Assessment approach with a conceptual model.

Potential Mitigation Measures

8.54 At this stage in the Project it is not considered possible to specify the mitigation measures that would be required. The need for mitigation will be addressed in the EIA, based on the outcome of the detailed assessments.

9. Flood Risk

Overview

9.1 This Chapter presents the proposed approach to the Flood Risk Assessment for the Humber Renewables Project. It includes a discussion of baseline conditions and sensitivity, preliminary identification of potential impacts, proposed impact assessment methodology for assessment of the construction and operational phases of the Project, and potential mitigation measures.

9.2 The assessment will be carried out in accordance with PPS 25: Development and Flood Risk[50]. As part of the planning process, PPS 25 requires that all proposed development at risk of flooding (from any source) must be accompanied by a Flood Risk Assessment if it is in excess of 1 hectare (ha) in area or lies within Flood Zone 2 or 3. The proposed development site is approximately 17 ha in area and, therefore, a Flood Risk Assessment is required.

9.3 The broad aim of PPS 25 is to reduce the number of people and properties within the natural and built environment at risk of flooding. To achieve this aim, planning authorities are required to ensure that flood risk is properly assessed during the initial planning stages of any development. Responsibility for this assessment lies with developers and they must demonstrate the following:

- whether the proposed development is likely to be affected by flooding;
- whether the proposed development will increase flood risk to adjacent properties; and
- that the measures proposed to deal with any flood risk are sustainable.

The developer must prove to the planning authority and the Environment Agency that the existing flood risk or the flood risk associated with the proposed development can be satisfactorily managed.

Baseline Description and Sensitivity

Sources of Flood Risk

9.4 The Humber Estuary forms the southern boundary of the development site; this is adjacent to recently reclaimed land in the south of the site[6]. The tidal stretch of Old Fleet Drain (also referred to as Wyton Drain and Sproatley Drain) is located along the eastern boundary of the site. Old Fleet Drain issues into the Humber Estuary. Sluice gates at Lord's Clough prevent the tide moving upstream and are therefore defined as the upstream point of influence[6]. Other surface watercourses within the vicinity of the site include Holderness Drain (also referred to as Foredyke Stream) which enters the Humber Estuary west of King George Dock and Burstwick Drain which enters the Humber Estuary approximately 1 km east of the proposed development site. Neither of these watercourses enters the proposed development site and they, therefore, do not present a flood risk to the site.

9.5 Several additional surface water features, such as ponds, are located on land adjacent to the proposed development site near Lord's Clough. This includes two rainwater-fed, semi-ephemeral ponds. However, these water features do not represent a flood risk to the site. Adjacent to Old Fleet Drain to the north of the development site, is a disused drainage feature. This drainage feature has no visible connection to Old Fleet Drain and has become choked with common reed[6]. It therefore does not present a flood risk to the site.

9.6 There is no formal drainage system in place draining the area within the proposed development site. It is assumed that surface water run-off in the northern portion of the site on the 'dry side' of the flood defence embankment drains into the Humber Estuary through perched groundwater or sub-surface flow. The southern portion of the site is reclaimed land and the made ground is

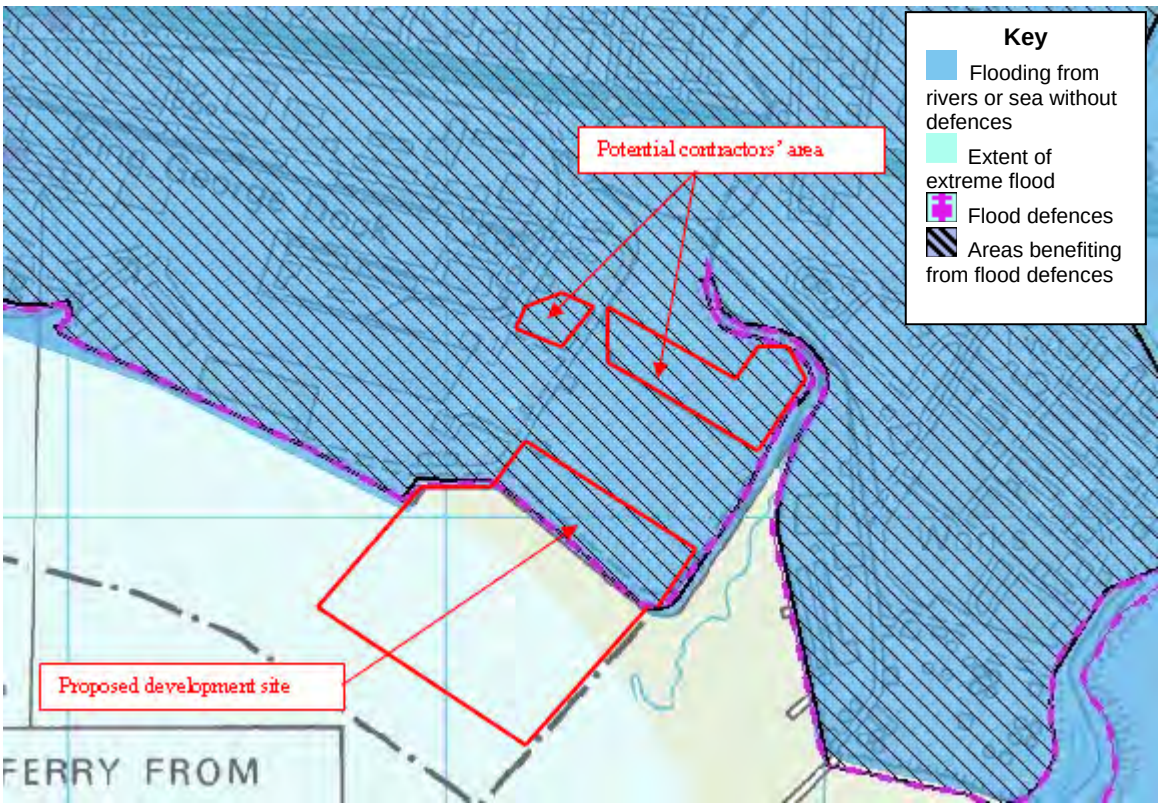
relatively porous allowing surface water to drain directly to the Humber Estuary via perched groundwater or sub-surface flow.

9.7 The proposed development site comprises Made Ground with the site being reclaimed at various stages over the last 60 years. The Made Ground is approximately 3 m in depth and overlays in turn alluvial clay/silts, glacial till and the Upper Chalk Formation. Due to the presence of clay at the site it is anticipated that there is little interaction between the Chalk aquifer and surface water but perched groundwater may be present above the clay layer. The site is, therefore, potentially at risk of groundwater flooding.

Environment Agency Flood Map

9.8 The Environment Agency Flood Map is provided in Figure 9.1 and shows that the northern portion of the site is currently within the 0.5% annual exceedance probability (aep) tidal event and an area benefiting from flood defences. The site is, therefore, considered to be at high risk of flooding. However, the southern portion of the site on the Flood Map is assumed to be 'wet', i.e. part of the Humber Estuary.

Figure 9.1 - Flood Map (derived from Environment Agency Website 2010)



9.9 The Environment Agency Flood Map is based on still water tide levels and does not take into account surge or waves (except the component of these that is inherently embedded in the tidal gauge data around the Humber Estuary). Also the Environment Agency Flood Map does not distinguish between the tidal and fluvial flood risk of Old Fleet Drain but as the proposed development site is downstream of Lord's Clough it is assumed that the flood risk from Old Fleet Drain is entirely tidal.

Flood Defences

9.10 The Hull Flood Alleviation Scheme was completed in 2000 and consists of a floodwall which extends along the Humber Estuary from the Tidal Dock to the east end of King George Dock. The defence height is 6.5 m above Ordnance Datum (AOD) and was designed using the 1 in 200 extreme tidal levels and an account for sea level rise over the next 50 years. An earth embankment with a minimum crest level of 6.3 m AOD extends from the Dock Loop Road to Lord Clough Sluice.

9.11 The southern (most recently reclaimed) portion of the site is bounded by a chalk armoured sloping revetment which continues along the eastern boundary of the site which forms the right bank of Old Fleet Drain. Survey data of the existing crest level indicates the chalk revetment is approximately 5 to 5.5 m AOD along the southern face and 5.4 m AOD along Old Fleet Drain[6].

Previous Flood Risk Assessments

9.12 A previous Flood Risk Assessment report has been undertaken for the proposed HRBT development[51]. Within this report the 0.5% aep tidal still water was estimated to be 5.24 m AOD at the site based on Alexandra Dock. The Flood Risk Assessment considers climate change impacts, wave heights and overtopping of the defences. The potential flood mitigation measures considered for the HRBT development include a new flood defence structure along the southern boundary of the site which will provide protection for a 0.5% aep tidal event.

Potential Impacts

9.13 A preliminary assessment of potential flood risk impacts relating to the Humber Renewables Project has been undertaken, taking into account PPS 25. Potential impacts are divided into impacts arising during the construction phase and impacts during the operational phase. These will be investigated further during the EIA. Potential flood risk to the site during construction and operation has been considered along with the potential impact of the development of the site on flood risk within the vicinity.

Construction

9.14 As the southern portion of the proposed development site is considered to be within an undefended area of the Humber Estuary there is a risk of flooding of the site during the construction phase. In addition, the chalk revetment along Old Fleet Drain protecting the northern portion of the site is not considered by the Environment Agency to offer the required standard of protection of a 200 year return period tidal event (0.5% aep). There is, therefore, a risk to the entire development site from extreme tidal events during the construction phase of the development.

9.15 It is unlikely that any significant increases in sea level will occur as a result of climate change during the construction phase due to the relatively short timescale. It is, therefore, considered that no significant change in flood risk at the site is anticipated to occur during construction. Land raising is proposed as part of the HRBT development, which may result in displacement of flood water and changes to surface water run-off pathways increasing flood risk to the surrounding area.

9.16 During construction, the operation of machinery may result in compaction of the soil which will reduce the infiltration capacity. This may result in an increase in surface water run-off and could lead to localised flooding. Any surface water flooding is likely to have an adverse impact on the construction of the development site and so surface water run-off will need to be managed such that it will not increase the risk of flooding at the proposed development site or land within the surrounding area.

Operation

9.17 Associated British Ports as part of the HRBT development propose to construct a new flood defence along the southern boundary of the development site and upgrade defences along the eastern boundary to meet the indicative standard of protection of 0.5% aep plus a climate change allowance. The proposed Humber Renewables Project will therefore be protected for tidal flood events up to the 0.5% aep event. Whilst this level of flood protection would be considered high the site will be at risk from more extreme events and from wind generated wave action in combination with storm surge and high tide levels.

9.18 PPS 25 sets out the recommended contingency allowances for sea level rise as a result of climate change. The potential increase in sea level rise to 2061, assuming construction starts at the end of 2011, is 383 mm. This potential increase in sea level rise is likely to increase the risk of flooding to the site. However, the proposed upgrades and new flood defences will be constructed to provide a standard of protection for a 0.5% aep tidal event with an allowance for sea level rise.

9.19 Land raising is proposed as part of the HRBT development, which may result in displacement of flood water and changes to surface water run-off pathways increasing flood risk to the surrounding area. The proposed land raising will improve the existing level of protection of flooding for the development site. A surface water drainage system will ensure that any alterations to surface water run-off pathways and displacement of flood water will be managed to ensure there is no increase in flood risk in the surrounding area.

9.20 The proposed development will increase the impermeable area of the site and will result in an increase in surface water run-off. Any surface water flooding is likely to have an adverse impact on the operation of the site and so surface water run-off will be managed such that it will not increase the risk of flooding at the proposed development site or on land within the surrounding area. It is anticipated that surface water run-off from the development site will be discharged to the Humber Estuary (having first been treated and re-used for flushing activities at the power station) rather then via infiltration as at present. Considering the volume of water present within the Humber Estuary the change in volume arising from the proposed development will not cause a significant change in volume or water level in the estuary.

Assessment Methodology

9.21 The Environment Agency has been contacted during this scoping study. Further discussion with the Environment Agency will continue for the EIA along with consultation with Hull City Council East Riding of Yorkshire Council, Preston Internal Drainage Board and Associated British Ports.

9.22 This section provides a preliminary outline of the methodology for the EIA, with regards to flood risk. The assessment will be based on quantitative thresholds and the methodology will be finalised during the EIA. The outcome of the Flood Risk Assessment will need to be viewed in parallel with the assessment carried out for other aspects of the EIA, in particular water quality (see Chapter 7), sediments (see Chapter 8) and ecology (see Chapter 11). Any inter-linkages between these disciplines (e.g. mobilisation of contaminants through increased surface water run-off) will need to be investigated to consider potential wider-scale environmental impacts as a result of the development.

Construction

9.23 The baseline information including data, literature, site specific construction activities and their spatial distribution will be reviewed relative to previous studies of this type and using professional knowledge and opinion.

9.24 Data received through consultation, e.g. flooding history, extreme tidal and fluvial levels, flood defence heights, will be used to derive a baseline description for the site. Data on tidal flood

levels in the Humber Estuary and fluvial flood levels in Old Fleet Drain are available within the Environment Agency's National Flood and Coastal Defence Database along with flood defence heights. These flood levels will be compared with the detailed topographic survey of the site to determine the level of flood risk at the site.

9.25 Information on the timeline of the proposed upgrade to the current flood defences proposed as part of the HRBT development will be obtained from Associated British Ports and utilised to assess the risk of flooding during the construction phase of the proposed power station development. Information on the timeline of the specific construction activities will be utilised to understand the impact of the land raising proposed as part of the HRBT development, potential compaction of soils and hardstanding areas on the increase in surface water run-off so that it can be appropriately managed during the construction phase.

Operation

9.26 The extent, depth and flood flow pathways will be indicated on a scale map of the site for appropriate return periods. The likely rate or speed with which inundation might occur, the order in which various parts of the development site might flood and the likely duration of flood events will be assessed. An assessment of the future changes in baseline flood risk will be undertaken including potential sea level rise as a result of climate change, rise in groundwater levels and increases in surface water run-off. Existing and post development run-off rates from the proposed development site will be determined to assess the likely impact of the development on water levels within watercourses in the vicinity and to determine any onsite storage required to limit the run-off from the new development to the rates that currently exist for the site.

9.27 Consultation with Associated British Ports and the Environment Agency will be undertaken to determine the most appropriate level and construction type for a flood defence to protect the southern portion of the proposed development site so that it benefits the wider Associated British Ports' site. Information from the Flood Risk Assessment for the HRBT on extreme still tidal levels and wave action will be utilised to undertake assessment of any proposed flood defences.

9.28 Design floor levels for the development site will be derived taking into consideration the land raising proposed as part of the HRBT development and the potential overtopping of the proposed new flood defences. Cross sections of the site showing finished floor levels, access routes or other relevant levels relative to the source of flooding will be provided. Routes of safe access and egress during an extreme flood event will be provided along with depth of flood water which may be encountered along these routes.

Potential Mitigation Measures

9.29 The current level of protection offered by the flood defences is not considered by the Environment Agency to be at the required standard. Thus, in order to ensure the site is protected to at least a 0.5% aep tidal event with inclusion for climate change, upgrades and / or additional new flood defences are required to mitigate against flooding. It is important that a holistic approach is adopted and any potential mitigation measures will need to be discussed with Associated British Ports and the Environment Agency to ensure that adequate protection is offered for the HRBT development and the Humber Renewables Project.

10. Waste

Overview

10.1 This chapter presents the proposed approach to the assessment of waste for the construction and operational phases of the Humber Renewables Project. It includes a discussion of baseline conditions, preliminary identification of potential impacts, the proposed impact assessment methodology and the potential for the requirement of mitigation measures.

10.2 The chapter focuses on the generation of wastes, waste handling and storage and disposal options. It does not include the transport of waste, as this is discussed in Chapter 13.

10.3 Cumulative / in-combination impacts due to other planned developments are not discussed herein; however, these will be identified and considered in the EIA.

Baseline Description and Sensitivity

10.4 As the proposed development site is currently undeveloped, no wastes are currently generated.

Potential Impacts

10.5 The general philosophy for the Project will aim to ensure that waste generation from construction activities and during operation will be prevented or minimised at source. For wastes that can not be avoided, the preferred options will be re-use, recycling or recovery and finally disposal. Any waste disposal and waste recovery activities will be undertaken in accordance with relevant legislation.

Construction

10.6 The construction of the Humber Renewables Project is not expected to result in the generation of any atypical construction wastes. Construction wastes are expected to be primarily generated as a result of general site preparation works (e.g. site clearance, grading, levelling), civil works (e.g. foundations, installation of infrastructure and fabrication of buildings and structures), commissioning / testing and final landscaping. Thus, the main construction wastes are likely to consist of soil arisings and waste construction materials (e.g. metal, wood and concrete). There could also be small quantities of waste chemicals / substances (e.g. paints, solvents, fuels, oils and lubricants) and hydrotest water generated. Surface water run-off and site drainage will generate an aqueous discharge. In addition, construction worker facilities are anticipated to generate domestic and office type wastes.

10.7 The potential impacts associated with the generation of construction waste could arise as a result of generation of contaminated soils (if the land is contaminated), improper storage and handling of wastes and the ultimate disposal option. The potential for the soil beneath the site to be contaminated is discussed in Chapter 6. Inappropriate waste handling and storage can result in the generation of airborne dust, leaks and accidental spills. Dust generation can potentially cause disturbance / nuisance effects to residential properties / neighbouring facilities, smothering of vegetation and, if contaminated, impacts on soils and surface waters. Leaks and spills and improper handling and disposal of aqueous waste streams, if contaminated, could result in the contamination of soils, soil-gas, groundwater and surface waters and can lead to effects to human and ecological receptors.

10.8 A construction Waste Management Plan (WMP) will be prepared prior to commencement of construction works. The WMP will address the working methodologies and practices which will be adhered to during the construction works and control of pollution (including prevention of contaminants entering soils and waters). The WMP will be based upon good practice in terms of material / waste storage, handling and disposal. Adherence to such working practices will limit the potential for adverse impacts associated with waste generation and disposal.

Operation

10.9 The operation of the power station will generate gaseous, liquid and solid waste streams. Gaseous emissions (e.g. combustion gas emissions) are discussed in Chapter 5 and are not included further herein.

10.10 The main liquid waste streams will be the once-through cooling water, process water effluent from the boiler water system and water from flushing activities. Surface and roof water run-off will be treated and re-used for flushing activities. Following treatment (as necessary), these aqueous emissions will be combined and discharged to the Humber Estuary; this is discussed in Chapter 7 and is not included further herein. Waste water from domestic and sanitary use will be discharged via the local sewerage network.

10.11 The main solid wastes will be ash from the combustion process, marine debris from the cooling water abstraction system and ammonium sulphate from the boiler water system. Current estimates suggest that between 65,000 t and 90,000 t of fly ash and between 8,600 t and 10,000 t of bottom ash could be generated each year by the power station. Fly ash will be held in an enclosed storage system which will be fitted with a bag filter to minimise dust emissions. DONG Energy is investigating the potential for using the fly ash and bottom ash in the fertiliser or in the building industries as a quality product. The least favoured disposal option is landfill. It is anticipated that fly ash and bottom ash will be removed from the site by road; however DONG Energy will investigate further the option for removing the ash by ship or rail. Any marine debris will also be disposed of to landfill. Ammonium sulphate can be sold as fertiliser.

10.12 Any other process wastes produced will be limited to those associated with the maintenance of process equipment (such as oily rags, waste lubricating oils) and those arising from the operation and maintenance of supporting activities, such as water / stack gas treatment systems. Office and staff facilities will generate domestic and office type wastes.

10.13 As discussed above for construction activities, the potential impacts associated with the generation of waste could arise as a result of improper storage and handling of wastes and the ultimate disposal option, leading to the generation of airborne dust, leaks and accidental spills. Dust can result in disturbance / nuisance effects to residential properties / neighbouring facilities, smothering of vegetation and impacts on soils and surface waters. Leaks and spills can result in the contamination of soils, soil-gas, groundwater and surface waters and can lead to effects to human and ecological receptors.

10.14 Wastes will be segregated, stored, handled, labelled, packaged and disposed of in accordance with good practice and the relevant legislation. The design of the power station will ensure that the potential for accidental releases (e.g. leaks and spills) is minimised.

10.15 On-site operations, including the generation, handling, storage and transportation of wastes will comply with the requirements of BAT and will be conducted following the strict control measures that will be in place as a result of the Environmental Permit issued by the Environment Agency and the power station's Environmental Management System.

10.16 The design of the power station and adherence to the permit requirements, the Environmental Management System and compliance with BAT will limit the potential for adverse impacts associated with waste generation and disposal.

Assessment Methodology

Construction

10.17 In the ES, waste will be initially addressed within a sub-section of the development description chapter. This section of the ES will, so far as possible, provide confirmation and further detail in relation to the types and quantities of wastes that are expected to be generated along with a description of:

- waste minimisation techniques;
- waste handling techniques;
- storage of wastes;
- opportunities for re-use, recycling and recovery;
- disposal options, along with anticipated transport requirements (where necessary); and
- waste management.

10.18 The waste section of the development description chapter of the ES will also take into consideration the relevant guidance documents, guidelines, legislative requirements and regulations applicable to waste. Planning policy documents relevant to waste will be discussed in the chapter of the ES addressing plans and policies.

10.19 The potential impacts associated with waste will be addressed within the relevant assessment chapters (e.g. impacts associated with dust will be addressed in the air quality assessment, impacts on ecological receptors will be addressed in the ecological assessment and impacts on soils / groundwater will be addressed in the assessment of land quality).

10.20 Thus, the outputs from the waste section of the project description chapter of the ES will be used to inform the assessment sections of the chapters relation to air, land and water quality, ecology and transport (as applicable).

Operation

10.21 The approach to the assessment of operational waste in the ES will be the same as that outlined above for construction waste.

Potential Mitigation Measures

10.22 At this early stage in the Project the scope of, and requirement for, mitigation measures in relation to waste cannot be identified. However, assuming that the construction and operation of the Project are undertaken as described above, specific mitigation measures are not envisaged to be required. This will be addressed further, if applicable, in the EIA.

11. Ecology

Overview

11.1 This chapter describes the existing ecological features and resources within the vicinity of the proposed development site and potential contractors' areas as they are understood at present. It presents the proposed approach to the ecological assessment, a preliminary identification of potential key ecological impacts associated with construction and operation of the development, and describes the potential requirement for mitigation measures to minimise adverse ecological impacts.

11.2 Potential cumulative impacts due to planned developments are not discussed within the scoping report; however, these will be identified and considered within the EIA. Cumulative impacts on ecological receptors for the EIA will make particular reference to the proposed HRBT.

11.3 The key sensitive ecological features in the vicinity of the proposed development site are the statutory designated sites of the Humber Estuary including the Humber Estuary SPA, Humber Estuary SAC and the Humber Estuary Ramsar site which support a range of habitats and species and which are particularly notable for the presence of internationally important populations of birds.

Baseline Description and Sensitivity

Baseline Information Sources

11.4 Gathering of ecological information has been undertaken to inform the scoping report. Information sources are shown in Table 11.1. Some of the information is currently awaited and will be reviewed as part of the EIA.

Table 11.1 - Information Sources Used to Inform the Scope of Assessment

Information / Data	Source
Statutory sites of nature conservation importance within 10 km of the proposed development site[viii]	Multi-Agency Geographic Information for the Countryside (MAGIC) website[52]
Information on the Humber Estuary SSSI, SAC, SPA and Ramsar site	Joint Nature Conservation Committee website[53] Natural England website[54] The Humber Estuary: A comprehensive review of its nature conservation interest[55] Ramsar sites information service[56]
Non-statutory site locations and notable species records within 2 km of the proposed development site	North and East Yorkshire Ecological Data Centre National Biodiversity Network Gateway[57]

[viii] 10 km was chosen following guidance in H1 Environmental Risk Assessment for permits – Draft for Consultation, September 2009, Environment Agency. Technical Annex (f) Air Emissions of this document gives advice on assessing emissions to air when applying for a bespoke permit under the Environmental Permitting Regulations including screening for nature conservation sites giving specified distance criteria of 10 km from the installation for Internationally important sites for nature conservation (Special Protection Areas, Special Areas of Conservation and Wetlands of International Importance (Ramsar sites)). However, as a precaution the search area of 10 km was used for all statutory designated nature conservation sites.

Information / Data	Source
Water bodies within 500 m of the proposed development site (which could support breeding populations of great crested newt, a European Protected Species)	Ordnance Survey base maps Extended Phase 1 habitat walk-over survey undertaken by Atkins in September and October 2009 following the 'Extended Phase 1' methodology[58]
Data based on bi-monthly bird counts of the Salt End mudflats since December 2005 (taken from Salt End Jetties by the Institute for Estuarine and Coastal Studies	HRBT ES[6]
Wetland Bird Survey (WeBS) data for high tide core count sector 38440 and low tide count sector CH088 (WeBS Sector NF: Hull to Paull)	The British Trust for Ornithology
Information on habitats and species within, and adjacent to, the proposed development site	Extended Phase 1 habitat walk-over survey undertaken by Atkins in September and October 2009, to be updated during visits in 2010 HRBT ES[6] Flash Earth aerial photography and satellite imagery[59]
Fisheries and marine invertebrate data for the Humber Estuary within and adjacent to the proposed development site.	Environment Agency Marine and Fisheries Agency Institute for Estuarine and Coastal Studies Centre for Environment, Fisheries and Aquaculture Science Marine Life Information Network for Britain and Ireland[60]

11.5 To aid the scope of the assessment initial discussions have been undertaken with the following organisations:

- Natural England, York Office;
- Environment Agency, York Office;
- Royal Society for the Protection of Birds, York Office;
- Hull City Council;
- East Riding of Yorkshire Council; and
- Institute for Coastal and estuarine Studies.

Designated Sites and Associated Species

11.6 The Humber Estuary is the fourth largest estuary in the UK, covering approximately 24,470 ha. Habitats associated with the estuary include intertidal and subtidal muds and sands, and salt marsh and fringing reed beds which support a large number of rare or threatened mammals, fish, invertebrates and plants.

11.7 The proposed development site lies directly adjacent to five statutory sites of nature conservation importance: Humber Estuary SSSI, Humber Estuary SAC, Humber Estuary SPA, Humber Estuary

Ramsar site, and Humber Estuary European Marine Site (EMS). The Humber Estuary EMS encompasses the marine areas of the SAC, SPA and Ramsar site and incorporates all aspects of the qualifying features for the SAC, SPA and Ramsar site. The boundaries of these designated sites in the vicinity of the proposed development site are shown in Figure 11.1, and the reasons for designation are given in Table 11.2.

Figure 11.1 - Boundaries of Designated Sites in Vicinity of Development Site

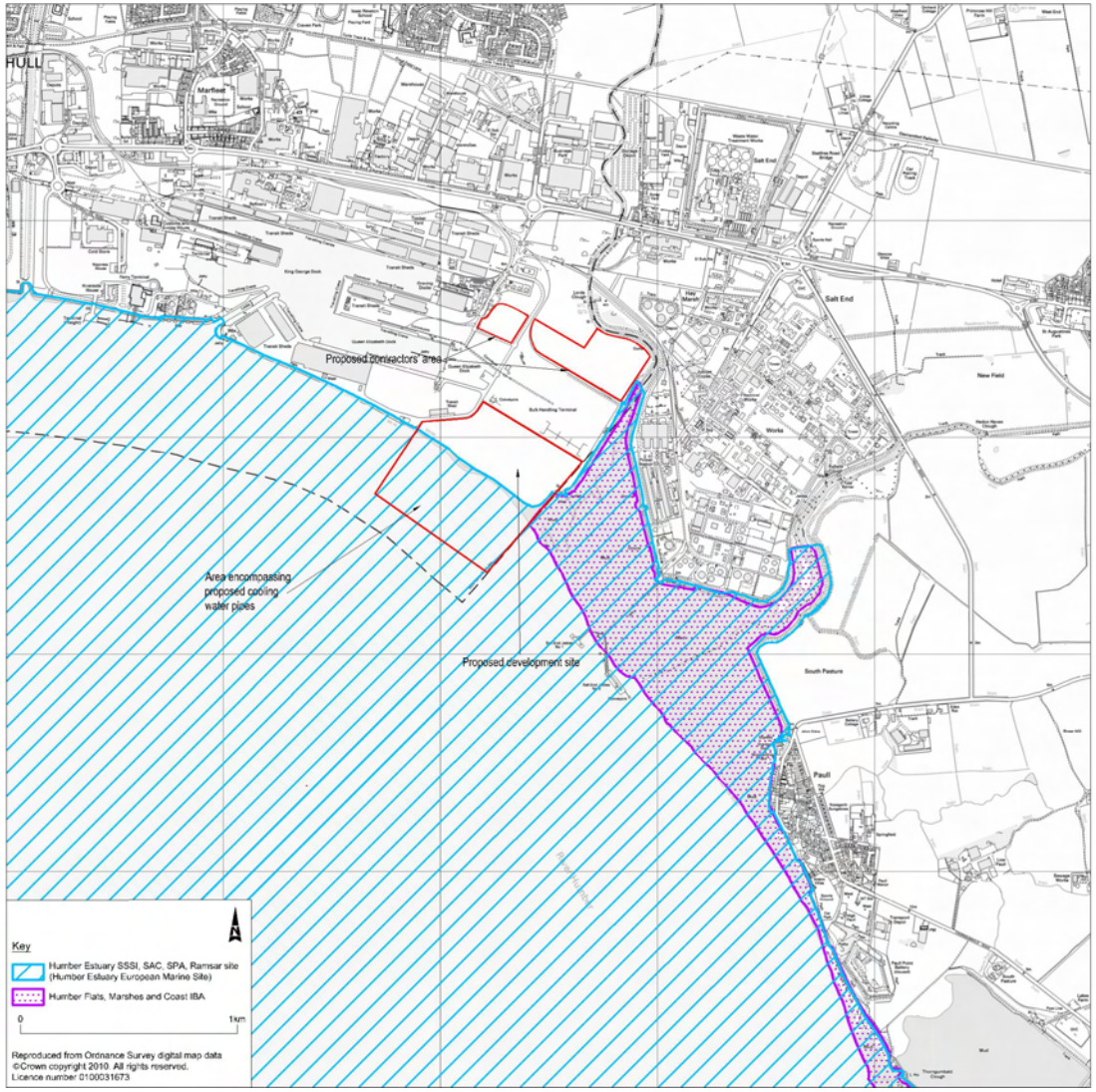


Table 11.2 - Statutory Designated Sites Immediately Adjacent to Proposed Development Site and Reasons for Designation

Site Name	Reasons for Designation
Humber Estuary SSSI	Designated under the Wildlife and Countryside Act 1981 (as amended) for estuarine and coastal habitats and geological features, the SSSI is recognised as supporting important populations of wintering, passage and breeding birds, grey seal, river lamprey, sea lamprey and an assemblage of vascular plants and invertebrates.
Humber Estuary SAC	Designated under the Habitats Directive[ix]. Annex 1 Habitats that are a primary reason for selection of the SAC are: estuaries; and, mudflats and sandflats not covered by seawater at low tide, both of which are adjacent to the proposed development. Annex 1 Habitats present as a qualifying feature, but not a primary reason for selection of the SAC include: • sandbanks which are slightly covered by seawater all the time; • coastal lagoons; • *Salicornia* and other annuals colonising mud and sand; • Atlantic sea meadows (*Glauco-Puccinallietalia maritimae*); • embryonic shifting dunes; • shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes'); • fixed dunes with herbaceous vegetation ('grey dunes'); and • dunes with *Hippophae rhamnoides*. Annex II species that are present as a qualifying feature, but not a primary reason for site selection, includes sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and grey seal (*Halichoerus grypus*).
Humber Estuary SPA	The Humber Estuary SPA covers virtually the same area as the Humber Estuary SAC. Designated under the Birds Directive[x] due to its importance in protecting and conserving certain European wild bird populations and their habitats, as well as protecting migratory birds and those considered rare or vulnerable. The SPA qualifies under Article 4.1 of the Birds Directive by supporting populations of European importance of the following Annex 1 species: **During the breeding season** • Little tern (*Sterna albifrons*), 51 pairs, 2.1% of the Great Britain (GB) population (based on 5 year peak mean between 1998 - 2002); • Bittern (*Botaurus stellaris*), 2 males, 10.5% of the GB population (2000 - 2002); • Avocet (*Recurvirostra avosetta*), 64 pairs, 8.6% of the GB population (1998 - 2002); and • Marsh harrier (*Circus aeruginosus*), 10 females, 6.3% of the GB population (1998 - 2002).

[ix] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Special Areas of Conservation are strictly protected sites designated under the European Commission Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).

[x] Council Directive 79/409/EEC on the conservation of wild birds (the Birds Directive). The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. Annex 1 of the Directive lists vulnerable species for which SPA can be designated.

Site Name	Reasons for Designation
	On passage • Ruff (*Philomachus pugnax*), 128 individuals, 1.4% of the GB population (1996 - 2000). **Over winter** • Bittern (*Botaurus stellaris*), 4 individuals, 4% of the GB population (1998/9 - 2002/3); • Hen harrier (*Circus cyaneus*), 8 individuals, 1.1% of the GB population (1997/8 - 2001/2); • Bar-tailed godwit (*Limosa lapponica*), 2,752 individuals, 4.4% of the GB population (1996/7 - 2001/2); • Golden plover (*Pluvialis apricaria*), 30,709 individuals, 12.3% of the GB population (1996/7 - 2001/2); and • Avocet (*Recurvirostra avosetta*), 59 individuals, 1.7% of the GB population (1996/7 - 2001/2). The SPA also qualifies under Article 4.2 of the Birds Directive by regularly supporting passage and wintering populations of European importance of the following migratory species: **Over winter** • Dunlin (*Caladris alpina alpina*), 22,222 individuals,1.7% of the bio-geographic population (1996/7 - 2001/2); • Red knot (*Caladris canutus*), 28,165 individuals, 6.3% of the bio-geographic population (1996/7 - 2001/2); • Black-tailed godwit (*Limosa limosa islandica*), 1,113 individuals, 3.2% of the bio-geographic population (1996/7 - 2001/2); • Shelduck (*Tadorna tadorna*), 4,462 individuals, 1.5% of the bio-geographic population (1996/7 - 2001/2); and • Redshank (*Tringa totanus*), 4,632 individuals, 3.6% of the bio-geographic population (1996/7 - 2001/2). **On passage** • Dunlin (*Caladris alpina alpina*), 20,269 individuals, 1.5% of the bio-geographic population (1997/8 - 2001/2); • Red knot (*Caladris canutus*), 18,500 individuals, 4.1% of the bio-geographic population (1996/7 - 2001/2); • Black-tailed godwit (*Limosa limosa islandica*), 915 individuals, 2.6% of the bio-geographic population (1996/7 - 2001/2); and • Redshank (*Tringa totanus*), 7,462 individuals, 5.7% of the bio-geographic population (1998/9 - 2002/3). The site further qualifies by supporting a wintering waterfowl assemblage of European importance consisting of over 20,000 individual birds. Although the assemblage refers to all species of water bird, 26 species are listed as important components of the assemblage[xi]. These include 10 of the species listed above, along with a further 16 additional species, examples of which include oystercatcher, lapwing, grey plover, sanderling, turnstone, teal, wigeon and mallard.

[xi] Important component species of the assemblage are identified as those which regularly occur in populations of 1% or more of their national (GB) populations or for some species in populations of 2,000 or more individuals.

Site Name	Reasons for Designation
Humber Estuary Ramsar site	The Ramsar site[xii] qualifies under Ramsar criteria 1, 3, 5, 6 and 8; a summary is given below: Ramsar criterion 1: The site is a representative example of a near-natural estuary with various component habitats (similar to those listed within the SAC citation); Ramsar criterion 3: The site supports a breeding colony of grey seals at Donna Nook and the dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north easterly breeding site in GB of the natterjack toad (*Bufo calamita*); Ramsar criterion 5: Support of an assemblage of waterfowl population of international importance (153,934 waterfowl, non-breeding season, five year peak mean 1996/97 - 2000/01); Ramsar criterion 6: bird species / populations occurring at levels of international importance including common shelduck, golden plover, red knot, dunlin, black-tailed godwit, bar-tailed godwit and common redshank; and Ramsar criterion 8: The Humber Estuary acts as an important migration route for both river lamprey and sea lamprey between coastal waters and their spawning areas.

11.8 Also adjacent to the proposed development site is the Humber Flats, Marshes and Coast Important Bird Area (IBA), a non-statutory designation identified and monitored by Birdlife International, a global partnership of conservation organisations. Birdlife International has developed criteria for the selection of IBAs in Europe based on a site's international importance for threatened and congregatory bird species, assemblages of restricted-range bird species and for assemblages of biome-restricted bird species[61]. The Humber Flats, Marshes and Coast IBA is designated because of its international importance for supporting a significant number of threatened bird species, its exceptional numbers of migratory species and because the site supports many bird species with restricted ranges.

11.9 The flood protection bund which borders the northern bank of Old Fleet Drain, the sea wall along the Humber Estuary adjacent to the proposed development, and land within the proposed development site has been noted to provide high tide roosting and loafing habitat for several species of water birds including those for which the Humber Estuary SPA and Ramsar site is designated. Eighty curlews were observed by Atkins in September 2009 within the proposed development site adjacent to the Humber Estuary.

11.10 The three marine / estuarine habitats of most relevance to the proposed development site, and which are within the Humber Estuary EMS, are intertidal mud predominantly at Salt End mudflats, the subtidal channel of the River Humber, and a small area of saltmarsh at the mouth of Old Fleet Drain. The intertidal mudflats at Salt End are adjacent to the south eastern part of the proposed development site. These mudflats are particularly productive, supporting a range of benthic communities, and are important for a range of feeding and loafing water birds, including those which are primary qualifying reasons for the designation of the SAC, SPA, and Ramsar site, in particular for golden plover[62].

11.11 The Salt End mudflats are also an important feeding resource for fish. There are records of over 80 species of fish within the Humber Estuary[62]. Common species found include gobies

[xii] Ramsar sites are wetlands of international importance designated under the Convention on Wetlands (the 'Ramsar Convention' 1971). Sites proposed for selection are advised by the UK statutory nature conservation agencies and coordinated through Joint Nature Conservation Committee. In selecting sites, the relevant authorities are guided by the c set out in the Ramsar Convention.

(*Pomatoschistus* spp.), dab (*Limanda limanda*), plaice (*Pleuronectes platessa*), whiting (*Merlangius merlangus*) and sole (*Solea solea*) as well as sea lamprey and river lamprey which are important components of the Humber Estuary EMS. The Humber Estuary is primarily a nursery ground for fish and is not commercially fished[62].

11.12 The only other statutory designated sites of nature conservation importance within 10 km of the proposed development site are Kelsey Hill Gravel Pit SSSI, a geological SSSI over 9 km east and North Killinghome Haven Pits, a biological SSSI, approximately 9 km away and on the opposite bank of the Humber Estuary. The main reasons for the designation of North Killinghome Haven Pits SSSI are their importance as large saline lagoons with an exceptionally rich fauna, and their significance as roosting and feeding grounds for waterfowl.

11.13 No National Nature Reserves or Local Nature Reserves have been identified within 10 km of the proposed development site.

11.14 There are several non-statutory designated local wildlife sites within 2 km of the proposed development site, the closest being Meadow Area 4 SINC and Jubilee Copse SINC. Details of all nature conservation designations within 2 km of the proposed development site will be given and considered within the EIA.

Non-designated Habitats and Species

11.15 An initial Extended Phase 1 habitat walk-over survey was undertaken by Atkins on 22nd September and 16th October 2009 following the 'Extended Phase 1' methodology. The extended Phase 1 habitat survey provides information on the habitats in the survey area and assesses the potential for legally protected and notable fauna to occur in or adjacent to the proposed development site. The main habitats, within the proposed development site and land within 500 m, were mapped and are shown in Figure 11.2 and the target notes are in Table 11.3. This information will be updated during further site visits in 2010.

Figure 11.2 - Results of Habitat Survey

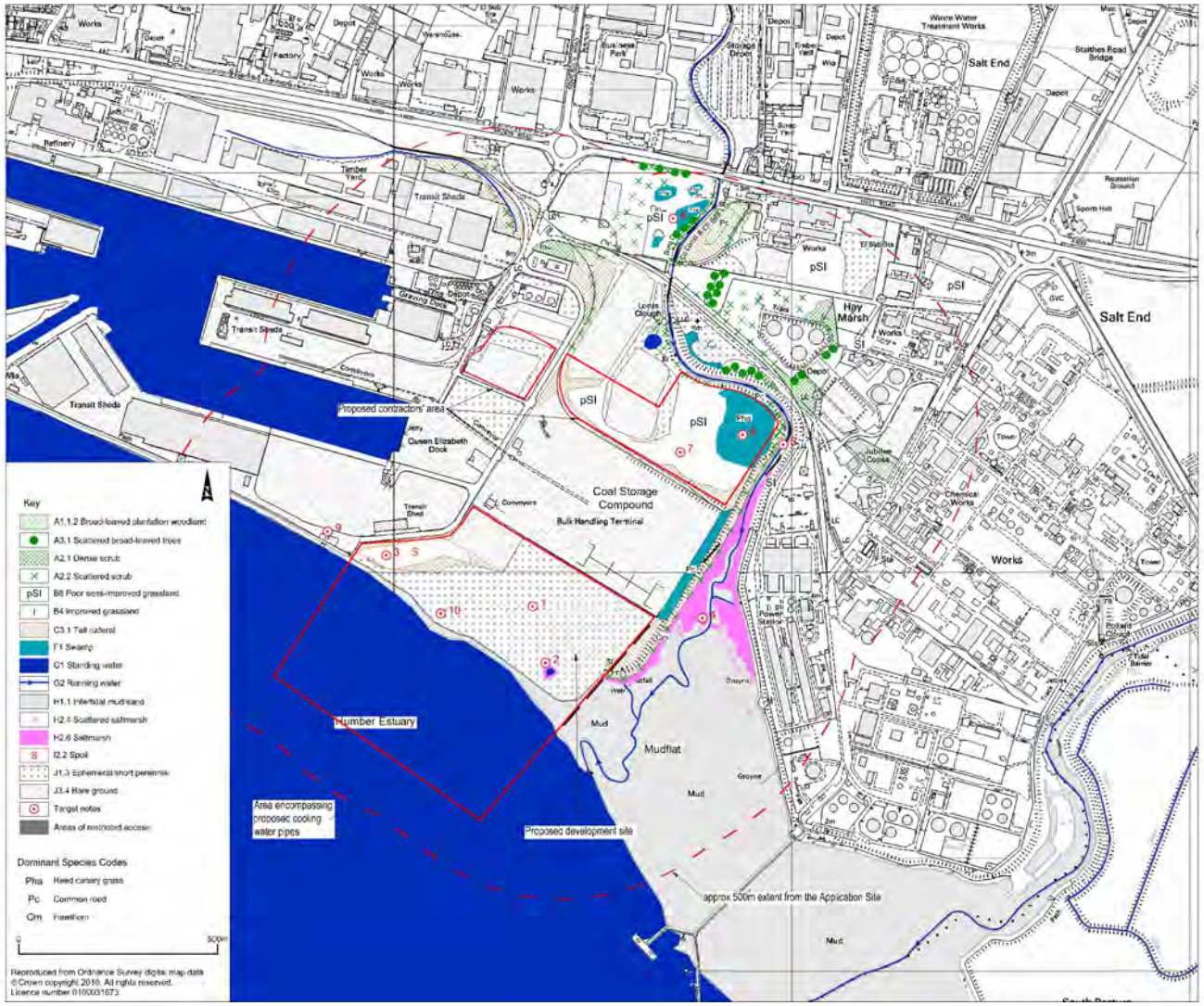


Table 11.3 - Extended Phase 1 Habitat Survey Target Notes

Target Note No.	Habitat Description
1	Land previously claimed from mudflats. Ephemeral / short perennial vegetation dominated by creeping bent grass (*Agrostis stolonifera*) and bird's-foot trefoil (*Lotus corniculatus*). White clover (*Trifolium repens*) is present in abundance while golden mellilot (*Melilotus altissima*), perforate St. John's wort (*Hypericum perforatum*), black medic (*Medicago lupulina*) and red clover (*Trifolium pratense*) are commonly present. Throughout this area bare ground is visible and the habitat is likely to be at the early stages of succession. Other plant species present include creeping thistle (*Cirsium arvense*), colt's foot (*Tussilago farfara*) and bristly ox-tongue (*Picris echioides*), teasel (*Dipsacus fullonium*) and yellow wort (*Blackstonia perfoliata*). This area contains areas of seasonal standing water although the wetter areas appear to support minimal floristic difference other than at Target Note 2. Large number of bird footprints in the mud in some wetter areas, possibly indicate use as a high tide roost This area has potential to support reptiles, particularly basking reptiles. Linnet (*Carduelis cannabina*) and skylark (*Alauda arvensis*) were noted.
2	Brackish pond with some marginal estuarine swamp and salt marsh plants including sea club rush (*Scirpus maritimus*), sea couch grass (*Agropyron junceiforme*), sea plantain (*Plantago maritima*), sea aster (*Aster tripolium*), reed canary grass (*Phalaris arundinacea*) and sea mayweed (*Tripleurospermum maritimum*).
3	Spoil heap of rubble from various dock works including bricks and hardcore. Plants present include coloniser species such as great mullein (*Verbascum thapsus*), common toadflax (*Linaria vulgaris*), weld (*Reseda luteola*), ragwort (*Sencio* sp.), vipers' bugloss (*Echium vulgare*), and bramble (*Rubus fruticosus* agg.). Other scattered species including field wood rush (*Luzula multiflora*), creeping buttercup (*Ranunculus repens*), cranesbill sp. (*Geranium* sp.) and tufted vetch (*Vicia cracca*) Tall ruderal species (weedy, opportunistic plants generally growing on disturbed areas) were also present including common nettle (*Urtica dioica*), creeping thistle and rosebay willowherb (*Chamerion angustifolium*). This area has potential to support reptiles for both basking and refuge.
4	Salt marsh habitat adjacent to extensive mudflats (Salt End mudflats). Salt marsh is limited to the edge of the mudflat and within the inundated section of Old Fleet Drain. At the base of the channel and at the edge of the mudflat (where inundation regularly occurs) common salt marsh grass (*Puccinella maritima*) dominated with frequently occurring sea aster. At the upper elevation sea couch dominated with no other plant species present.

Target Note No.	Habitat Description
5	Old Fleet Drain, a tidally influenced creek as far as the sluice gates at Lord's Clough, was inundated to above the main dual carriageway (Hull Road, A1033) at the time of the surveys. From the end of the salt marsh vegetation, at the river mouth, both banks of the river above the exposed mud were dominated by common reed (*Phragmites australis*). Tree / scrub works recently carried out on north bank with removal of poplar (*Poplus* sp.). Remaining tree growth includes grey willow (*Salix cinerea*), crack willow (*Salix fragilis*), alder (*Alnus glutinosa*) and common hawthorn (*Crataegus monogyna*). A kingfisher (*Alcedo atthis*) was observed flying down Old Fleet Drain towards the Humber Estuary. No evidence of otters or water voles was located along the watercourse. Tidal influence and brackish nature of the channel generally makes it less suitable for water voles although otters may use the channel as a route to / from the Humber Estuary.
6	Area dominated by reed canary grass; not obviously wet under foot but classed as swamp due to the single species composition of this area. It may have historically been wetter when the river was less engineered. Some scattered field wood rush.
7	Species similar to those within the habitat classified as ephemeral in Target Note 1 such as bristly ox-tongue, teasel, colt's foot and bird's-foot trefoil. However, vegetation cover more established here and closer to poor semi-improved grassland, with different grasses dominating smaller pockets of habitat including false oat grass (*Arrhenatherum elatius*), cock's-foot grass (*Dactylis glomerata*) and creeping bent. Field evidence of foxes (*Vulpes vulpes*) and rabbit (*Oryctolagus cunniculus)* in this area and a roe deer (*Capreolus capreolus*) observed (moving inland toward Lords Clough).
8	Patches dominated by common reed classed as swamp habitat. No obvious water was present although these areas are likely to be wet during the winter months and the ground conditions are likely to be constantly moist.
9	Close to the outfall adjacent to Queen Elizabeth Dock abundant mallard (*Anas platyrhynchos*) observed at low tide. On the river side of the sea wall (flood defence) is a thin strip of strandline vegetation supporting sea aster and sea plantain. Sea wall looks fairly recent in some areas, possible coastal otter resting sites in rock armour although little protection and more likely to be suitable resting sites up river.
10	Vegetation denser and includes rib-wort plantain (*Plantago lanceolata*), teasel, mugwort (*Artemesia vulgaris*), Yorkshire fog (*Holcus lunatus*), spear thistle (*Cirsium vulgare*) and curled dock (*Rumex crispus*). Localised patches of sea plantain and sea couch grass. Possible orchids identified (old leaves, could not identify species).

11.16 The terrestrial vegetation within the proposed development site and the potential contractors' areas is predominantly ephemeral / short perennial vegetation and hard standing with areas of species poor semi-improved grassland typical of disused industrial sites. The proposed development site, adjacent to the Humber Estuary, is part of land claim work on mudflats carried out by Associated British Ports in the 1990s. There are records of common spotted orchid, southern marsh orchid and bee orchid adjacent to the proposed development site and yellow wort, a Hull Biodiversity Action Plan priority species, has been recorded within the proposed development site.

11.17 There are records for nesting birds within, and adjacent to, the proposed development site including skylark and little ringed plover (*Charadrius dubius*). Evidence of fox, rabbits and roe deer was recorded by Atkins in September and October 2009 and hedgehogs (*Erinaceus europaeus)* have been recorded within the site during previous surveys. There is no potential for roosting bats within the proposed development site or immediately surrounding areas and no records of badgers have been identified within or adjacent to the proposed development site. Previous surveys for reptiles for the HRBT development close to the proposed development site near Lord's Clough recorded no reptiles, although land in the southern part of the proposed development site is suitable for basking and refuge.

11.18 The wet areas within the proposed development site are seasonal and regularly dry out. These areas do not support sufficient depth of water or aquatic plant material to provide egg-laying habitat for great crested newt. The site is also isolated within a heavily industrialised area. Therefore it is considered unlikely that great crested newts will be present within the proposed development site or within the potential contractors' areas. This was also the finding of previous studies undertaken for the proposed HRBT development[6]. It appears that since these studies were undertaken in 2006, the wetter areas of the site may have become drier (based on comparison of Phase 1 habitat maps and target notes).

11.19 No detailed terrestrial invertebrate surveys have been carried out within the proposed development site although some terrestrial invertebrates have been previously identified in land within the proposed HRBT development[6] such as green-veined white butterfly (*Pieris napi*), small tortoiseshell (*Aglais urticae*), devil's coach-horse beetle (*Staphylinus caesareus*), common field grasshopper (*Chorthippus brunneus*), a red ant (*Myrmica rubra*), a bumble bee (*Bombus hortorum*) and common blue butterfly (*Polyommatus icarus*). The conclusion of the HRBT ES[6] was that within the HRBT application site the habitat is unlikely to support significant invertebrate species assemblages.

11.20 During Atkins' surveys in 2009, common seals (*Phoca vitulina*) were noted in the Humber Estuary adjacent to the proposed development site in November. A common seal was noted landing at the mouth of Old Fleet Drain during an Atkins bird survey in January 2010.

Completion of Baseline Description

11.21 Further terrestrial ecological work which will be undertaken to complete the baseline description of the site includes:

- further research and discussion with relevant organisations regarding existing information on the Humber Estuary designated sites;
- analysis of existing invertebrate data and contact with the County Invertebrate Recorder;
- monthly bird counts within and adjacent to the proposed development site following the WeBS High and Low Tide methodology and breeding bird surveys at an appropriate time of year following standard bird census and survey techniques[62];
- otter surveys along the edge of the Humber Estuary, and otter and water vole surveys along Old Fleet Drain following guidance by Strachan and Moorhouse[63], National Rivers Authority[64] and Royal Society for the Protection of Birds[65];
- reptile presence / absence surveys within the proposed development site following guidance from Natural England[66], Gent and Gibson[67] and Froglife[68];
- bat activity surveys to assess the value of the proposed development site to foraging bats following relevant guidance from Natural England[69] and the Bat Conservation Trust[70]; and
- updates to the Phase 1 habitat survey, particularly focusing on identification of orchids within the proposed development site and potential contractors' areas.

11.22 Ecological marine baseline data will be based on analysis of existing information on the Humber Estuary wherever possible. If insufficient data exist, fish and benthic invertebrate surveys may need to be undertaken. The requirement for these surveys and the detailed methodologies will be discussed and agreed with the relevant statutory consenting authorities including Natural England and the Environment Agency.

Potential Impacts

11.23 A preliminary assessment of potential ecological impacts relating to the proposed development site has been undertaken, divided into impacts arising during the construction phase and impacts during the operational phase. These will be investigated further during the EIA.

Construction

11.24 The main potential impacts during construction are given in Table 11.4. Apart from the horizontal directional drilling of the cooling water intake and outfall pipes into the channel of the Humber Estuary, construction of the Project does not require any other land take within designated sites.

Table 11.4 - Main Potential Impacts during Construction

Source	Potential Impact and Receptors
Land take for site clearance and drilling for the cooling water intake / outfall pipes	• loss of high tide roosting and loafing habitat used by a number of bird species which are qualifying features of the Humber Estuary SSSI and EMS; • loss of non-designated habitats within the construction footprint comprising mainly ephemeral / short perennial vegetation, hard standing and semi-improved grassland; • loss of plant and animal species associated with habitat within the construction footprint (potentially including orchid species yet to be identified), breeding birds, deer, and common invertebrates; and • damage to the bed of the Humber Estuary and benthic species within estuarine sediments.
Noise, vibration and visual stimuli (presence of people, machinery and lighting) during construction works	• disturbance of wintering, autumn passage and breeding birds for which the Humber Estuary SSSI and EMS are designated leading to effective loss of roosting and loafing habitat within the site and at Salt End mudflats and loss of the mudflats as a foraging resource; • disturbance to grey seals (a component of the Humber Estuary SSSI and EMS) and common seals which may use the Salt End mudflats; and • possible disturbance to other fauna not associated with the designated sites including breeding birds and deer.
Water and sediment pollution from construction run-off and drilling for the cooling water intake and outfall pipes	• contamination of intertidal mud, estuarine sediments and aquatic habitat, reducing their productivity and value to foraging birds and fish and causing contaminants to enter the food chain leading to damaging health effects to terrestrial and aquatic organisms including those for which the Humber Estuary SSSI and EMS are designated; • silting up of the disused drainage ditches or ponds on-site. In ditches this would restrict flow, leading to stagnant water conditions and potential algal proliferation, smothering habitats and causing damaging health effects to aquatic organisms; and • smothering of animals and habitats as a result of litter accumulation, due to increased activity on the site.

Operation

11.25 The main potential impacts during operation are given in Table 11.5. Operation of the power station does not require land take within any designated sites. A once-through cooling water system is proposed for the development, which should result in no net loss of water between abstraction and discharge, therefore it is believed that there will be no impact on the water levels in the estuary and watercourses in the vicinity in the area.

Table 11.5 - Main Potential Impacts during Operation

Source	Potential Impact and Receptors
Noise, vibration and visual stimuli (predominantly presence of people, machinery and lighting) during operation of the site[a]	• disturbance of wintering, autumn passage and breeding birds for which the Humber Estuary SSSI and EMS are designated leading to effective loss of roosting and loafing habitat within the site and at Salt End mudflats and loss of the mudflats as a foraging resource; • disturbance to grey seals (a component of the Humber Estuary SSSI and EMS) and common seals which may use the Salt End mudflats; and • possible disturbance to other fauna not associated with the designated sites including breeding birds and deer.
Water and sediment pollution from consented discharges (including the cooling water discharge)[a]	• contamination of intertidal mud, estuarine sediments and aquatic habitat, reducing their productivity and value to foraging birds and fish and causing contaminants to enter the food chain leading to damaging health effects to terrestrial and aquatic organisms including those for which the Humber Estuary SSSI and EMS are designated; • silting up of the disused drainage ditches on-site. In ditches this would restrict flow, leading to stagnant water conditions and potential algal proliferation, smothering habitats and causing damaging health effects to aquatic organisms; and • smothering of animals and habitats as a result of litter accumulation, due to increased activity on the site.
Cooling water abstraction from the Humber Estuary	• potential for entrainment and death of fish at the point of intake including river and sea lamprey for which the Humber Estuary SSSI and EMS are designated.
Discharge of airborne pollutants from the power station stack including NO_x, SO_2 and particulate matter	• nitrogen deposition and total acid deposition onto sensitive habitats.
Note: [a] DONG Energy is intended to be only one of the users of the HRBT therefore the ecology chapter of the EIA will set the Humber Renewables Project in context in relation to the HRBT development as concerns potential impacts arising from use of the HRBT jetty and shipping.	

Assessment Methodology

11.26 The assessment of potential effects of the development on ecological features will take into account both on-site effects and those that may occur to adjacent and more distant ecological features and will particularly identify any significant effects in relation to designated sites for nature conservation importance.

11.27 In order to conform to best practice, the evaluation of ecological features and the assessment of impacts on those features will follow guidance given in the Guidelines for Impact Assessment in the UK[71]. Having characterised the impacts, professional judgement will be applied to assess whether impacts are significant or not in line with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999. Significance is determined by changes in the integrity or conservation status of nature conservation features.

11.28 Significant impacts on ecological features would also be assessed in a consistent manner with other topics within the EIA using significance of effect categories (i.e. major, moderate, minor and negligible as set out in Table 4.1). Project specific criteria for the significance or effect categories will be developed in relation to ecological receptors and agreed with the relevant statutory authorities.

11.29 The ecological assessment will take account of relevant national, regional and local planning policy and wildlife legislation with particular reference to:

- PPS 9 and the accompanying Government Circular[72];
- The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended);
- Wildlife and Countryside Act 1981 (as amended);
- The Countryside and Rights of Way Act 2000; and
- Natural Environment and Rural Communities Act 2006.

11.30 The ecological assessment will be carried out in parallel with, and using information from, the assessment carried out for other aspects of the EIA, with particular reference to air quality (see Chapter 5), water quality (see Chapter 7), sediments (see Chapter 8) and noise and vibration (see Chapter 12).

11.31 An appropriate level of assessment will be carried out for the EIA to determine the significance of impacts on the integrity of designated sites and in particular the Humber Estuary EMS in relation to the construction and operation of the development.

11.32 To define the total extent of the study area for ecological assessment the proposed activities will be reviewed in order to identify the spatial scale at which ecological features could be affected. This ‘zone of influence’ will be the geographical area encompassing all predicted negative or beneficial ecological effects from the development, including those which may arise from land-take and habitat loss and those which may occur through disturbance or alteration to air quality, water quality etc. The zone of influence will be reviewed throughout the assessment and extended as appropriate to accommodate any additional areas of ecological importance or reduced where applicable.

11.33 Discussion and consultation with relevant organisations, such as Natural England and the Environment Agency, will continue throughout the EIA.

Construction

11.34 The assessment of ecological effects of land take will be confined to the construction footprint and immediately adjacent land. The ecological zone of influence of noise and vibration sources will be confirmed through noise and vibration modelling and research on the sensitivity of ecological receptors to levels of noise and vibration. Visual disturbance will be assessed in terms of sight lines between disturbing stimuli (such as the movement of vehicles and people within the construction site) and sensitive receptors including potential light spill from the construction site to adjacent areas. The zone of influence for ecological impacts from pollution will be informed by the air quality assessment, land quality assessment, water quality assessment etc. The methodologies for assessment of construction impacts on marine receptors will be discussed and agreed with the relevant statutory consenting authorities including Natural England and the Environment Agency.

Operation

11.35 The ecological zone of influence of noise and vibration sources during operation will be confirmed through noise and vibration modelling (see Chapter 12) and research on the sensitivity of ecological receptors to levels of noise and vibration. The zone of influence for ecological impacts from aquatic pollution will be informed by the water quality assessment (see Chapter 7) and the modelling of the cooling water discharge. An assessment on impacts of fish entrainment will be undertaken with reference to the levels of cooling water intake and research on the sensitivity of relevant ecological receptors. The zone of influence for operation in relation to air quality impacts will be informed by air quality modelling. However, the effects on habitats potentially sensitive to airborne pollutants will be considered for SACs, SPAs and Ramsar sites within 10 km, for SSSIs within 5 km and for National Nature Reserves, Local Nature Reserves, local wildlife sites and ancient woodland within 2 km of the proposed development following Environment Agency guidance[15].

11.36 The methodologies for assessment of operational impacts on marine receptors will be discussed and agreed with the relevant statutory consenting authorities including Natural England and the Environment Agency.

Potential Mitigation Measures

11.37 Potential mitigation measures cannot be identified based on the information available to date. Identification of mitigation measures will be addressed in the EIA, as applicable, based on the outcome of the impact assessment.

12. Noise and Vibration

Overview

12.1 This chapter presents the proposed approach to the noise and vibration assessment for the Humber Renewables Project. It covers baseline information, preliminary identification of potential impacts, proposed impact assessment methodology for the construction and operational phases of the Project, and potential mitigation measures.

12.2 The cumulative impacts due to other planned developments are not discussed in this chapter; however, these will be identified and considered in the EIA.

Baseline Description and Sensitivity

12.3 The proposed development site is located on the Humber Estuary near to Queen Elizabeth Dock. The site is surrounded by industrial installations on three sides and the Humber Estuary to the south. The site's location on the Humber Estuary places it in the vicinity of the statutory designated sites of the Humber Estuary. These sites are notable for the presence of internationally important populations of birds which are likely to be sensitive to disturbance from noise and vibration. Birds are known to use the mudflats at Salt End immediately south east of the site.

12.4 The nearest residential receptors, which are at distance of 1 km or more from the site, were identified as:

- receivers in Paull village approximately 1.6 km south east of the site;
- receivers on Hedon / Hull Road, A1033, between Tower House Lane and Century Road, approximately 1 km north east of the site; and
- receptors on Hedon Road, A1033, approximately 1.6 km north west of the site.

Indicative Survey

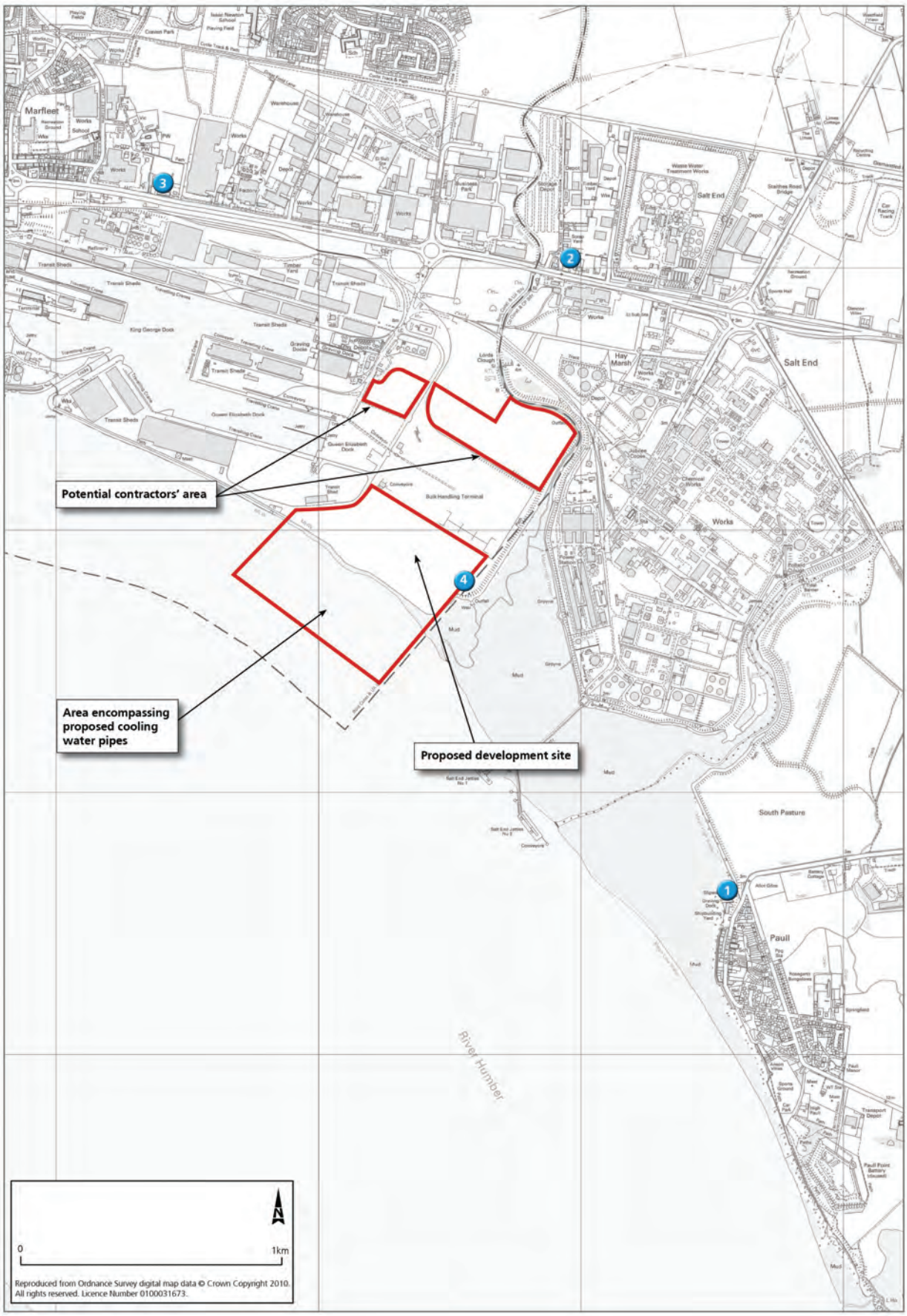
12.5 An indicative baseline noise survey was carried out on Wednesday and Thursday, 3rd and 4th March 2010. A Norsonic 140 sound level meter (serial No: 1403790) and a Norsonic 1225 microphone (serial No: 106950) were used to take the noise measurements. The meter and microphone were calibrated using a Norsonic 1251 calibrator (serial No: 32543) before and after use and no significant drift was found. The equipment was used as a set and is in calibration. The next calibration is due July 2011. The noise meter was mounted on a tripod at a height of 1.5 m above ground level. All measurement positions were free-field. The weather conditions were clear and dry throughout the survey. The wind speed was less than 5 m/s.

12.6 Short-term sample noise measurements were measured at four locations during the day, evening and night time periods. The measurement positions are described in Table 12.1 and shown in Figure 12.1.

Table 12.1 - Details of Noise Measurement Positions

Position No.	Measurement Description	Measurement Type	Distance from site, m
1	Paull village	Residential	1,600
2	A1033, Tower House Lane	Residential	1,000
3	A1033, No.1225 Hedon Road	Residential	1,600
4	Eastern edge of site	Ecological	0

Figure 12.1 - Locations of Noise Measurement Positions



12.7 At each of the three residential locations six non-consecutive short-term 15 minute noise measurements were taken, two during the day time (07:00 to 19:00), two during the evening time (19:00 to 23:00) and two during the night time (23:00 to 07:00).

12.8 The fourth measurement location is on the proposed development site adjacent to the Salt End mudflats. Four non-consecutive short-term 15 minute noise measurements were taken at this position.

12.9 The results of noise measurements are shown in Table 12.2.

Table 12.2 - Noise Measurement Results

File	Date	Time On	Period	Duration (mins)	dB L_{Aeq}	dB L_{A90}	dB L_{AFmax}
Position 1 - Paull Village							
001	04/03/2010	01:02	Night	15	41	38	57
004	04/03/2010	02:14	Night	15	41	39	59
008	04/03/2010	11:55	Day	15	53	45	71
012	04/03/2010	15:16	Day	15	59	46	81
018	04/03/2010	21:21	Evening	15	49	44	66
021	04/03/2010	22:35	Evening	15	55	47	63
Position 2 - A1033, Tower House Lane							
002	04/03/2010	01:29	Night	15	56	49	76
005	04/03/2010	02:42	Night	15	59	49	80
009	04/03/2010	12:26	Day	15	71	64	83
013	04/03/2010	15:47	Day	15	71	66	81
016	04/03/2010	20:40	Evening	15	67	59	80
019	04/03/2010	21:45	Evening	15	67	58	77
Position 3 - A1033, No.1225 Hedon Road							
003	04/03/2010	01:51	Night	15	63	57	84
006	04/03/2010	03:02	Night	15	66	58	88
010	04/03/2010	12:47	Day	15	74	66	87
014	04/03/2010	16:06	Day	15	76	70	90
017	04/03/2010	20:59	Evening	15	72	63	85
020	04/03/2010	22:05	Evening	15	72	61	85
Position 4 – Eastern Edge of Development Site							
007	04/03/2010	11:18	Day	15	57	54	65
011	04/03/2010	14:40	Day	15	56	54	63
015	04/03/2010	20:04	Evening	15	55	54	63
022	04/03/2010	23:18	Night	15	50	48	59

12.10 The lowest measured noise levels are at position 1, in Paull Village. This position is the furthest from the major industrial and road noise sources. The dominant source of noise at position 1 is industrial noise from the BP Chemicals site. The other sources of noise include local road traffic noise and noise from ships and associated loading / unloading activities when present. There is no screening between this measurement position and the proposed development site.

12.11 At measurement positions 2 and 3 the dominant source of noise during the day and evening time is road traffic noise from the A1033. The dominant source of noise during the night time is industrial noise. At position 2 the fan noise from the UCM Magnesia Ltd plant is the main source of industrial noise. At position 3 the noise from the Aarhus Karlshamn UK Ltd plant is the main source of industrial noise. Existing industrial buildings provide screening between these measurement positions and the proposed development site.

12.12 The noise measurements taken at the proposed development site, position 4, show that there is little difference between the ambient noise levels, L_{Aeq}, and the background noise levels, L_{A90}. This implies that the dominant source of environmental noise in this area is in constant operation. Currently the dominant sources of noise at the Salt End mudflats, adjacent to position 4, are industrial noise from the BP Chemicals site, the coal storage area, ships and ship loading / unloading activities when present.

Baseline for EIA

12.13 In the preparation of the EIA, further noise measurements will be required for the purposes of undertaking a detailed noise impact assessment. It will be necessary to take measurements over a longer time period to establish the variation in ambient noise levels at the identified receptor locations. There are several variable noise sources such as noise due to existing ship movements and ship loading / unloading activities, and some activities may change from day to night and weekday to weekend day. Further consultation with the local authorities will also be carried out to ensure that the scope of the survey is sufficient to represent all noise sensitive receivers in the area.

Potential Impacts

Construction

Noise

12.14 During the construction phase various activities will generate noise and their potential impact will need to be considered. The plant and equipment which are required for construction activities are not yet known however they are likely to include: excavators; dozers; compactors; trucks; concreting equipment; cranes; and piling equipment. The noise generated by the construction plant and equipment could result in an increase in ambient noise levels at the residential receiver locations and is likely to result in an increase in noise levels at the Salt End mudflats. Many of the construction activities generate noise that is impulsive and / or tonal. This type of noise can cause disturbance even if the overall ambient noise level is not increased. The estimated construction working hours are 07:00 to 23:00 but there are occasions when night time working may be required. People are more sensitive to noise at night as it can cause awakenings. The likelihood of awakenings is higher when the nose is impulsive and / or tonal.

12.15 Vehicle movements generated by the construction work could increase traffic along the main routes in the area. The number of vehicle movements is not yet known however there could be up to 75 HGV and LGV movements on a daily basis. This increase in traffic could result in increased noise levels along some routes depending on the existing traffic volumes. This might result in an increase in noise levels at residential receptors living in the vicinity of these routes.

Vibration

12.16 It is likely that significant piling work would be required during the construction phase. Piling can cause high levels of vibration. It is not anticipated that the nearest residential receptors would be affected by piling vibration as the distances are too great at 1 km or more. However, the birds in the adjacent Salt End mudflats are likely to be amongst the ecological receptors affected by the piling vibration.

12.17 HGV movements could generate ground borne and airborne vibration at sensitive receptors when passing near them. The magnitude of this impact would depend on the number, size and speed of HGVs and the conditions of the roads.

Operation

Noise

12.18 When operational the proposed development will include a number of fixed plant activities and involve deliveries to and from site by road, rail and sea. Noise will be generated by on-site activities and will include noise of the conveyors, fan noise, transformer noise and on-site vehicle noise. The exact details of the noise levels generated from the operational equipment are not yet known. The noise levels generated could increase the ambient noise levels and the background noise levels in the area. This could affect the residential receivers and the birds in Salt End mudflats.

12.19 Road vehicle movements to and from the site are likely to be minimal during operation of the power station as the bulk of materials will be transported by ship. At present the details of these vehicle movements are not yet known. Any significant increase in traffic flow over the existing traffic could result in an increase in noise levels for nearby residential receptors.

12.20 As discussed previously DONG Energy is intended to be only one of the users of the HRBT. Therefore the noise and vibration chapter of the EIA will set the Humber Renewables Project in context in relation to the HRBT development as concerns the potentially increased noise levels for residential receivers along the Humber Estuary and the Salt End mud flats conservation area that could result from ship movements and ship loading / unloading activities.

Vibration

12.21 The information available for the operational phase is not detailed enough to indicate whether there will be any vibration impacts on receivers, however at this stage it is considered unlikely.

Assessment Methodology

Construction

On-Site Noise and Vibration

12.22 The construction noise and vibration impacts associated with on-site activities from the proposed development will be assessed in accordance with the guidelines given in BS 5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1 – Noise and Part 2 – Vibration. The assessment will address the impact at residential receptors and will provide relevant information to the ecology specialist for assessment of the impacts on birds in the Salt End mudflats.

BS 5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1 - Noise

12.23 Part 1 of the Code of Practice for Noise and Vibration Control on Construction and Open Sites provides guidance on the methods that can be used to predict and measure noise from construction activities and how to assess the impact on those exposed to it. In particular Annex F sets out the methods of estimating noise from construction sites which take into account distance, ground effects, reflections from surfaces, and screening by obstacles. Annex E gives guidance on the significance of noise effects from construction works. It advises that the predicted noise levels are added to the existing ambient levels and then assessed in terms of the increase to the existing ambient levels. The increase in noise levels due to the construction works are generally deemed to be significant if it they are greater than 3 dB(A). It advises that noise with impulsive or tonal characteristics may be more disturbing that continuous noise of the same level, therefore a difference of 0 dB(A) may cause disturbance.

12.24 Annexes C and D of Part 1 of the Code of Practice provide generic source noise data for various items of plant used on open sites which can be used in the absence of measured data.

BS 5228:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 2 - Vibration

12.25 Part 2 of the Code of Practice for Noise and Vibration Control on Construction and Open Sites gives guidance on methods for measuring vibration and how to assess its effects on the environment and people. The main vibration impacts are likely to arise from piling activities or heavy construction vehicle movements near sensitive receptors. Annex B gives guidance on the significance of vibration effects in terms of human response to vibration (see Table 12.3) and structural response to vibration (see Table 12.4).

Table 12.3 - Guidance on Effects of Vibration Levels Perceptible to Humans

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration
0.3 mm/s	Vibration might be just perceptible in residential environments
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level

Table 12.4 - Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4 Hz to 15 Hz	**15 Hz and above**
Reinforced or framed structures	50mm/s at 4 Hz and above	50mm/s at 4 Hz and above
Industrial and heavy commercial buildings		
Unreinforced or light framed structures	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Residential or light commercial buildings		

12.26 Annex D of Part 2 of the Code of Practice provides some historical measured vibration levels for various piling methods and Annex E gives empirical formulae for the prediction of the resultant peak particle velocity vibration levels for various types of piling. The formulae found in Annex E can be used to estimate the vibration levels when detailed information about the piling method is known. If only general information is known about the piling activities then a range of levels can be obtained from the historical data presented in Annex D.

Offsite Traffic

12.27 The noise generated from construction traffic would be assessed in accordance with the methods in the DMRB which uses calculation procedures from the Calculation of Road Traffic Noise.

Department for Transport Memorandum, Calculation of Road Traffic Noise, 1988

12.28 The Department for Transport Memorandum, Calculation of Road Traffic Noise provides methods for measuring and calculating noise levels from road traffic, which are assessed over an 18 hour period from 06:00 to 24:00, using annual average weekday traffic (AAWT) flows. The basic noise level for a road segment can be calculated using the traffic flow, traffic speed and percentage heavy vehicles for a road segment. The traffic data will be based on the construction methods that are to be employed and information from the traffic assessment.

Design Manual for Roads and Bridges, Volume 11 Section 3 part 7 HA 213/08, August 2008

12.29 The DMRB details the assessment methodology relating to noise and nuisance exposure. It provides guidance on the significance of changes in road traffic noise, identifying that changes in noise smaller than 1 dB(A) are not perceptible. An increase in traffic volume of 25% is required to alter the noise levels by 1 dB(A).

Operation

12.30 Consultation with the Environment Agency and the relevant local authorities would take place prior to commencement of the assessment to ensure that a common methodology is agreed upon and the study area is clearly defined. The results of the operational noise and vibration assessment would be shared with the ecology specialist who would assess the impacts on the birds in the Salt End mudflats.

On-Site Noise and Vibration

12.31 The development falls under the Environmental Permitting (England and Wales) Regulations 2007. Specific guidance is available for noise and thus the operational assessment must be undertaken in accordance with the requirements of Horizontal Guidance Note IPPC H3 Part 2 – Noise Assessment and Control. Reference to vibration impact assessments is made in the document.

Horizontal Guidance Note IPPC H3 Part 2 – Noise Assessment and Control, 2002

12.32 The Horizontal Guidance Note IPPC H3 Part 2 outlines the noise impact assessment requirements for new and existing industrial sites. The aim of the guidance is to assist in determining noise related BAT for a given installation.

12.33 Section 2 of the guidance note outlines the measurement and evaluation procedures that should be followed. It describes the key components of a noise assessment which include: identification of the sensitive receptors; review of complaint history; risk assessment; impact assessment; and implementation of noise control measures if required. It advises the use of BS 4142:1997 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas for determining the impact of the installation, and it advises the use of BS 7445:1991 Description and Measurement of Environmental Noise, Parts 1 to 3, for guidance on the measurement of environmental noise. Section 3 gives guidance on noise control techniques and technologies.

12.34 The guidance refers to the possibility that vibration may need to be assessed. It recommends that specialist advice is sought if impacts from vibration are considered to be a risk.

BS 4142 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, 1997

12.35 BS 4142:1997 describes methods for determining and assessing noise levels from fixed plant with a view to determining the likelihood of complaints.

12.36 The likelihood of complaints about noise from the occupiers of nearby residential properties can be assessed using the method described in BS4142:1997. This method compares the rating noise level to the measured background noise level in the absence of the source. Rating noise level is defined as the noise level from the source, adjusted for certain acoustical features. It is measured in terms of dB L_{Aeq} which is an energy based acoustic indicator. The standard defines the 'specific noise level' as the L_{Aeq} of the source, and the 'background level' as the L_{A90} level without the source operating.

12.37 Guidance on how to measure the background noise level, L_{A90}, is also provided in the standard. The length of measurement should be sufficient to obtain a representative value for the background noise level and should cover all periods when the specific noise will operate.

12.38 The standard states that "*Certain acoustic features can increase the likelihood of complaint over that expected from a simple comparison between the specific noise level and the background noise level. Where present at the assessment location, such features are taken into account by adding +5 dB(A) to the specific noise level to obtain the rating noise level. A +5 dB(A) correction is applied if one or more of the following features occur, or are expected to be present for new or modified noise sources;*

- *the noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc);*
- *the noise contains distinct impulses (bangs, clicks, clatters, or thumps); or*
- *the noise is irregular enough to attract attention."*

12.39 The standard then rates the likelihood of complaints by comparing the rating level with the background level:

- if the rating level is more than 10 dB(A) above the background level, then complaints are likely;
- if the rating level is more than 10 dB(A) below the background level, then this is a positive indication that complaints are unlikely; or
- if the rating level is 5 dB(A) above the background level, then this is of marginal significance.

BS 7445:1991 Description and Measurement of Environmental Noise, Parts 1 to 3

12.40 BS 7445: 1191 provides detailed information on environmental noise measurement procedures and the reporting of environmental noise levels. Guidance is given on how to measure and assess noises with a tonal component. It also provides specific information on suitable weather conditions for noise measurements.

On-Site Noise Modelling

12.41 Noise modelling of the operational phase of the development will be carried out to predict the noise levels. The model will be used to identify potential noise problems owing to the development and will allow mitigation to be incorporated into the design if required. The modelling software would use prediction methods based on ISO 9613-2 1996 Acoustics – Attenuation of Sound during Propagation Outdoors.

ISO 9613-2 1996 Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation

12.42 ISO 9613-2 1996 provides methods for predicting the noise level at a receptor due to noise sources of known emission. The source of noise can be moving or stationary and methods on how to correct for geometrical divergence, atmospheric absorption, ground effect, reflection from surfaces and screening by obstacles are given.

Offsite Traffic

12.43 At this stage it is believed that the road traffic generated by the operational plant would be minimal. However a traffic noise assessment would be carried out in line with the DMRB assessment methodology and using the Department for Transport Memorandum, Calculation of Road Traffic Noise calculation procedures. The traffic data would be obtained from the traffic assessment.

Potential Mitigation Measures

12.44 At this early stage in the Project, it is not possible to identify whether mitigation is required as the full details of the proposals are not currently available. The need for mitigation will be addressed in the EIA, based on the outcome of the detailed assessments of potential construction and operational noise and vibration impacts.

13. Transport

Overview

13.1 This chapter provides the proposed approach to the Transport Assessment for the Humber Renewables Project. It includes an initial description of baseline conditions in the immediate vicinity of the site, the preliminary identification of potential impacts, the proposed impact assessment methodology for assessment of the construction and operational phases of the Project, and potential mitigation measures.

13.2 The Transport Assessment report will form a technical appendix to the EIA. A summary of the Transport Assessment will also be included as a transport chapter in the EIA. Early discussions have taken place with Hull City Council Highways Officers and the assessment methodology included here is based on these discussions. However, it should be recognised that these discussions have been based on emerging development information and the scope may change during the life of the Project to reflect more detailed information as it is forthcoming. It is recognised that the location of the development site on the Humber Estuary allows excellent access to the site by sea.

Baseline Description and Sensitivity

Baseline Description

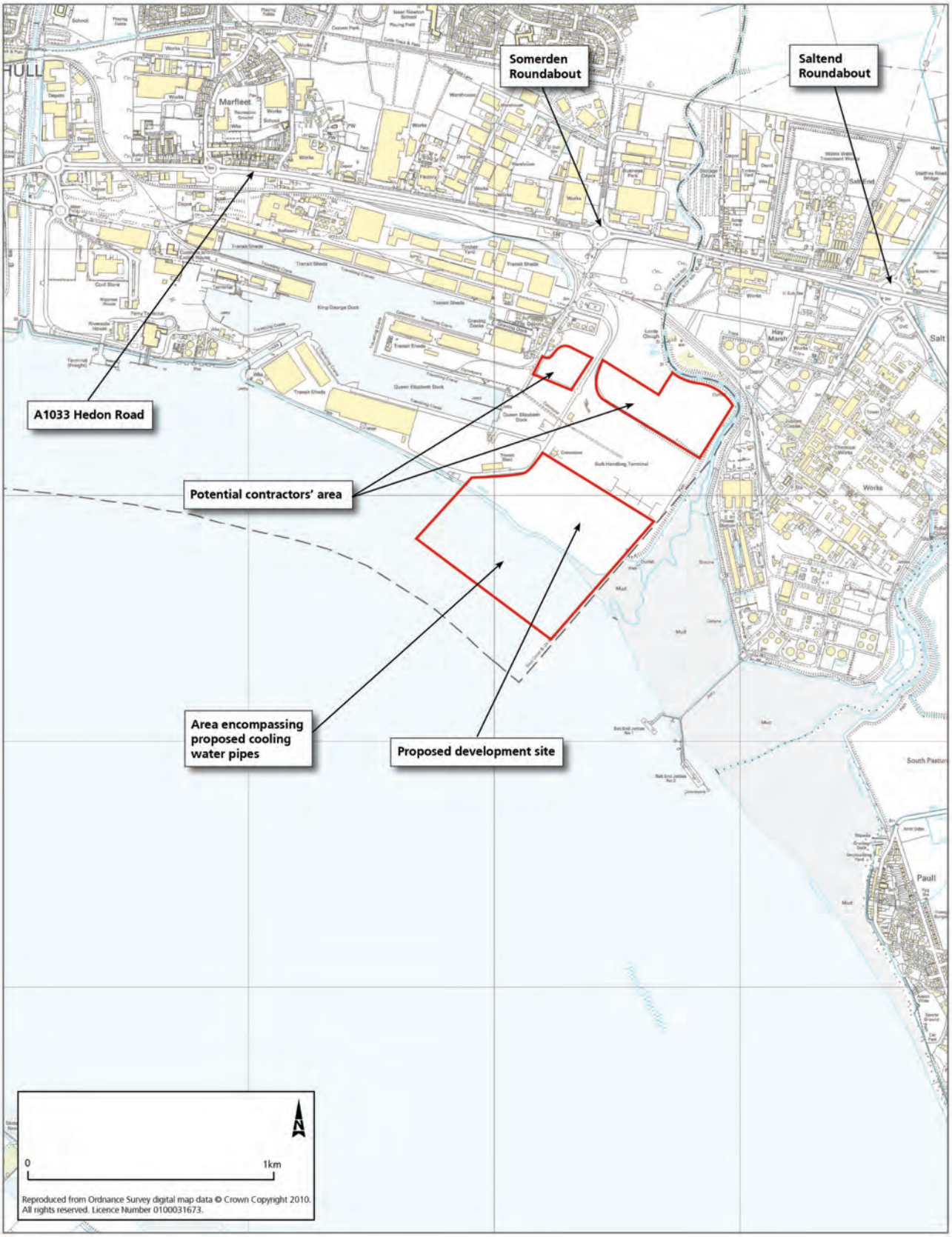
13.3 The site is located within the Associated British Ports' port estate near to Queen Elizabeth Dock and as such the primary road access will be via an existing private single carriageway road, within the estate (see Figure 13.1). This road connects through to the Dock Gate (with manually controlled barriers) at Somerden Roundabout (A1033 Hedon Road / Somerden Road). There is a level crossing (for freight trains) approximately 115 m inside the port estate, which, if closed, can cause vehicles to back up onto the A1033 Hedon Road during busy periods.

13.4 Hedon Road is a two lane dual carriageway trunk road and is subject to a 40 mph speed restriction. To the immediate east of the Somerden Roundabout are bus lay-bys and a staggered Toucan Crossing that connects the port entrance to a segregated shared surface footway / cycleway on the northern side of the A1033 Hedon Road. A footpath crosses the southern side of the proposed development site, although it is understood from Hull City Council that this route is considered unsuitable for staff access to the site. This footpath joins the Trans Penine Trail after running west along the estuary foreshore.

13.5 To the east of Somerden Roundabout the A1033 continues as the A1033 Hull Road to form a roundabout junction with Saltend Lane, known as Saltend Roundabout. The westbound A1033 is grade-separated at this roundabout with slips down to, and away from, the roundabout. This junction marks the eastern extent of the trunk road network. The A1033 continues beyond this junction, east, to Hedon and Withernsea.

13.6 To the west of the Somerden Roundabout the A1033 Hedon Road meets the A63 at the Northern Gateway Roundabout. West of here, the A63 continues along the northern bank of the Humber Estuary to the south of Hull city centre to join with the M62.

Figure 13.1 - Road Network in Vicinity of Development Site



13.7 From initial discussions with Hull City Council it was noted that the immediate highway network of the A1033 Hedon Road does not suffer from congestion. However, the A63 Castle Street and Mytongate Roundabout do experience significant congestion during the peak hours and at various other times of day. The Highways Agency is currently awaiting a funding decision from central Government on an approximate £200 million improvement scheme for the A63 Castle Street / Mytongate Roundabout, although it is unlikely any construction will begin before 2016. If the funding is not forthcoming from central Government a fallback position has been agreed whereby a £5 to £6 million scheme will be implemented at the roundabout.

13.8 The proposed development site is situated to make use of the HRBT development, in particular for deliveries of biomass. Additionally, the Hull Docks Branch Railway runs close to the development site on the port estate. It was noted by Hull City Council that this line has capacity for in excess of 20 trains per day, with current usage estimated at less than 10 trains per day. The proximity to the HRBT and rail line offers the potential significantly to reduce road borne trips. Deliveries of biomass will be made by sea via the HRBT. Both sea and rail are being considering as alternative to road transport for the removal of fly ash and bottom ash.

Updating the Baseline

13.9 To inform the Transport Assessment and EIA transport chapter a review will be undertaken of all relevant transport policy relating to the proposed development.

13.10 As part of the EIA a more thorough review will be carried out for the prevailing road traffic conditions in the area, where this information is available. Access to the site by sustainable modes of transport including bus routes and timings will also be reviewed. Additionally, a review of existing Park and Ride facilities within Hull will be undertaken and available areas of land that could potentially be used as marshalling points for construction workers will be identified. The locations and capacities of these would then be used to inform mitigation proposals if required.

13.11 It is likely that a new fully classified traffic count will be required at the Somerden Roundabout to update a previous count conducted in 2006.

13.12 There will be a requirement to take account of traffic flows generated by other committed developments in the area. It is understood that Hull City Council will provide information on committed developments and the traffic flows associated with them. Particular consideration will need to be given to the HRBT development.

13.13 Hull City Council has already made initial contact with the Highways Agency to make them aware of the Humber Renewables Project. However, prior to the Transport Assessment being developed further consultations will be required with the Highways Agency to present to them more details of the development proposals and discuss the potential requirements for mitigation of impacts on their network. Discussions will also be held with the East Riding of Yorkshire Council, although it is thought at this stage that there will be no highway impact on their road network.

Potential Impacts

13.14 From the information provided to date, the road traffic impact will be greatest during the construction phase of the development, whilst the operational traffic impact is likely to be negligible. Initial estimates as to likely road impacts during the construction and operational phases of the development are discussed below.

Construction Phase

13.15 During construction, road traffic will be generated by:

- construction workers / contractors; and
- deliveries of construction materials.

13.16 It is envisaged that up to 30 abnormal loads will be delivered over the course of the construction phase, the majority of which will arrive by sea. The potential impacts on shipping movements in the Humber Estuary associated with the additional vessels over the 40 month construction phase will be considered further in the Transport Assessment.

13.17 Careful consideration will need to be paid to the potential interaction between the construction / operation of the HRBT and the construction of the Humber Renewables Project. This interaction could involve an increase in vehicle trips, interaction between HGV traffic and interaction between HRBT operational traffic and Humber Renewables Project construction traffic.

13.18 If Park and Ride facilities are implemented to reduce the number of construction worker trips associated with the Humber Renewables Project, there is potential that the arrivals and departures of staff travelling by car to these Park and Ride sites may have an adverse impact on the highway network surrounding them. The potential impacts would not be known until the Park and Ride sites were selected and information on background traffic flows is obtained.

13.19 Owing to the site's excellent location on the strategic road network, the likelihood of large vehicles travelling through sensitive receptors, such as residential areas, is low. However, depending on the origins of materials and contractors, vehicle routing through residential areas may be unavoidable, in which case appropriate mitigation would be suggested to minimise any impact.

13.20 Depending on the arrival and departure patterns of construction workers and the delivery of materials, there may be a requirement to take account of any potential interaction between construction traffic and the embarkation / disembarkation of passenger ferries, which are understood to set sail / dock around the highway peak hours. It was noted that during these times queues often form within the port estate as the traffic waits to enter the highway network.

Operation

13.21 It is understood that the operational phase of the development will generate significantly less road traffic than the construction phase and therefore potential impacts will be less. However, during operation of the power station, additional road traffic will be generated by:

- staff travelling to and from work;
- deliveries of chemicals;
- removal of bottom ash from site; and
- removal of fly ash from site.

13.22 Additionally, up to 2 million t per year of biomass fuel in the form of wood chips, wood pellets and wood briquettes will be brought in by sea. The potential for the fly ash and bottom ash to be removed from site by sea or rail instead of road is still under consideration.

13.23 As with the construction traffic the largest potential impact would occur if traffic arrives / departs the site during the network peak hours (thought to be 08:00 to 09:00 and 16:30 to 17:30). Impacts could potentially be felt at the Somerden Roundabout and along the sensitive stretch of the A63 Castle Street and at Mytongate Roundabout.

13.24 There are certain highway and transportation issues which will need to be considered. These include the requirement to accommodate and encourage access to the site by non-car modes, the interaction at the level crossing within Associated British Port's port estate, the improvement scheme for the A63 Castle Street and Mytongate Roundabout and the potential impact that the Humber Renewables Project could have in combination with the HRBT development. All these issues will be addressed in the Transport Assessment.

13.25 The footpath that crosses the development site will need either to be terminated at an earlier point or diverted.

Assessment Methodology

13.26 The assessment of transport effects will be based on the Department for Transport and Department for Communities and Local Government report Guidance on Transport Assessment – March 2007. More detailed development information and discussions with the local highway authority and the Highways Agency will determine the possible impact of the proposed construction and development trips on the study area transport network. The assessment process will also include management of residual road borne trips during the construction phase. It is noted that construction workers will work either a one or two 8-hour shift system and that operating staff will work a three 8-hour shift system with the majority of staff operating on a day shift.

13.27 In addition to the above, the assessment will consider issues such as the trip generation and distribution arising from the proposed development, modal split of such trips, identification of likely peak activity periods and the potential to achieve modal shift to more sustainable modes of transport.

13.28 In light of the HRBT development it is not envisaged that there will be a need for any detailed work in the EIA associated with rail and marine transport capacity for the Humber Renewables Project. The transport chapter for the EIA will set the Humber Renewables Project in context in relation to the HRBT development from a marine and rail perspective.

Construction

Trip Generation and Distribution

13.29 The anticipated number of workers active on-site at any one time will be identified to provide a profile of staff numbers over the construction period. Further information will be sought on the likely mix of contractors and local workforce which will aid in assuming modal split. Any required mitigation measures, such as use of Park and Ride, would also be included in the assumptions on modal split.

13.30 A likely traffic distribution will then be developed based on further information that is available, but also taking account of potential mitigation measures. Information on the number of deliveries by HGVs and LGVs over the construction period (currently assumed to be 75 per day) will be included in the assessment.

Impact Assessment

13.31 The impacts of the increased number of trips will be assessed at the Somerden Roundabout for the peak period of construction activity. Commentary will also be provided on the suitability of facilities within the site to accommodate the expected number of trips.

13.32 The majority of abnormal loads are not expected to arrive by road, however, if proposals change Autotrack Swept Path analysis will be used to confirm the suitability of the proposed route to accommodate the anticipated vehicle type.

13.33 The impact of up to 30 abnormal loads to be delivered by sea over the 40 month construction period is likely to be negligible; however, during the preparation of the Transport Assessment, consultation with the relevant authorities will be undertaken.

Operation

Trip Generation and Distribution

13.34 The anticipated operational usage of the site in terms of personnel and the transportation of materials will be considered. The transportation of materials will be presented as annual movements by mode. First principle assumptions based on the operational characteristics of the

site will then be used to profile the traffic to provide hourly HGV movements. HGV traffic will be assigned to the highway network in accordance with the origin / destinations and assumed routes. However, it is anticipated that the majority of HGVs will use the strategic road network via the A63 Castle Street. Similar first principle assumptions based on projected employee numbers, working hours and shift patterns will be used to derive employee trip movements and these will be assigned to the highway network.

Impact Assessment

13.35 Assessment years will be agreed with Hull City Council but in line with Department for Transport Guidance on Transport Assessments it is envisaged that this will be the opening year (potentially 2016) and 10 years after registration of the planning application for the strategic road network. It is likely that an operational capacity assessment will be required at the Somerden Roundabout, whilst other areas of the network will be assessed using the anticipated increase in traffic flows. Further consultation will be undertaken with Hull City Council and East Riding of Yorkshire Council with reference to the footpath that currently crosses the site.

Potential Mitigation Measures

13.36 Currently it is not known at what times of the day construction staff will travel to / from the site. However, early discussions with Hull City Council have suggested that mitigation measures may be required to lessen the impact of construction worker trips on the highway network during peak hours, particularly on the A63 at the Mytongate Roundabout. It is likely that the majority of construction workers will arrive from the west via the A63 and as such it may be beneficial to provide a Park and Ride facility to limit the number of vehicles passing through the sensitive A63 Castle Street corridor. Such a facility would enable workers to park securely and be driven to site by bus, and allow arrival / departure times to be controlled by the timing of the buses provided.

13.37 DONG Energy is also considering use of the existing rail line to transport materials to / from the site and therefore lessen the impact on the highway network.

14. Landscape and Visual

Overview

14.1 The purpose of this scoping assessment is to gain an understanding and provide an initial interpretation of the surrounding landscape / townscape character and the visual context, and to identify any potential impacts that may arise from the proposed Project. The results of this scoping assessment will inform and guide the design of the development, including mitigation measures, and will determine the requirement for further assessment during the EIA.

14.2 Cumulative / in-combination impacts owing to other planned developments are not discussed herein; however, these will be identified and considered in the EIA.

14.3 A landscape assessment is the systematic description and analysis of the physical features of the landscape and their values. The features may include landform, field and settlement patterns, building styles, historical and cultural elements, road and transport patterns, vegetation cover and land use. The landscape assessment can then identify the potential impact of the proposed development on these elements.

14.4 Visual assessment is the description and analysis of the views experienced by receptors from residential properties, public buildings, historic buildings, conservation areas (see Chapter 15 for historic building and conservation area information), public open spaces, public rights of way, open access areas, transport corridors and places of work, and the potential impact of the proposed development on the receptors.

14.5 A substation will be provided as part of the Project, however any development required for the connection to the national grid network is anticipated to be dealt with separately by National Grid. The connection from the site boundary going off site may be by underground cable or overhead line. This is undetermined at the time of this study (March 2010), however the corridor for the connection will be considered at a generic level as part of the EIA.

Baseline Description and Sensitivity

14.6 For the purpose of the scoping study no defined area of search has been applied, however an area that extends up to 5 km has generally been considered. Some baseline information beyond this distance has been included where it provides useful context or where it has the potential to guide the scope of further assessment.

Site and Context Description

14.7 The proposed development would be located on the northern bank of the Humber Estuary, on the eastern edge of the city of Hull at National Grid Reference 515500 428000. The proposed development site area amounts to approximately 17 ha. The site lies on previously reclaimed land, which is retained by a foreshore of rock rip rap (an engineered method of bank retention / stabilisation). The site can be described as a disturbed brownfield site with limited vegetation cover. There is also limited vegetation present adjacent to the site's boundaries. The site sits within an existing large industrial area, with industrial uses located to the west, north and east. Queen Elizabeth Dock is located to the north west of the site. Lighting is present within the area.

14.8 The settlement of Hedon is location to the east of the site at a distance of approximately 2.2 km. The settlement of Thorngumbald is located approximately 5 km to the east of the site. The settlements of Barrow upon Humber, New Holland, Goxhill and East Halton are all situated on the south side of the Humber Estuary. Of these New Holland and Goxhill are located in closest proximity to the proposed development site at a distance of over 7.5 km. Information in respect of heritage features is included in Chapter 15.

14.9 The topography is very flat within the estuary area, with minor variance created by flood defence features. Vertical man made structures such as church spires, pylons, cooling towers and stacks dominate the skyline. The Humber Bridge is also a dominant feature within the landscape. The presence of trees is limited to those located within the built up areas, private gardens and public open spaces, however there are some small patches of copse scattered through the area. The landscape adjacent to the built up areas is open, dominated by farmland and a strong linear pattern created by roads and drainage ditches.

14.10 Further, more detailed, analysis of the landscape baseline situation will be undertaken as part of the EIA.

Landscape Character

14.11 The Character of England's Landscape, Wildlife and Cultural Features map, produced in 2005 by Natural England with support from English Heritage, was an update to that produced by the Countryside Commission in 1996. This map subdivides England into 159 National Character Areas (NCAs). It provides a picture of the differences in landscape character at the national scale. Four NCAs relate to the proposed development site and the wider area; NCA 40: Holderness, NCA 41: The Humber Estuary, NCA 42: Lincolnshire Coasts and Marshes and NCA 43: Lincolnshire Wolds[73]. The proposed development site lies within NCA 41: The Humber Estuary landscape character area. This character area also extends across the Humber Estuary to cover the area to its south.

14.12 Several Landscape Character Assessments have been prepared at a more detailed, regional level. Those identified to date as applicable to the site and surroundings are:

- Gillespies (1995) Our Landscape Today for Tomorrow: An Assessment of the Landscape North and South of the Humber with Management Guidelines for its Future, Countryside Commission and Humberside County Council;
- Carl Bro and Golder Associates (2005) East Riding of Yorkshire Landscape Character Assessment, East Riding of Yorkshire Council; and
- Estell Warren Landscape Architect (1999) North Lincolnshire Landscape Character Assessment and Guidelines. North Lincolnshire Council.

14.13 The development site is not delineated within any of the identified district or local Landscape Character Assessments, however the land located immediately to the east falls within East Riding of Yorkshire Character Assessment, Landscape Character Type (LCT) 21: Drained Farmland and Landscape Character Area (LCA) 21d Paull Farmland[74].

14.14 Confirmation and updating of relevant Landscape Character Assessments will be undertaken as part of the EIA. Also a detailed assessment in terms of landscape character and its sensitivity to, and ability to absorb, change will be undertaken as part of the EIA.

Statutory Designations and Planning Policy

14.15 The desk study[xiii] has identified that there are no statutory landscape designations applicable on the development site. Spurn Point, located to the east of the site at a distance of approximately 25 km is a designated Heritage Coast. The nearest Area of Outstanding Natural Beauty (AONB) is the Lincolnshire Wolds located approximately 25 km to the south of the proposed site. The Howardian Hills AONB is situated at a greater distance (approximately 50 km) to the north of the proposed site. Due to the large distances between the site and these designated areas, the designated areas would be excluded from the scope of the full assessment.

[xiii] MAGIC, OS Explorer Maps 293, 281 and 284, aerial photography of the site and surroundings, consultations with: Natural England for the presence of sensitive landscape features and character; Hull City Council, Public Rights of Way and Tree Preservation Order teams; East Riding of Yorkshire Council, Public Rights of Way and Tree Preservation Order teams; and HRBT ES.

14.16 Two Country Parks; Humber Bridge Country Park and Waters Edge Country Park are located to the west of the proposed development site at an approximate distance of 15 km. Information in respect of conservation areas in included in Chapter 15. A Grade II Registered Park and Garden, East Park, has been identified to the north west of the site at a distance of less than 5 km (further information in respect of Registered Parks and Gardens is included within Chapter 15).

14.17 Tree Preservation Order (TPO) information has been requested from Hull City Council and East Riding of Yorkshire Council, for the area that covers the development site and the areas on the immediate boundaries. At the time of this study (March 2010) information in respect of TPOs has been received from Hull City Council, who confirmed that there are no trees subject to TPOs within or immediately adjacent to the site and its boundaries (8th March 2010). To date no confirmation has been received from the East Riding of Yorkshire Council. Updated information in respect of TPOs will be sought during the EIA.

14.18 Relevant landscape planning policy will be considered as part of the EIA. The sources of policy discussed below have to date been identified as relevant. The proposed development site lies within the administrative area of Hull City Council but is adjacent to the boundary with the East Riding of Yorkshire. The documents below form the relevant development plans:

- RSS for the North East (July 2008);
- JSP for Kingston upon Hull and the East Riding of Yorkshire (adopted June 2005);
- Kingston upon Hull City Council Local Plan (adopted 2000); and
- Holderness District Wide Local Plan (adopted 1999).

14.19 Within Hull City Council's Open Space Assessment, February 2009, reference is made to the objectives for the delivery of green corridors and in particular to the area within which the development site is situated: "*Promote the opportunities available to increase usage of green corridors, particularly working with ABP to increase access along the Humber foreshore'.*

14.20 Hull City Council has prepared a Public Rights of Way Improvement Plan. This document is due to be made available on Hull City Councils' website in Spring 2010 and will be referred to during the EIA to identify the potential for any future visual receptors.

Visibility

14.21 Visibility within the study area varies. In some locations extensive panoramic views are achievable due to the flat and low lying nature of the topography, with vertical man made features forming strong reference points in views and creating a varied skyline. Views down and across the estuary are also common, with long distance and panoramic views of the existing landscape experienced from points along the estuary edge. However, at a more local level the large-scale of the built structures and the industrial context, provide visual containment, restricting views in some instances.

Access

14.22 Information in respect of public rights of way has been taken from Ordnance Survey mapping[75] to identify potential visual receptors. Updated confirmation on the location of public rights of way will be sought from the relevant local authorities during the EIA.

14.23 The following long distance paths have been identified in the locality:

- Trans Pennine Trail (European Long Distance Route E2 – Atlantic - Mediterranean), which at its closest is located approximately 1.2 km to the west of the development site near to King George Dock. The trail heads from this location along the north bank of the Humber Estuary in a westerly direction until it reaches the Humber Bridge, here it continues in its westerly direction and also heads across the Humber Bridge;

- Viking Way (Long Distance Path), which at its closest is located approximately 13 km to the west of the development site on the south bank of the Humber Estuary. Starting to the east of the Humber Bridge, at Barton Haven near to Water Edge Country Park, this path heads in a westerly direction along the south bank of the Humber Estuary ; and
- Yorkshire Wolds Way (National Trail), which at its closest is located approximately 12 km to the west of the development site. This trail starts to the east of the Humber Bridge at Hessle Haven, it then heads along the north bank of the Humber Estuary in a westerly direction until it reaches North Ferriby where it heads inland in a northerly direction.

14.24 Several public footpaths have been identified within the study area. One public footpath, Footpath 22, starts at Lord's Clough and follows Old Fleet Drain before crossing the centre of the development site from east to west. From this point the route heads west along the estuary foreshore until it joins the Trans Pennine Trail. The footpath is currently stopped up to the south west of the site, where is starts to head along the edge of the Humber Estuary. The length of the existing footpath, from the south west corner of the site to its termination at Lord's Clough is just less than 2 km. The footpath currently follows the pre-1999 Humber Estuary bank route. Another footpath runs parallel to the Humber Estuary on the opposite bank to the south of the estuary.

14.25 The A1033 is situated to the north of the site traversing from east to west. A cycle route, Number 63, also runs from east to west to the north of the site. At a greater distance a footpath and cycle route runs over the Humber Bridge, which is situated to the west of the site.

Viewpoints

14.26 The following viewpoints have been identified from Ordnance Survey sources[76]. Also included below are views identified in the cultural heritage scoping for their heritage importance (see Chapter 15):

- viewpoints located both to the north and south of the Humber Estuary near the Humber Bridge;
- viewpoint near Albert Docks;
- viewpoint from the Paull Point Battery (scheduled monument and museum);
- viewpoints from the northern and western edges of the Paull Conservation Area and the Grade II listed lighthouse and keeper's house (see Chapter 15);
- views from open ground in the Marfleet Conservation Area and from the churchyard of the Grade II listed Church of St Giles (see Chapter 15);
- views from locally listed buildings in the Marfleet Conservation Area (see Chapter 15); and
- views from the Church of St Andrew, Paull Grade I listed (see Chapter 15).

14.27 In addition to those identified above the following potential receptors may include, but are not limited to, residents of and visitors to the surrounding settlements, including the more recent residential developments along the estuary edge to the west of the site:

- residents of and visitors to the settlements to the south of the estuary;
- visitors to Albert Docks and the aquarium to the north west of the site;
- visitors to the retail development at St Andrews Quay;
- users of the public footpath routes, especially users of the Trans Pennine Trail, and the footpath that runs through the development site;
- visual receptors also include users of the estuary, including passengers on the ferries; and
- users of cycle routes within the area, including route number 63 to the north of the site.

14.28 Also several recreational uses and their associated visual receptors have been identified, including those associated with the caravan sites and an outdoor centre, situated to the west of the site on the southern side of the estuary in the vicinity of the settlement of Barton-upon-Humber.

14.29 The location and nature of visual receptors will be reviewed during the EIA to ensure that all sensitive receptors or receptors that would potentially be subject to significant impacts are considered.

Potential Impacts

14.30 The inherent industrial nature and large-scale of the proposed development may result in impacts upon landscape and visual receptors. It is anticipated that the EIA may identify additional impacts over those identified in the following sections; however the appraisal of key development components discussed here provides an initial understanding of the potential impacts. This understanding allows the early identification of mitigation measures that can influence and be integrated into the development of the design of the Humber Renewables Project. Furthermore these initial findings will be used to guide the direction and scope of further assessment work.

Construction

14.31 Impacts on positive landscape elements during the construction phase are not anticipated to be significant; however changes in patterns and structure of the landscape may occur as a result of the introduction of new temporary features. The plant and construction requirements are not fully known at this stage however temporary visual disturbance may occur as a result of the construction activities. This could include the presence of moving features such as the plant and could result from increased illumination.

Operation

14.32 The potential impacts identified below are based on information available to date and on assumptions concerning the design of the proposed development which are as follows:

- a stack of between 80 and 120 m in height;
- several large-scale buildings being required to house the power station, the details of which are not known at this time, but will be considered during the full EIA in terms of roof style and enclosure methods;
- cable routes / overhead lines going off site along the expected grid corridor (the location of this is not known at present);
- an enclosed conveyor connection and a transfer tower;
- both underground and potentially over ground pipes being required to supply water, telecommunications etc. to the site;
- illumination of the site, the extent of which is not known at this stage; and
- anticipated operation of the proposed development for 24 hours a day, seven days a week.

14.33 Therefore during the operational phase potential impacts may include the following:

- long-term changes in existing landscape structure and pattern though the addition of landscape elements, especially new vertical structures;
- long-term changes in views achieved from receptor locations identified in the baseline section; and
- long-term increased illumination and activity within the site.

Assessment Methodology

14.34 The approach for the assessment in the EIA will be based on a methodology developed in accordance with guidance set out in the Landscape Institute and the Institute of Environmental Management Guidelines for Landscape and Visual Impact Assessment published by Spon (2002). Reference will also be made to Landscape Character Assessment: Guidance for England and Scotland, prepared by Land Use Consultants on behalf of the Countryside Agency and Scottish Natural Heritage (2002). The assessment will also include an analysis of the proposed development on the settings of designated heritage assets identified above and in Chapter 15. This will be undertaken with reference to PPG 15, PPG 16 and available English Heritage guidance, and will be supported by a cultural heritage specialist.

14.35 As part of the impact assessment a Zone of Theoretical Visibility (ZTV) will be prepared for the proposed development in its operational form. This will be undertaken prior to the field studies. It may be appropriate to extend the limits of the collated baseline information to reflect the area delineated by the ZTV. The limits of the study area will be agreed with the relevant stakeholders.

Construction

14.36 The landscape and visual impact assessment of the construction phase will be approached in the following stages:

- confirmation and identification of the baseline landscape context, including consultations with relevant authorities on the locations of public rights of way (definitive map search) and TPOs (data update request). This will also include desk top review of current landscape designations and relevant policy for the study area (as identified above). Field studies will be undertaken to check and verify gathered information and to verify the ZTV. A photographic record will be undertaken as part of the field studies; best practice guidelines will be used when taking photographs[76]. The field studies will include confirmation of the visual receptors within the study area and the location of key viewpoints. These details will also be agreed in consultation with the relevant stakeholders including those identified in Chapter 15;
- identification of landscape and visual receptors, and the evaluation of the sensitivity of the identified receptors;
- review of the proposed development design, and the identification and confirmation of potential sources of impact that may arise during this phase;
- prediction of landscape and visual effects during the construction phase and the appraisal of their significance. This will include an assessment of the quality and sensitivity of the landscape elements and character. It will also include an assessment of the sensitivity of the agreed viewpoints. Criteria will include the number of visual receptors affected and the quality of the view. The establishment of thresholds of effect, or impact significance, is recognised as a valid way of standardising the conclusions of the landscape and visual assessment. The significance of the effect will depend not only on the magnitude of the change (impact) but also on the sensitivity of the location or receptor, these will be assessed during the EIA using standard classifications; and
- consideration of mitigation measures to address potential significant adverse landscape and visual effects it required.

Operation

14.37 The landscape and visual impact assessment of the operational phase will be approached in the following stages:

- review of the proposed development design, and the identification and confirmation of potential sources of impact that may arise during the operational phase;
- prediction of landscape and visual effects during the operational phase and the appraisal of their significance. These will be assessed in terms of both Year 1 and Year 15 so that consideration of the establishment of any mitigation measures can be factored into the assessment. An assessment of the quality and sensitivity of the landscape elements and character will be undertaken. This will also include an assessment of the sensitivity of the agreed viewpoints, including relevant illustrative material such as photomontages, to assess the impact of the proposed development on each view. Criteria will include the number of visual receptors affected and the quality of the view. The establishment of thresholds of effect, or impact significance, is recognised as a valid way of standardising the conclusions of the landscape and visual assessment. The significance of the effect will depend not only on the magnitude of the change (impact) but also on the sensitivity of the location or receptor, these will be assessed during the EIA using standard classifications; and
- consideration of mitigation measures to address any potential significant adverse landscape and visual effects, and the identification of residual effects.

Potential Mitigation Measures

14.38 Potential mitigation measures cannot be identified based on the information available to date. Identification of mitigation measures will be addressed in the EIA, as applicable, based on the outcome of the impact assessment.

15. Cultural Heritage

Overview

15.1 This chapter provides an overview of the likely effects of the proposed Humber Renewables Project on the cultural heritage resource and presents the proposed approach to the assessment of those effects. It includes a discussion of baseline conditions and sensitivity, identification of potential impacts, proposed impact assessment methodology for assessment of both the construction and operational phases of the Project, and possible mitigation measures. Cumulative / in-combination impacts owing to other planned developments are not discussed herein; however, these will be identified and considered in the EIA.

Baseline Description and Sensitivity

15.2 The following section examines the cultural heritage baseline for the proposed development by reference to archaeological remains, built heritage assets and the wider historic landscape.

Archaeological Remains

15.3 The proposed development site is located on reclaimed land to the south east of Queen Elizabeth Dock within Associated British Port's port estate. Analysis of historic Ordnance Survey mapping from approximately 1855 to 2008 indicates that the development site was reclaimed in stages in the latter half of the 20th century (see Figure 15.1). The 1956 map shows the site as mud flats (much of which lay below the mean high water line), with saltings at the north end, whilst the 1971 map shows the majority of the site as reclaimed land. The southern part of the development site was reclaimed during, or after, 1999.

15.4 There are no known archaeological sites recorded within the boundaries of the proposed development site. Given the recent reclamation of the site there is no potential for archaeological remains within the boundary of the proposed development. The proposed development site is therefore not sensitive in terms of archaeological remains.

15.5 There are four Scheduled Monuments in the wider landscape around the site. These are, in order of distance:

- Paull Point Battery, coastal artillery battery and Submarine Mining Establishment approximately 2.5 km south east of the proposed development (see Figure 15.2);
- Hedon Medieval Town approximately 3 km to the east;
- Paull Holme moated site and tower approximately 4 km to the south east; and
- Hull Castle, South Blockhouse and part of late 17th century Hull Citadel Fort at Garrison Side approximately 4.5 km to the east.

15.6 The visual setting of these types of sites can be sensitive to change and potential impacts are discussed below. The assessment for the EIA will include further baseline analysis of the monuments that may be affected in the form of site visits, review of published material and consultation with English Heritage.

Figure 15.1 - Stages of Reclamation of Development Site

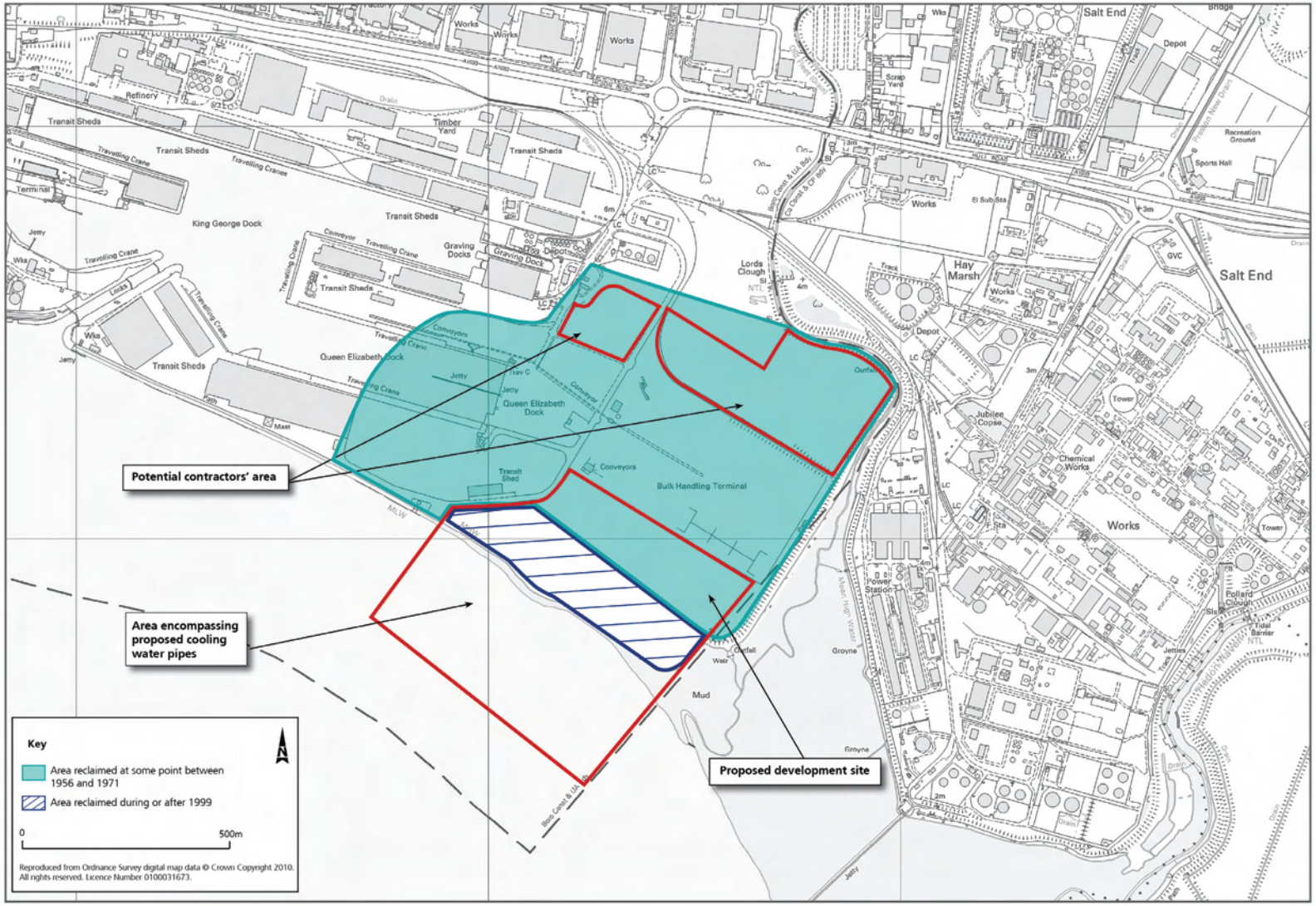
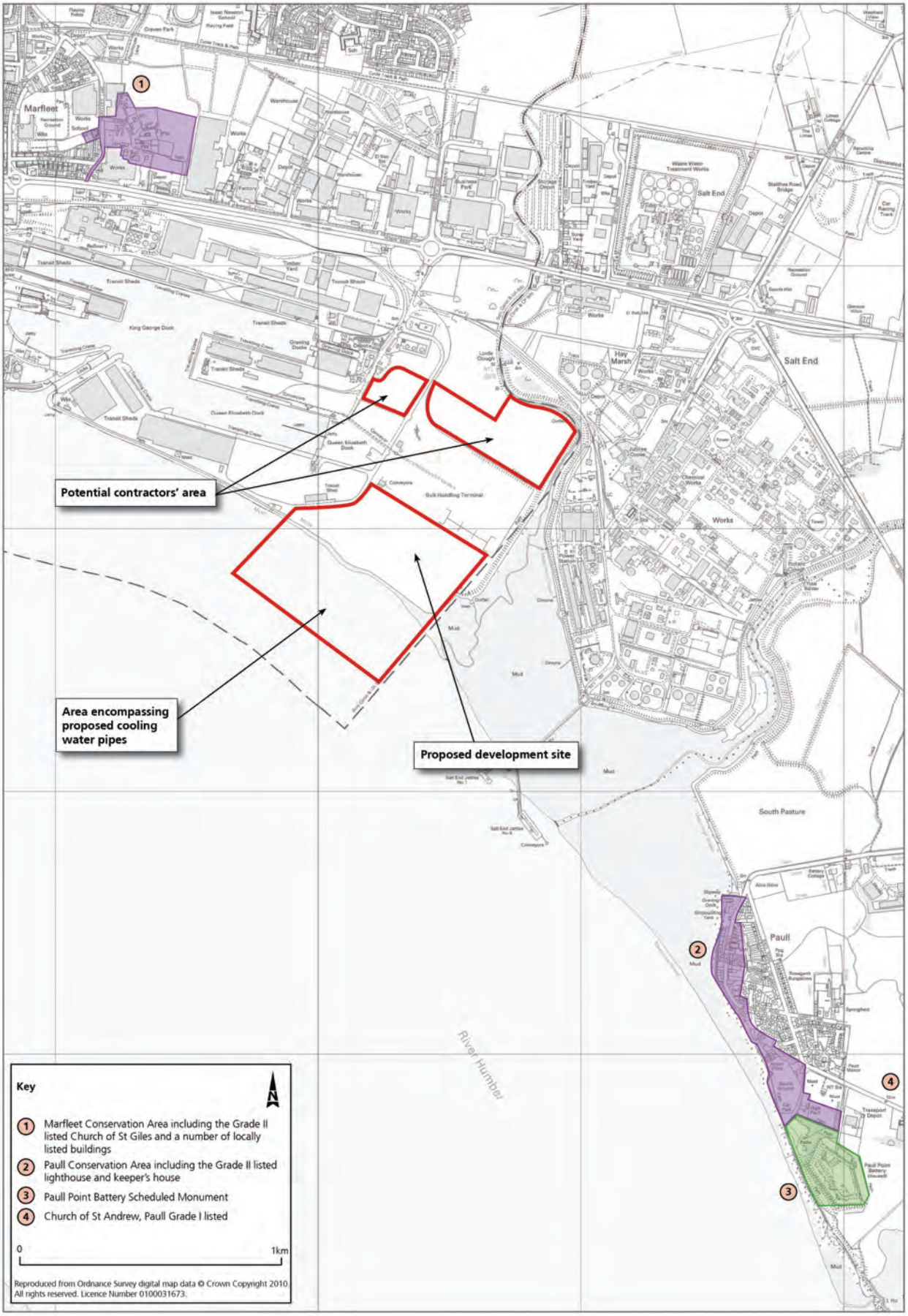


Figure 15.2 - Scheduled Monuments in Vicinity of Development Site



Built Heritage Assets

15.7 There are no historic buildings within the boundaries of the proposed development site. Within the wider landscape around the development site there are a number of conservation areas, listed buildings and locally listed buildings. These are set out below in order of distance from the site:

- Marfleet Conservation Area including the Grade II listed Church of St Giles and a number of locally listed building approximately 1.5 km to the north west of the proposed development site (see Figure 15.2);
- Paull Conservation Area including the Grade II listed lighthouse and keeper's house approximately 1.5 km to 2.5 km to the south east of the proposed development site (see Figure 15.2);
- Church of St Andrew, Paull Grade I listed approximately 2.5 km south east of the proposed development site (see Figure 15.2); and
- Alexandra dock complex including a number of Grade II and Grade II* listed structures and buildings such as the docks, lock gates, steam crane and engine / pump houses approximately 3 km to the west of the proposed development site.

15.8 The setting of these types of assets can be sensitive to change and potential impacts are discussed below. Future assessment for the EIA will include further baseline analysis of the buildings and areas that may be affected in the form of site visits, review of published material and consultations with relevant conservation officers.

Historic Landscape

15.9 The proposed development site lies in a modern, highly industrialised landscape on the edge of Hull's dockland zone. To the west are modern dock buildings, the north is dominated by 20th century industrial / commercial development and road infrastructure, whilst the area to the east is dominated by a large-scale chemicals works and power station. The proposed development site is situated on recently reclaimed ground and has no distinguishing features of historic interest.

15.10 The site and the wider historic landscape are of no historic significance or sensitivity. Therefore no further baseline work will be undertaken in relation to the historic landscape.

15.11 There is one Grade II Registered Historic Park and Garden (East Park) approximately 4 km to the north west. This is situated within an urban area and its setting would not be affected by the proposed development. No further baseline work will be undertaken in relation to this.

Potential Impacts

15.12 The following section considers the potential impact that the proposed development may have as a result of its construction and operation in relation to archaeological remains, built heritage assets and the wider historic landscape.

Construction

Archaeological Remains

15.13 The proposed development site has no potential to contain archaeological remains. Consequently there will no direct physical impacts on archaeological remains.

15.14 There are four scheduled monuments in the area around the proposed development; the following examines the potential impact of the development on their settings:

- Paull Point Battery, coastal artillery battery and Submarine Mining Establishment approximately 2.5 km south east of the proposed development (see Figure 15.2): the proposed development would be situated upstream from the battery and would not feature in historically important views across the estuary and downstream. Any views from the monument to the development site would be largely screened by local vegetation and nearby urban form. The development would also be situated within a wider modern industrial landscape and would not be out of keeping with the monument's existing setting. Given these factors and the associated distance the proposed development is not considered to have a significant impact on the setting of the scheduled monument. However as the monument is of national importance, however further assessment will be undertaken as part of the landscape and visual impact assessment for the EIA (see below and Chapter 14);
- Hedon Medieval Town approximately 3 km to the east of the proposed development: any glimpsed views from the western parts of the monument, which circumnavigates the town, towards the proposed development are dominated in the foreground by views of existing major industrial development. Given this and the distances involved the proposed development would have no impact on the setting of the monument;
- Paull Holme moated site and tower approximately 4 km to the south east of the proposed development: local topography, distance and the existing industrialised nature of the landscape around the development site mean that the proposed development would have no impact on the setting of this monument; and
- Hull Castle, South Blockhouse and part of late 17th century Hull Citadel Fort at Garrison Side approximately 4.5 km to the east of the proposed development: the monument is located on the edge of the city centre. Views west towards the development site are dominated and screened by existing built form, and given this and the distance it is clear that the proposed development will not affect the setting of the monument.

15.15 Overall, the only possible impact on the archaeological resource associated with the construction of the proposed development is its potential to alter the setting of the Paull Point Battery Scheduled Monument. Any impact is however likely to be slight but given the national importance of the monument this will be confirmed by further assessment (see below).

Built Heritage Assets

15.16 The proposed development site contains no historic buildings or structures. Consequently, there will be no direct physical impacts on built heritage assets. Within the wider landscape around the proposed development site there are a number of conservation areas, statutorily listed buildings and locally listed buildings. The following examines the potential impact of the scheme on their settings:

- Marfleet Conservation Area including the Grade II listed Church of St Giles and a number of locally listed buildings: this small largely undeveloped Conservation Area and its locally and statutorily listed buildings are surrounded by modern industrial and commercial development and major road infrastructure. The proposed development lies approximately 1.5 km away and it is possible that views of the upper parts of the proposed development (where these show above the exiting urban form) may be achieved from locations across the conservation area and near to the listed church and locally listed buildings. These visual alterations to the setting of the site would be in keeping with its existing modern industrial surroundings and consequently are very unlikely to be significant or contrary to policy; further assessment of the potential changes is required. This would form part of the landscape and visual impact assessment for the EIA (see below);

- Paull Conservation Area including the Grade II listed lighthouse and keeper's house: there would be clear views from the conservation area, particularly from the northern half of the area and the estuary edge, towards the proposed development. The proposed development would become a noticeable feature in views from the area to the north west; however it would be read as part of a wider industrial landscape and would not significantly alter the character or form of the conservation area's setting. Given the absence of substantial intervening built form it is considered important to assess further the likely changes to views from the conservation area, although the current industrialised nature of the views means that changes are very unlikely to represent a significant adverse impact and are not likely to be contrary to policy. Further assessment would form part of the landscape and visual impact assessment for the EIA (see below);
- Church of St Andrew, Paull Grade I listed: the building is located on a south west facing slope and is largely screened from the proposed development site. Any views of the upper parts of the proposed development from the churchyard or local landscape would not be visually intrusive given the distances involved (approximately 2.5 km) and would also be read as part of the wider industrial landscape. Even though there is only a minimal possibility of an impact the building is Grade I listed and therefore a precautionary approach is required and further assessment as part of the landscape and visual impact assessment for the EIA will be undertaken (see below); and
- Alexandra dock complex including a number of Grade II and Grade II* listed structures and buildings: the complex's historical and modern setting is that of a largely industrialised dockland landscape. The development of a new power station approximately 3 km to the east, with an existing facility in the background, would therefore not change the nature and form of the setting of the listed buildings in this complex even if there were distant views from the complex to the development.

Historic Landscape

15.17 The proposed development would have no impact on the historic fabric or character of the existing industrial landscape.

Operation

15.18 In addition to the impacts discussed under construction, operational factors such as night time lighting and anti-collision lighting may affect the setting of the following designated assets:

- Paull Point Battery Scheduled Monument;
- Marfleet Conservation Area including the Grade II listed Church of St Giles and a number of locally listed buildings;
- Paull Conservation Area including the Grade II listed lighthouse and keeper's house**;** and
- Church of St Andrew, Paull Grade I listed.

15.19 The scale of such impacts is likely to be relatively minor given the industrialised nature of the wider landscape. However, further assessment will be undertaken as part of the landscape and visual impact assessment for the EIA (see Chapter 14).

Assessment Methodology

Construction and Operation

15.20 The potential changes to the settings of the designated assets that are listed below will be assessed as part of the landscape and visual impact assessment for the EIA and will be reported in the chapter addressing that assessment in the ES. This process will include input from a cultural heritage specialist to define the setting of the affected assets, consultation with English Heritage concerning the Scheduled Monument and consultation with the relevant conservation officers. The designated assets are:

- Paull Point Battery Scheduled Monument;
- Marfleet Conservation Area including the Grade II listed Church of St Giles and a number of locally listed buildings;
- Paull Conservation Area including the Grade II listed lighthouse and keeper's house; and
- Church of St Andrew, Paull Grade I listed.

15.21 No further assessment of impacts on archaeological remains within the scheme footprint or the wider historic landscape is required. Given this, a separate chapter addressing cultural heritage will not be produced for the ES but the above matters will be considered in the chapter addressing landscape and visual impact.

Potential Mitigation Measures

15.22 Detailed design measures including materials, colours, lighting and the location of the stack for the proposed development will be considered as part of the design process to minimise and avoid any potential impacts on the setting of the identified designated assets.

16. Socio-economics

Overview

16.1 This chapter presents the proposed approach to the socio-economic assessment for the construction and operational phases of the Humber Renewables Project. It includes sections relating to baseline conditions, preliminary identification of potential impacts, proposed impact assessment methodology and the potential for the requirement of mitigation measures.

16.2 Cumulative / in-combination impacts due to other planned developments are not discussed herein; however, these will be identified and considered in the EIA.

Baseline Description and Sensitivity

16.3 The site is located within an established industrial area on the outskirts of the Hull City Council area. The JSP sets the framework for the development and use of land up to 2016 in the combined council areas of city of Hull and East Riding of Yorkshire.

16.4 For the purposes of the study, a range of geographical areas will be identified for which socio-economic effects of the proposed development will be measured. These include:

- local area: defined as the area surrounding the proposed development with partial inclusion of the ward of Southcoates West within the Hull City Council area and partial inclusion of the ward of South West Holderness within the East Riding of Yorkshire Council area. More specifically, these include part of the industrial area at the outskirts east of Hull City, Paull settlement, the area between Paull and Saltend, and the east part of Hedon urban centre;
- sub-regional area: defined as the area within the administrative boundaries of Hull City Council and East Riding of Yorkshire Council; and
- regional area: defined as the English region of Yorkshire and Humberside.

16.5 The population change over the past two decades has been highly variable within the sub-regional area and between the two council areas. Total population in East Riding of Yorkshire in 1991 was 294,400 rising to 314,900 in 2001 and 335,000 in 2008, showing a 7% total increase between 1991 and 2001, and 6.4% increase between 2001 and 2008. Conversely in the Hull City Council area total population in 1991 was 263,000 falling to 249,900 in 2001, before recovering to 258,700 in 2008. This change translates to 5.1% decrease in the number of residents between 1991 and 2001, and 3.5% increase between 2001 and 2008.

16.6 Time-serious data and mid-year population estimates are not available for the local area. However, based on 2001 census data, there were some 3,160 people living in the area. Using local census data for the local area, it is apparent that the locality in which the site is situated is heavily dependent on manufacturing employment. Some 40% of total employment in the locality is accounted for by the manufacturing sector compared to 17% in the city of Hull as a whole and 14% in the East Riding of Yorkshire. Similarly, a high proportion of employees hold elementary occupations and jobs in process, plant and machine operations. This is more evident within parts of Southcoates West ward where over one third of employees hold low skilled jobs (41%).

16.7 In terms of deprivation, over half of the wards in the city of Hull fall within the most deprived 10% of all wards in England. Furthermore, unemployment is the city is significantly higher than the national average.

16.8 Initial analysis of baseline data indicates that the areas where socio-economic effects of the proposed development are likely to be most pronounced are subject to significant social and

economic challenges including structural industrial vulnerability, unemployment, poor skills base and deprivation.

16.9 In terms of policy guidance, the JSP recognises the need to make "*best and most appropriate use of the area's significant economic asset*" whilst it identifies strategic employment sites which include the Hedon Haven / Paull area where more industry could be developed.

16.10 A more detailed analysis of existing socio-economic conditions will be undertaken as part of the EIA to provide a benchmark against which potential impacts can been assessed. These conditions will include: key socio-economic indicators such as employment activity; structure of local industry; unemployment; employment opportunities and skills; population change; and age structure of the local population. The analysis will also consider the local and regional policy context in terms of identifying key economic, social and regeneration priorities for the impact areas. This will include an outline of key policies which seek to enhance the role of sourcing energy from renewable resources in meeting economic and social objectives.

16.11 Establishing the baseline will primarily be a desk-top exercise, drawing on national, regional and local economic data and sources such as the Census, Office of National Statistics, Labour Force Survey and Indices of Deprivation, as well as publications from local and regional sources. At this stage, it is anticipated that most of the information relating to the administrative areas of Hull City Council and East Riding of Yorkshire Council and the surrounding areas will be provided through secondary sources including the websites of the local authorities and Yorkshire Forward.

Potential Impacts

Construction

16.12 The construction of the Humber Renewables Project could result in both adverse and beneficial impacts including:

- temporary employment associated with the construction programme;
- indirect and induced employment which comprises:
  - employment arising offsite in response to the demand generated by the proposed development in relation to construction materials and supplies;
  - employment arising from employee's (including contractors) expenditure on local goods and services;
- inconvenience / nuisance impacts to local communities including those associated with:
  - stress as a result of poor communication / consultation and / or stress associated with construction activities (e.g. arising from noise, traffic congestion), and
  - interruption to the use of (or limited access to) local amenities, which could affect for example leisure activities; and
- potential changes to land / property values.

Operation

16.13 The potential impacts associated with the operational phase of the Project are largely the same as those listed above during the construction phase:

- employment associated with the operators of the completed development;
- indirect and induced employment which comprises:
  - employment arising offsite through the increased demand for goods and services by the operators of the development; and

- employment arising from employee's (including the operators) expenditure on local goods and services;

- introduction of new skills / training opportunities;
- inconvenience / nuisance impacts to local communities including those associated with:
  - stress as a result of poor communication / consultation and / or stress associated with operational activities (e.g. arising from noise, traffic congestion), and
  - limited access to local amenities, which could affect for example leisure activities; and
- potential changes to land / property values.

16.14 The operation of the proposed development will generate electricity for supply to the national grid and contribute towards the national target of generating 15% of energy from renewable resources by 2020. Furthermore, the design of the power station provides the potential to allow the future supply of steam and / or heat to potential consumers in the nearby industrial area.

Assessment Methodology

16.15 This section considers the assessment methodology and the temporal, spatial and technical scope of the socio-economic issues to be assessed in the EIA for the construction and operational phases of the Project.

16.16 The socio-economic impact assessment will examine the potential national, regional and local impacts. Regional impacts will be considered in terms of the areas within the boundaries of Hull City Council and East Riding of Yorkshire Council, local impacts will be considered in relation to the immediate area surrounding the proposed development.

16.17 The methodology for the evaluation of socio-economic impacts will be based on previous experience of similar developments and professional judgement. Statutory requirements and Government advice will be taken into account; these will include:

- Circular 02/99: Environmental Impact Assessment, Department for the Environment, Transport and the Regions, 1999;
- Environmental Impact Assessment: Guide to Procedures, Department for Communities and Local Government, 2000;
- Environmental Impact Assessment: A Guide to Good Practice and Procedures: A consultation paper June 2000, Department for Communities and Local Government, 2000; and
- Amended Circular on Environmental Impact Assessment: A consultation paper June 2006, Department for Communities and Local Government, 2006.

16.18 The significance of the socio-economic effects will be based on defined assessment criteria; an example of the type of criteria that could be used is provided in Table 16.1.

Table 16.1 - Assessment Criteria for Magnitude of Socio-economic Impacts

Magnitude	Description
Major beneficial	Positive effect on economic or social activity at a national level
Moderate beneficial	Positive effect on economic or social activity at a regional level
Minor beneficial	Temporary or permanent positive effect on economic or social activity at a local level
Negligible	Little or no effect on economic or social activity at a local level
Minor adverse	Temporary or permanent adverse effect on economic or social activity at a local level
Moderate adverse	Adverse effect on economic or social activity at a regional level
Major adverse	Adverse effect on economic or social activity at a national level

16.19 It is envisaged that there will be limited or no specific consultation undertaken as part of the socio-economic impact assessment, given the location of the proposed development away from residential areas and within an existing industrial environment.

Construction

16.20 The assessment for the construction phase will focus on the number of direct and indirect jobs that are likely to be associated with the construction of the development. The assessment will also identify impacts of the Project on demand for local services and amenities, including any additional requirements for health and education services.

16.21 Direct impacts to people relating to increases in noise, traffic, congestion, dust, visual impact etc. during the construction phase will be assessed (as necessary) in the relevant EIA chapters (i.e. noise, transport, air quality etc.); however, the socio-economic assessment will consider the potential inconvenience / stress caused to communities as a result of these impacts.

16.22 Potential impacts on land and property values associated with the construction phase are not expected to be significant and will only be briefly discussed in the ES.

Operation

16.23 The focus of the assessment for the operational phase will be the number of direct and indirect jobs that are likely to be associated with the operation of the power station. The assessment will consider the impacts of the Project on demand for local services and amenities, including any additional requirements for health and education services.

16.24 Direct impacts to people relating to increases in noise, traffic, congestion, dust, visual impact etc. arising from the operation of the power station will be assessed (as necessary) in the relevant EIA chapters (i.e. noise, transport, air quality etc.); however, the socio-economic assessment will consider the potential inconvenience / stress caused to communities as a result of these impacts.

16.25 Potential impacts on land and property values associated with the operation of the power station are not expected to be significant and will only be briefly discussed in the ES.

16.26 The other key issue to be assessed will be the role of the Project in meeting local, regional and national policies aimed at maximising the economic and social benefit of supplying energy from renewable resources.

Potential Mitigation Measures

16.27 At this early stage in the Project the scope of, and requirement for, mitigation measures cannot be identified. However, in the EIA the socio-economic assessment will consider mitigation measures which will aim to avoid, minimise or compensate for any adverse impacts.

17. Summary of Environmental Impact Assessment Topics

17.1 As a result of the work that has been undertaken to produce this scoping report, it has not been possible to identify any of the EIA topics as being insignificant and therefore not needing to be addressed in the EIA. It has however been possible to determine that separate chapters addressing cultural heritage and waste will not be provided in the ES.

17.2 For cultural heritage the decision is based on the fact that no further assessment is required of the impacts on archaeological remains within the Project footprint or the wider historic landscape. Potential changes to the settings of the four designated assets for which assessment is necessary (see Chapter 15) will be addressed as part of the landscape and visual impacts assessment within the EIA. The results of the assessment will therefore be reported in the chapter of the ES addressing landscape and visual impacts.

17.3 Waste will initially be addressed within a sub-section of the development description chapter of the ES. The potential impacts associated with the waste will then be addressed within the relevant assessment chapters of the ES e.g. air quality, land quality, water quality, ecology and transport (as applicable).

17.4 For all of the other EIA topics that have been addressed in this scoping report the ES will include a separate chapter presenting the results of the EIA. On this basis the draft outline of the ES is provided in Section 18.

18. Draft Outline of Environmental Statement

18.1 It is proposed to adopt a three volume format for the ES, comprising of the following volumes:

- Volume 1: Non-technical Summary;
- Volume 2: Environmental Statement Main Text; and
- Volume 3: Environmental Statement Figures.

18.2 The ES Main Text (Volume 2) will comprise of a series of introductory chapters and EIA chapters, the preliminary format for which is presented below:

- Introduction;
- Rationale and Need for the Development;
- Alternatives;
- Description of Development Site and Surroundings;
- Description of Development;
- Plans and Policies;
- EIA Methodology;
- Stakeholder Consultation;
- Air Quality;
- Land Quality, Geology and Hydrogeology
- Hydrology and Water Quality;
- Sediment and Geomorphology;
- Flood Risk
- Ecology;
- Noise and Vibration;
- Transport;
- Landscape and Visual;
- Socio-economics;
- Summary of Impact Assessment;
- Cumulative Impacts.

18.3 Each of the chapters addressing an EIA topic is proposed to have the following approximate format:

- Introduction;
- Legislation and Policy
- Assessment Methodology and Significance Criteria;
- Baseline Description;

- Identification of Potential Impacts;
- Impact Assessment;
- Mitigation Measures;
- Residual Impact Assessment; and
- Summary / Conclusion.

19. References

[1] Climate Change Act 2008; 2008; Great Britain; Parliament

[2] Directive 2009/28/EC of the Euopean Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2203/30/EC; 2009; Official Journal of the European Union L 140/16

[3] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC; 2003; Official Journal of the European Union L 275/32

[4] Directive 2001/80/EC of the European Parliament and of the Council of October 2001on the limitation of emissions of certain pollutants into the air from large combustion plants; 2001; Official Journal of the European Community L 309/1

[5] The UK Low Carbon Transition Plan, 2009; Department of Energy and Climate Change. Available at: http://decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.asp

[6] Hull Riverside Bulk Terminal; Environmental Statement; D122173; 2010; Associated British Ports Marine Environmental Research and Scott Wilson

[7] Local Air Quality Management Updating and Screening Assessment; April 2009; Kingston Upon Hull City Council

[8] 2009 Air Quality Updating and Screening Assessment for East Riding of Yorkshire Council; February 2010; East Riding of Yorkshire Council

[9] Environment Agency 'What's in your backyard'. Available at http://www.environment-agency.gov.uk/homeandleisure/37793.aspx

[10] Design Manual for Roads and Bridges; Volume 11; May 2007; Highways Agency. Available at http://www.standardsforhighways.co.uk/dmrb/index.htm

[11] HMIP Technical Guidance Note (Dispersion) D1: Guidelines on Discharge Stack Heights for Polluting Emissions; 1993; Her Majesty's Inspectorate of Pollution; ISBN 0-11-752794-7

[12] Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Cmd paper No. 7169); July 2007; Department for Environment, Food and Rural Affairs

[13] Local Air Quality Management Technical Guidance LAQM.TG(09); February 2009; Department for Environment, Food and Rural Affairs. Available at http://www.defra.gov.uk/environment/quality/air/airquality/local/guidance/

[14] Development Control: Planning For Air Quality (2010 Update) - Draft for Consultation; February 2010; Environmental Protection UK

[15] H1 Environmental Risk Assessment for Permits – Draft for Consultation; September 2009; Environment Agency

[16] Environmental Protection Act 1990; 1990; Great Britain; Parliament

[17] Environmental Protection Act 1990: Part IIA Contaminated Land; Statutory Guidance; Circular 01/2006; 2006; Department of Environment, Food and Rural Affairs

[18] CLR11: Model Procedures for the Management of Land Contamination; 2004; Department of Environment, Food and Rural Affairs and Environment Agency

[19] Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances; 1980; Official Journal of the European Community L 020

[20] The Groundwater Regulations 1998; 1998; SI No. 2746; Great Britain; Parliament

[21] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for community action in the field of water policy; 2000; Official Journal of the European Community L 327/1

[22] The Water Act 2003; 2003; Great Britain, Parliament

[23] Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration; 2006; Official Journal of the European Union L 372/19

[24] Building Control Regulations 1991 (as amended); SI No. 2768; 1991; Greta Britain, Parliament

[25] Approved Document C - Site Preparation and Resistance to Contaminates and Moisture; 2004; Office of the Deputy Prime Minister

[26] The Control of Substances Hazardous to Health Regulations 2002 (as amended); SI 2002 No. 2677; 2002; Great Britain, Parliament

[27] Planning Policy Statement 23 Planning and Pollution Control; 2004; Department of Communities and Local Government (Former Office of the Deputy Prime Minister)

[28] Environmental Impact Assessment; A Guide to Good Practice and Procedures; A consultation paper; 2006; Department for Communities and Local Government

[29] Contaminated Land Risk Assessment, A Guide to Good Practice (C552); 2001; Construction Industry Research and Information Association

[30] Guidance on the Safe Development of Housing on Land Affected by Contamination; R&D Publication 66; 2008; National House Building Council, Environment Agency and Chartered Institute of Environmental Health

[31] Envirocheck Report; April 2008; Landmark Information Group

[32] Personal Communication; Jane Gray; Environment Agency

[33] Pollution Prevention Guidelines; 2007; Environment Agency, Scottish Environment Protection Agency, and Environment and Heritage Service. Available at: http://www.netregs.gov.uk/netregs/links/63875.aspx

[34] Reference Document on the Application of Best Available Techniques to Industrial Cooling Systems; pages 30, 277, 282 and 287; December 2001; European Commission. Available at: http://eippcb.jrc.es/pub/english.cgi/0/733169

[35] Guidance on information requirements and chemical safety assessment; Draft Version 2.0; Chapter R.16: Environmental Exposure Estimation; 2010; European Chemicals Agency (ECHA). Available at: http://guidance.echa.europa.eu/docs/guidance_document/draft_guidance_ir_csa_r16_en_forum_20100126.pdf (last viewed 09/03/2010)

[36] Environmental Standards and Conditions; Final; March 2008; UK Technical Advisory Group on the Water Framework Directive. Available at:

http://www.wfduk.org/UK_Environmental_Standards/LibraryPublicDocs/UKTAG_Report_Surface_Water_Standards_and_Conditions

[37] Proposals for environmental quality standards for Annex VIII substances; Final; June 2008; UK Technical Advisory Group on the Water Framework Directive. Available at: http://www.wfduk.org/stakeholder_reviews/stakeholder_review_1-2007/LibraryPublicDocs/final_specific_pollutants

[38] European Marine Sites: toxic substances and associated mixing zones WQTAG083f; Implemented; July 2005; Babbedge N and Taylor M; Habitats Directive Technical Advisory Group on Water Quality

[39] Guidance on assessing the impact of thermal discharges on European Marine Sites; WQTAG160 (version 4); Final; January 2006; WQ sub-group; Habitats Directive Technical Advisory Group on Water Quality

[40] Humber Geomorphological Studies – Stage 2: 3D Modelling of Flows, Salinity and Sediment Transport in the Humber Estuary; Report No R.854; January 2000; ABP Research and Consultancy Ltd

[41] Flood/ebb tidal asymmetry in a shallow sandy estuary and the impact on net sand transport; Geomorphology; 114; 431-439; 2009; Brown JM

[42] The transport of fine sediment in the Humber estuary; Report 4; Estproc; May 2003. Available at http://www.estproc.net/documents/report04.pdf

[43] Physical processes in the Humber Estuary; Report for the Environment Agency on LOIS Special Topic 56-6STy02y747; 2001; Hardisty J; Hull: University of Hull

[44] Seasonality of the turbidity maximum in the Humber-Ouse estuary; Marine Pollution Bulletin; 37(3):206 – 215; 1999; Uncles RJ, Easton AE, Griffiths ML, Harris C, Howland RJM, King RS, Morris AW and Plummer DH.

[45] A preliminary net sediment budget for the Humber Estuary; The Science of the Environment; 314-316; 755-767; 2003; Townend I and Whitehead P

[46] Natural England Profiles No 21 – The Humber Estuary; available at http://www.english-nature.org.uk/Science/natural/profiles%5CnaProfile21.pdf

[47] Humber Estuary and Coast; East Yorkshire Coastal Observatory; 1994; Hull University. Available at http://www.hull.ac.uk/coastalobs/

[48] Physical characteristics; In: The Quality of the Humber Estuary 1961-1981; 1982; Gameson, ALH; Humber Estuary Committee

[49] Review and Formalisation of Geomorphological Concepts and Approaches for Estuaries; FD2116; 2007; Department for Environment, Food and Rural Affairs

[50] Planning Policy Statement 25: Development and Flood Risk; December 2006; Department of Communities and Local Government

[51] Hull Riverside Bulk Terminal; Flood Risk Assessment; D122173; 2010; Scott Wilson

[52] Multi-Agency Geographic Information for the Countryside website http://www.magic.gov.uk/

[53] Joint Nature Conservation Committee website http://www.jncc.gov.uk/

[54] Natural England website http://www.naturalengland.org.uk/

[55] The Humber Estuary: A comprehensive review of its nature conservation interest; English Nature Research Report Number 547; December 2003; Institute of Estuarine and Coastal Studies (IECS); English Nature; ISSN 0967-876X

[56] Wetlands International Ramsar Sites Information Service website http://ramsar.wetlands.org/

[57] National Biodiversity Network Gateway website http://data.nbn.org.uk/

[58] Guidelines for Baseline Ecological Assessment; 1995; Institute of Environmental Assessment

[59] Flash Earth website http://www.flashearth.com/

[60] MarLIN, Marine Life Information Network website http://www.marlin.ac.uk/

[61] Birdlife International website http://www.birdlife.org

[62] Bird Census and Survey Techniques; 2004; Gregory RD, Gibbons DW and Donald PF

[63] Water Vole Conservation Handbook; 2nd Edition; 2006; Strachan R and Moorhouse T

[64] Conservation Technical Handbook Number 3; Otters and River Habitat Management; 1993; National Rivers Authority

[65] The New Rivers and Wildlife Handbook; Eds: Ward D, Holmes N and José P; 1994; Royal Society for the Protection of Birds

[66] Reptile Mitigation; Consultation Draft; 26 January 2010; Natural England

[67] Herpetofauna Workers Manual; 2003; Gent T and Gibson S

[68] Reptile Survey An Introduction to Planning, Conduction and Interpreting Surveys for Snake and Lizard Conservation; Froglife Advice Sheet 10; November 1999; Froglife

[69] Bat Mitigation Guidelines; 2004; Natural England

[70] Bat Surveys Good Practice Guidelines; 2007; Bat Conservation Trust

[71] Guidelines for Impact Assessment in the United Kingdom; June 2006; Institute of Ecology and Environmental Management

[72] Biodiversity and Geological Conservation - Statutory Obligations and their Impact within the Planning System; 2005; Office of the Deputy Prime Minister 06/2005; Department for Environment, Food and Rural Affairs 01/2005

[73] The Character of England's Natural and Man-made Landscape Volume 3; Yorkshire and The Humber; 1996; The Countryside Commission

[74] East Riding of Yorkshire Landscape Character Assessment; 2005; East Riding of Yorkshire Council, Carl Bro and Golder Associates

[75] Ordnance Survey Explorer Maps: 293 Kingston upon Hull and Beverly 2010, ISBN 9780319238301; 281 Ancholme Valley 2006, ISBN 9780319237762; 284 Grimsby, Cleethorpes and Immingham 2006, ISBN 9780319238257

[76] Landscape Institute Advice Note 01/09 Use of Photography and Photomontage in Landscape and Visual Assessment; 2009; Landscape Institute

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