Northern Gateway Container Terminal
Environmental Statement

PD Teesport

April 2006
Final Report
9R2629

A COMPANY OF

ROYAL HASKONING

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ENVIRONMENT

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Common Abbreviations

AADT	Annual Average Daily Traffic
ABP	Associated British Ports
ADCP	Acoustic Doppler Current Profiler
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
APIS	Air pollution information system
AQMA	Air quality management area
AQO	Air Quality Objective
AQS	Air Quality Strategy
AURN	Automatic Urban and Rural Network
BD	Backhoe Dredger
BGL	Below ground level
BPM	Best Practicable Means
BS	British Standard
BTO	British Trust of Ornithology
CD	Chart Datum
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CHE	Cargo handling equipment
CL	Critical Load
CO	Carbon Monoxide
CPA	Coast Protection Act
CRN	Calculation of Rail Noise
CRTN	Calculation of Road Traffic Noise
CSD	Cutter Suction Dredger
dB(A)	Decibels (noise measurement)
DBT	Di-butyl Tin
DEFRA	Department for Environment, Food and Rural Affairs
DETR	Department for Environment, Transport and the Regions
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DPD	Development plan document
DRL	Dredging Research Ltd
DWS	Drinking Water Standard
DWT	Deadweight tonnes
EA	Environment Agency
EC	European Community
ECML	East Coast main line
EIA	Environmental Impact Assessment
EN	English Nature
EPH	Extractable petroleum hydrocarbons
EQS	Environmental Quality Standard
ES	Environmental Statement (reporting outcome of EIA)
ESL	Ecological Services Ltd
ESR	Environmental Scoping Report
FEPA	Food and Environment Protection Act
FRA	Flood risk assessment
GDP	Gross domestic product
GIS	Geographical information system

GPS	Global Positioning System
GVA	Gross Value Added
Ha	Hectare
HBCD	Hexabromocyclododecane
HCHs	Hexachlorohexanes
HGV	Heavy Goods Vehicle
HRO	Harbour Revision Order
Hs	Significant wave height
HSE	Health and Safety Executive
HW	High Water
INCA	Industry Nature Conservation Association
ISQG	Interim sediment quality guideline
IZ	Inner zone
LAT	Lowest astronomical tide
LDF	Local Development Framework
Leq	Equivalent continuous noise level
LPA	Local planning authority
LTP	Local transport plan
LW	Low water
M	Metres
MAFF	Ministry for Agriculture, Fisheries and Food (now DEFRA)
MDS	Multidimensional scaling
MHW	Mean high water
MLWN (MLWS)	Mean low water neaps (springs)
mg/l	Milligram per litre
µg/kg	Microgram per kilogram
mm	Millimeters
Mm^3	Million cubic metres
m/s	Metres per second
mS	Millisiemens (units of conductivity)
MZ	Middle zone
NAQS	National Air Quality Standards
NAQIA	National Air Quality Information Archive
NESFC	North Eastern Sea Fisheries Committee
NGCT	Northern Gateway Container Terminal
NMMP	National Marine Monitoring Programme
NNR	National Nature Reserve
NO_x	Nitrogen oxides (e.g. NO_2 Nitrogen Dioxide)
NSCA	National Society for Clean Air
NTS	Non Technical Summary
NVQ	National Vocational Qualification
OCP	Organochlorine pesticides
ODPN	Office of the Deputy Prime Minister
OS	Ordnance Survey
OZ	Outer zone
PAH	Polyaromatic hydrocarbon
PBDE	Polybrominated diphenyl ethers
PCB	Polychlorinated biphenols
PEL	Probable Effect Level
PM	Particulate matter

PPG	Planning Policy Guidance
PPM	Parts per million
PPS	Planning Policy Statement
PRIMER	Plymouth Routines in Multivariate Ecological Research
PTT	Port Tractor and Trailer Units
RCHME	Royal Commission for Historic Monuments England
RES	Regional Economic Strategy
RMG	Rail mounted gantry
ROT	Redcarr Ore Terminal
RPG	Regional Planning Guidance
RSPB	Royal Society for the Protection of Birds
RSS	Regional Spatial Strategy
RTG	Rubber tyred gantry
RUS	Route Utilisation Strategy
SA	Sustainability appraisal
SAM	Scheduled Ancient Monument
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SEL	Sound Exposure Levels
SGV	Soil Guideline Values
SLA	Special Landscape Area
SMR	Sites and Monuments Record
SO_2	Sulphur Dioxide
SPA	Special Protection Area
SSC	Suspended sediment concentration
SSGC	Ship to shore gantry crane
SSSI	Site of Special Scientific Interest
TA	Transport Assessment
TBT	Tri-butyl Tin
TBBPA	Tetrabromobisphenol A (brominated flame retardant)
TCT	Teesport Container Terminal
TDS	Tonnes Dry Solids
TEL	Threshold effect level
TEU	Twentyfoot Equivalent Unit
TGS	Twentyfoot ground slot
THPA	Tetrahydrophthalic Anhydride
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons
TSHD	Trailing Suction Hopper Dredger
TVEPG	Tees Valley Environmental Protection Group
UKAS	United Kingdom Accreditation Service
US EPA	United States Environmental Protection Agency
VTS	Vessel Traffic Services
WeBS	Wetland Bird Survey
WFD	Water Framework Directive
WHO	World Health Organisation
WLMP	Water Level Management Plan
ZVI	Zone of Visual Influence

Glossary of terms

Airborne Sound	Sound which is transmitted from the source via the surrounding air, as distinct from energy transmission through the ground.
Ambient noise	Totally encompassing sound in a given situation at a given time usually composite of sounds from many sources near and far. [BS4142]
Amphipod	A type of crustacean. The head carries two pairs of antennae, the eyes which are not on stalks, and the mouthparts. Amphipods have seven pairs of walking legs of which the first four reach forward, and the fifth to seventh reach backwards. The abdomen is divided into two parts, three segments with brush-like limbs and three with short immobile rod-like uropods.
Anadromous	An anadromous fish lives most of its life in the sea and returns to freshwater to spawn e.g. Salmon.
Attenuation (sound)	A reduction in the intensity of a sound signal
A - Weighting dB(A)	The sound pressure level determined when using the frequency-weighting network A. The A-weighting network modifies the electrical response of a sound level meter so that the sensitivity of the meter varies with frequency in approximately the same way that the sensitivity of the human hearing system varies with frequency. The human ear has a non-linear frequency response; it is less sensitive at low and high frequencies and most sensitive in the range 1 to 4 kHz. The A-weighting is applied to measured or calculated sound pressure levels so that these levels correspond more closely to the response of the human ear. A-weighted sound levels are often denoted as dB(A).
Background Noise Level	L_{A90}, T; The A-weighted sound pressure level of non-specific noise in decibels exceeded for 90% of the given time, T. [BS4142]
Bathymetry	Representation of natural and artificial features of the seabed
Bed sheer stress	Rhe shear stress applied to the sea bed by a current
Benthic organisms	Organisms associated with the bottom or substratum or aquatic systems

Bivalve	Marine or freshwater mollusc whose body is enclosed between two shells hinged together by a ligament on the dorsal side of the body
Catadromous	A catadromous fish lives most of its life in freshwater and returns to the sea to spawn e.g. eel.
Disturbance	A perturbation in the system (either biological e.g. predation or physical e.g. storms) which alters the nature of the biological community
Decibel (dB)	**1.** Unit level which denotes the ratio between two quantities that are proportional to power; the number of decibels corresponding to the ratio of two amounts of power is 10 times the logarithm to the base 10 of this ratio. **2.** A linear numbering scale used to define a logarithmic amplitude scale, thereby compressing a wide range of amplitude values to a small set of numbers. **3.** A unit which indicates that a quantity has a certain LEVEL above some pre-defined reference value. **4.** The unit of measurement used for sound pressure levels. The scale is logarithmic rather than linear. The threshold of hearing is 0dB and the threshold of pain is 120dB. In practical terms these limits are seldom experienced and typical levels lie within the range 30dB (a quiet night time level in a bedroom) to 90dB (at the kerbside of a busy city street).
Ecological succession	A predictable ordering of a dominance of a species or groups of species following the opening of an environment to biological colonization.
Equivalent continuous A-weighted sound pressure Level (L_{Aeq})	Value of the A-weighted sound pressure level of a Continuous, steady sound that, within a specified time Interval T starting at t1 and ending at t2 and measured in decibels, has the same mean square sound pressure as the sound under consideration whose level varies with time
Epifauna	Species living on the surface of the sediment
Estuary	Downstream part of a river where it widens to enter the sea, often with significant freshwater influence and predominantly comprising sediment habitats.
Fetch	Distance over water measured from a specified point in a specified direction to the nearest land.
Free Field	**1.** A free sound field is a field in a homogeneous, isotropic medium free from boundaries. In practice it is a field in which the effects of the boundaries are negligible

	over the region of interest. The actual pressure impinging on an object (e.g. a microphone) placed in an otherwise free sound field will differ from the pressure which would exist at the point with the object removed, unless the acoustic impedance of the object matches the acoustic impedance of the medium. **2.** An environment in which there are no reflective surfaces within the frequency region of interest. **3.** A region in which no significant reflections of sound occur.
GA 94	An instrument that uses infra-red technology to monitor the main gases within a landfill.
Gross added value	The value generated by any unit engaged in production and the contributions of individual sectors or industries to gross domestic product. It is measured at basic prices, excluding taxes less subsidies on products.
Haul out sites	Areas where seals regularly haul out of the water.
Hertz (Hz)	This is the unit of frequency representing the number of times a periodic wave repeats itself per second.
Infauna	Species living within sediment
Intertidal	The area of land between mean high water and mean low water
Invertebrates	Animals without backbones.
Larvae	A discrete stage in the life history of many species, beginning with zygote formation and ending in metamorphosis
Littoral drift	The movement of beach material in the littoral zone by waves and currents.
MCERTS	The Environment Agency has established its Monitoring Certification Scheme (MCERTS) to ensure the delivery of high quality environmental measurements. The MCERTS "Performance Standard for Laboratories Undertaking Chemical Testing of Soil" requires that where results are to be submitted to the Agency for regulatory purposes, laboratories must both fulfil the general requirements of ISO/IEC 17025, and meet specific method validation and performance requirements laid down in the Performance Standard
Neap tide	Neap tides occur when the moon is in the first or third quarter - when the sun, earth and moon form a right

	angle. The lunar high tide coincides with the solar low tide and they partly cancel out, giving a small total tide.
Octave Bands	1. A range of frequencies whose upper limit is twice the frequency of the lower limit. 2. The octave-band pressure level of a sound is the band pressure level for a frequency band corresponding to a specified octave. (The location of the octave-band pressure level on a frequency scale is usually denoted by the geometric mean of the upper and lower frequencies of the octave.) The ISO standard octave centre frequencies are 32, 63, 125, 250, 500, 1k, 2k, 4k, 8k, 16k Hz (etc.).
One-third octave band sounds pressure levels	The ISO standard one-third octave band frequencies are 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3, 8 Hz and decade multiples thereof.
Percentile level (statistical sound level indices L_{AN},L_{A90})	L_{AN} is the dBA level exceeded N% of the time measured on a sound level meter with Fast (F) time weighting, e.g. L_{A90} the dBA level exceeded for 90% of the time, is commonly used to estimate background noise level. L_{A10}, the level exceeded for 10% of the time, is commonly used in the assessment of road traffic noise.
Plankton	Organisms suspended in the water column and incapable of moving against water currents.
Piling	The installation of bored and driven piles and the effecting of ground treatments by vibratory dynamic and other methods of ground stabilization. [BS5228]
Ramsar site	Areas designated by the UK Government under the International Ramsar Convention (the Convention on Wetlands of International Importance).
Ration of flow to capacity (RFC)	Relates the forecast traffic demand for any particular turn to the capacity for making that turn. A junction is considered to "work" if the RFC for each approach/arm is 85% or less.
Reflection	A wave reflection is that part of a wave which is returned seawards after it has impinged on a beach, seawall or other reflecting surface
Reefer containers	Refrigerated containers
Refraction	The process by which the direction of a wave moving in shallow water at an angle to the contours is changed.

Resource	A commodity that is required by an organism and is potentially in short supply.
Return period	Anticipated period of return of a flood or wave event (based in a single occurrence in that year)
Roosting site	Roosting sites are areas where birds congregate during the high water period when intertidal feeding areas are covered.
Ro-Ro	RORO and ro-ro are acronyms for Roll On/Roll Off; a type of ferry, cargo ship or barge that carries wheeled cargo such as automobiles, trailers or railway carriages.
Significant wave height	Average height if the highest one third of wave heights in a random train.
Site of Special Scientific Interest (SSSI)	A statutory designation under the Wildlife and Countryside Act (1981)
Site noise	That component of the ambient noise in the neighbourhood of a site that originates from the site. [BS5228]
Sound level	Sound level, in decibels, is the weighted sound pressure level obtained by use of a sound-level meter. The reference pressure is 20 μPa, unless otherwise stated.
Sound power level (L_w)	**1.** The sound power level is the fundamental measure of the total sound energy radiated by a source per unit time. **2.** A value equal to 10 times the logarithm to the base 10 of the ratio of the total acoustic power emitted by a source to a reference power, which is normally taken to be 10^{-12} watt.
Sound pressure level (L_p)	**1.** The level of the pressure of the sound above the internationally accepted reference value of 20 μPa ($2x10^{-5}N/m^2$), which corresponds to the pressure of the quietest sound an average person can hear at the frequency of 1000 Hz. It is a quantity that can be measured, thus the intensity of a sound can be derived from it. **2.** The sound pressure level is a measure of a dynamic variation in atmospheric pressure. The pressure at a point in space minus the static pressure at that point.
Source Protection Zones	Defined by the Environment Agency. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk
Special Protection Area	SPAs are designated under the EU Directive on

(SPA)	conservation of wild birds (79/409/EEC).
Spring tide	Spring tides happen just after every full and new moon, when the sun, moon and earth are in line. Lunar and solar tides line up and reinforce each other, making a bigger total tide.
Taxa	A group of species which are related by virtue of possessing similar morphological or physiological features which may be used in their identification.
TEU	Twenty-foot equivalent unit. Standard measure for container traffic. A move involving a twenty-foot container is considered as 1 TEU. A movement involving a forty-foot container is 2 TEUs.
Waterfowl	Waders and wildfowl
WeBS	(Wetlands Bird Survey). The WeBS programme is a system of co-ordinated counts of wildfowl around the UK estuaries. The counts are carried out at high water throughout the winter months and are therefore indicative if the use if a particular estuary by roosting birds.

1 INTRODUCTION

1.1 Background

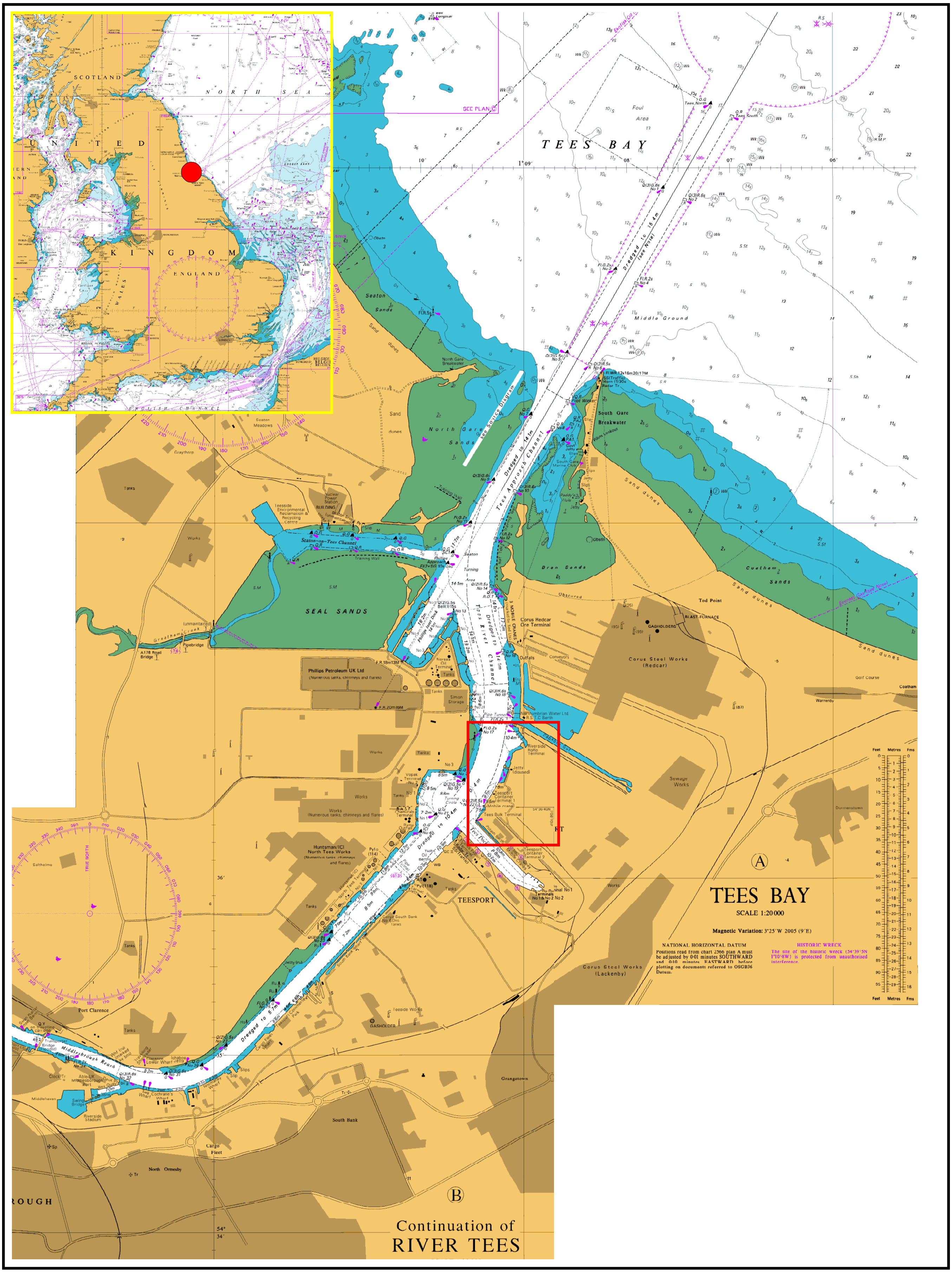
1.1.1 Overview of the proposed development

1. PD Teesport is proposing to construct a deep sea container terminal on the site of the existing Teesport Container Terminal 1 (TCT1), the redundant former Shell jetty and the Riverside Ro-Ro No. 3 at Teesport. Capital dredging of the approach channel will be undertaken to provide the required access to the proposed terminal for container vessels. The proposed development is known as the Northern Gateway Container Terminal (NGCT).

2. A plan showing the location of the proposed development within the Tees estuary is shown in Figure 1.1. Figure 1.2 shows a photomontage of the proposed development and surrounding area.

Figure 1.2 Photomontage of the proposed development and surrounding area

3. The construction phase for the proposed development will comprise capital dredging in the Tees estuary, construction of a new quay wall, reclamation and land-side development (including buildings, cargo handling equipment, etc), a new intermodal rail terminal, road modifications and the disposal of dredged material. During its operational phase, the terminal will be able to accommodate up to three deep sea container vessels simultaneously and the total throughput of the fully operational terminal is predicted to be 1.5 million twenty-foot equivalent units (TEU) per annum. Full details of the construction and operational phases of the proposed scheme are provided in Section 3.



Key:

Source: ARCS Charts under license from the UKHO

General location of proposed container terminal

Northern Gateway Container Terminal Environmental Statement

PD Teesport

April 2006

Approx scale: 1cm - 0.5km

Figure 1.1

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4. This Environmental Statement (ES) represents the output of the Environmental Impact Assessment (EIA) process undertaken for the proposed NGCT and accompanies a number of applications for the proposed development. These applications are listed below:

- An application for a Harbour Revision Order (HRO) under the Harbours Act 1964;
- An application for planning permission under the Town and Country Planning Act 1990 as amended by the Planning and Compulsory Purchase Act 2004;
- Applications under the Food and Environment Protection Act 1985 (FEPA)/the Coast Protection Act 1949 (CPA) to dispose of dredged material below the level of mean high water springs and for construction works below mean high water springs; and,
- An application under the Transport and Works Act 1992 to authorise the acquisition of certain land interests.

1.1.2 Overview of existing facilities at and in the vicinity of the proposed development site

1. The site of the proposed development is located within the Teesport Estate. The river frontage within the existing Teesport Estate comprises approximately 2000m of quay with seven general cargo berths, three tidal Ro-Ro ramps and two container terminals. Within the Teesport Estate, the main facility is Tees Dock which is a deep water tidal facility providing local free open access for vessels up to panamax size (50,000 deadweight tonnes (dwt)). Tees Dock handles over 5 million tonnes of cargo a year including dry bulks, steel, project cargo, general bulkhead and unitised traffic. Additionally, Cleveland Potash located on the eastern side of Tees Dock provides the facilities for the handling and storage of dry bulk products.

2. The majority of the port's container traffic is handled at TCT1 and TCT2 and Ro-Ro berths 1, 2 and 3. The current annual throughput is approximately 250,000 TEUs. TCT1 currently provides 294m of quay for two continuous container berths with a depth of 8.5m below Chart Datum (CD) for one berth and 7.5m below CD for the other berth. TCT2 provides a total quay length of 360m for two continuous berths with depths for both berths at 10.9m below CD.

3. The existing Ro-Ro facilities (No. 1 and 2) are located within Tees Dock; both provide facilities for maximum vessel lengths of 200m and berth depths of 7.8m below CD and 10.9m below CD respectively. Ro-Ro No. 3 provides for vessels of maximum length 180m and a berth depth of 10.8m below CD.

1.2 Report structure

1. **Section 1** introduces the proposed NGCT and provides a brief outline of the construction and operational phases of the proposed scheme. The requirement for EIA is also described which includes a statement of the various legislation

under which the EIA has been prepared. A broad overview of the EIA process follows which is accompanied by a description of the EIA study area.

2. **Section 2** contains the statement of need for the proposed NGCT development. A detailed description of the construction and operational phases of the proposed development, describing the process of consideration of alternatives in a number of contexts, is provided in **Section 3**.

3. An appraisal of the proposed development in the context of various national, regional and local policies is presented in **Section 4** and an assessment of the proposed development in light of various sustainability objectives is provided in **Section 5**.

4. **Sections 6 to 24** contain the technical assessment of the impacts of dredging, reclamation and land-side development. These sections describe the nature of the existing (baseline) environment for the various parameters considered during the EIA process. The potential impacts of the proposed development during the construction and operational phases on each of these parameters are then identified and assessed and, where appropriate and practicable, mitigation measures are defined. These measures aim to ameliorate any potential adverse impacts. The residual impacts (i.e. the potential impacts remaining assuming that the recommended mitigation measures are implemented) are then stated. The potential impacts of the proposed NGCT on the following list of parameters have been assessed through the EIA process:

- Hydrodynamic and sedimentary regime (**Section 6**);
- Marine sediment quality (**Section 7**);
- Soil quality and geology (**Section 8**);
- Water quality (**Section 9**);
- Marine ecology (**Section 10**);
- Marine and coastal ornithology (**Section 11**);
- Terrestrial and coastal ecology (**Section 12**);
- Fisheries resources (**Section 13**);
- Commercial navigation (**Section 14**);
- Archaeology and heritage (**Section 15**);
- Recreation and access (**Section 16**);
- Road traffic (**Section 17**);
- Rail traffic (**Section 18**);
- Noise and vibration (**Section 19**);
- Air quality (**Section 20**);
- Landscape and visual setting (**Section 21**);
- Coastal protection and flood defence (**Section 22**);
- Infrastructure and land drainage (**Section 23**); and,
- Socio-economic context (**Section 24**).

5. **Section 25** considers the implications of the disposal of dredged material at two offshore disposal sites. The potential dispersion and deposition of silts, clay and sand during disposal, and associated potential impacts, is discussed.

6. **Section 26** presents proposals for monitoring and **Section 27** presents a summary of the potential impacts, mitigation measures and residual impacts for the construction and operational phases.

7. **Section 28** describes the implications of the proposed NGCT on the designated status of the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site.

8. The ES contains the following appendices:

- Appendix 1 Scoping responses.
- Appendix 2 Citations and designated site maps.
- Appendix 3 Sediment quality data.
- Appendix 4 Soil quality data.
- Appendix 5 Marine ecology data.
- Appendix 6 Terrestrial ecology.
- Appendix 7 Archaeology.
- Appendix 8 Flood Risk Assessment.

9. In addition to the ES, the following reports accompany this ES as separate documents ('Accompanying Documents'):

- Accompanying Document 1 Hydrodynamic and sedimentary studies.
- Accompanying Document 2 Transport Assessment.
- Accompanying Document 3 Air quality.

10. A non-technical summary is provided as a separate document.

1.3 Brief description of the proposed scheme

1.3.1 Overview of the construction phase

1. Full details of the construction phase are included in Section 3.1. The main features of the construction phase are summarised as follows:

- Capital dredging within the existing dredged approach channel to deepen the channel by 0.4m from 14.1m below CD to 14.5m below CD, with deepening from 10.4m below CD to 14.5m below CD for the final (approximately) 1km of the approach to the proposed terminal;
- Realignment of the existing approach channel in the vicinity of the proposed terminal and deepening of the two existing turning circles (Tees Dock turning circle and Seaton Channel turning circle) in the Tees estuary;
- Construction of a 1000m quay face with a proposed quay deck level of 9.0m above CD (+6.15m OD). It is proposed that the terminal construction would be undertaken in two phases (700m followed by 300m);
- Pumping suitable dredged material ashore for use in the reclamation works and for locally raising land levels within the proposed terminal area;
- Disposal of the balance of the capital dredged material at existing offshore disposal grounds in Tees Bay;
- Relocation of the existing Riverside Ro-Ro facility to accommodate the new container terminal;

- Capital dredging of deep water berthing areas alongside the proposed quay face (dredged to 16m below CD);
- Paving the terminal area (approximately 55ha);
- Provision of an area outside of the terminal fence for emergency parking of heavy goods vehicles (HGVs) (approximately 6ha);
- Construction of a new intermodal rail terminal;
- Installation of cargo handling equipment;
- Modifications to the existing roads within the Teesport Estate to provide vehicular access to the new terminal;
- Entrance and exiting gateways to the terminal;
- Buildings and workshops within the proposed terminal area; and,
- Installation of a surface water drainage system, a pumped foul drainage system, a power supply system (including floodlighting) and installation of a water supply system (including fire fighting supply).

2. With respect to the disposal of dredged material, it is proposed to dispose of the majority of the dredged material offshore (i.e. the balance of material remaining following the reclamation work). However, the environmental implications of the disposal of a proportion of the material within the lagoon adjacent to the proposed development site to the north-east (termed the ‘Bran Sands lagoon’ hereafter) are also assessed. Bran Sands lagoon is not currently within the ownership of PD Teesport and disposal at this location does not form part of the proposed scheme or any of the applications to which this ES relates. However, this potential option for disposal has been included in the EIA process as a potential alternative means of disposal which PD Teesport could take forward if ownership of the Bran Sands lagoon were to be secured at some time in the future.

3. In summary, the use of dredged material on land under this option would comprise the infilling of the Bran Sands lagoon, along with reclamation and raising land levels locally within the proposed terminal area. The balance of dredged material would be disposed at offshore disposal sites within Tees Bay.

4. Figure 1.3 shows the main land based elements of the proposed scheme. Figure 1.4 shows the terminal area in more detail, with the proposed layout for the container stacking areas, buildings and rail sidings. Figure 1.5 shows the footprint of the capital dredging and the locations of the two existing disposal sites for dredged material in Tees Bay are shown in Figure 1.6.

5. Figure 1.4 shows proposed new building locations although it should be noted that the details of the buildings are illustrative. For the purposes of the assessment of the potential environmental impacts associated with these buildings, parameters for the buildings have been defined and these will be fixed by planning condition to control their location, height, footprint and floor space.

6. Figure 1.7 shows the existing rail access to the Teesport Estate and where the rail infrastructure connects to the main network. The figure also shows how the proposed intermodal rail terminal will be linked into the existing rail network.

DRAWING No.

9R2629 FIGURE 1.3

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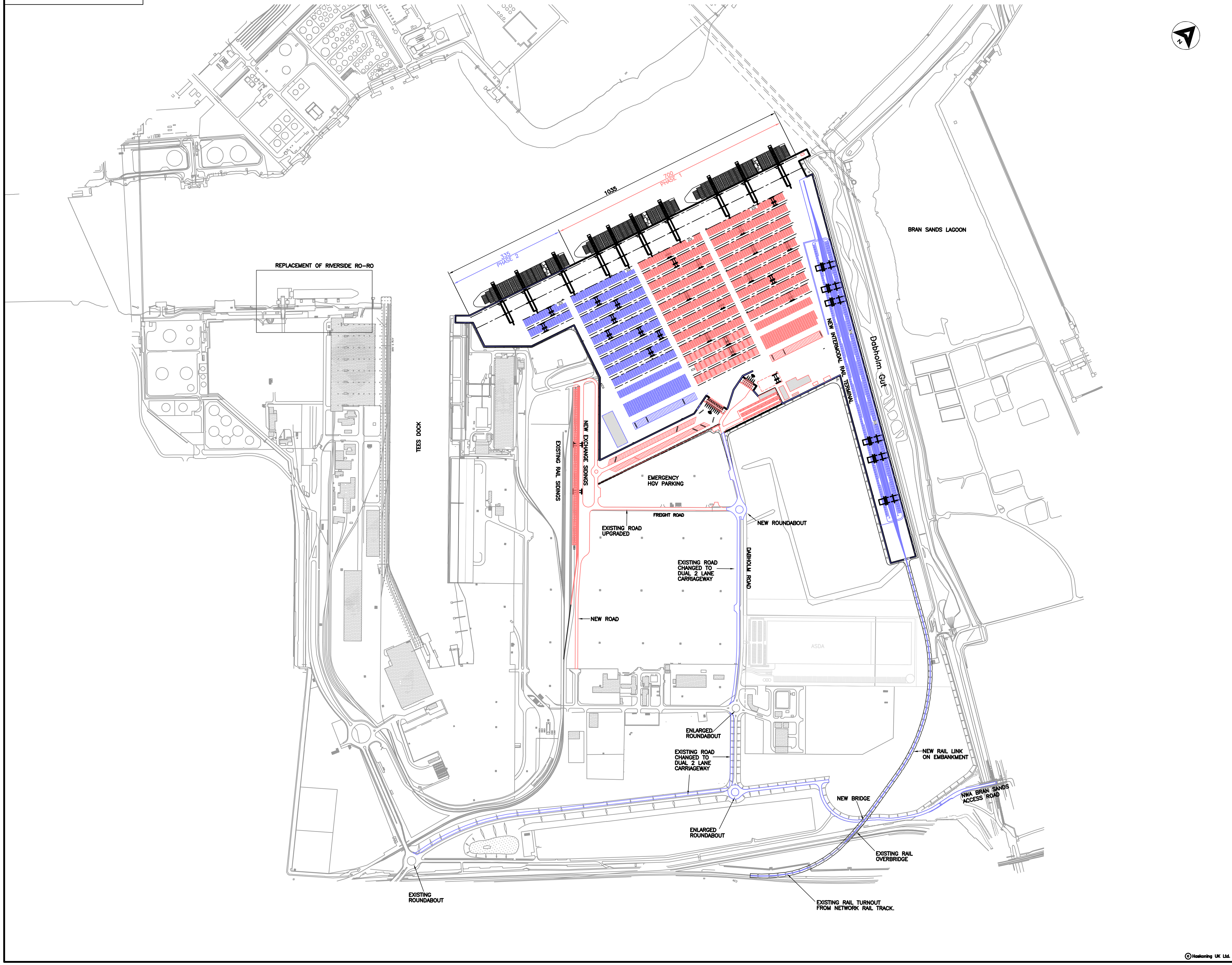

NOTES:

1. PHASE 1 WORKS SHOWN IN RED.
2. PHASE 2 WORKS SHOWN IN BLUE.

REV	DATE	DESCRIPTION	BY	CHK	APPD

REVISIONS

CLIENT

PD TEESPORT

PROJECT:

THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

DRAWING TITLE:

OVERVIEW OF MAIN LAND BASED ELEMENTS OF THE NGCT SCHEME

A COMPANY OF ROYAL HASKONING

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DRAWN M.C.	DATE APRIL '06
JOB No. 9R2629	AUTOCAD REF. 9R2629 FIG1.3.DWG
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DRAWING No. 9R2629 FIGURE 1.3	REVISION

DRAWING No. 9R2629 FIG1.4

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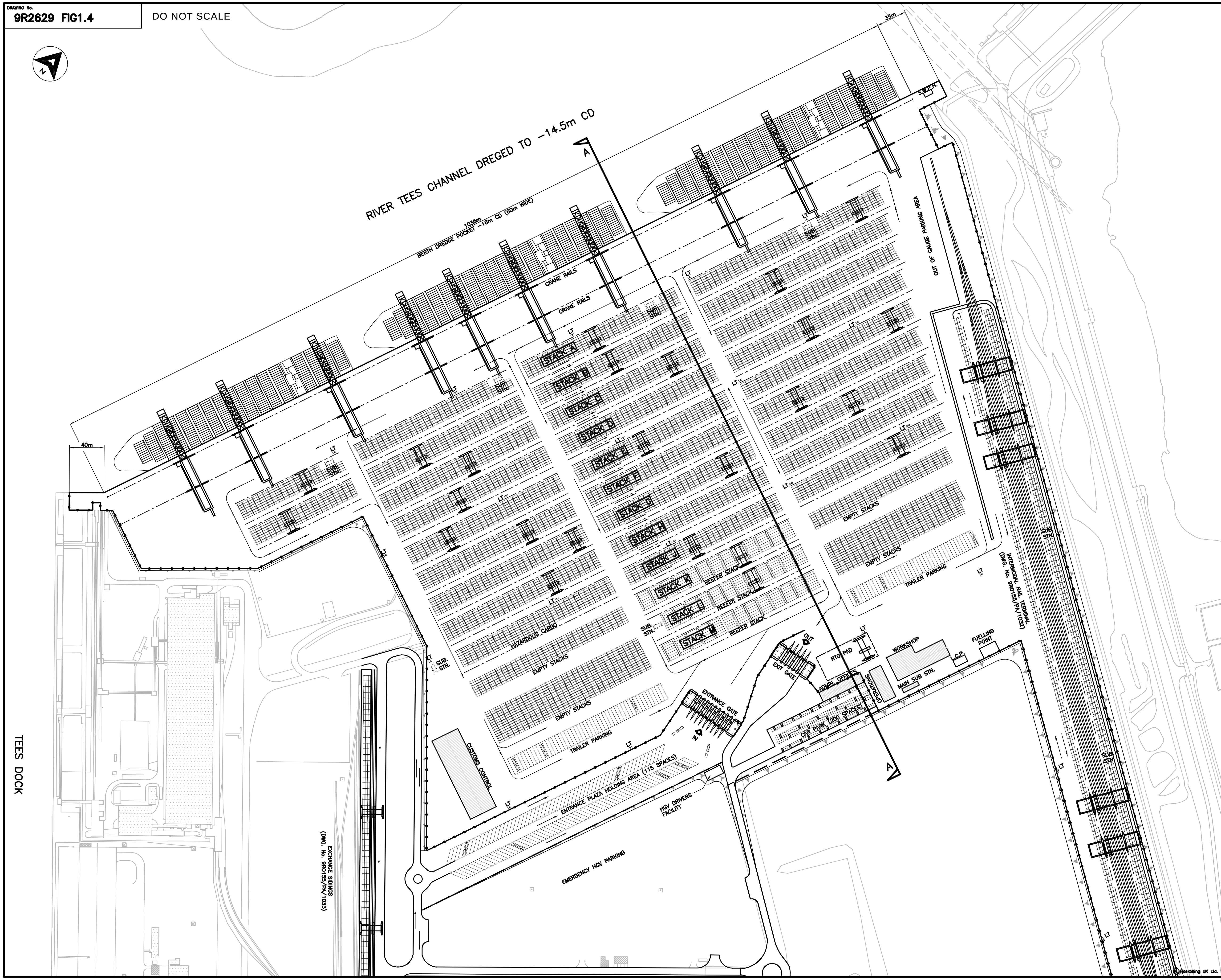

KEY

LT – LIGHTING TOWER
SUB.STN. – SUB STATION
LCP – LEAKING CONTAINER PIT
SWPH – SALT WATER PUMP HOUSE

REV	DATE	DESCRIPTION	BY	CHK	APPD

REVISIONS

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PD TEESPORT

PROJECT:

THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

DRAWING TITLE:

TERMINAL ARRANGEMENT IN MORE DETAIL

A COMPANY OF ROYAL HASKONING

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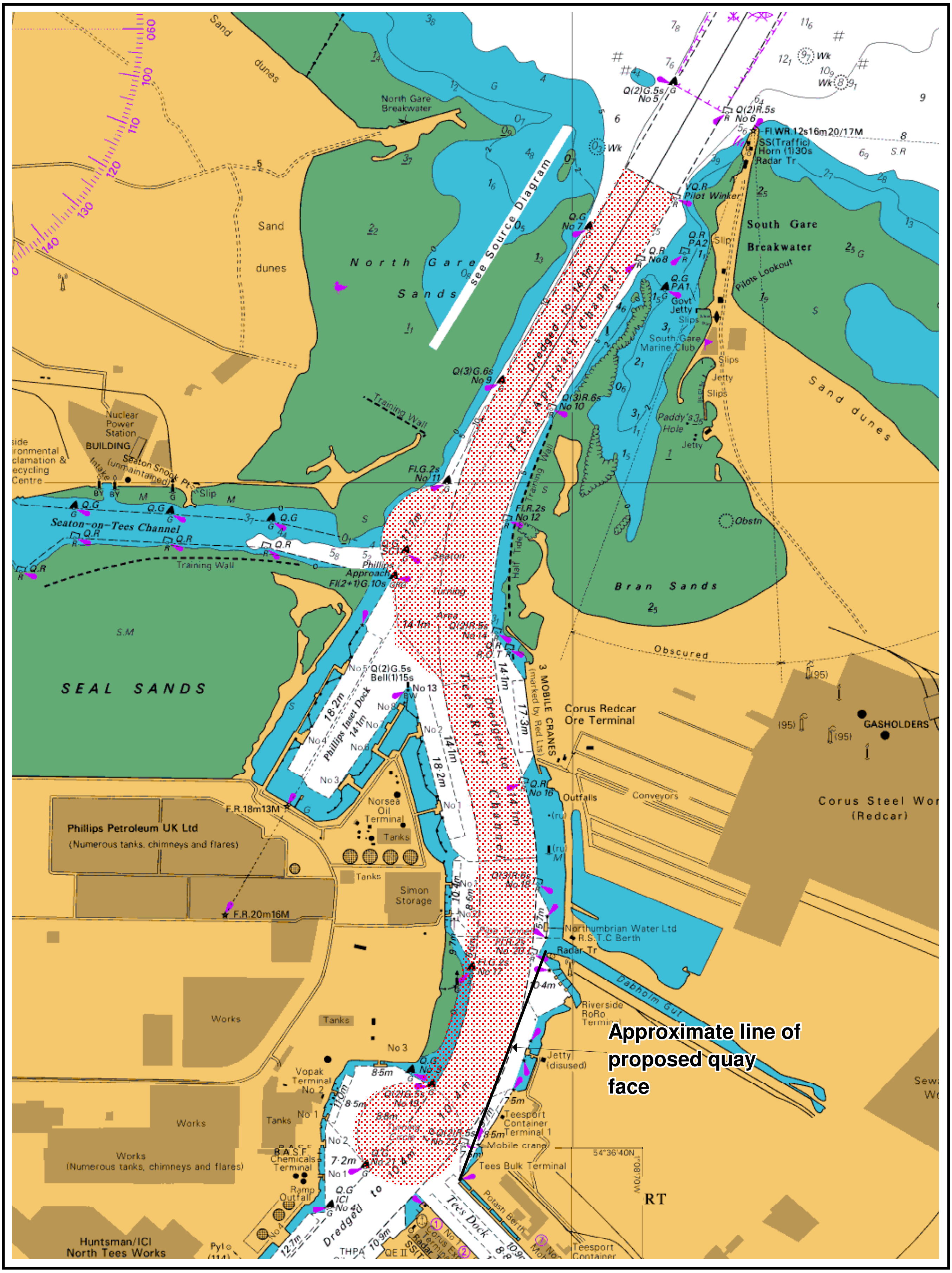
DRAWN	M.C.	DATE	APRIL '06
JOB No.	9R2629	AUTOCAD REF.	9R2629 FIG1.4.DWG
SCALE AT A1	1:2000		
DRAWING No.	9R2629 FIGURE 1.4	REVISION	



Key:

Proposed dredge area

Source: ARCS Charts under license from UKHO

Footprint of proposed capital dredging

Northern Gateway Container Terminal Environmental Statement

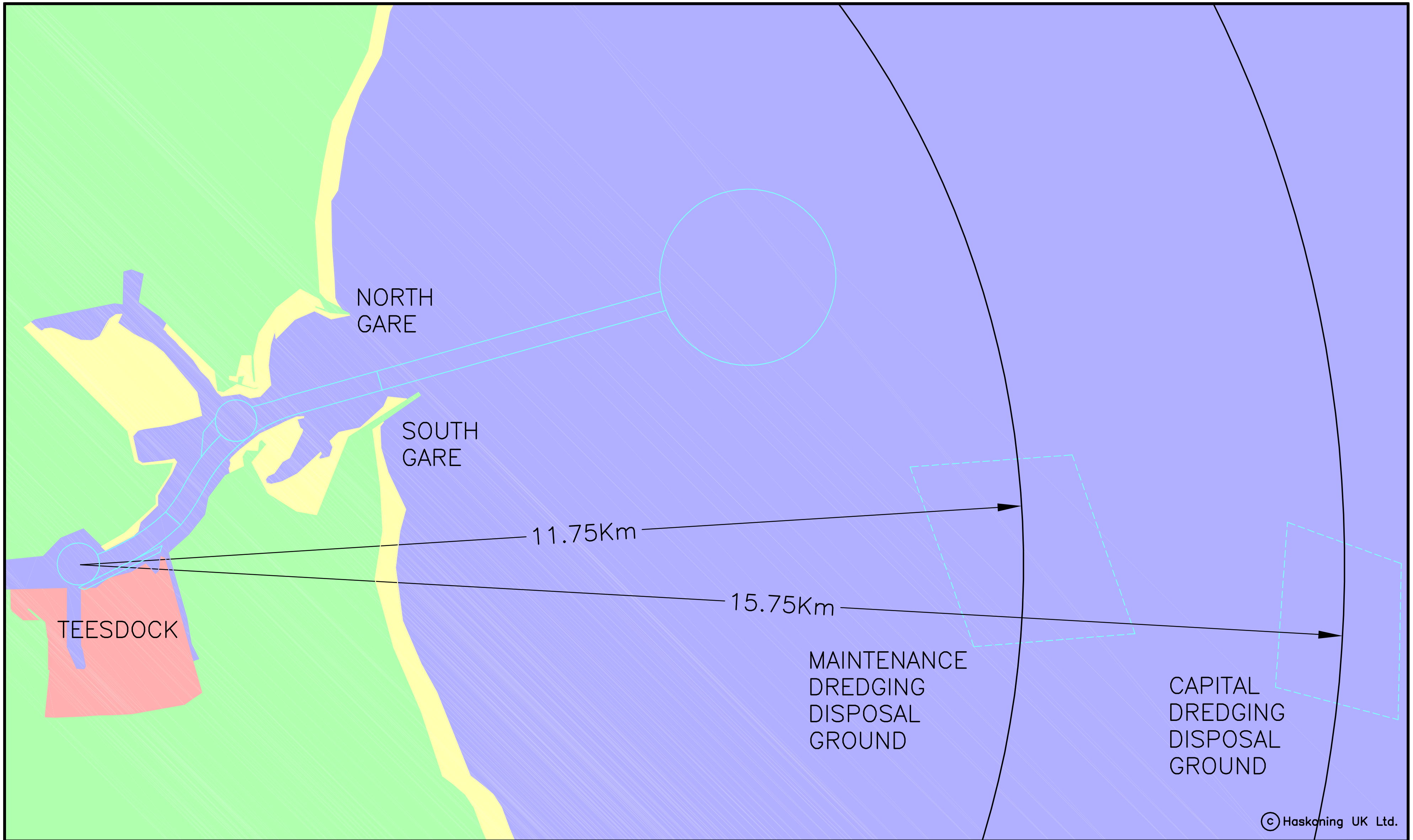
PD Teesport

April 2006

Approx scale: 1cm - 0.16km

Figure 1.5

ROYAL HASKONING



TITLE
LOCATION OF TWO EXISTING DISPOSAL SITES IN TEES BAY GROUNDS

PROJECT
THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

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DRAWN I.T.	SCALE N.T.S.
DATE APRIL'06	JOB No. 9R2629
DRG No. FIGURE 1.6	

7. Figure 1.7 also illustrates the existing road network in the area. Areas where improvements to the existing road network within the Teesport Estate are proposed are also shown. Upgrading (dualling) of the existing roads within the Teesport Estate will be undertaken to improve access to the proposed terminal and new and enlarged roundabouts will be provided. Works are proposed to Freight Road, Dabholm Road and Teesport Road, which would link in with the existing main road network.

8. Figure 1.8 shows the key scheme parameters as assessed in the EIA process and includes, for example, maximum crane heights, footprint and maximum heights of buildings, container stacking heights, quay level, etc.

1.3.2 <u>Overview of the operational phase</u>

Terminal capacity and internal plant

1. The total container throughput of the terminal will be approximately 1.5 million TEU per annum with the following anticipated modal split:

- 10% of containers transhipped by sea or feeder vessels;
- 70% of containers carried by road; and,
- 20% of containers carried by rail.

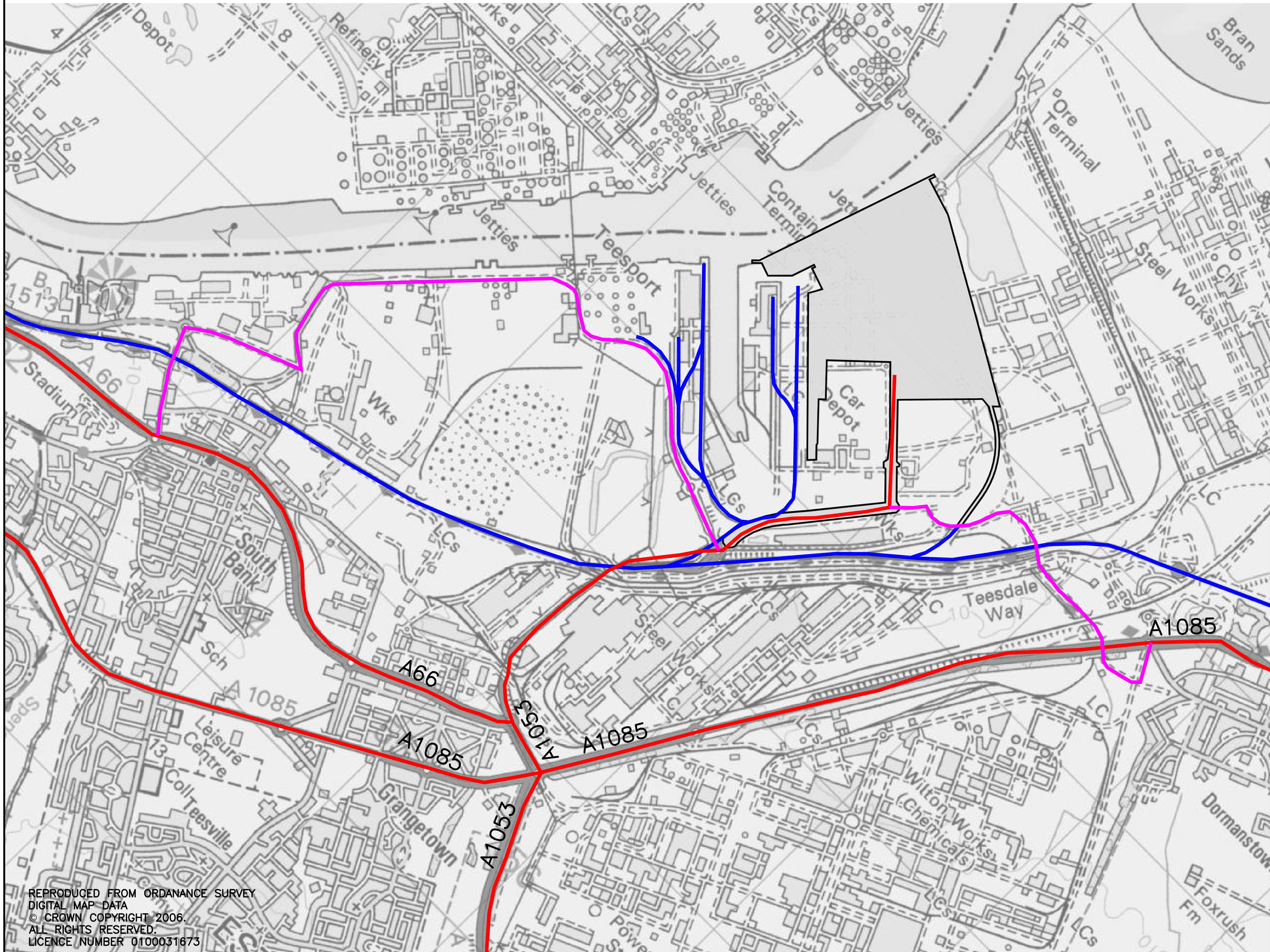
2. With respect to the predicted modal split, it is important to note that there is uncertainty as to what the actual modal split would be as this depends, amongst other factors, on the particular requirements of the customers. To account for this uncertainty in terms of the assessment of potential effects, in addition to considering the impacts of the modal split described above, the impacts of carrying 100% of containers by road are considered. This ensures that a worse case situation with respect to potential environmental impact (i.e. effects on road traffic and consequently noise and air quality effects) is taken into account in the assessment process in the event that the aspirations for modal split are not achieved.

3. There are existing rail sidings at the western end of the development site (see Figure 1.3) and it is proposed that these sidings would be used to transport containers by rail until such time that additional rail capacity is needed (to be provided by the new intermodal rail terminal at the eastern end of the development). The increase in the container throughput of the terminal over time is linked to the phasing of the construction of the development.

4. The terminal will operate 365 days per year, 24 hours per day.

DRAWING No. 9R2629 FIGURE 1.7

DO NOT SCALE



LEGEND

- RAIL ACCESS
- MAIN ROAD ACCESS
- EMERGENCY ROAD ACCESS

REV	DATE	DESCRIPTION	BY	CHK	APPD

REVISIONS

CLIENT: PD TEESPORT

PROJECT: THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

DRAWING TITLE: SITE ACCESS ROUTES

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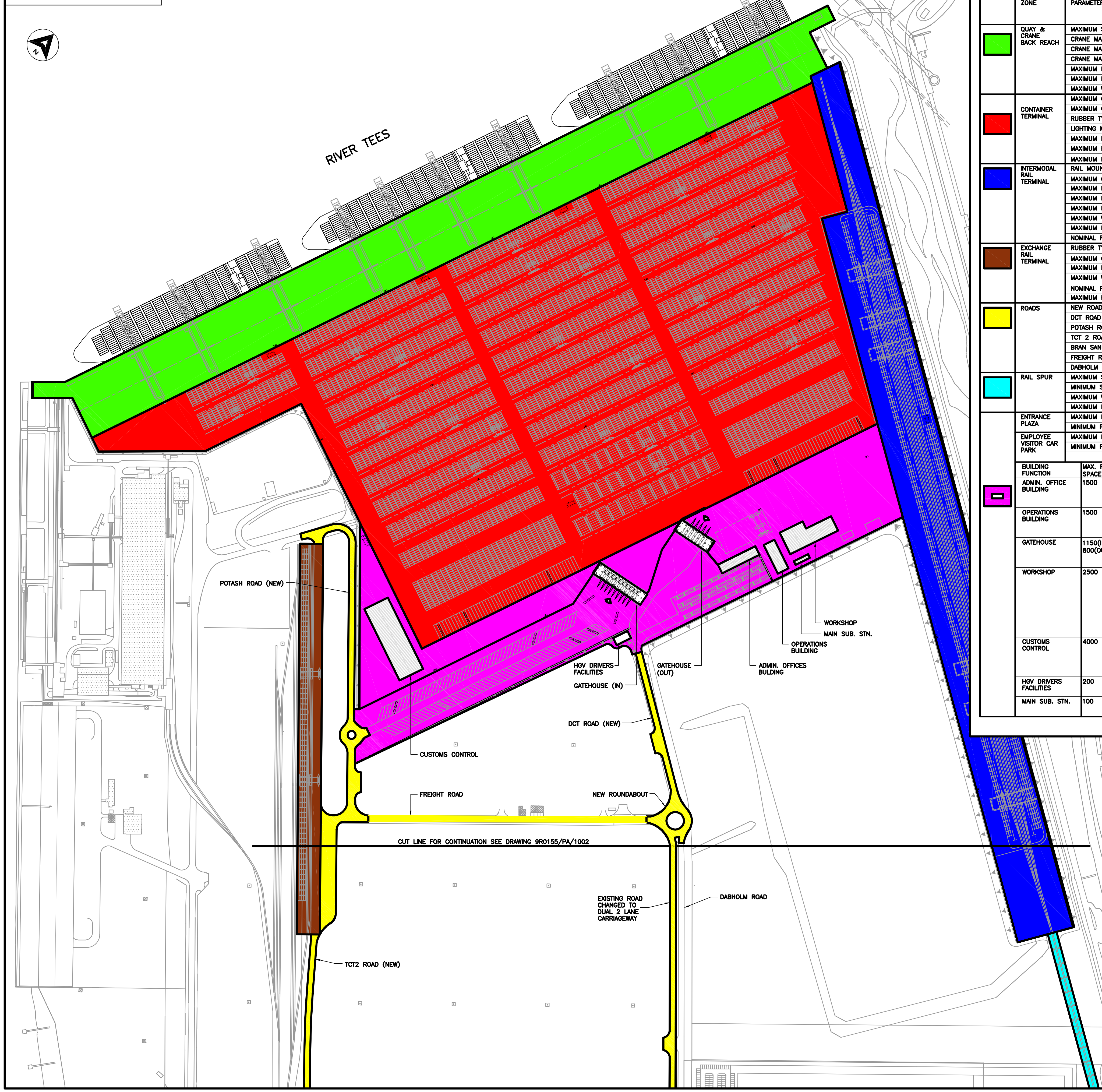
DRAWN M.C. | DATE MARCH '06
JOB No. 9R2629 | AUTOCAD REF. 9R2629 FIG1.7.DWG
SCALE AT A1 1:10,000

DRAWING No. 9R2629 FIGURE 1.7 | REVISION

DRAWING No. 9R2629 FIGURE 1.8

DO NOT SCALE



	ZONE	PARAMETER	VALUE
(green)	QUAY & CRANE BACK REACH	MAXIMUM SURFACE LEVEL	6.5m OD
		CRANE MAXIMUM HEIGHT WITH JIB IN VERTICAL POSITION	100m
		CRANE MAXIMUM HEIGHT WITH JIB IN HORIZONTAL POSITION	70m
		CRANE MAXIMUM OUTREACH FROM QUAY EDGE	65m
		MAXIMUM NUMBER OF CRANES	10
		MAXIMUM LENGTH	1120m
		MAXIMUM WIDTH	80m
(red)	CONTAINER TERMINAL	MAXIMUM CONTAINER STACK HEIGHT LADEN CONTAINERS STACKED 5 HIGH	14.5m
		MAXIMUM CONTAINER STACK HEIGHT EMPTY CONTAINERS STACKED 8 HIGH	23.5m
		RUBBER TYRED GANTRY CRANE MAXIMUM HEIGHT	25m
		LIGHTING MASTS MAXIMUM HEIGHT	30m
		MAXIMUM No. OF LIGHTING MASTS	20
		MAXIMUM PAVED SURFACE LEVEL	9.0m OD
		MAXIMUM PAVED SURFACE AREA (HECTARES)	31
(blue)	INTERMODAL RAIL TERMINAL	RAIL MOUNTED GANTRY CRANES MAXIMUM HEIGHT	25m
		MAXIMUM CONTAINER STACK HEIGHT (CONTAINERS STACKED 3 HIGH)	9m
		MAXIMUM NUMBER OF RAIL MOUNTED GANTRY CRANES	6
		MAXIMUM No. OF LIGHTING MASTS	6
		MAXIMUM LENGTH	1150m
		MAXIMUM WIDTH	75m
		MAXIMUM PAVED SURFACE LEVEL	9.0m OD
		NOMINAL RAIL LEVEL	8.0m OD
(brown)	EXCHANGE RAIL TERMINAL	RUBBER TYRED GANTRY CRANES MAXIMUM HEIGHT	25m
		MAXIMUM CONTAINER STACK HEIGHT (CONTAINERS STACKED 5 HIGH)	14.5m
		MAXIMUM LENGTH	500m
		MAXIMUM WIDTH	30m
		NOMINAL RAIL LEVEL (AS EXISTING RAILS)	6.15m OD
		MAXIMUM PAVED LEVEL	6.5m OD
(yellow)	ROADS	NEW ROAD LEVELS GENERALLY TO MATCH EXISTING ROAD LEVELS. TYPICAL ROAD LEVEL	6m OD
		DCT ROAD MAXIMUM WIDTH	7.3m
		POTASH ROAD MAXIMUM WIDTH	7.3m
		TCT 2 ROAD MAXIMUM WIDTH	7.3m
		BRAN SANDS ACCESS ROAD RECONSTRUCTION	7.3m
		FREIGHT ROAD	7.3m
		DABHOLM ROAD NEW CARRIAGEWAY MAXIMUM WIDTH	7.3m
(cyan)	RAIL SPUR	MAXIMUM SURFACE LEVEL	+9.0m OD
		MINIMUM SURFACE LEVEL	+8.0m OD
		MAXIMUM WIDTH	25m
		MAXIMUM LENGTH	1200m
	ENTRANCE PLAZA	MAXIMUM PAVING LEVEL	9.0m OD
		MINIMUM PARKING SPACES FOR H.G.V.	100
	EMPLOYEE VISITOR CAR PARK	MAXIMUM PAVING LEVEL	9.0m OD
		MINIMUM PARKING SPACES	200

BUILDING FUNCTION	MAX. FLOOR SPACE (m^2)	MAX. HEIGHT TO EAVES (m)	CONSTRUCTION (TYP.)	FACITILIES (TYP.)
ADMIN. OFFICE BUILDING	1500	8	STEEL FRAME WITH BRICK/METAL CLADDING AND PITCHED ROOF.	RECEPTION, OFFICE SPACE TRAINING/MEETING ROOMS, PLANT ROOM, NETWORK ROOM, WC ON BOTH FLOORS.
OPERATIONS BUILDING	1500	8	STEEL FRAME WITH BRICK/METAL CLADDING AND PITCHED ROOF.	SHIFT MANAGERS ROOM, MESS ROOMS, KITCHENS, LOCKER ROOMS, COAT ROOMS, DRYING ROOM, CLEANING ROOMS, WC.
GATEHOUSE	1150(IN) 800(OUT)	8	STEEL FRAME WITH METAL CLAD PITCHED ROOF.	LANE BOOTHS, HIGH LEVEL INSPECTION WALKWAY, VEHICLE BARRIER.
WORKSHOP	2500	14	STEEL FRAME WITH BRICK/METAL CLADDING AND PITCHED ROOF.	HIGH WORKSHOP BAYS, VEHICLE PITS, STORES, SUPERVISORS ROOM, LOCKER ROOMS, MESS ROOM, IT ROOM, DRYING ROOM, KITCHEN, ARCHIVE ROOM, ELECTRONICS WORKSHOP, ELECTRICAL INSPECTION ROOM, MECHANICAL INSPECTION, WC & SHOWERS.
CUSTOMS CONTROL	4000	6	STEEL FRAME WITH METAL CLADDING, PITCHED ROOF, HGV DOCKS AND ROLLER SHUTTER DOORS.	WAREHOUSE AREA, CUSTOM CAGES, OFFICES, CHANGING ROOMS, MESS ROOM, WC.
HGV DRIVERS FACILITIES	200	3.5	BRICK STRUCTURE WITH PITCHED ROOF	SEATING AREA, WC.
MAIN SUB. STN.	100	3.5	BRICK STRUCTURE WITH PITCHED ROOF	ELECTRICAL SWITCH GEAR

NOTES:

REV	DATE	DESCRIPTION	BY	CHK	APPD

REVISIONS

CLIENT

PD TEESPORT

PROJECT:

THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

DRAWING TITLE:

KEY SCHEME PARAMETERS ASSESSED IN EIA PROCESS

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DRAWN M.C.	DATE APRIL '06
JOB No. 9R2629	AUTOCAD REF. 9R2629 FIG1.8.DWG
SCALE AT A1 1:2500	
DRAWING No. 9R2629 FIGURE 1.8	REVISION

5. The operation of the proposed container terminal will require the following cargo handling equipment:

- 10 ship to shore quayside electric rail mount container cranes;
- 24 rubber tyred gantry cranes (RTG);
- 72 port tractor and trailer units (PTT);
- 6 rail mounted gantry cranes (RMG);
- 6 reach stacker empty container handlers; and
- 4 railhead reach stackers.

6. Modelling of container handling operations has been undertaken to determine the above requirements for internal plant and has predicted that the throughput of 1.5 million TEU is achievable given the proposed layout and nature of the handling equipment at the terminal.

Emergency access

7. In the event that the proposed terminal could not be accessed via the main gateway during an emergency situation, there is a provision for a secondary access to the terminal for the emergency services. Secondary access to Teesport is available via Corus land along a private road running parallel to the river. This is shown in Figure 1.8.

8. In the event of an emergency, it is possible that the terminal would be closed. Provision has, therefore, been made for overflow parking of HGVs outside of the terminal fence should this be required. The area illustrated on Figure 1.3 is estimated to have the capacity to accommodate 650 HGVs. It is also estimated that 200 HGVs could be accommodated in the terminal gateway area itself, with the potential for approximately a further 100 HGV's parked on the inside lane of the new dual carriageway from the entrance roundabout to Freight Road. This gives a total capacity of 950 HGV's, which is equivalent to approximately 6 hours worth of arrivals.

Maintenance dredging

9. At present, maintenance dredging of the navigation channel and various berthing areas is required throughout the lower Tees estuary. The existing maintenance dredging regime is well established and the locations, volumes and frequency of dredging are well recorded. The various aspects of the existing maintenance dredging are discussed in detail in the Tees Maintenance Dredging Baseline Document (ABPmer, 2005) and, where they are of direct relevance to the baseline conditions and impact assessment for the proposed scheme, are encompassed within Section 6 of this ES.

10. As a result of the proposed development, it is not expected that the existing maintenance dredging strategy will need significant adjustment; this has been established through the hydraulic and sedimentary studies undertaken as part of the EIA (see Section 6). It is proposed that maintenance dredgings will be disposed of at the existing disposal sites in Tees Bay, as currently occurs.

1.3.3 Other committed development

1. It should be noted that the assessment of the potential impacts associated with the proposed development has taken into account other development that has the potential to materially affect the findings of the EIA process. The consultation process has informed consideration of the developments that may be of relevance in this context.

2. It is concluded that the proposed Asda distribution centre has the potential to give rise to a cumulative effect on road traffic and therefore this proposal has been included in the assessment process. Similarly, there is a proposal for a paper recycling and manufacturing facility on the Wilton site and this facility is, therefore, also included in the assessment. A number of other plans and projects have also been taken into account in the consideration of in-combination effects as required under the Conservation (Natural Habitats &c.) Regulations 1994; this is discussed in detail in Section 26.

1.4 Requirement for EIA and Appropriate Assessment

1.4.1 Harbours Act 1964

1. In June 2005, a formal screening and scoping opinion was requested from the Department for Transport (DfT) (Ports Division). This request was accompanied by an Environmental Scoping Report (Royal Haskoning, 2005).

2. A response to the above request was received from the DfT in November 2005 (see Appendix 1). This response stated that the Secretary of State has decided that the proposed application relates to a project which falls within Annex I to the EC Directive 85/337/EEC (as amended by Directive 97/11/EC) and that an Environmental Statement (ES) to accompany the application is therefore required. For proposals that require a HRO, EC Directive 85/337/EEC is implemented *inter alia* by schedule 3 of the Harbours Act 1964 and by the Harbour works (Environmental Impact Assessment) Regulations 1999. This ES is being submitted to accompany the application under the Harbours Act 1964.

1.4.2 Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999

1. This ES also accompanies an application for planning permission under the Town and Country Planning Act 1990. As such, the relevant regulations are the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999. These Regulations require that planning permission must not be granted for a relevant development unless environmental information (comprised in an ES) has been taken into account by the decision maker.

2. As the local planning authority, the Environmental Scoping Report was submitted to Redcar and Cleveland Borough Council (RCBC) who confirmed that the planning application should be accompanied by an Environmental

Statement. A copy of this letter, with accompanying comments on the scope of the EIA, is contained within Appendix 1.

1.4.3 Transport and Works Act 1992

1. This ES accompanies an application under the Transport and Works Act 1992. This application relates to the compulsory acquisition of land.

1.4.4 Habitats Regulations and appropriate assessment

1. There are two European Directives relating to nature conservation that are of particular relevance to the proposed development. Firstly, Council Directive 79/409/EEC on the conservation of wild birds (commonly referred to as the 'Birds Directive') provides for the protection of wild birds through the designation of Special Protection Areas (SPA). In addition, Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna (commonly referred to as the 'Habitats Directive') allows for the establishment of Special Areas of Conservation (SAC) for habitats and species listed in Annexes I and II to the Directive. Taken together, the Europe wide network of SPAs and SACs is termed *Natura 2000.*

2. The Habitats Directive was implemented in UK law by the provisions contained in the Conservation (Natural Habitats &c.) Regulations 1994 (the 'Conservation Regulations'). These Regulations incorporate all SPAs into the definition of 'European sites' and consequently the protections afforded to European sites under the Habitats Directive, through the 1994 Regulations, apply to SPAs designated under the Birds Directive. This legislation is of relevance given the proximity of the proposed development to the Teesmouth and Cleveland Coast SPA (see Appendix 2 for the SPA boundary).

3. Regulation 48 of the Conservation Regulations defines the procedure for the 'assessment of implications for European sites' (i.e. the appropriate assessment process). If the proposed development is unconnected with site management and is likely to significantly affect the site, under Regulation 48(1) the decision-maker must then undertake an 'appropriate assessment' of whether the proposal will 'adversely affect the integrity of the site' in light of its conservation objectives. This assessment also needs to consider potential in-combination effects with other plans and projects.

4. English Nature are the Governments' advisor on matters relating to nature conservation and are normally the lead advisor with respect to the requirement or otherwise for appropriate assessment. In this instance, English Nature did not confirm the need for appropriate assessment at the scoping stage but did confirm that advice would be given on receipt of a formal application (i.e. when further information had been provided on the implications of the scheme on the European site). However, it is the intention of PD Teesport that this ES provides all of the information that is required for appropriate assessment to be undertaken in the event that English Nature advise that such an assessment is necessary. An assessment of the implications of the proposed development in light of the designated status of European sites is contained within Section 28

which also gives an overview of the key stages of the appropriate assessment of relevance in this instance.

1.5 The impact assessment process

1.5.1 Environmental Impact Assessment

1. EIA is a tool for systematically examining and assessing the potential impacts of a proposed development on the environment. Broadly, the resultant ES typically contains the following information:

- A description of the proposed scheme and alternative options considered by the developer;
- A definition of the study area for the EIA;
- A description of the existing (baseline) environment that the proposed scheme has the potential to affect;
- Prediction of potential impacts on the existing environment and assessment of their significance;
- A description of any mitigation measures that would avoid or reduce potential impacts; and
- A non-technical summary (NTS).

2. In terms of the process, the following main stages are typically included in EIA:

- Screening (i.e. determining whether the proposed scheme requires an EIA to be undertaken);
- Scoping (i.e. determining the issues that the EIA should address);
- Preparing the ES itself (i.e. establishing baseline data, evaluating impacts, etc.); and
- Submitting the ES and formally consulting the public and affected parties for their views.

3. The following sub-sections describe the process that has been followed for screening and scoping, consultation and assessment of potential impacts for the proposed NGCT development.

1.5.2 Screening and scoping

1. A formal screening opinion was requested from the DfT and RCBC with respect to the proposed scheme. This request was accompanied by an Environmental Scoping Report. Scoping is the first stage of the EIA process and is undertaken to identify the potential environmental issues associated with the proposed scheme. It also determines the scope of work required for the subsequent stages of the EIA process. The environmental scoping study consisted of the following tasks:

- Site visit;
- Collation of existing environmental information;
- Identification of potentially significant environmental impacts;
- Consultation with relevant organisations and individuals; and,
- Preparation of the environmental scoping report.

2. The Environmental Scoping Report (ESR) was circulated to a number of interested parties (in addition to the DfT and RCBC) in order to provide the opportunity for comment. This feedback was taken into account in the subsequent stages of the EIA. Lists of consultees and details of consultation responses are described in Section 1.5.4 below.

1.5.3 Preparation of the ES

1. The process of assessing potential environmental impact for each parameter identified to potentially be at risk is documented in an ES. For each potential impact identified, an assessment must be made of the impact significance. There are a number of criteria that must be addressed in the determination of the significance of potential impacts. These criteria are listed below:

- Magnitude (local/strategic);
- Spatial extent (small/large scale);
- Duration (short term, intermediate or long term);
- Reversibility;
- Probability of occurrence;
- Confidence in the impact prediction; and
- The margins by which set values are exceeded (e.g. air or water quality standards).

2. In order to classify the significance of predicted impacts, and in an effort to provide a consistent framework for considering and evaluating impacts on different environmental parameters, the terminology presented in Table 1.1 has been adopted.

Table 1.1 Terminology for classifying and defining environmental impacts

Impact	Definition
Negligible	The impact is not of concern
Minor adverse	The impact is undesirable but of limited concern
Moderate adverse	The impact gives rise to some concern but it is likely to be tolerable (depending on its scale and duration)
Major adverse	The impact gives rise to serious concern; it should be considered as unacceptable
Minor beneficial	The impact is of minor significance but has some environmental benefit
Moderate beneficial	The impact provides some gain to the environment
Major beneficial	The impact provides a significant positive gain

3. Where adverse impacts have been identified, potential mitigating measures have been examined and recommended in order to reduce residual impacts, as

far as possible, to environmentally acceptable levels. Residual risks are then stated for each impact.

1.5.4 Consultation

1. Consultation with various statutory and non-statutory consultees has been maintained throughout the EIA process. The consultation exercise was initiated during the environmental scoping stage, at which time a series of meetings were held. The aim of these meetings was to present details of the proposed scheme and to receive initial feedback on potential issues relevant to the various parties.

2. Circulation of the Environmental Scoping Report then followed and further meetings were held as required to ensure all potential issues had been identified, and where necessary, included in the EIA process.

3. Table 1.2 provides a summary of comments received in response to the Environmental Scoping Report and indicates the relevant section of this ES which addresses each of the comments.

4. Informal consultation occurred throughout the EIA process where information, advice and agreement were required on specific elements of the process.

5. In March 2006, a two-day public exhibition was held at South Bank library which provided the opportunity for members of the public to learn about, and comment on, the proposed NGCT development. In addition, a number of presentations on the proposals were made to various interest groups in Middlesbrough (e.g. transport groups, nature conservation/environment interests and local councils).

Table 1.2 Summary of consultation responses received in response to the Environmental Scoping Report

Organisation	Contact name	Summary of comments	Relevant sections of the EIA
CEFAS	Sylvia Blake	• Specified issues to consider in hydrodynamic assessment. • Requested more information on proposed locations of benthos samples, and sampling methodology. • Suggests inclusion of brominated flame retardants in sediment analysis. • Request for description of fish resources in estuary. Suggests obtain offshore fishery information to assist in assessing consequences of offshore disposal. • Requests a cost-benefit analysis of disposal options. • Requested inclusion of list of consultees in ES	**1, 6, 7, 10, 13, 25**
Countryside Agency	Tracy Jones	Proposed development is unlikely to result in significant environmental effects on the surrounding/nearby designated landscape or the Countryside Agency's access or recreation interests.	**21**
Crown Estate	Thomas Arculus	Majority of proposal does not affect the property of the Crown Estate. Developer to approach Crown Estate concerning new quay wall.	**-**
English Nature	Mike Quigley	• Include effects of dredging on hydrodynamics, sediment transport, river profiles, intertidal areas and tidal profiles. • Concerns over the use of the Leathers site as close to the SSSI. • Need to quantify/model changes to maintenance dredging regime and update baseline document in due course. • Recommend a programme of water quality modelling for dewatering discharge and action plan should levels of suspended solids exceed consent. • Recommend a comprehensive ground study. Should develop a risk assessment to assess risk to aquatic habitats. Agree remediation with LPA. • Assess impact of dredge plume and dewatering discharge on interest features. • Suggestions concerning bird information required and which data should be requested. Also recommends looking at value of Bran Sands in more detail. • Recommend that potential changes to erosion and accretion rates be assessed and impacts on birds. • Requests consideration of noise impacts on wildlife. • Makes various suggestions on supporting material such as figures/maps to assist in describing certain areas/issues in the ES (e.g. requested diagrammatic figures of quay wall construction). • Recommends navigational issues be considered in combination with other projects.	**3, 6, 8, 9, 11, 13, 14, 19, 26**

Organisation	Contact name	Summary of comments	Relevant sections of the EIA
		• Recommends looking at dissolved oxygen issues caused by re suspension of sediments during the dredging. • Potential for works to affect seasonal sprat runs should be assessed in relation to importance as a bird food source. • The loss of habitat should be quantified and evaluated.	
Environment Agency	Sam Kipling	• Flood Risk Assessment required; • Desk study of site requested to include identification of previous site uses and potential contaminants. This should inform a site investigation which would then enable a method statement to be produced detailing any remediation requirements. All to be agreed at individual stages with the LPA. • Required methods for foundation piling and drainage disposal to be agreed with LPA before work commenced. • Concerning ecology, required habitat loss to be quantified in context of estuary. • Concerned about noise and impact on seal and bird populations. • Highlighted requirement to consider development in combination with other projects. • Concerning water quality; expressed concern about dispersion of Dabholm Gut and the impact the development may have on the outflow. • Highlighted that the sediment disposal to land may require a waste management licence. • Highlighted importance of site drainage and appropriate storage of oils and chemicals. • Requirement for a settlement facility for dewatering of dredged sediment process. • Recommended inclusion of nonylphenols in contaminant list for sediments. • Recommended reference to PPG 5 (works in or near water), PPG6 (Working at construction and demolition sites), PPG25 (Flood risk assessment guidance), Planning policy statement no 23 and Model procedures for the management of contaminated land report 11.	**3, 6, 7, 8, 9, 19, 22, 23, 26**
Highways Agency	Robert Rodger	Comments supplied by JMP consulting: • Transport Assessment (TA) guidance documents recommended • TA should propose an opening year and an assessment year 15 years after opening. • Peak period traffic flows should be identified from most recent survey data available and should be factored to predict opening year and assessment year baseline flows. Surveys may be required at specific junctions. • Recommendations to assess trip generation. • Recommendations that the TA should assess impact of construction and operational traffic on surrounding highway networks, links and on turning movements at primary junctions.	**17**

Organisation	Contact name	Summary of comments	Relevant sections of the EIA
		• Recommended assessment of peak period traffic flows and impact at junctions A1053/A172, A1053/A66 and A1053/A1085. • Impact on traffic should be considered in combination with any other developments. • TA should suggest improvement measures for links and junctions that are predicted to experience a material increase in traffic. • Consideration should be given to the impact on public transport access to the site. • TA should make reference to accident statistics. • Requested a travel plan.	
HSE	A Keddie Julie Maher (Nuclear Sub division)	Recommendations made concerning consultation with pipeline operator due to the location of a major hazard pipeline within the Consultation Distance. Also recommended discussions to be held with HSE's Nuclear Safety Directorate since the proposed development is within the Detailed Emergency Planning Zone. No concerns highlighted. Awaiting full planning application to make final decision.	**23**
General Lighthouse Authority	John Cannon	Content that scoping report covers all issues.	**-**
Hartlepool Borough Council	Roy Merrett	Comments were made concerning the impacts on the hydrodynamic regime on coastal defence, particularly in relation to the Able development. Also requested inclusion of issues to do with noise and dust emissions from the operation and nature conservation interests of sites.	**6, 19, 20, 22**
INCA	Geoff Barber	Commented that great effort has gone into relocating the terns from Bran Sands lagoon.	
Network Rail	Richard Iggilden	Letter of support. Do not consider that an ES is required.	**18**
Middlesbrough Council	Stephen Litherland	No comments to make. Considers the ESR covers environmental issues adequately.	**-**
RSPB	Nick Mason	Strongly support detailed modelling work to look at hydrodynamic aspects, particularly tidal propagation. Also recommended bird surveys to be undertaken over a range of tidal states and consideration to be given to the impact on intertidal areas associated with shipwash. Highlights proximity of Teesmouth and Cleveland Coast SPA and Ramsar site and likely need for an appropriate assessment.	**6, 11, 26**

Organisation	Contact name	Summary of comments	Relevant sections of the EIA
Teesmouth Bird Club	Ted Parker	Summary of concerns: • Possible adverse effect of development on sedimentary regime on birds. • Major concern over proposed use of former Leathers Chemical Works site for disposal of dredged material (significant ornithological importance). • Major concern over proposed use of Bran Sands for disposal of dredged material. Would prefer disposal at sea. • With respect to general ecology, concerned about effect on North Gare Sands as it is within the SPA.	**3, 6, 11**
SRA	Duncan Buchanan	Stated interest in the Transport Assessment.	**17, 18**
Stockton-on-Tees Borough Council	Greg Archer	Approved approach to the assessment of traffic impact on road. Identified the cross borough boundary issues and asked to be consulted on development of the Traffic Assessment. Also requested that relevant planning permissions be sought from both authorities as dredging operations would be partly within the Stockton Administrative Boundaries.	**17, 18**
Redcar and Cleveland Borough Council	Helen Oakes	Main concern was over the limitations of a single access point and RCBC recommended identification of an emergency access route. Concerns also expressed over figures used for traffic issues in scoping report. Also recommended that the TA should indicate specific locations of gauge restrictions that will limit the use of rail and timescales required to undertake the improvement works. A travel plan was requested.	**3, 17, 18**
Maritime and Coastguard Agency	Simon Gooder	Concerned about safety of navigation in the area. Also suggested inclusion of the following: • The impact of weather to container transhipment operations and container vessel movement. • Indicative construction timescale • Details of proposed monitoring regime to assess outcome of hydrodynamics etc Applicants Port Marine Safety Code must be reviewed in light of the development.	**3, 6, 14, 27**

1.6 Definition of the study area

1. The study area for the EIA comprises the area over which the potential direct and indirect impacts of the proposed development could occur. For the different environmental parameters addressed in the EIA process (e.g. noise, air quality, water quality, etc) the potential zone of direct and indirect influence varies and, therefore, the study area for each of the environmental parameters varies. For this reason, the individual study areas for each of the environmental parameters considered in this ES are outlined below.

1.6.1 Hydrodynamic and sedimentary regime, marine ecology, fisheries, marine and coastal ornithology, marine archaeology, land drainage, flood and coastal protection, commercial and recreational navigation and water and sediment quality

1. The spatial extent of the study area for the investigations into the direct effects of the proposed development on these aspects is defined as the general area of the Tees estuary and coastal waters in Tees Bay. In addition to the direct effects, the scheme has the potential to have indirect effects on the wider environment through changes to the hydraulic and sedimentary regime of the Tees estuary and coastal area.

2. The study area for these parameters therefore, covers the area encompassed within the boundary for the hydraulic and sediment transport model (model domain) and is illustrated in Figure 1.9. The figure also illustrates the existing bathymetry incorporated within the numerical model.

3. As well as including the area illustrated in Figure 1.9, the study area for marine and coastal ornithology also encompasses terrestrial areas around the Tees estuary, given the use of some of these areas by waterbird populations (see Section 1.6.2).

4. The study area for the offshore disposal of dredged material is illustrated in Figure 1.6. Essentially, the study area equates to the boundaries of the two potential disposal sites and the area over which material may disperse during the disposal operations. This is established through the domain for the dispersion modelling which ensures that the model covers the area over which maximum potential impact may occur.

5. On the basis of the results of the dispersion modelling described above, a description has been made of the potential impacts of the proposed disposal activities on water quality, fisheries and marine ecology. In addition, the potential impacts of the disposal operations on commercial navigation are described.

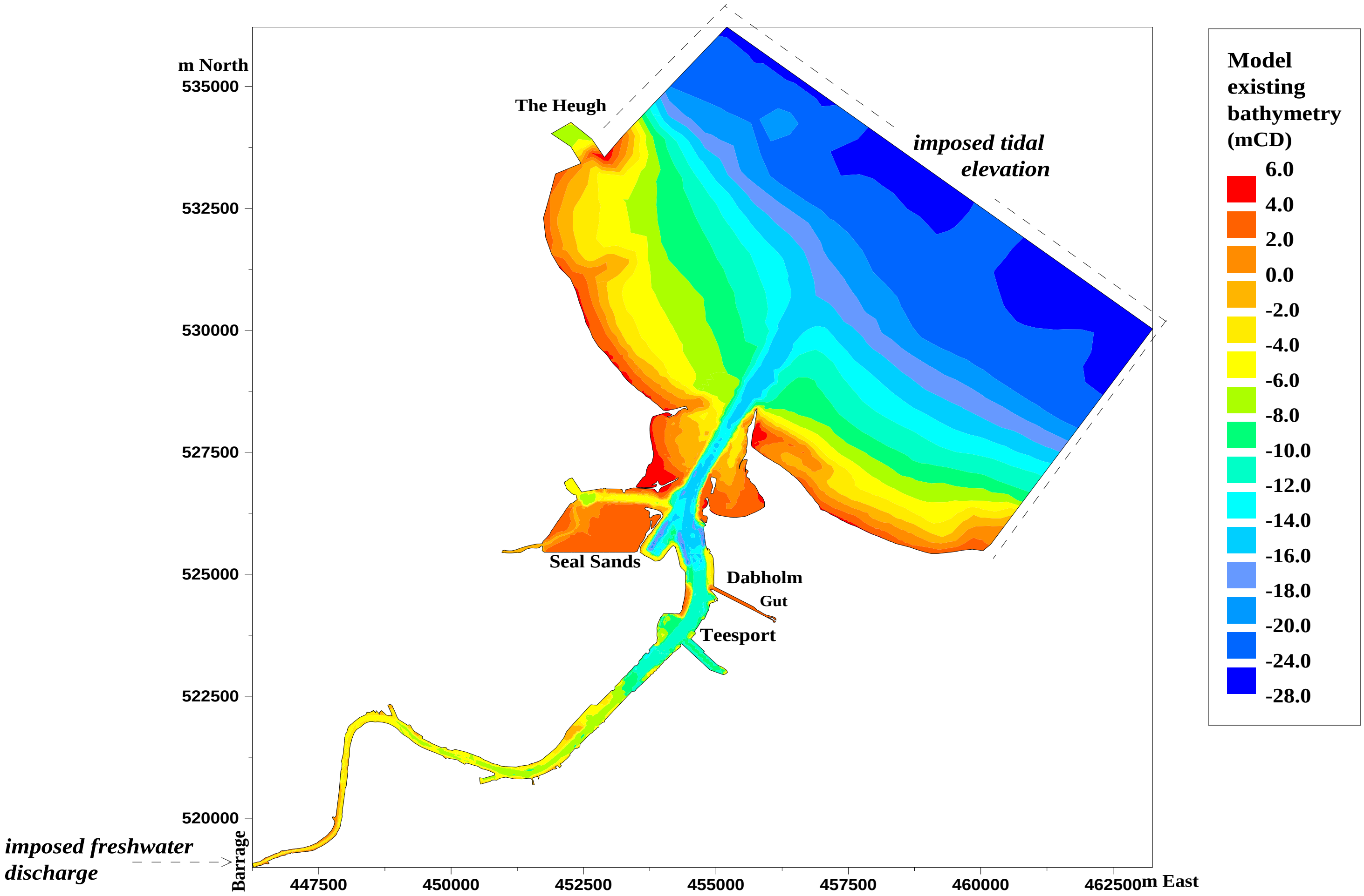


Figure 1.9 The domain for the hydraulic and sedimentary modelling

1.6.2 Coastal and terrestrial ecology, soil quality and geology, recreation and access, heritage

1. The study area with respect to these parameters is broadly defined as the area in the immediate vicinity of the development, that is, the area on which landside developments will occur (e.g. terminal construction, construction of the intermodal rail terminal, upgrading of estate roads, etc.). This is because the potential impacts are largely related to the scheme footprint.

2. Figure 1.3 illustrates the study area over which the above parameters will be considered.

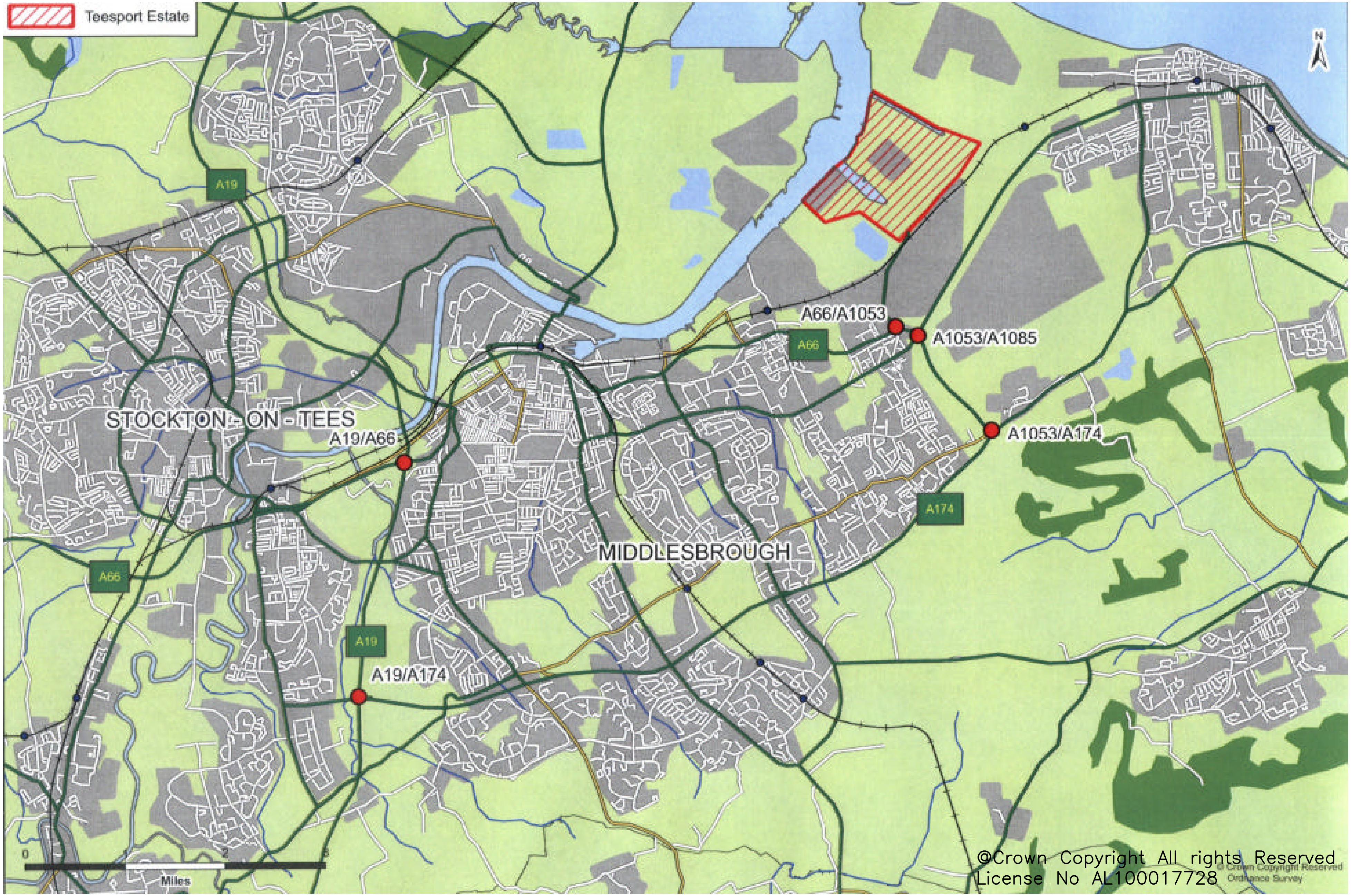
1.6.3 Road and rail traffic

1. The local highway network can be seen as a strategic box comprising the A19 at its western edge, the A66 in the north, A1053 in the east and the A174 in the south. Tees Dock Road provides the key route into the Teesport Estate and connects to the strategic box directly at the A66/A1053 junction. The A19 provides links to the north and south from the study area and the A66 continues westwards past Stockton to the A1 and then onwards to the north-west. Apart from the A66, each side of the box is operated by the Highways Agency and forms part of the strategic trunk road network.

2. The study area for rail is wider in that freight paths to destinations further afield have been considered. However, the greatest level of detail has concentrated on rail access arrangements into and out of the dock, and the routes between the port and the East Coast Main Line, taking into consideration Tees Yard and gauge issues at Yarm.

1.6.4 Noise and vibration

1. The study area for noise and vibration is defined as the area between the proposed terminal, the A19 to the west and the A174 to the south (see Figure 1.10). It also includes sites of ecological importance on the north bank of the Tees Estuary and Teesmouth. The study area takes into account the potential effects on road and rail traffic and, therefore, allows for the assessment of potential effects of road and rail traffic on noise and vibration.



TITLE	PROJECT	HASKONING UK Ltd.			
STUDY AREA FOR THE ASSESSMENT OF THE IMPACT OF THE PROPOSED DEVELOPMENT ON ROAD TRAFFIC	NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT	ROYAL HASKONING ELIZABETH HOUSE EMPEROR WAY EXETER, EX1 3QS Telephone +44 (0)1392 447999 Fax +44 (0)1392 446148 E-mail mail.exeter@royalhaskoning.com Internet www.royalhaskoning.com	Job No. 9R2629	DATE APRIL'06	SCALE N.T.S
			ACAD Ref.9R2629/FIG1.10	CHECKED CU	PASSED CU
			DRAWN GG	DRG No. FIGURE 1.10	REV

1.6.5 Air quality

1. The assessment of emissions to air from the proposed scheme and associated shipping considered an area measuring 13.0km x 15.5km encompassing Middlesbrough, Billingham and Seal Sands. In essence, the study area for the air quality assessment is based largely on that for the road traffic assessment as the air quality assessment needs to include emissions from road traffic. The study area therefore extends to the area over which the effects of changes in the level of road traffic are significant and is shown in Figure 1.10.

2. The road traffic assessment included Middlesbrough's primary roads including the A19 from the A1044 to the A1046, the A66 from the A19 to the A1053, the A1053 from the site to the A174, and the A174 from the A1053 to the A19, and the B1380 west from the junction of the A1053 and the A174.

1.6.6 Landscape and visual environment

1. Broadly, the study area for the assessment of potential effects on landscape and visual character encompasses the lower Tees estuary and its environs.

1.6.7 Socio-economics

1. The study area for the predicted effects on socio-economics focuses on the Tees Valley and comprises five unitary authority areas: Hartlepool, Darlington, Stockton on Tees, Middlesbrough and Redcar and Cleveland. Figure 1.11 shows the location of the unitary authorities.

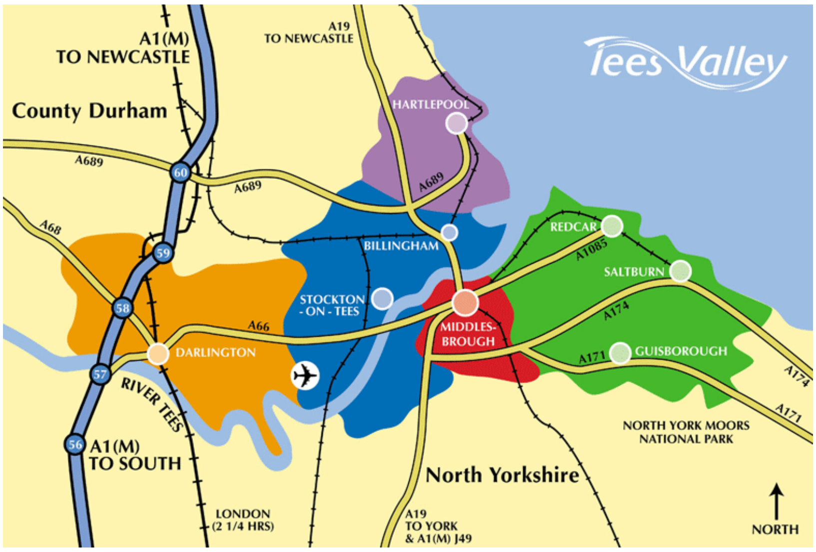


Figure 1.11 The five unitary authorities in the Tees Valley

1.6.8 Disposal of dredged material

1. The study area for the offshore disposal of dredged material can broadly be described as Tees Bay. This is due to the location of the two offshore disposal sites at which it is proposed that dredged material will be placed. With respect to the disposal of dredged material, the effect on water quality has been assessed through undertaking modelling of the dispersion of the sediment plume. The potential effects of disposal on fisheries and navigation are also considered. The study area extends to the area over which the dispersion of material that is deposited at the disposal site(s) may occur. Figure 1.6 illustrates the extent of the study area with respect to the offshore disposal of dredged material.

2. As noted in Section 1.1.3, the potential option of the disposal of a proportion of the dredged material in the Bran Sands lagoon is addressed in this ES. Therefore, the study area for possible disposal at this location encompasses the lagoon itself (see Figure 1.3) and also the Tees estuary which has the potential to be influenced as a result of disposal of dredged material in the lagoon. The following environmental parameters are considered relevant in relation to the potential disposal of dredged material within the Bran Sands lagoon:

- Coastal and terrestrial ecology;
- Marine and coastal ornithology;
- Water and sediment quality; and
- Commercial and recreational navigation.

2 STATEMENT OF NEED

2.1 Introduction

1. Trends in the UK economy have led to an increase in demand for containerised imports. As the UK economy grows this demand will continue to grow, increasing the requirement for appropriate port facilities capable of handling such imports.

2. *Modern Ports: A UK Policy* emphasises the importance of a thriving ports sector to the UK economy. 95% of the UK's international freight tonnage movements, and 75% in terms of value, is estimated to come through UK ports. In 2004 this amounted to £249 billion in imports and £191 billion in exports (approximately 38% of Gross Domestic Product (GDP)).

3. The proposed NGCT project fulfils the requirements for a modern container terminal in its technical specification and represents an alternative to an increasingly congested South East England quadrant, where there is increasing congestion both at ports and on roads and railways. In addition, regulatory changes such as the Working Time Directive are increasing the cost of transporting containers from the South East to northern UK markets.

4. The proposed NGCT is designed to attract the 8,000+ TEU vessels and, therefore, meets a need for UK deep sea container facilities rather than short sea or transhipment facilities.

5. This section sets out the need for the proposed NGCT and begins with a description of the current UK container market and an analysis of UK deep sea container terminal capacity. These sections draw on the evidence presented at the public inquiry for the Felixstowe South Reconfiguration scheme and summarise the following:

- Trends in UK deep sea container traffic;
- Regional distribution of trade and containerised traffic across the UK;
- Publicly available forecasts for UK container traffic growth;
- UK deep sea port capacity including proposed expansions/new developments; and,
- Shipping line port call strategies and how this affects the UK;
- Supply chain analysis including shipping, road and rail costs under different scenarios.

2.2 UK container market

2.2.1 <u>Container demand trends in the UK</u>

1. UK ports handled 8 million TEU in 2004 including deep sea, short sea and transhipment, an increase of 85% since 1994. This growth has been driven by a

6.4% annual growth in load on-load off (lo-lo) container traffic and represents an annual growth of 4% in terms of tonnage.

2. This total container traffic is split mainly between five 'main' container terminals: Felixstowe, Southampton, Tilbury, Liverpool and Thamesport (Medway) and some smaller, 'secondary' container ports such as Tees and Hartlepool and Hull. The remaining ports handling containers are classed as 'other ports'.

3. The split between container movements at main, secondary and other ports is shown in Figure 2.1. This chart shows the trend in container volumes handled over the 10 years to 2004. As stated, these volumes include transhipment traffic, which is not separated out in maritime statistics.

4. This selection of ports is consistent with the selection presented by DfT in *Focus on Ports, 2006*. It should be noted that the 'main' ports group gathers all the terminals currently receiving deep sea calls in the UK.

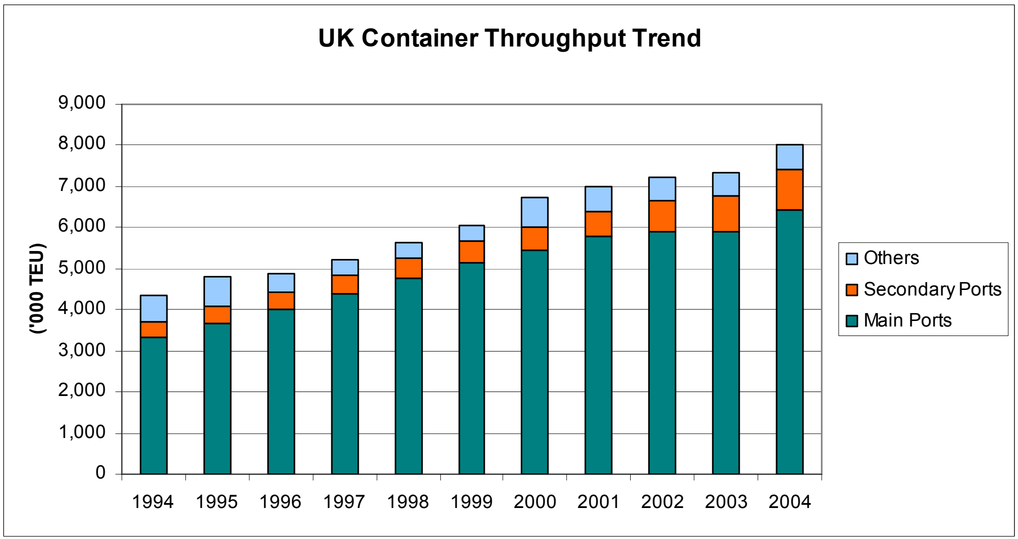


Figure 2.1 Container throughput in UK ports (Source: DfT)

5. Figure 2.1 shows a modest change in the overall market share of the main ports from 77% in 1994 to 76% in 2004, peaking in 1999 at 85%. There has, however, been some increase in the market share for secondary ports reflecting their growing importance as short sea and transhipment (spoke) ports.

6. The share of traffic through each of the main ports is presented in Figure 2.2, while Figure 2.3 presents the trend in the share of the total UK container market handled by main ports. These figures show that Felixstowe is markedly the largest container port in the UK with Southampton and Tilbury following. The trends underpin the common understanding that the bulk of the container traffic flows through the South-

East quadrant of the UK. With four out of the five main ports located in the South East, the quadrant accounts for 69% of the total UK container market.

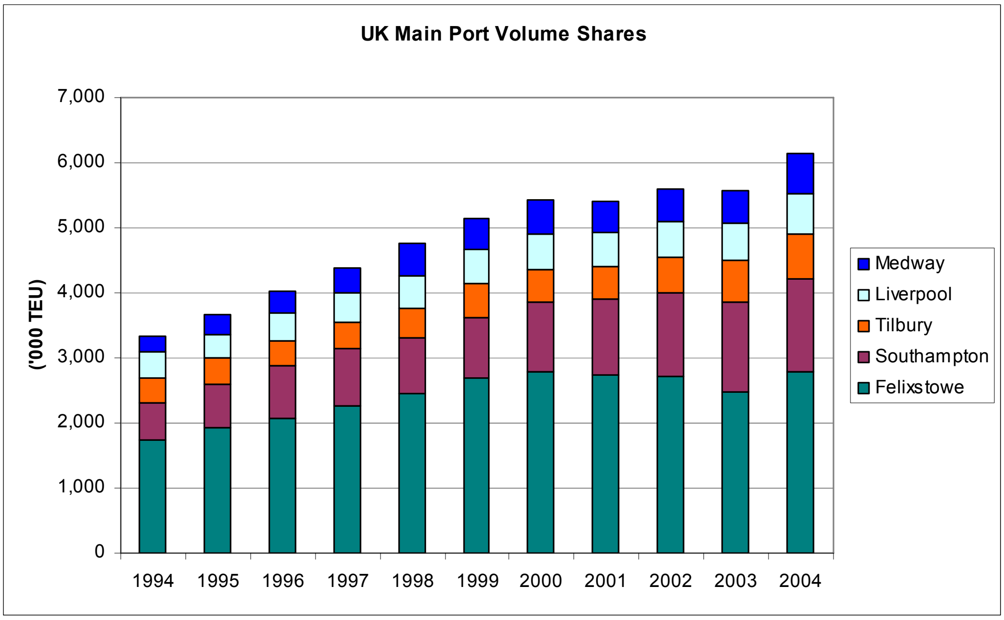


Figure 2.2 Container throughputs at main ports (Source: DfT and Ocean Shipping Consultants)

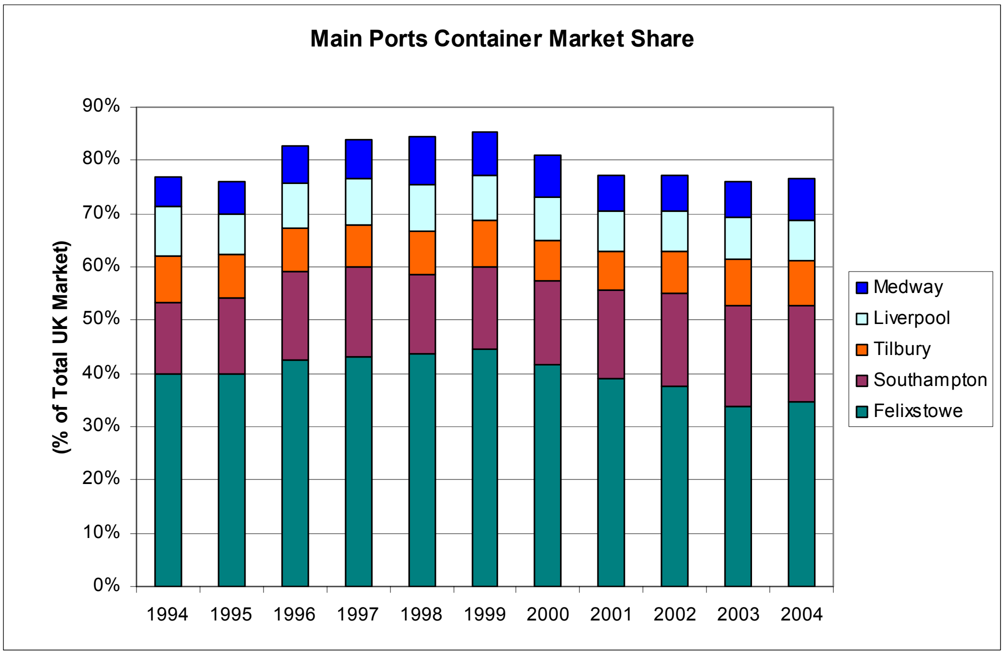


Figure 2.3 Main ports market share trend (Source: DfT and Ocean Shipping Consultants)

7. Capacity constraints at the main ports (and adjoining hinterlands) have increased the role of secondary ports. As the ability of the main ports to encompass the level of growth has been constrained, shippers and shipping lines have established alternative routes. This has largely been focused on transhipment of goods from mainland European ports such as Rotterdam, Antwerp or Le Havre.

2.2.2 Deep Sea trends in traffic through UK ports by type

1. In order to understand the market for deep sea containers, and hence the need for port capacity, an analysis of port traffic by type is needed. As such it is important to be able to differentiate between:

- Deep sea traffic;
- Transhipment (related to hub-type operations);
- Short sea traffic

2. Deep sea (e.g. Trans-Pacific, Europe-Far-East routes) and transhipment container terminals typically serve 8,000+ TEU vessels and as such require 14+ metres draft, while feeder and short sea routes favour the use of smaller vessels requiring only 8-10m draft (Drewry Shipping Consultants, 2002)

3. Against a backdrop of increasing overall traffic, the proportion of direct deep sea traffic has shown modest gains over the 10 years previous to 2004. In this period the deep sea share had a low of 62% in 1998 returning to a high of 70% in 2003. The majority of this traffic has been handled at the main ports. Figure 2.4 shows the trend in containerised traffic by each of these traffic types based on estimates.

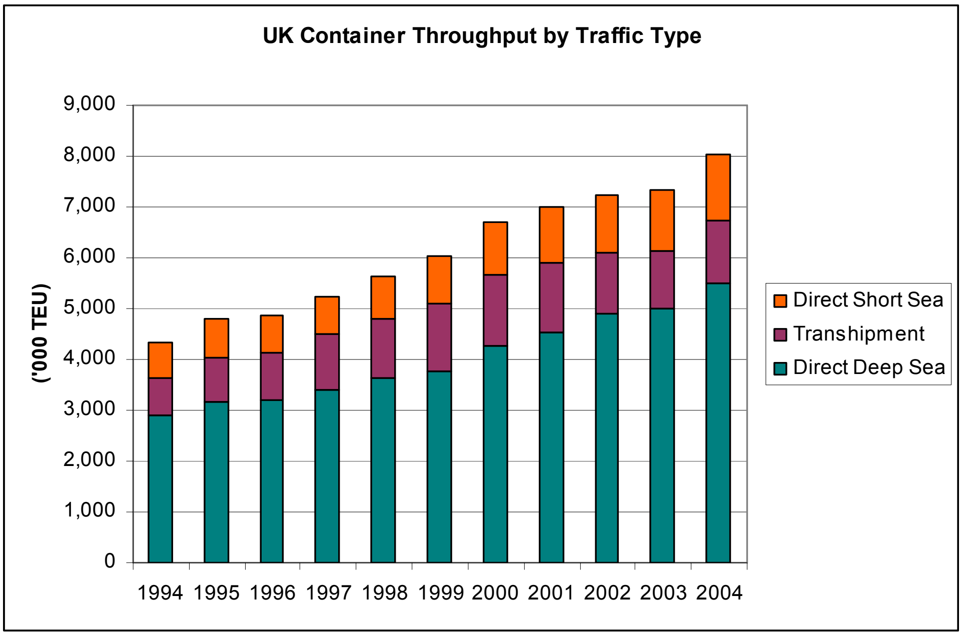


Figure 2.4 Unitised traffic trends by traffic type (Source: Ocean Shipping Consultants and Steer Davies Gleave)

4. After 2001, the main ports experienced a reduction in the level of transhipment traffic as volumes diverted from UK ports to mainland Europe, thus explaining the earlier drop in market share of main port traffic from 81% to 76% between 2000 and 2004 (see Figure 2.3). A large amount of this is attributable to a decision of a single shipping line to relocate its transhipment from Felixstowe to Antwerp and Le Havre showing the "lumpy" impact of shipping line decisions. The footloose and marginal nature of transhipment enables a shipping line to move it to wherever it is most suited. However, much of this traffic has since been replaced with direct deep sea calls enabling the main ports to maintain their dominant position.

5. The share of UK container traffic attributed to transhipment movements has decreased from 22% in 1999 to 11% in 2003, affecting mostly the five main ports and benefiting secondary ports as they become spoke recipients in feeder hub and spoke operations from mainland Europe (in the absence of data for 2004 it has been assumed that this percentage has not changed in 2004).

6. It is also important to note that the five main ports are the only ones with current capacity to accommodate deep sea traffic, implying that up to 89% of the 2004 main port volumes consisted of direct deep sea calls. This share has increased sharply in the 6 years previous to 2004 following the trends just described.

7. Looking strictly at the deep sea share of UK container traffic as presented in Department for Transport Statistics for 2004, the regional tendency towards the

South East is clear. Figure 2.5 shows the share of deep sea throughput at each of the main UK ports, illustrating the case in point: 94% of the deep sea container traffic is handled in the South-East quadrant.

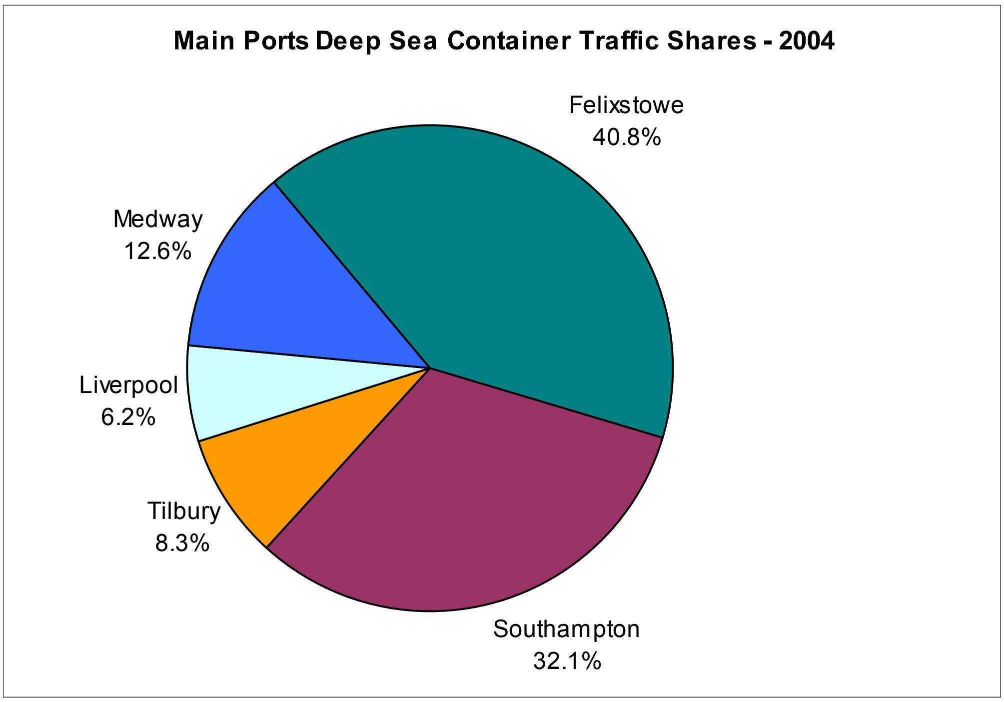


Figure 2.5 Deep sea container traffic share by main ports (Source: DfT, 2004)

8. The shares presented in Figure 2.5 imply that the north of England is mostly served by inland transport (road and rail modes) or by feeder services. This distribution should remain unchanged unless new infrastructure is introduced elsewhere, or congestion rises to a point where traffic movements are significantly constrained. It is thought that congestion is becoming a significant issue and Professor Phil Goodwin has calculated “that the widely quoted figure of an annual cost of £20 billion, would increase to £30 billion by 2010” (Rail Freight Group, 2004). A clear example of the impact is the recent move by B&Q to feed through Immingham citing increased congestion in the South. They believe delivery reliability has improved from 65% to 92% (Containerisation International, 2005).

2.2.3 Forecasts of container traffic

1. National port forecasts that are available in the public domain have been reviewed. These included those made available for recent port development public inquiries. In light of the recent approval of the Felixstowe South Reconfiguration application, the forecasts prepared by Ocean Shipping Consulting for that inquiry have been adopted here under the precept that they are implicitly accepted. The growth forecasts imply

a multiple to GDP projections ranging between 2 and 2.5 (based on a GDP forecast of 2 to 2.3% over the 2004 to 2020 period).

2. Figure 2.6 presents the base growth line for deep sea and transhipment container traffic in the UK. Both direct deep sea and transhipment traffic forecasts have been included as these tend to use the same infrastructure and therefore represent the need for deep sea facilities overall. These estimates are used hereafter in this section. The chart also includes a low and high transhipment case, based on assumptions accepted at the Felixstowe South Reconfiguration Inquiry that the UK share of the North Sea transhipment market recovers to 13% (Low – 2002 level), 16% (Base - 2001 levels), and 20% (High – 1999 level), from a 7.5% share estimated for 2004.

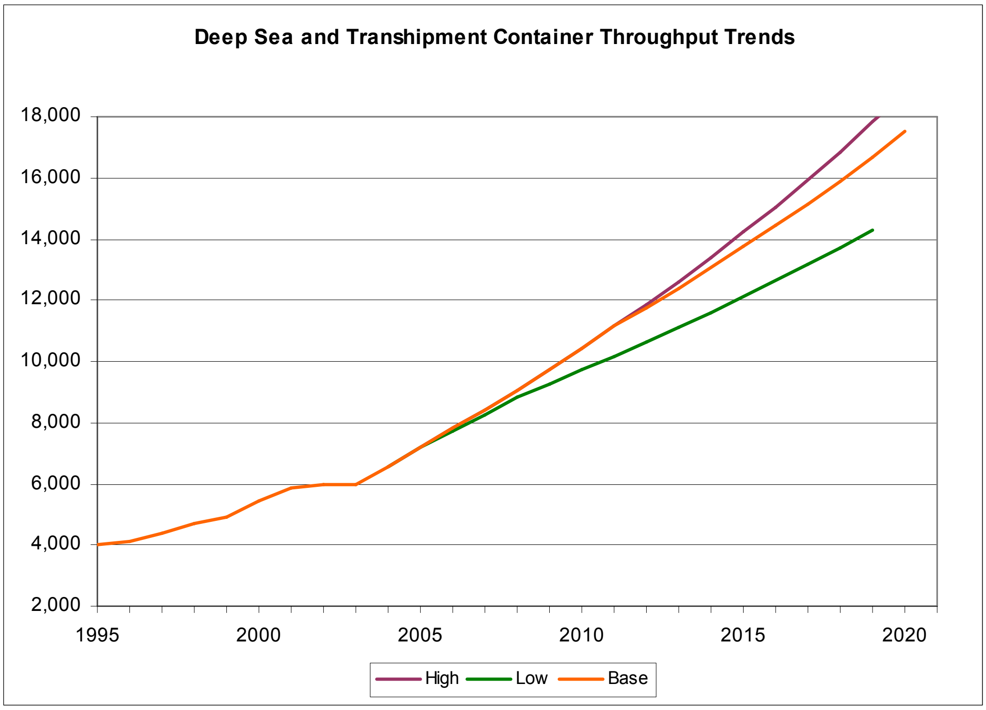


Figure 2.6 UK main port container throughput historic trends and forecasts (Source: DfT Maritime Statistics and OSC estimates for Felixstowe South Reconfiguration public inquiry)

3. This base forecast suggests an increase of more than 50% in the 5 years to 2010, and almost trebling of 2004 levels of throughput volume for the year 2020.

4. The trends in traffic type are expected to stabilise in the near future, with transhipment reaching a 24% share of the total UK market by 2020. Figure 2.7 shows the implied shares of traffic type in the forecasts as presented in the Felixstowe South Reconfiguration Inquiry for all major UK ports.

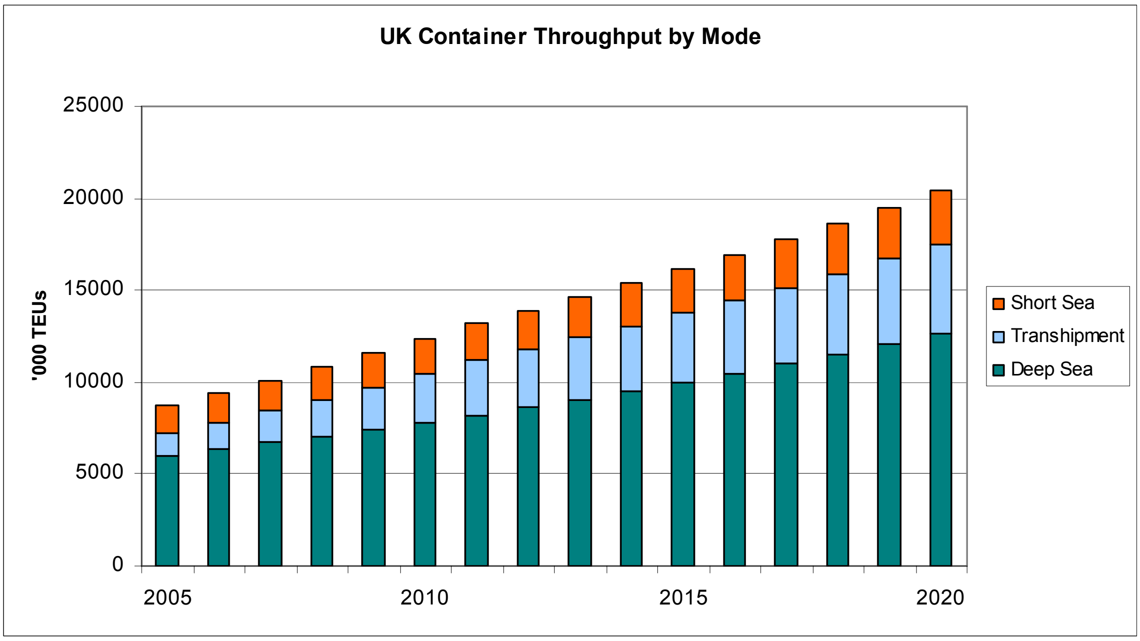


Figure 2.7 Expected shares of traffic type (based on OSC Estimates presented for Felixstowe South Reconfiguration public inquiry)

5. The share of transhipment will depend on how much capacity becomes available at UK ports. As ports become busier with import/export traffic, transhipment traffic is commercially less attractive. The ports of Southampton and Felixstowe have around 90% and 75% utilisation rates (annual rate) at the moment respectively while the Felixstowe South Reconfiguration public inquiry indicates that 85% is a desirable utilisation rate to ensure efficiency and hence international competitiveness. Should capacity increase at these ports transhipment rates may also increase. However, as will be shown, the ability for Southampton to further expand is constrained although Felixstowe has just had its expansion plans approved.

6. It is important to note that these forecasts anticipate transhipment to be a higher proportion of UK main port traffic compared with an expected share of 20% for 2020 as presented in the evidence for Bathside Bay expansion which pre-dates the evidence in the Felixstowe South Reconfiguration inquiry.

2.2.4 <u>Container traffic by region – imports and exports</u>

1. Understanding the distribution of containers throughout the UK is complex and a complete primary data set is not available. However the following section sets out Steer Davies Gleave's understanding of regional trade and draws on a range of data sources to demonstrate the size of the market in the Midlands and North of the UK (data sources include: DfT Maritime Statistics, 2004; HMCE Container Traffic Data,

2004; Intrastat, EC, 2004 and Felixstowe South Reconfiguration Inquiry, Proof of Need, evidence provided by Andrew Penfold, OSC).

2. The total value of UK trade in 2004 was £440 billion (www.uktradeinfo.com) and amounted to 460m Tons. Of this total, 56.5m tons correspond to container traffic. The distribution in terms of origin and destination of trade over the UK is presented in Table 2.1, aggregated into three main regions (based on Government Office regions) for clarity. These regions have been defined loosely to be representative of the area of influence of port clusters in the UK. Hence, the South region covers Eastern, South East and London regions; the North region includes the North West, North East and Scotland and the Midland region includes West and East Midlands, Yorkshire and Humber plus Wales.

Table 2.1 Distribution of containerised traffic in the UK by partner world region (Source: HMCE, 2004)

World Region	North	Midlands	South	Total
Exports				
Asia & Pacific	40%	24%	36%	100%
Europe*	44%	21%	35%	100%
Rest of the World	39%	23%	38%	100%
Imports				
Asia & Pacific	30%	18%	52%	100%
Europe*	25%	22%	52%	100%
Rest of the World	19%	16%	65%	100%

* The world region 'Europe' is defined loosely, and relates to countries within the EU25 plus other countries sharing the same shipping routes e.g. Norway, Turkey and Russia.

3. Just over all import and export volumes are loaded/unloaded through ports in the South East. The location of manufacturing plants in the North of England explains the northern bias in the proportion of exports compared with the shares of imports which are largely dominated by London and the South East, where population and purchasing power are substantially higher.

4. Of the 8m TEU handled in UK ports in 2004, 83% (6.6m) correspond to trade traffic. Of the rest, 15% was transhipment (see Figure 2.4) and 3% was domestic. According to DfT data, 61% of the trade traffic corresponds to imports, amounting to 3.9m TEU.

5. Based on the distribution presented in Table 2.1, plus published DfT data for the shares of imports/exports, it can be estimated that the North received over 0.9m TEU of imports and generated 1m TEU of exports, in 2004. Of these, 0.7m TEU and 0.9m TEU, respectively, correspond to deep sea traffic (i.e. the origin/destination outside the UK is either Asia & Pacific or Rest of the World).

6. As is shown in Figure 2.5, Liverpool receives only 6.2% of direct deep sea calls which implies that the rest of the northern demand for containerised traffic is either served by feeder operations or is transported overland from ports in the South East. Considering that Liverpool receives mainly trans-Atlantic traffic, this analysis suggests that a deep sea terminal for the North-East coast could serve a substantial potential market.

7. Furthermore, in terms of inland transport distances, the Midlands appears as a market that could potentially be served by Teesport, and which represents a total current demand of 1.3m TEU. This analysis will be re-visited in later sections in light of the comparative road and rail costs of serving the regions from different deep sea ports.

2.2.5 Regional traffic forecasts

1. As is shown in Figure 2.5, over 90% of the deep sea traffic calls at ports located in the South East quadrant. However, over 52% of the imports and under 40% of the exports are related to this region (see Table 2.1).

2. Using the Base growth scenario presented in Figure 2.6, coupled with the regional distribution of container traffic in the UK presented in Table 2.1, future export distribution estimates are presented in Table 2.2, and estimates for future import distribution are presented in Table 2.3. Figures in both tables are net of transhipment traffic.

3. These tables are prepared on the basis that 61% of UK container traffic relates to imports (in terms of tonnage) (DfT maritime statistics).

Table 2.2 Container traffic – regional distribution forecast for exports ('000 TEU) (Source: HMCE, 2004)

World Region	North	Midlands	South
2004			
Asia & Pacific	195	116	178
Europe	259	126	208
Rest of the World	724	425	698
2010			
Asia & Pacific	267	158	244
Europe	355	173	285
Rest of the World	991	582	955
2015			
Asia & Pacific	344	204	313
Europe	434	211	349
Rest of the World	1,274	748	1,228
2020			
Asia & Pacific	435	258	396
Europe	513	250	412
Rest of the World	1,611	946	1,553

Table 2.3 Container traffic – regional distribution forecast for imports ('000 TEU) (Source: HMCE, 2004)

World Region	North	Midlands	South
2004			
Asia & Pacific	318	194	550
Europe	215	191	447
Rest of the World	445	358	1,495
2010			
Asia & Pacific	435	266	753
Europe	294	262	613
Rest of the World	610	490	2,047
2015			
Asia & Pacific	559	342	968
Europe	360	320	750
Rest of the World	784	630	2,631
2020			
Asia & Pacific	708	433	1,225
Europe	425	378	886
Rest of the World	991	796	3,329

4. These tables present a breakdown of the UK container traffic in terms of partner region of the world providing some insight towards the share of traffic operating the Far East – North Europe route. This long haul traffic is best suited for the use of extra large vessels (6,000+ TEU) due to economies of scale.

5. Tables 2.2 and 2.3 show that in 2020 the North will offer a strictly deep sea market of 1.1m TEU, due to trade with the Far East alone, and 2.6m TEU from the Rest of the World. Potentially, a northern port could compete for the Midlands market as well, which would add an extra 0.7m TEU per year of trade with the Far East, and 1.7m TEU from the Rest of the World, by 2020. Even by 2010 the Far East trade with the North will reach 0.7m TEU with an additional 1.6m TEU from the Rest of the World, which implies there is enough market for a northern port of NGCT proportions.

6. The North offers a substantial container market that is currently being served by feeder services from continental Europe and, to a much lesser extent, by domestic services from Felixstowe or Southampton. This implies that a large portion of the container traffic is transported either by rail or road, compounding the congestion problems experienced in the South East of England.

7. Currently, export containers are carried by lorry or train to their port of exit. Of the export containers carried by truck from the North, 28.3% were loaded on ships in South East ports. Furthermore, of the export boxes carried by truck from the Midlands, 76.6% were taken to South East ports. For imports, the numbers are similar: 24.8% of northbound trucks come from SE ports as do 78.5% of Midland-bound trucks (Continuing Survey of Road Goods Transport 2004, DfT).

8. Equivalent figures for rail traffic are not publicly available. However, given that rail freight economics only becomes competitive for longer haulages, these proportions are likely to be even higher than for road based transport.

2.2.6 Summary

- Container traffic in the UK was 8m TEU in 2004 of which 71% is deep sea traffic. Throughput is expected to be double this number by 2015.
- Based on this trend, Far East trade container traffic originating or terminating in the North will amount to 0.7m TEU by 2010 and 1.1m by 2020.
- Currently only 6% (260,000 TEU) of the deep sea traffic enters the UK via a port in the North (namely Liverpool), the rest of the 1.68million TEU Northern market is handled in the South East and continental Europe. This implies that a large amount of container traffic destined for the North already needs to be transported on rail or road contributing to congestion throughout the South East and Midlands. Without substantial increased deep sea capacity in the North this situation is only set to get worse.

2.3 UK deep sea container terminal capacity

1. This section reviews the supply of deepwater container terminal capacity in the UK. It demonstrates how container capacity is measured and reviews planned expansions at existing and proposed deep sea terminals. Expansion plans targeting the short sea market such as Hull have not been included.

2. *A Project Appraisal Framework For Ports* published by the Department for Transport in 2003 states that owing to the commercial nature of port development in the UK it is only reasonable to expect that promoters of schemes should give details of alternatives within their control and will only be able to comment on information within the public domain with regard to projects being promoted by others. As such this review of UK port capacity and proposed port developments does not seek to critique each proposal and does not comment on whether existing ports have the ability to increase their capacity over and above announced plans.

3. The review encompasses projects which are expected to compete directly with the proposed NGCT. Expansion projects that specifically target the short sea market, for example Hull, have been excluded from the analysis since they will not compete directly for direct mainline calls. It should, however, be noted that these projects will aim to attract feeder services with deep sea cargo moving to/from UK and European hub ports.

2.3.1 Measuring port capacity

1. The capacity of a port terminal is influenced by many factors, related not only to the design, layout and equipment of the terminal but also the market it is operating in. For this reason measuring port capacity is not an exact science and industry experts rely on benchmarks to determine the operational capacity of a terminal.

2. There has been much debate in recent years regarding UK port capacity. The major port operators have made publicly available the capacity at existing and proposed terminals during the various planning inquiries into the proposed container terminal developments at Dibden Bay, London Gateway (Shellhaven), Bathside Bay and Felixstowe. Table 2.4 shows the existing and planned container terminals considered in this section.

Table 2.4 Existing and planned deep sea UK container terminals

Current UK Container Terminals	Planned UK Container Terminals
Felixstowe	Felixstowe South*
Southampton	London Gateway (Shellhaven)**
Thamesport	Bathside Bay (Harwich)*
Tilbury (TCS)	Bristol
Liverpool	Hunterston
	Northern Gateway Container Terminal (Teesport)
	Liverpool Riverside

* Approved
** “Minded to approve”

3. For terminals (existing and planned) where no capacity figures have been made available, it has been necessary to estimate capacity based on estimated performance (this is the case for Hunterston and Bristol). All other capacity figures come from press releases, public inquiries or other public domain documents.

4. Whilst physical factors such as quay length and yard area provide the ultimate limit to terminal capacity, market related factors such as the size of vessels handled and the proportion of total cargo exchanged also strongly influence the maximum productivity achievable at a terminal. Deep sea terminals handling a high proportion of large vessels will achieve a higher average productivity than an identical short-sea terminal handling a larger number of small vessels.

5. The benchmark of performance (i.e. TEU per metre of quay per annum) has been accepted in previous UK port planning inquiries as a basis for capacity estimation. Table 2.5 summarises the factors that can influence performance.

6. The Trinity Terminal at Felixstowe is reported to handle 1,450 TEU per metre of quay per annum and is considered to represent a benchmark of efficiency (The Bathside Bay, Harwich, Container Terminal Inquiry Report”, 23rd March 2005). The Planning Inspectorate has since indicated that 1,450 TEU per metre of quay per annum is the preferred benchmark for new deepwater container terminal capacity in the approval of the Bathside Bay Container Terminal project. This benchmark has therefore been used to estimate capacity of new developments, under the assumption of similar efficiency levels, where it has not been officially confirmed by the ports concerned.

Table 2.5 Factors influencing terminal capacity (Source: Moffatt & Nichol)

	Factors contributing to high quayline performance	Factors contributing to lower quayline performance
Terminal/berth	Purpose built container terminal Dedicated container berths Uniform layout Straight line berths	Converted general cargo facilities Multi-purpose berths (i.e. shared with other cargo activities) Non-uniform layout Non-straight line berths
Yard	High density yard stacking (e.g. RTG, straddle carriers) Advanced IT system	Low density yard stacking (e.g. top-lifters, reach-stackers) No / basic IT system
Cranes	Newer ship-to-shore gantry cranes High crane allocation per vessel Twin-lift capability High reliability	Ship's gear / mobile cranes / shore cranes / older ship-to-shore gantry cranes Low allocation per vessel Low reliability
Trade	High proportion 40' boxes High transhipment element High % cargo exchange	Low proportion 40' boxes High proportion of reefer cargo Low % cargo exchange Out-of-gauge / project cargo
Vessel	Large, cellular container vessel Uniform / predictable arrival pattern – adherence to booked berthing windows Stowage pre-planned to match crane allocation	Small / non-cellular vessels Random / unpredictable arrival pattern – low adherence to booked berthing windows Dispersed stowage

2.3.2 Timing of new capacity

1. The timing of the introduction of new capacity is dependent upon several key factors:

- Approval of the project by the Secretary of State, together with any conditions attached to the approval.
- The lead time required to design and build the new terminal.
- The market conditions, which will determine the commercial viability of each project and will determine the timing of each phase of development.

2. Moffatt and Nichol estimated the timing of developments based upon the public statements of intent made by the project sponsors. It should however be noted that since all proposed projects are being developed by the private sector that development timescales may be extended so as to enable capacity to be introduced to the market in line with demand.

2.3.3 Overview of current and planned UK deep sea container terminal capacity

1. Table 2.6 provides an overview of planned capacity for UK ports up to 2020. The following section summarises what is known about each planned development.

Table 2.6 Overview of deep sea terminal port capacity

Port	Terminal	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Southampton	Southampton Container Terminals	1.55	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.95
Felixstowe	Trinity	3.27	3.37	3.43	3.49	3.55	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
	Landguard	0.45	0.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Felixstowe South	-	-	1.10	1.10	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Harwich	Bathside Bay CT	-	-	-	-	-	-	1.02	1.78	1.78	2.03	2.03	2.03	2.03	2.03	2.03	2.03
Liverpool	Seaforth	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
	Riverside				*0.30*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*
London	Tilbury Riverside	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
	London Gateway	-	-	-	1.00	1.00	1.00	1.50	1.50	2.00	2.00	2.50	2.50	3.00	3.00	3.00	3.50
Medway	Thamesport	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Bristol	Royal Portbury	0.14	0.14	0.14	0.14	0.14	-	-	-	-	-	-	-	-	-	-	-
	Deepsea Container Terminal	-	-	-	-	-	*0.38*	*0.75*	*1.13*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*	*1.50*
Hunterston	*Deepsea Container Terminal*	-	-	-	-	*0.58*	*0.58*	*1.16*	*1.16*	*1.16*	*1.16*	*1.16*	*1.16*	*1.16*	*1.16*	*1.16*	*1.16*
Teesport	***Northern Gateway Container Terminal***	**-**	**-**	**-**	**-**	***1.00***	***1.00***	***1.00***	***1.00***	***1.50***	***1.50***	***1.50***	***1.50***	***1.50***	***1.50***	***1.50***	***1.50***
Total		**7.61**	**8.11**	**8.82**	**10.18**	**12.98**	**13.27**	**15.74**	**16.87**	**18.25**	**18.50**	**19.00**	**19.00**	**19.50**	**19.50**	**19.50**	**20.00**
Growth			***6.6%***	***8.8%***	***15.4%***	***27.5%***	***2.2%***	***18.6%***	***7.2%***	***8.1%***	***1.4%***	***2.7%***	***0.0%***	***2.6%***	***0.0%***	***0.0%***	***2.6%***
Total exc unapproved		**7.61**	**8.11**	**8.82**	**9.88**	**10.80**	**10.71**	**12.23**	**12.99**	**13.49**	**13.74**	**14.24**	**14.24**	**14.74**	**14.74**	**14.74**	**15.24**

Notes

Includes only ports with current / planned capacity to handle deep sea container traffic
Timescales for construction are based on estimates
Phasing of capacity will be influenced by market demand
Terminals in italics have yet to receive approval / provisional approval for development

Southampton

2. Container handling at the Port of Southampton is undertaken at Southampton Container Terminals (SCT), a four-berth deep-water facility owned and operated by a joint venture P&O Ports/Associated British Ports.

3. The proposed expansion of container handling capacity at Dibden Bay in Southampton was rejected by the Secretary of State in 2004. As a result, SCT management undertook a program of capacity optimisation during 2005 which included a redevelopment of the terminal yard layout and the introduction of a vehicle booking system which enabled productivity gains on the landside of the operation. Capacity has therefore risen from an estimated 1.55 million TEU in 2004 to close to 2 million TEU by the end of 2005.

Felixstowe

4. The Port of Felixstowe has two container terminals – the deepwater Trinity Terminal and the smaller, shallower-draft Landguard Terminal.

5. The Trinity Terminal has been expanded to its maximum capacity in recent years by the port's owners Hutchison Port Holdings (HPH). The final Trinity III Extension is reported to have added an additional 0.4 million TEU per annum to the port's total handling capacity (Felixstowe South Reconfiguration Inquiry - proof of evidence submitted by Andrew Penfold, Ocean Shipping Consultants working on behalf of HPH).

6. The scope for further capacity increases at the Trinity Terminal is now limited to the gains that can be achieved via productivity gains, related to investment in new equipment. This is expected to add 0.45 million TEU per annum to the port's total capacity, phased between 2003 and 2010 (Felixstowe South Reconfiguration Inquiry - proof of evidence submitted by Andrew Penfold, Ocean Shipping Consultants working on behalf of HPH).

7. In February 2006, HPH was granted planning permission for Felixstowe South Reconfiguration following an inquiry. The original timescale detailed in the application assumed that the new terminal would be operational in 2006, but given the delays in the approval Moffatt & Nichol now estimate a 2007 start date. The terminal will be developed in two phases:

- Phase 1 will add 760m quay / 1.1 million TEU annual handling capacity (NB: the first phase will also see the loss of Landguard Terminal capacity, i.e. 0.45 million TEU per annum)
- Phase 2 will add 590m quay / 0.86 million TEU annual handling capacity

Bathside Bay

8. Hutchison Port Holding's submission to the planning inquiry stated that Bathside Bay would provide a total capacity of 1.68 million TEU per annum, to be developed in three phases:

- Bathside Phase I = 840,000 TEU;
- Bathside Phase II = 630,000 TEU;
- Bathside Phase III = 210,000 TEU.

9. Bathside Bay Container Terminal received full approval in March 2006, but the development is contingent upon, amongst many other factors, the upgrade of the A120. The terminal is therefore not expected to become operational until 2011. This timescale could fall back further if the take-up of capacity at Felixstowe South is slower than planned, or if the requisite road / rail improvements are not completed.

10. The inspectors report also indicated that, based on current UK deep sea terminal benchmarks, Bathside Bay expansion should be expected to provide total capacity of over 2 million TEU when fully developed. This higher benchmark has, therefore, been used to determine Bathside Bay capacity.

Medway

11. The two-berth Thamesport terminal, located within the Medway port area, is owned and operated by HPH. It provides 0.75 million TEU capacity per annum (Felixstowe South Reconfiguration Inquiry - proof of evidence submitted by Andrew Penfold, Ocean Shipping Consultants working on behalf of HPH). The site provides the future capability to develop a third berth (referred to as "British Gas Land"), which could add an estimated 0.375 million TEU per annum to Thamesport's operational capacity, but HPH has not opted to pursue this development opportunity to date and would be subject to the usual planning procedures.

Tilbury and London Gateway

12. There are three container terminals located at Tilbury, the major general cargo port facility within the Port of London. However only the Tilbury Container Services Ltd. (TCS) operated two-berth riverside terminal is assessed to provide deep sea terminal capacity. TCS, owned by Associated British Ports, also operates two berths within the port's enclosed dock system, but these have been excluded from this capacity analysis because: a) they are equipped with only a single ship-to-shore gantry crane, therefore making them unsuitable to handle significant volumes of deep sea container cargo; and b) Tilbury's Panamax lock prevents the berths in the enclosed dock being able to handle deep sea traffic. Additionally Tilbury's Short Sea Container Terminal is also excluded from this analysis as it also cannot handle deep sea traffic.

13. Further downstream P&O Ports (now owned by Dubai Ports World) are planning to redevelop the Shellhaven site into a modern container terminal. The company received a “minded to approve” decision letter for the 3.5 million TEU capacity London Gateway port in July 2005. When fully developed it will provide 2,300m of deepwater quay – the capacity is based on a performance benchmark of over 1,500 TEU per metre of quay per annum (the 1,500 TEU per quay metre benchmark is presented as submitted by P&O in their inquiry, and is not challenged).

14. The terminal will be developed in phases and these have been factored into the capacity forecast as per the timings included in the planning application.

Liverpool

15. Liverpool’s deep sea container business is handled at the port’s Seaforth Container Terminal. It markets itself as a predominant port for trans-Atlantic trades linking Eastern Seaboard and Latin America with the UK.

16. Liverpool’s operator, Mersey Docks and Harbour Company (acquired in September 2005 by Peel Holdings Limited.), lodged an application with the Secretary of State for Transport in August 2005 for a Harbour Revision Order. The application was in relation to a proposed £80 million riverside post-Panamax container terminal. This development would increase total port capacity to nearly 1.5 million TEU per annum.

17. The timing of the development will depend upon the date of approval of the HRO, the time required to design and construct the terminal and also the level of demand within the market which will determine the commercial viability of the project. The terminal is estimated to become operational in mid-2008.

Bristol

18. Bristol currently offers two deep-water berths at the Royal Portbury Dock, and additionally provides short-sea terminal capacity at Avonmouth Docks. The latter is excluded from the capacity analysis.

19. Bristol’s proposed deep sea terminal would provide a maximum capacity of 1.5 million TEU per annum when fully developed. The project, for which a formal application is yet to be submitted, will require substantial dredging and reclamation, including the deepening of approximately 11 nautical miles of navigation channel to provide deep water access to the terminal.

20. Should this project be developed, the port’s current deep sea capacity, estimated at 135,000 TEU per annum, would be re-assigned to handling short-sea / feeder vessels and multipurpose vessels. For this reason, this capacity is excluded from the calculations for scenarios where the expansion is approved.

Hunterston

21. The development of a deep sea container terminal at Hunterston is being proposed by port operator Clydeport together with North Ayrshire Council and Scottish Enterprise. Clydeport have to yet submit a formal application.

22. According to the evidence submitted at the Felixstowe South Inquiry an initial development of two berths / 800 metres of deepwater quay is planned at Hunterston. This has been estimated to become operational in 2009. Capacity, using the 1,450 TEU per metre of quay per annum benchmark, would be 1.16 million TEU per annum when the terminal is fully developed, assuming no yard constraints.

23. Table 2.6 summarises the current and project port capacity taking into account the above planned expansions and developments.

2.3.4 Suitability of proposed capacity

1. Estimates presented (Figure 2.6) for the expected container throughput to the year 2020 show that direct deep sea and transhipment container throughput will increase to 17.5m TEU in this time, of which 3.7m will have an origin or a destination in the North.

2. This section discusses proposed plans for deep sea capacity expansions in the UK over the same period, concluding that the committed capacity (including only the projects that have been approved or minded to approve, namely London Gateway, Bathside Bay and Felixstowe South Reconfiguration) of deep sea port expansion plans will reach 15.2m TEU by 2020, and would be increased to 16.7m TEU with the addition of the NGCT.

3. Utilisation forecasts for UK deep sea ports are estimated using the projected deep sea capacity against deep sea throughput at all UK ports forecasts presented earlier. As shown earlier a desirable utilisation rate for ports is around 85% and for the case where all committed capacity is included, it is estimated that deep sea capacity will have reached 91% utilisation by 2010, rising to 110% by 2020. However, with additional capacity at Teesport these estimates decrease to 84% of deep sea capacity utilisation by 2010 and 100% for 2020. In either case, the level of utilisation at 2020 is significant and would again be at the point where international competitiveness with mainland European ports is at risk due to congestion.

4. Evidence presented for the Felixstowe South Reconfiguration inquiry states that: "If all proposed capacity is added [including Felixstowe South, but excluding NGCT] then this will all be effectively utilised by the second half of the 2010s." (Felixstowe South Inquiry – Evidence presented by Andrew Penfold of Ocean Shipping Consultancy). In this light, and given the planned timing of capacity expansion at Teesport, the NGCT offers a viable and opportune alternative for relieving stress on

the UK deep sea port system, and certainly does not lead to overcapacity in the UK port system.

2.3.5 Summary

- A series of deep sea container terminal projects have been identified, but of these only Felixstowe South Reconfiguration and Bathside Bay are approved; London Gateway currently is 'minded to approve' status.
- The total committed deep sea capacity in the UK will amount to 15.2m TEU for 2020 and would increase to 16.7m TEU with the approval of NGCT.
- Medium term deep sea capacity developments are all located in the South East, increasing consolidation, and congestion, in this region.
- Additional deep sea container handling capacity should be welcome as it will relieve utilisation levels in the main UK ports.
- Throughput for direct deep sea and transhipment container traffic is forecast to be 17.5m TEU by 2020.

2.4 Shipping line strategies

1. A key element under consideration while assessing the competitive position of a port like NGCT is to understand the behaviour of its customers (i.e. shipping lines) and the way in which these are expected to unfold in the future.

2. In this respect, there are two main trends currently observed in the shipping market, and although seemingly contradictory, they complement each other and represent the current market forces underpinning shipping strategies in the North Sea.

3. On the one hand, there is a trend towards mega-hub strategies, driven by larger vessels and stronger investment stakes of carrier lines on main ports. On the other hand, there is a trend towards direct regional calls for deep sea services, aided by shipping lines diversification and forwarders' pressures.

4. The first trend leads to consolidation in the container shipping industry which in turn leads to a move from the search for economies of scale (attained by increased volumes in a given point), for economies of scope (i.e. aiming to serve more points).

2.4.1 Mega-hub port strategies

Deployment of Larger Vessels

1. Advances in ship and engine design on the supply side and sustained growth in the global container trade on the demand side has enabled container ship operators to invest in larger vessels. For example, the number of vessels with a capacity of 6,000 TEU or greater is set to increase from 170 at the end of 2005 to 417 by 2011, at which point this size of ship is expected to account for more than 25% of total global fleet capacity.

2. Looking forward the average container vessel size is set to increase from 2,262 TEU at the end of 2005 to 2,648 by the end of 2011. This is, in part, a reflection of the number of vessels with over 6,000 TEU of capacity more than doubling over the next five years.

3. Containerisation International figures estimate that by 2011, 25.7% of the world vessel capacity will be carried by 6,000+ TEU vessels, compared to only 14.9% in 2005. This compares with a declining share of total capacity for vessels between 5,000-5,999 TEU from 14.8% in 2005 to 13.0% in 2011.

4. As an indication of the expected increase in vessel size, it is interesting to note that by 2011 54% of the global vessel capacity will be carried on only 25% of the vessels.

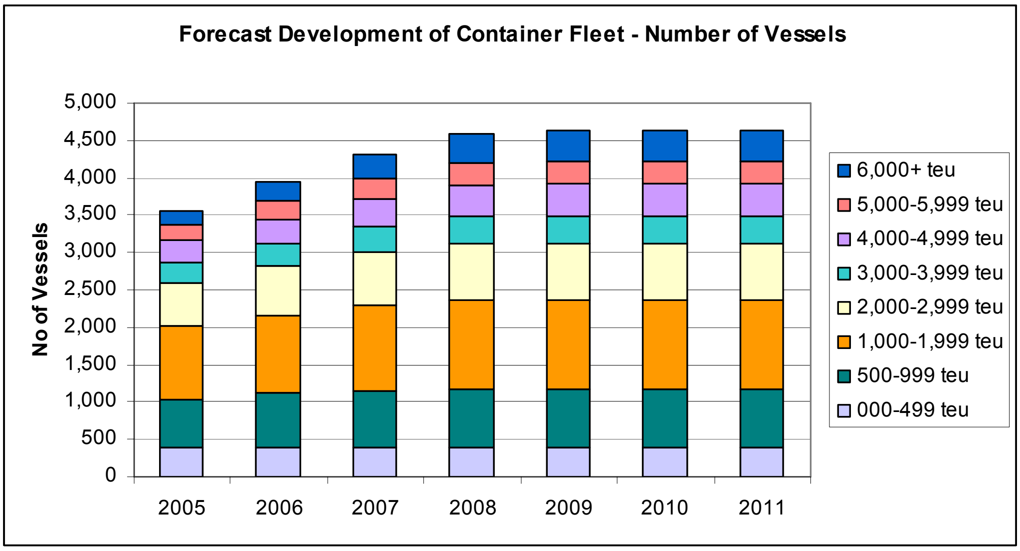


Figure 2.8 Forecast development of global container fleet – number of vessels added (Source: Containerisation International)

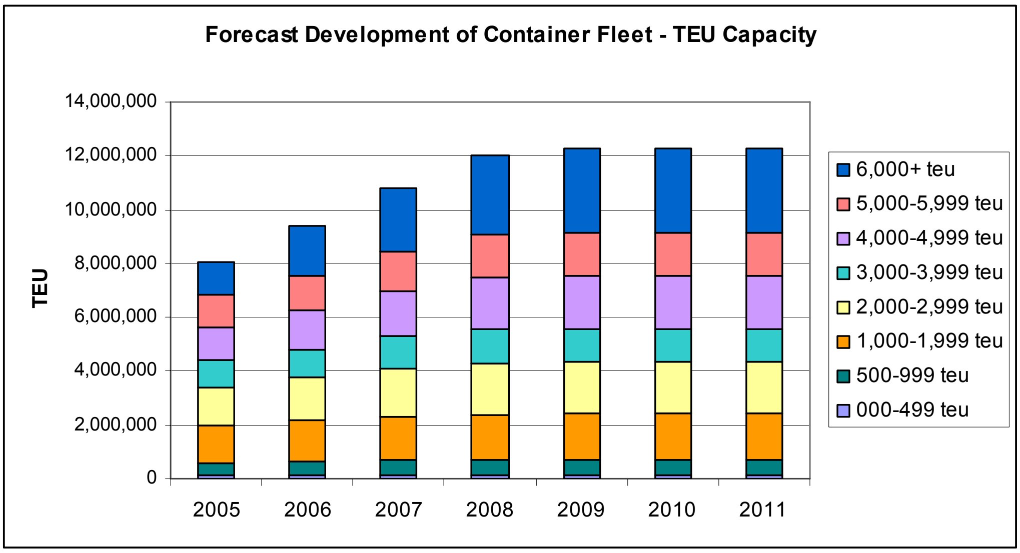


Figure 2.9 Forecast development of global container fleet – TEU capacity added (Source: Containerisation International)

5. The largest post-Panamax vessels in service are currently deployed on the transpacific and Europe-Far East trade lanes, where demand is strongest and there are almost no port / canal constraints to limit the size of the vessels in service. Consequently, it is these trade routes that will attract the next generation of 8,000 - 10,000 TEU capacity ships.

6. The deployment of larger vessels requires that ports / terminals must provide :

- Sufficient depth of water both for 24-hour port access (some access restrictions may be acceptable, but tidal windows should be as wide as possible to enable carriers to maintain fixed sailing schedules. Inability to offer 24-hour berthing windows reduces terminal utilisation levels as longer berthing windows must be reserved) and alongside at container berths.
- Dedicated container berths with modern cranes capable of sufficient outreach to handle wider vessels.

7. In addition there is also a commercial pressure that the ports/terminals should provide:

- High levels of operational performance to ensure vessels spend minimal time in port.
- Good connections to the hinterland to enable cost-effective distribution of import-export cargo.
- Sufficient cargo demand to justify a direct port call.

8. Ports which fail to meet these 'must have' requirements will not receive direct calls from the large post-Panamax container vessels due to the physical constraints that prevent them actually handling vessels of this size. For example, Maersk Line will transfer its new AE10 (Code for a Maersk Sealand service) service from Antwerp to Zeebrugge in mid-2006, as there is deeper water access at Zeebrugge.

9. There can be strategic reasons why ports that do not fulfil all the "must have" criteria detailed still continue to receive calls from large vessels (e.g. carrier investment in terminals, disproportionately high market share, etc). This has been observed in recent years with Maersk Sealand's deployment of 8,633 TEU capacity vessels to both Aarhus and Gothenburg on its AE1 Europe-Far East service.

10. Several carriers are pursuing a strategy of concentrating cargo at a small number of larger ports. Hanjin Shipping, for example, indicate that the deployment of 8,000+ TEU capacity vessels will mean "bigger volumes and fewer port calls…we intend to centralise our volumes in a few mega-hubs" (GS Choi, Senior VP, quoted in Containerisation International magazine, February 2006)

11. Consolidation of volumes at a small number of larger ports enables carriers to negotiate large volume discounts with terminal operators, although these must be offset against any increases in transhipment and other distribution costs.

Carrier Investment in Terminals

12. Outside of the UK, carrier investment in container terminals is common-place. The business case for both stakeholders is clear :-

- Container terminals are generally a profitable business and also far less cyclical than the liner shipping market - this makes them an attractive financial option for carriers;
- Carriers wish to secure access to key markets and investment in terminals at strategically located ports can help them achieve this aim;
- Ports make large up-front investment to construct terminals and provide the associated harbour and landside infrastructure. Carrier investment in terminals is seen as positive as it provides guaranteed volumes.

13. Carrier investment, however, is not always positive, as the port may lose traffic from competing lines that are unwilling to utilise a competitor's terminal. The ability (or perceived ability) of a liner company to operate a common-user terminal on a fair basis is a major concern.

14. Table 2.7 details the investments made in North European ports by container shipping lines. When compared with major shipping line port calls it shows the high degree of influence in port choice.

Table 2.7 Shipping line investments in UK deep sea container terminals (Source: Moffatt & Nichol)

Country	Port	Deepsea Terminal	Terminal operator
UK	Felixstowe	Trinity / Landguard Terminals	Hutchison Port Holdings
	Liverpool	Seaforth	Mersey Docks & Harbour Co.[1]
	Southampton	Southampton Container Terminals	P&O Ports / ABP
	Tilbury	Tilbury Container Services	P&O Ports / Forth Ports / ABP
	Thamesport	Thamesport	Hutchison Port Holdings
FRANCE	Le Havre	Quai de L'Europe / Quai des Ameriqués	GMP (P&O Ports / CMA-CGM)
		Bougaineville Terminal	Terminaux du Normandie / MSC
		Port 2000	*GMP (P&O Ports / CMA CGM)*
		Port 2000	*Terminaux du Normandie / APM Terminals*
	Dunkirk	NFTI Terminal	Dunkirk Port Authority / APM Terminals
BELGIUM	Antwerp	Europa / Noordzee Terminals	Hesse-Noord Natie[2]
		MSC Home Terminal	Hesse-Noord Natie[2] / MSC
		Delwaide Dock (Berths 732-748)	P&O Ports
		Antwerp Gateway	P&O Ports / Cosco / P&O Nedlloyd[4] / CMA-CGM / Duisport
		Deurganckdok West (opens 2006)	Hesse-Noord Natie[2]
		Antwerp International Terminal	Hesse-Noord Natie[2] / Hanjin / K Line / Yang Ming
	Zeebrugge	Container Handling Zeebrugge	Hesse-Noord Natie[2] / CMA-CGM
		APM Terminal (opens Q2 2006)	*APM Terminals[3]*
NETHERLANDS	Rotterdam	ECT (Home / Delta / City Terminals)	Hutchison Port Holdings
		APM Terminals	APM Terminals[3]
		Euromax Terminal (operational 2008)	*Huthcison Port Holdings / P&O Nedlloyd[4]*
	Amsterdam	Ceres Paragon Terminal	NYK Line
GERMANY	Bremerhaven	Bremerhaven Container Terminal	Eurogate
		North Sea Terminal	Eurogate / APM Terminals[3]
		MSC Gate	Eurogate / MSC
	Hamburg	Burchardkai / Tollerort / Unikai Terminals	HHLA
		Eurogate Container Terminal	Eurogate
		Altenwerder Container Terminal	HHLA / Hapag-Lloyd
DENMARK	Aarhus	APM Terminal	APM Terminals[3]
SWEDEN	Gothenburg	Skandia Container Terminal	Port of Gothenburg

Notes

Bold indicates shipping line investment in terminal

Italics indicate new developments

1. Owned by Peel Holdings

2. Owned by PSA
3. Owned by the AP Moller - Maersk Group (owner of Maersk Line)
4. Acquired by Maersk Sealand in 2005

Source: Moffatt & Nichol

2.4.2 Direct deep sea regional calls strategy

Niche Port Strategies

1. Whilst there has been a clear tendency towards larger vessels calling at larger hub ports, a contradictory trend has been developing in the North Sea, and favours the use of smaller, 'niche' deep sea ports.

2. Some carriers are increasingly introducing calls to relatively smaller North European ports such as Dunkirk, Zeebrugge and Amsterdam. The deviation distance from the major shipping lanes to each of these ports is low. Also the mainland location means that each has the potential to access the same hinterland as the leading ports of Antwerp and Rotterdam, albeit with a different cost / service level.

3. More importantly, these ports also have a good track-record in container handling, with a traditional focus on short-sea as opposed to deep sea trades. Hence, many of the necessary key transport links and support services are already in place.

4. Direct calls at secondary/"niche" ports can offer carriers:

- Direct cost savings: arising due to lower port / terminal costs
- Indirect cost savings: arising from congestion free / less congested access to the port hinterland
- Commercial advantage: direct calls should increase the carrier's share of cargo moving to/from the port's primary hinterland (i.e. the area closest to port) as shippers typically prefer direct services;
- Investment opportunities: carriers utilising a niche port are often able to invest in terminals, haulage, warehousing and other logistics related functions;
- Increased control of port operation: carriers providing a high proportion of a port's business are able to influence / control the port operation better than in ports where they are one of many competing carriers.

5. These potential advantages of direct calls are generally offset by any increases in the direct and indirect costs arising from the introduction of the new port call.

6. In the UK, a well established secondary port like Teesport has the robust track-record required to make the transition to deep sea.

Changing Shipper Demand

7. Shippers are increasingly gaining more influence over both shipping schedules and port calls. The disruption to supply chains caused by the US West Coast port stoppages in 2003, and the increased levels of congestion experienced at major US and European import ports during the peak season in 2004, led to shippers facing costs in excess of the freight rates paid to ship the goods.

8. In recent years unforeseen delays have led to perishable goods rotting during transit, the cessation of production at manufacturing sites and goods failing to arrive at retail outlets in time for Christmas. To mitigate these events shippers have taken steps such as increasing lead-time, raising stock levels and diversifying their supply chains. Major shippers, such as Walmart and Home Depot in the US, have located distribution centres at, or very near to, less congested ports. Due to the volumes of cargo these shippers command, ocean carriers have responded with new services to these ports.

9. In the UK a similar trend is starting to emerge. B&Q, a leading DIY retailer, routed 30,000 TEU of cargo via Immingham in 2004, preferring to receive cargo via feeder from Rotterdam into a northern UK port than via road / rail from a southern UK port. In addition, the construction of a distribution centre by Walmart (owners of supermarket chain Asda) in Teesport will see increased volumes of cargo moving via the port.

10. Shippers also cite other factors such as the lower cost of storage as important in the overall cost calculation for the change of strategy.

2.4.3 Consolidation in the container shipping industry

1. As is discussed earlier in this section, the shipping industry is observing consolidation both on a vessel basis (seeking economies of scale by deploying larger vessels) and on a port basis (seeking economies of scale by making fewer calls in major ports). Furthermore, consolidation in the liner shipping industry has advanced in later years. Recent examples of this trend include:

- Maersk Sealand's acquisition of P&O Nedlloyd, with the operation merged and re-branded as Maersk Line with effect from February 2006.
- The acquisition of CP Ships by Hapag-Lloyd parent company TUI Group.
- The acquisition of Delmas by CMA CGM.

2. Consolidation amongst carriers results in fewer carriers/alliances. With larger carriers / alliances, each operating a greater number of services on each trade lane there is a greater chance that smaller/secondary ports may be included in the schedules, as each carrier / alliance looks to ensure that it offers the widest market coverage. The attraction of secondary / niche port calls, discussed earlier in this

section, will increase as alliances seek to extend the scope of their supply, covering more destinations without the risk of neglecting a solid foothold in the major ports.

2.4.4 Summary

- The growing average size of deep sea container vessels and the increasing investment stakes shipping lines are taking in major European ports are driving a tendency towards mega-hub port strategies.
- At the same time, 'niche' port strategies favour regional ports based on the convenience associated with their proximity to end markets and the avoidance of congestion-led delays in bigger ports.
- These trends imply that increasingly consolidated shipping carriers and alliances are expanding the scope of their service, calling at more secondary ports without losing their foothold in major hubs.

2.5 Supply chain cost structure

1. Deep sea container demand in the North is currently being served by ports in the South East of England. The introduction of NGCT will provide a more direct point of entry/exit for containers destined for/originating in the North thus reducing the amount of inland transport to get goods to market. Below is an analysis of the differences in costs for forwarders and shipping lines if shipping through a direct deep sea port in the North compared with other existing alternatives.

2. The analysis is broken into modal links related to the shipping and overland legs of the supply chain, under the assumption that storage, demurrage documentation and other add-on lump-sum costs will be equal between alternatives considered. It can be argued that in the medium term a port in the North will hold an advantage in terms of storage facilities due to lower land prices and better availability.

2.5.1 Shipping Cost

1. Currently a typical Far East to North Europe shipping string would have a three or four stop rotation on major ports like Rotterdam, Antwerp, Hamburg or Felixstowe. In order to compare the relative incremental unit costs for shipping lines of making a direct call at NGCT, three main scenarios can be compared taking a starting point of Ushant, off the coast of France:

- Scenario 1: Northern market served by South East port (4 port call rotation): Ushant – Rotterdam – Hamburg – Antwerp – Felixstowe – Ushant
- Scenario 2: Northern market served by feeder from Rotterdam (Ushant – Rotterdam – Hamburg – Antwerp – Ushant. Feeder: Rotterdam – Teesport – Rotterdam)
- Scenario 3: northern market served direct through Teesport (Ushant – Rotterdam – Hamburg – **Teesport** – Antwerp – Ushant)

2. Owing to the commercial nature of port charging and operations some assumptions for costs have been made based on publicly available information. These estimates are benchmarked against Felixstowe on the assumption that Teesport will be at least as competitive.

3. Cost calculations are made on an incremental marginal cost per TEU basis, and incorporate stevedoring (terminal costs) and transhipment costs as well as port costs including:

- Pilotage
- Conservancy
- Tugs
- Boatmen
- Light Dues and Agency

4. Additionally, the relative costs of any one rotation will depend on the deviations involved. An analysis of the distances between the main ports in the North Sea (presented in Table 2.8) shows that deviation times to Teesport are not extreme when considering overall string duration and do not rule out the possibility of lines making direct calls there.

Table 2.8 Steaming times between main ports in the North Sea (Hrs)

	Antwerp	Felixstowe	Hamburg	Rotterdam	Southampton	Teesport
Antwerp	-	2.5	11.4	2.3	6.8	11.5
Felixstowe	2.5	-	12.2	3.7	7.8	-
Hamburg	11.4	12.2	-	9.2	17.4	12.6
Rotterdam	2.3	3.7	9.2	-	9	10.6
Southampton	6.8	7.8	17.4	9	-	18.4
Teesport	11.5	-	12.6	10.6	18.4	-

5. From Table 2.8 it can be seen that steaming time from Rotterdam to Teesport is only 7 hours longer than to Felixstowe, and just over 20 minutes longer for legs from Hamburg. Furthermore, steaming time will be 4.8 hours shorter for a leg between Hamburg and Teesport than to Southampton.

6. Unit cost estimates for each scenario can be computed using these assumptions on the basis of the incremental costs due to deviations from a base 3-port rotation defined on Ushant-Rotterdam-Hamburg-Antwerp-Ushant. Mainline vessel costs for this rotation have been estimated at £177,908, in terms of steaming time and fuel. Incremental costs due to deviations are then divided by the total exchange volume at the ports of call to arrive at an incremental unit cost estimate.

Scenario 1 – North UK Cargo via Felixstowe

7. This scenario considers a mainline 4-port rotation on Ushant-Rotterdam-Hamburg-Antwerp-Felixstowe-Ushant. The introduction of an additional port call at Felixstowe adds an incremental shipping cost estimated at £20,220 generating total vessel cost for the rotation of £198,128. Port costs at Felixstowe are calculated at £27,254 and variable costs at £73 per TEU. The variations of cost per TEU depending on the exchange size at UK port are presented in Figure 5.1 along with the equivalent curves for Scenarios 2 and 3.

8. For this scenario, conservancy and pilotage costs are as calculated using the Harwich Haven authority website based on "Cosco Tianjin" vessel particulars. Boatmen and Towage costs have been assumed to be marginally higher than in Teesport, although the requirement to take tugs depends on both the port and the vessel.

9. As the total size of the exchange rises, unit costs fall. Given the traditional inland market served by Felixstowe, it is likely it will handle larger exchanges than Teesport. For this, a central case with an exchange of 2,000 TEU has been assumed giving incremental unit costs of £97 per TEU. The variations of cost per TEU depending on the exchange size at UK port are presented in Figure 5.1 along with the equivalent curves for Scenarios 2 and 3.

Scenario 2 – North UK Cargo via Feeder ex Rotterdam

10. If the 3-port base rotation is maintained, cargo can be transported by a feedering service to the North of the UK, from Rotterdam. This alternative does not include a mainline deviation, but adds the fixed charge of a dedicated feeder vessel. Shippers generally accept this type of service when hub ports have a high degree of market coverage (i.e. high service frequency to an array of Asian ports), and where feedering services to ‘spoke’ ports are frequent.

11. This scenario does not entail additional mainline vessel costs, but does include a marginal terminal cost at Rotterdam for transhipment services. It is assumed that the carrier uses a third party feeder (as is the case normally) and pays a freight rate encompassing feeder vessel costs, and Teesport port and terminal costs.

12. Given the rate for feedering service is a fixed amount per TEU, unit cost estimates are not dependent on the size of the exchange, and are constant at £188 per TEU. This curve is also included in Figure 2.10 along with the Scenarios 1 and 3.

Scenario 3 – North UK Cargo via Direct Call at NGCT

13. In Scenario 3 it is assumed that cargo to the North of the UK is carried via direct mainline call at Teesport. The additional call, relative to the base rotation generates

an additional £41,103 of mainline vessel cost taking the complete 4-port rotation cost to £219,247. Port costs calculated for Teesport include a £22,225 port cost (including pilotage, light dues and tugmen) and £5 per unit conservancy charge which is a high estimate considering the much lower charge observed at Felixstowe. Terminal costs have been calculated based on £48 per loaded TEU charge.

14. It is expected that Teesport will handle lower exchange volumes than Felixstowe given that its main market will be the North of the UK. However, based on the discussion presented earlier, it is expected that the main lines will spread their calls to the UK depending on the location of their end market. For example, Maersk is expected to operate 7 strings in the North Sea, of which 6 could call in the UK, and more specifically, two could call at a northern UK port. This implies that the volume exchanged would not be substantially lower than the volumes observed in Felixstowe or Southampton.

15. Consequently, an assumption of 1,500 TEU exchange at Teesport would imply an incremental unit cost of £95 per TEU. This value is raised to £116 with a 1,000 TEU exchange. The curve showing the variation of unit costs as a function of exchanged volumes is presented in Figure 2.10 along with costs for Scenarios 1 and 2.

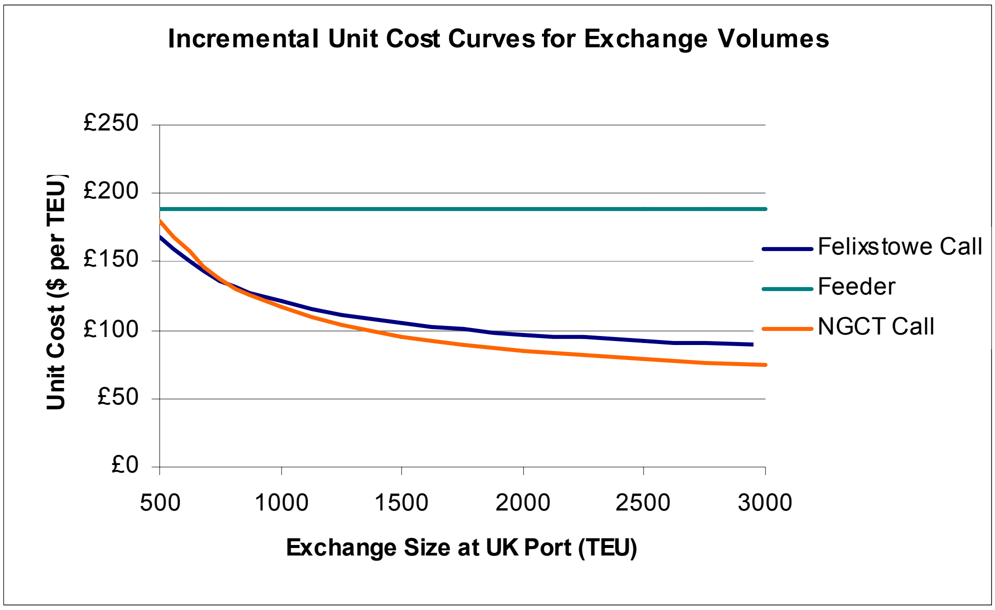


Figure 2.10 Maritime incremental unit costs for rotation scenarios

16. Of the three scenarios presented in Figure 2.10, Scenario 2, the feedering option, is clearly the most inappropriate for shipping lines (and subsequently shippers) given that they can make a deep sea direct call in a port in the UK.

17. The comparison of Scenarios 1 and 3 (i.e. Direct Call at Felixstowe and Direct Call NGCT) needs to be done carefully as Felixstowe will operate at approximately 2,000

TEU exchange volumes, for every deep sea vessel, whereas the NGCT is expected to operate at between 1,000 and 1,500 TEU exchange volumes. Hence, the incremental unit costs of stopping at Teesport lie between £95 and £116. Considering the incremental unit costs for Felixstowe are £97, it can be concluded that the cost advantage of Felixstowe over Teesport will be of £20 per TEU at the most, but will be nil in the case of a 1,500 TEU exchange in Teesport.

18. From a different perspective, for a given exchange volume above 750 TEU, a direct call at NGCT will be cheaper on a unit cost basis than a direct call at Felixstowe.

19. Even in a pessimistic case, the cost advantage of Felixstowe will be offset by the cost saving on overland transport, as is shown below.

2.5.2 Overland Costs

1. Hinterland transport costs are calculated separately for road and rail, comparing haulages from three ports of entry/exit (Felixstowe, Southampton and Teesport) to three representative destinations/origins (Scotland – Glasgow; North - Manchester; Midlands – Birmingham). Distances considered for each flow and mode are presented in Table 2.9.

Table 2.9 Overland road and rail based distances

	Manchester (North)	Birmingham (Midlands)	Glasgow (North – Scotland)
Road Based Distances (km)			
Felixstowe	239	167	424
Southampton	224	133	429
Teesport	118	180	195
Rail Based Distances (km)			
Felixstowe	375	200	470
Southampton	235	150	435
Teesport	125	190	200

2. From Table 2.9 it can be seen that a container taken to Manchester from Teesport would save 121 lorry miles if compared with a container taken from Felixstowe; and 106 lorry miles compared to a container taken from Southampton. For cargo heading to Glasgow, every container driven from Teesport would save 230 lorry miles compared to the same container driven from Felixstowe.

3. Given the expected distribution of NGCT container traffic, an average single container unloaded in NGCT will remove 116 lorry miles from UK roads.

4. Road and rail based costs for each of these flows were calculated using the CNRS guidance published by DfT (Company Neutral Revenue Support, DfT Guidance,

2005), and informed by the appropriate origin to destination distances by mode. This process yields indicative operating costs for the corresponding modes, and were scaled to match observed market rates for rail and road movements. The estimated rates for each flow and mode are presented in Table 2.10.

Table 2.10 Overland unit costs (£ per TEU)

	Manchester (North)	Birmingham (Midlands)	Glasgow (North Scotland)
Road Based Unit Costs			
Felixstowe	£504	£380	£822
Southampton	£479	£322	£831
Teesport	£297	£403	£429
Rail Based Unit Costs			
Felixstowe	£325	£228	£411
Southampton	£321	£257	£412
Teesport	£225	£267	£285

5. It is important to note that the costs in this table do not support a direct comparison between Rail and Road modes. While forward haulage has been considered in the rail based costs, there will be large variations depending on the locations of specific distribution centres. For comparison purposes it is assumed that irrespective of the port of origin, forward haulage costs are the same for all rail routes.

6. Rates for road based transport have been calculated on a round trip basis, as this is the norm for the industry. These rates are quoted for a unit as they tend to be the same for either 20' long containers or for 40' long containers.

7. As opposed to the calculations of shipping costs, road and rail costs have been estimated on a market rate basis on the premise that shipping lines will take these prices as their 'costs' since they will be contracted from third parties.

8. Table 2.10 shows that in terms of overland accessibility Teesport is best placed to serve the Northern market by road. Furthermore, these costs do not include other external costs related to road congestion reducing the reliability of delivery times of the cargo and thus placing cost pressures on inventories and can have severe knock-on effects on the supply chain.

9. In terms of rail costs, the NGCT offers the same relative advantages for serving the Northern market. Furthermore, and given that currently containers on rail, to and from Felixstowe, have to pass via the North London line which is expected to be increasingly capacity constrained, Teesport remains highly competitive on rail costs for serving the Midlands markets. This analysis does not consider the potential gauge limitations to rail mode on all routes that would further strengthen NGCT's advantage. A t the moment:

- The Southampton –WCML route is still requiring funding for enhancement to W10;
- Felixstowe – London has been gauge cleared and the cross-country route to the East Coast Mainline will form part of the developer contribution for Bathside Bay;
- There are potential gauge limitations for the Teesport gauge access, namely at the Yarm tunnel.

2.5.3 Supply Chain Cost Comparison

1. As shown earlier in this chapter, a deviation from a base 3-port rotation to the NGCT generates incremental unit costs of between £95and £116 compared to £97 for a deviation to Felixstowe. This analysis implies that NGCT and Felixstowe could compete for direct deep sea calls on a cost basis.

2. In terms of haulage from port to hinterland destinations, it has been shown that NGCT is better positioned to serve the North and Scotland, than Felixstowe or Southampton, both by rail and road.

3. The two links of the supply chain can be joined to provide an indication of the incremental unit cost for each shipping strategy scenario and final destination of cargo. Supply chain cost estimates are presented in Table 2.11 as percentages relative to Scenario 1 (road and rail costs were scaled by 1.7 to convert from cost per container to cost per TEU, for consistency with the per TEU shipping costs).

Table 2.11 Supply chain marginal costs by mode (£ per TEU)

	Manchester (North)	**Birmingham (Midlands)**	**Glasgow (North – Scotland)**
Supply Chain Additional Unit Costs – Overland Section by Road			
Scenario 1	100%	100%	100%
Scenario 2	92%	133%	76%
Scenario 3 (1500 ex.)	69%	104%	60%
Scenario 3 (1000 ex.)	74%	110%	64%
Supply Chain Marginal Costs – Overland Section by Rail as % Scenario 1			
Scenario 1	100%	100%	100%
Scenario 2	111%	149%	105%
Scenario 3 (1500 ex.)	79%	109%	78%
Scenario 3 (1000 ex.)	86%	118%	84%

4. Table 2.11 shows that for traffic originating/terminating in the North, direct deep sea calls at the NGCT provide the best strategy. It shows that a deep sea call in the NGCT can provide between 22% and 16% cost savings for rail cargo to Glasgow and 21% and 14% cost savings to Manchester, compared to a strategy calling at Felixstowe. For road transport, these cost savings are between 37% and 40% for Glasgow and 26% and 31% for Manchester.

5. The analysis also shows that the NGCT does not have a cost advantage for serving the Midlands. However, the expansion of port capacity will generate not only economies of scale but also economies of scope (increasing the number of points served even if returns to scale are kept constant). The gradual expansion of the terminal's coverage will produce an overlap of the zones of competitive advantage of NGCT and Felixstowe where commercial agreements and economies of scale will come into play.

2.5.4 Summary

- The additional costs for a shipping line of a deviation to NGCT from a base 3-port rotation in the North Sea, compared with a deviation to Felixstowe, are negligible.
- Furthermore road and rail transport links from the NGCT to representative points in the North and Scotland have substantially lower costs than overland links from Southampton or Felixstowe.
- On this basis, it can be concluded that the best alternative for serving the North and Scotland container markets is through a direct deep sea call at the NGCT.
- Furthermore, the average container unloaded in the NGCT will remove 116 lorry miles from UK roads.

2.6 The case for NGCT

2.6.1 Overview and summary

1. The background presented and discussed in this section provides a factual base for understanding the case for NGCT. In summary, the case is as follows:

- UK deep sea container traffic is expected to continue to grow over the coming years, and almost treble by the 2020 in comparison to 2004.
- Deep sea container demand to the North will reach 2.3m TEU by 2010 and 3.7m TEU by 2020.
- Of this demand, 30% (i.e. 0.7m TEU and 1.1m TEU) will be associated with Far East trade which requires capacity for post panamax ships.
- The North accounts for a 30% share of the total UK container market, but receives only 6% of the UK direct deep sea calls.
- Conversely, the South accounts for 50% of the UK container market and yet receives 92% of the direct deep sea calls.
- A series of deep sea container terminal projects have been identified; of these Felixstowe South and Bathside Bay are approved; London Gateway has 'minded to approve' status.
- The total of existing and committed deep sea capacity in the UK will amount to 15.2m TEU for 2020 and would increase to 16.7m TEU with the approval of NGCT. This compares to forecast deep sea and transhipment throughout of 17.5m TEU.
- Medium term deep sea capacity developments are all located in the South East, increasing consolidation, and congestion, in this region.

- Additional deep sea container handling capacity should be welcome as it will relieve utilisation levels in the main UK ports.
- The growing average size of deep sea container vessels and the increasing investment stakes shipping lines are taking in major European ports are driving a tendency towards mega-hub port strategies.
- At the same time, 'niche' port strategies favour regional ports based on the convenience associated with their proximity to end markets and the avoidance of congestion-led delays in bigger ports.
- These trends imply that increasingly consolidated shipping carriers and alliances are expanding the scope of their service, calling at more secondary ports without losing their foothold in major hubs.
- The additional costs for a shipping line of a deviation to NGCT from a base 3-port rotation in the North Sea, compared with a deviation to Felixstowe, are negligible.
- Independently, road and rail transport links from the NGCT to representative points in the North and Scotland have substantially lower costs than overland links from Southampton or Felixstowe.
- On this basis, it can be concluded that the best alternative for serving the North and Scotland container markets is through a direct deep sea call at the NGCT.
- Furthermore, the average container unloaded in NGCT will remove 116 lorry miles from UK roads.

2. This evidence supports the conclusion that there is substantial deep sea demand expected in the North over the next 10 to 15 years, and the NGCT is best suited to meet this demand. Furthermore, the development of NGCT would reduce the need for overland transport cutting up to 72 million lorry miles for 2020 (based on an estimated 70% of NGCT traffic going by road).

3. This argument is discussed below, supported by the evidence presented in previous sections.

2.6.2 Potential Market for NGCT

1. The forecast regional distribution of deep sea container traffic for the years to 2020 is summarised in Table 2.12.

Table 2.12 Forecast regional distribution for container traffic in the UK ('000 TEU)

	2004	2010	2015	2020
North	1,682	2,303	2,960	3,745
Midlands	1,093	1,496	1,923	2,433
South	2,921	3,999	5,140	6,504
Total Deep sea	5,696	7,798	10,024	12,682

2. Table 2.12 shows that the potential market for a deep sea port in the North will be 2.3m TEU by 2010, and will increase to 3.7m TEU by 2020. Of these totals, 0.7m TEU and 1.1m TEU correspond to trade with the Far East.

3. Currently, container demand in the North is served either by feedering services or by overland transport from ports in the South East. Industry trends discussed earlier in this section indicated that direct deep sea calls in a regional terminal (like NGCT) can and would be adopted by shipping lines, given the right economic conditions. Furthermore, it is shown above that in terms of unit costs, Teesport has an advantageous position to serve the Northern container market.

4. Teesport estimates for expected container traffic through the port are presented in Table 2.13. These figures are calculated on the basis of own estimates and commercial considerations.

Table 2.13 PD Teesport projections of container traffic through the NGCT ('000 TEU)

	2004	2010	2015	2020
NGCT Traffic	-	1.0	1.50	1.50
Road Traffic	-	0.7	1.05	1.05
Rail Traffic	-	0.2	0.30	0.30
Transhipment*	-	0.1	0.15	0.15

*The expected levels of transhipment at the NGCT are a by-product of receiving deep sea vessels and are associated with re-distribution to domestic destinations, especially Scotland and other locations due north.

5. Given these estimates, Teesport would be competing to capture only 24% of the North and Midlands market in 2010, and up to 22% from 2020. The rest of the North market will still need to be served by direct calls at Liverpool and overland transport from South East ports.

6. Assuming that the container traffic capture is extracted from Felixstowe, and based on the regional destinations estimated by Teesport for their expected traffic, a container hauled from Teesport produces on average a saving of 116 lorry miles. Given the expected container traffic for NGCT presented in Table 2.13, the port will induce an annual saving of 48 million lorry miles for 2010 and 72 million lorry miles for 2020.

7. If the NGCT container traffic is actually captured wholly from Southampton, the introduction of the terminal will remove 42 million lorry miles from UK roads by 2010 and 63 million lorry miles by 2020.

2.6.3 Economic Feasibility of NGCT as a Deep Sea Competitor

1. The analysis in Section 2.5.3 compared the cost structure of the supply chain for providing containers to Midlands and North locations, under three logistic scenarios. It concluded that in terms of additional unit costs Teesport is better suited than Felixstowe for delivering containers to locations in the North, both by rail or road based haulage.

2. The competitive position of NGCT in the container market is based on the following:

- In terms of unit costs (i.e. per TEU), it is between 10% and 15% cheaper to transport containers using a direct deep sea call at Teesport, and an overland rail leg, rather than doing the equivalent from Felixstowe;
- The cost saving between a direct call at Teesport and a direct deep sea call at Felixstowe increases to between 28% and 38% (depending on the exchange volume at the NGCT, i.e. 1,000 TEU or 1,500 TEU) should the overland leg be undertaken by road;
- The latter also carries the external benefits of reducing the overall lorry mileage in the UK by 52m as early as 2010, compared with a situation without NGCT;
- For the Midlands container market, the unit cost via direct deep sea call at Teesport is only 4% higher than those via Felixstowe, making the NGCT competitive once effects like congestion at ports and unreliability on delivery are considered.

3. This shows that the Northern Gateway Container Terminal proposed by Teesport, is an economically viable venture that will meet the implicit need to reduce the dependence of the container market in the North on the South East port cluster and reduce the burden on the overland transport system in the UK.

3 DESCRIPTION OF THE PROPOSED SCHEME AND ALTERNATIVES CONSIDERED

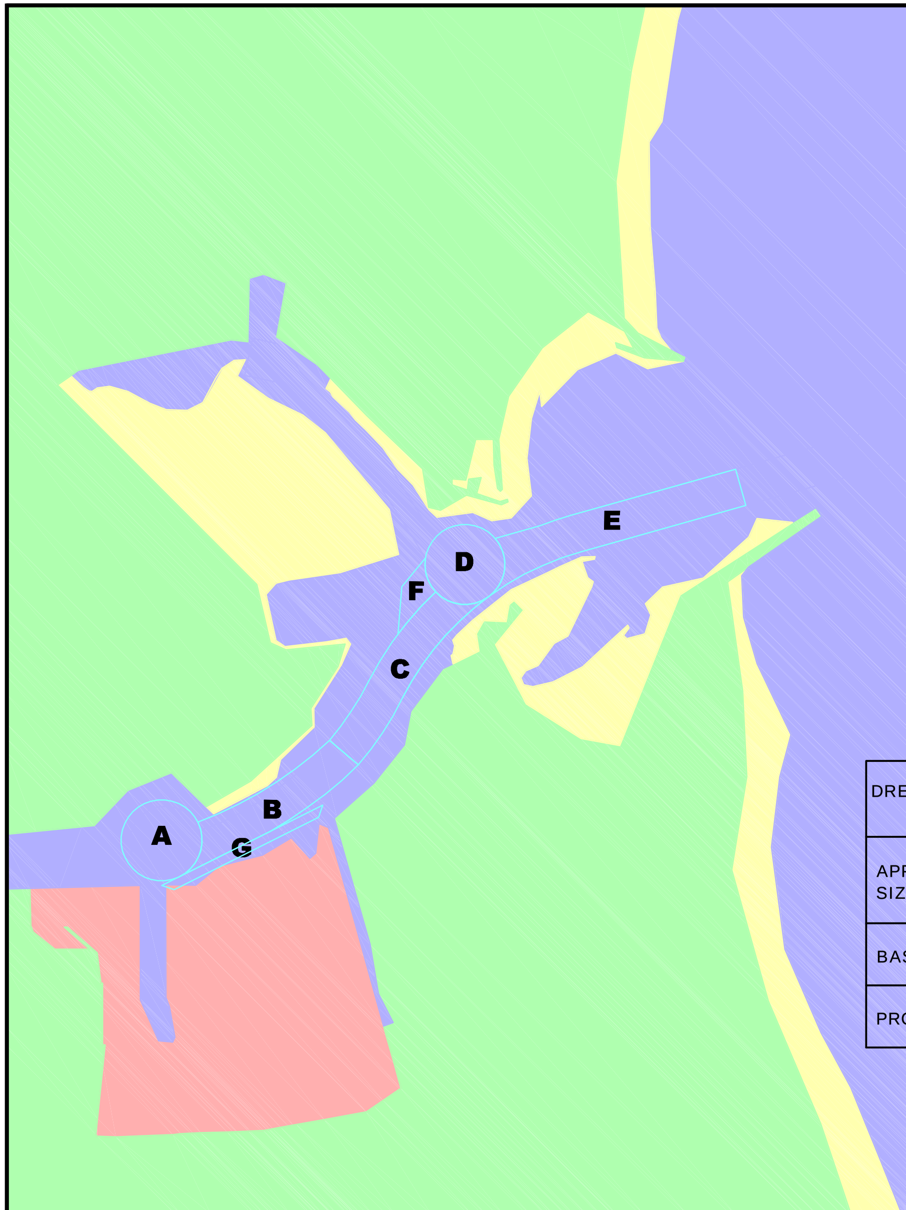
3.1 Construction phase

1. This section describes the various aspects of the construction phase of the proposed development. A photomontage of the proposed container terminal is illustrated in Figure 3.1 to show the proposed terminal in the context of the surrounding area. Figure 3.1 can be referred to alongside the following description of the construction and operational phases (Section 3.2) and the various figures illustrating different aspects of the development referred to below.

Figure 3.1 Photomontage showing the proposed container terminal

3.1.1 Capital dredging of the approach channel

1. The footprint of the proposed capital dredging is illustrated in Figure 1.5. For the purposes of describing the proposed changes in depth of the navigation channel, the channel has been divided into sections (as shown on Figure 3.2). Table 3.1 below summarises the existing channel depth in the various sections of the channel and the proposed declared channel depth following the capital dredging.



DREDGE DEPTHS mCD		A TEESDOCK TURNING AREA	B CHANNEL UPPER REACH	C CHANNEL LOWER REACH	D SEATON TURNING AREA	E CHANNEL SEA REACH	F ENLARGEMENT TO STA	G BERTHING POCKET
APPROX. SIZE	LENGTH m	CURRENT DIA. 450m	1100 m	1300m	515m DIA.	1600m	100 m	1040 m
	WIDTH m	FUTURE DIA. 525m	250 m	250 m		250 m	30 m	60 m
BASE CASE		-10.4	-10.4	-14.1	-14.1	-14.1		
PROPOSED		-10.4	-14.5	-14.5	-14.5	-14.5	-14.5	-16.0

TITLE

PROPOSED DREDGING FOOTPRINT DIVIDED INTO SECTIONS

PROJECT

THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

A COMPANY OF ROYAL HASKONING

HASKONING UK LTD
NEWCASTLE
Marlborough House
Marlborough Crescent
Newcastle upon Tyne NE1 4EE
+44 (0)191 211 1300 Telephone
+44 (0)191 211 1313 Fax
info@newcastle.royalhaskoning.com E-mail
www.royalhaskoning.com Internet

DRAWN I.T.	SCALE N.T.S.
DATE APRIL'06	JOB No. 9R2629
DRG No. FIGURE 3.2	

Table 3.1 Details of existing and proposed depth throughout the navigation channel

Dredge area (refer to Figure 3.2)	Channel section	Existing declared depth (m below CD)	Proposed declared depth (m below CD)	Volume and material to be dredged (Mm^3)
A	Tees Dock turning circle	10.4	14.5	1.15 (mudstone)
B	Channel upper reach	10.4	14.5	2.06 (mudstone)
C	Channel lower reach	14.1	14.5	0.85 (sand)
D	Seaton Channel turning circle	14.1	14.5	0.21 (sand)
E	Seaton Channel turning area (enlargement)	-	14.5	0.04 (mudstone)
F	Berthing pocket	-	16.0	0.50 (mudstone)

2. The total volume of material that will arise from the capital dredging will be approximately 4.8 million m^3. Based on previous investigations and capital dredging in the estuary, it is expected that, broadly, three material types would be dredged; silts and soft alluvial deposits, Mercia mudstone (boulder clay) and granular material. In area C and most of area D only granular material will need to be removed. This is because the channel and Seaton Channel turning circle have previously been dredged to a greater depth than the presently maintained depth of 14.1m below CD. Additionally there is a backlog of maintenance dredging in this area with some parts of the channel at depths above 14.1m below CD. There is also some overlying granular material to be removed from upstream locations before the mudstone is encountered. The total volume of silts and alluvial deposits to be dredged is expected to be small relative to the overall volume of the dredge given that the channel is already subject to maintenance dredging.

3. The dredging work can be divided into two phases as follows:

- Phase 1 involves the removal of granular surficial material in Areas C and D using a trailing suction hopper dredger (TSHD). The material arising from the dredging would be used for reclamation.
- Phase 2 of the dredging involves the removal of mudstone using a cutter suction dredger (CSD) loading into hopper barges. The material arising from this dredging would be disposed offshore at the existing licensed disposal sites. As part of this phase 20m wide, 1m deep trenches would be dredged on the inside of the edge of the dredged channel in the area upstream of Redcar in areas where there is not an existing dredged berth pocket. The purpose of these trenches is to allow maintenance material to accumulate without affecting channel depth; at present, PD Teesport state that maintenance material accumulates along the edges of the channel.

4. Due to the high production rates required for the deepening, the vast majority of the dredging would, as identified above, have to be undertaken by either a TSHD or CSD. Therefore, the use of these dredgers has been assumed for the purposes of the assessment of potential environmental effects (i.e. studies on the generation and dispersion of sediment plumes during dredging). Further details on the parameters used in the sediment plume simulations are provided in Section 6.3.1.

5. There may be a requirement to use a backhoe dredger (BD) for small areas of dredging in confined areas, for example, alongside the existing quay wall, to cut trenches for the berthing pockets or for construction of new quays. A BD would not be used for significant volumes of dredging due to its low production rate.

3.1.2 Terminal construction

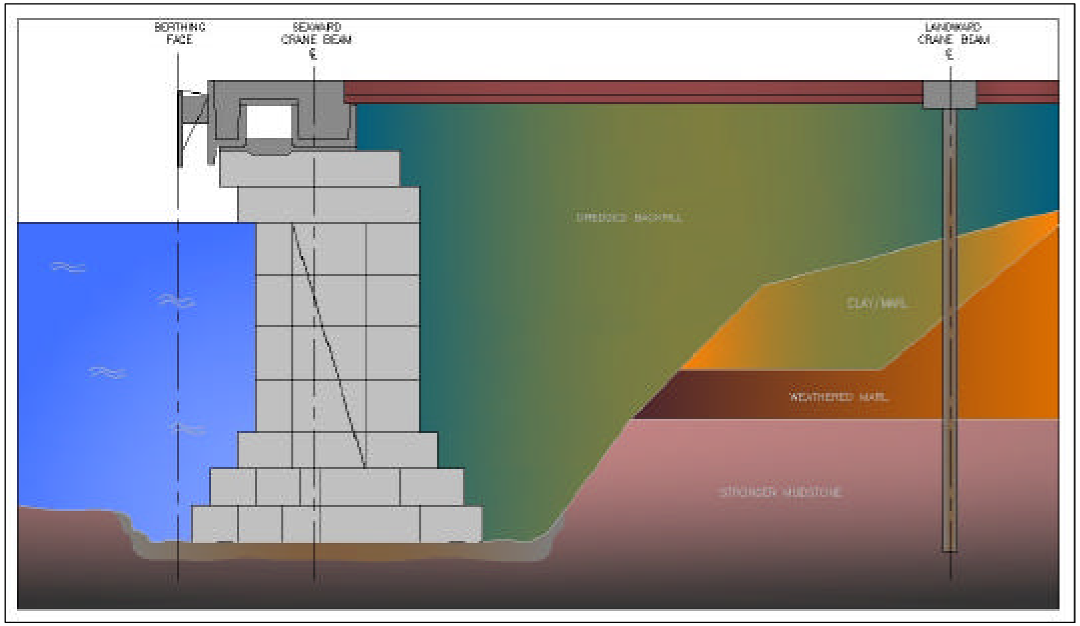
Construction of the main quay wall

1. There are three possible forms of construction that could be adopted for the quay wall:

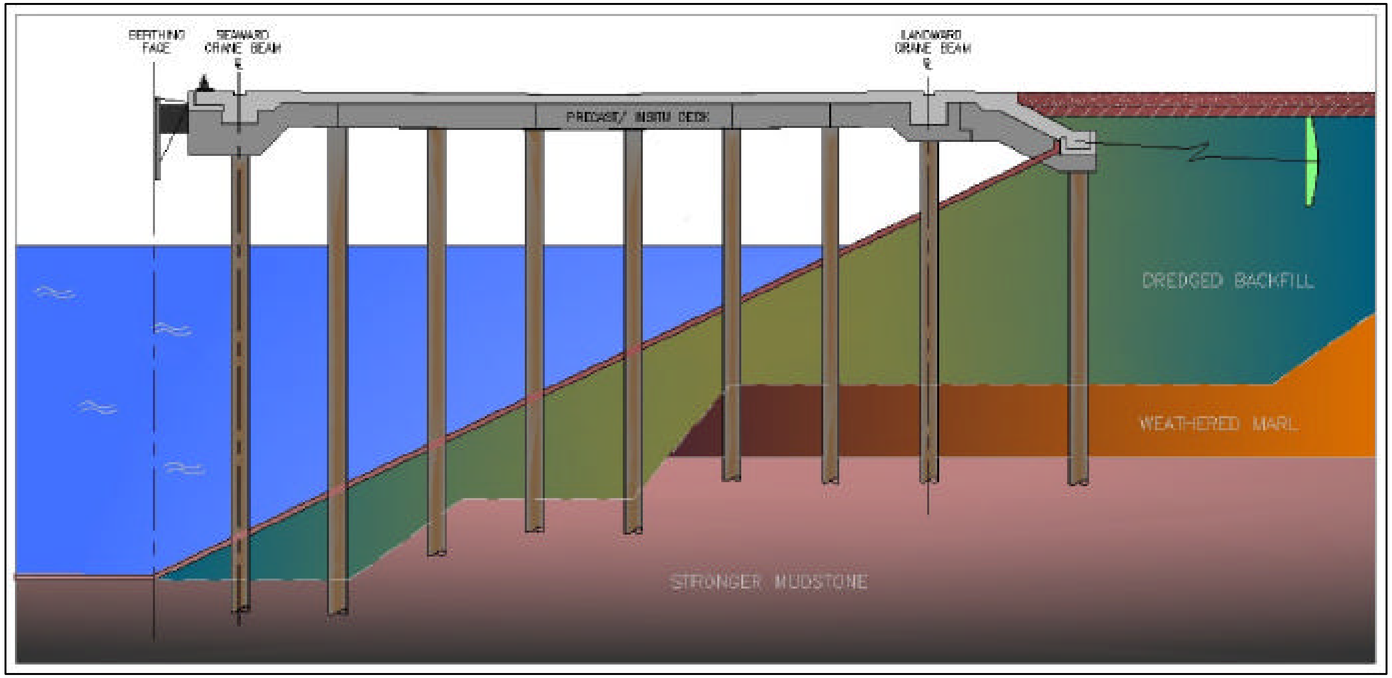
- A gravity wall structure
- A piled suspended deck structure
- An anchored retaining wall

2. Several different quay wall options have been considered, including different types of gravity wall structures, different types of suspended deck structures and different types of retaining wall structures. Based upon consideration of these options, two of the options were considered to be optimum:

- A mass concrete wall built with blocks placed in columns (see Figure 3.3)
- A suspended reinforced concrete deck on bored reinforced concrete piles formed within steel tubes (see Figure 3.4)



TITLE QUAY WALL CONCRETE BLOCKWORK	PROJECT THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT	A COMPANY OF ROYAL HASKONING HASKONING UK LTD NEWCASTLE Marlborough House Marlborough Crescent Newcastle upon Tyne NE1 4EE +44 (0)191 211 1300 Telephone +44 (0)191 211 1313 Fax info@newcastle.royalhaskoning.com E-mail www.royalhaskoning.com Internet	DRAWN MC SCALE N.T.S. DATE APRIL'06 JOB No. R2629 DRG No. FIGURE 3.3



TITLE QUAY WALL SUSPENDED DECK	PROJECT THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT	ROYAL HASKONING (A COMPANY OF) HASKONING UK LTD NEWCASTLE	DRAWN MC / SCALE N.T.S. / DATE APRIL'06 / JOB No. R2629 / DRG No. FIGURE 3.4

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3. A discussion of the main technical and environmental issues related to these two forms of construction is provided in Section 3.3.3.

4. The level of the proposed quay will be set at +6.15m OD. The main terminal area will generally have a downward slope of gradient 1 in 100 from the rear of the terminal towards the quay face, with intermediate valleys formed at 120m centres within traffic aisles. The terminal will be level parallel to the quay face. It is proposed that the terminal would be paved with Concrete Block Paving (CBP) surfacing on a Cement Bound Material (CBM) base.

5. The proposed terminal area will be approximately 55ha. This area can be subdivided into existing land (approximately 46.5ha) and the area which is currently below mean high water (approximately 8.5ha).

Phasing and proposed construction programme

6. It is proposed that the container terminal will be constructed in two phases in order to allow the continued operation of existing facilities within the proposed development site. Phase 1 will comprise the construction of 700m of quay (to be operational in 2010) and Phase 2 will provide the remaining 300m (to be operational in 2014). The proposed terminal phasing is illustrated in Figure 1.3. It has been assumed that construction will commence in 2009.

3.1.3 Disposal of dredged material

1. As described in Section 3.3.3, a number of alternative options have been considered for the disposal of dredged material. The preferred option is to use dredged material (mainly granular material) for reclamation purposes and to locally raise land levels within the terminal site. The remainder of the dredged material (silts, soft alluvial material and mudstone) will be disposed of at the existing offshore disposal sites in Tees Bay.

2. It is anticipated that all the granular material arising from the dredging would be used within the reclamation and turning area. Additional granular material may arise from routine maintenance dredging. A total of approximately 1.9 million m^3 of material would be required for the reclamation and terminal area. Some mudstone may be used in the reclamation. The material not used in the reclamation (i.e. up to approximately 2.9 million m^3, largely comprised of mudstone) would be disposed of at the offshore disposal sites. In addition to the material to be used for reclamation and within the terminal area, other practicable beneficial uses of dredged material have been sought. These are discussed in Section 11.2.

3. For the purposes of impact assessment, the possible alternative of disposal of dredged material within the Bran Sands lagoon is also considered within this ES. The purpose of including this alternative is to allow the potential environmental

impacts of this disposal option to be fully assessed in the event that this land becomes available to PD Teesport within the timescale of the construction programme. This alternative would involve using approximately 970,000 m^3 of material within the reclamation and terminal area, disposing of approximately 2.3 million m^3 within the Bran Sands lagoon and the remainder (i.e. approximately 1.5 million m^3) being disposed of to sea at the existing offshore disposal sites. An alternative scenario utilising some of the mudstone in the reclamation is also identified.

3.1.4 Replacement of Riverside Ro-Ro

1. In order to construct the container terminal, it will be necessary to replace the existing Riverside Ro-Ro facility. It is proposed that this facility is replaced at the Queen Elizabeth II (QE II) Berth located immediately upstream of Tees Dock on the southern side of the river. The berth is currently dredged to 10.4m below CD. Figure 1.3 shows the proposed location of the Ro-Ro facility.

2. The works required for this facility are:

- Four berthing/mooring dolphins;
- Two pontoon restraint dolphins;
- Bankseat for the linkspan bridge;
- Recess in the river embankment for the linkspan bridge;
- Pontoon nominally 40m x 30m;
- Linkspan bridge nominally 60m x 10m; and,
- Demolition of the existing QEII jetty structure.

3.1.5 Intermodal rail terminal

1. The intermodal rail terminal (see Figure 1.3) would have six rail sidings to accommodate six 750m long container trains plus one locomotive run around loop. The trains are served by rail mounted gantry (RMG) cranes with a 25m rail gauge and the capability to rotate containers horizontally through 180° to allow the doors of containers to be orientated correctly on the trains. The RMG cranes will have fixed cantilevers on each side allowing truck loading and discharge under one cantilever and container storage under the other cantilever. This allows for block storage of containers under one cantilever so that the RMG cranes may, if required, operate out of sequence with the tractor and trailer units.

2. The strip of paving parallel to the rail sidings would be 30m wide to facilitate the efficient turning of Port Tractor Trailers (PTTs). This width of paving will also accommodate the use of reachstackers to unload/load trains and PTTs should this be required to supplement RMG crane operations.

3. It is envisaged that an expansion of the existing Exchange rail sidings at the western end of the site would serve the terminal prior to the completion of both phases of

terminal development (and therefore before the total predicted capacity of 1.5 million TEUs is achieved), at which time the new intermodal rail terminal would be needed to provide the desired percentage throughput of containers (i.e. 20% by rail). It is envisaged that two additional 450m long rail sidings would be provided adjacent to the existing sidings. It is proposed that the sidings would be served by two rubber tyred gantry cranes (RTG's) similar to those used within the container terminal stack area. The RTG's would lift containers between rail wagons and PTT's which would shuttle between the sidings and either the new container terminal or the existing TCT 2 container terminal. Heavy duty paving roadways would be provided alongside the new sidings for a roadway to allow containers to be stacked under the span of the RTG's so that trains may operate out of sequence with trailer and tractor units. A new road would be provided to provide more direct access between the new rail sidings and TCT 2.

3.1.6 Road access

1. Road access to the terminal is shown in Figure 1.3. It is proposed that the existing roads will be upgraded to a dual carriageway in both directions, with new and enlarged roundabouts provided where indicated on Figure 1.9. Works are also proposed to Freight Road, Dabholm Road and Teesport Road; this road would link in with the main road network.

2. It is proposed that new estate roads would be required at the western end of the proposed terminal in order to serve the existing rail sidings in this location. The roads would allow access to the rail sidings from the terminal; the location of the new roads is shown in Figure 1.3.

3. The access road to the Northumbrian Water Bran Sands sewage treatment plant is situated in the north east corner of the Teesport Estate. This access road connects to the roundabout at the junction between Teesport Road and Dabholm Road and passes close to the old Shell rail bridge which will provide rail access to the new intermodal rail terminal. The existing road will need to be lowered by some 3m, to provide sufficient headroom for a bridge to carry the new rail line over the road.

3.1.7 Terminal gate complex

1. The terminal gate complex includes an external truck marshalling area for 115 HGVs and a gatehouse comprising eight 'in' lanes and four 'out' lanes. It is envisaged that truck overspill parking (in the event of temporary closure of the terminal due to high winds for example) will be feasible outside the terminal on adjacent land but off the terminal access road.

3.1.8 Buildings

1. The requirements for buildings within the terminal area are set out below in Table 3.2 which broadly defines parameters for the various buildings. The area of the terminal

with indicative locations where these buildings would be located is shown on Figure 1.4.

Table 3.2 Outline details of the buildings to be included within the proposed terminal area

Building	Floorspace (m^2)	Max. roof height (m)	Construction type	Facilities
Administration Office Building	1500	15	Steel frame with brick/metal cladding and pitched roof	Reception, Office space, Training and meeting rooms, Plant room, Network room, WC on both floors
Operations Building	1500	15	Steel frame with brick/metal cladding and pitched roof	Shift Managers room, Mess rooms, Kitchens, Locker rooms, Coat rooms, Drying room, Cleaners' rooms, WC
Gatehouse	1150 (IN) 600(OUT)	11	Steel frame with brick/metal cladding and pitched roof	Lane booths, High level incremental walkway, Vehicle barrier
Workshop	2500	20	Steel frame with metal cladding, pitched roofs and roller shutter doors	High workshop bays, Vehicle pits Stores, Supervisors room, Locker rooms, Mess room, IT room, Drying room, Kitchen, Archive room, Electronic workshop, Electrical inspection room, Mechanical inspection, WC and showers
Customs Control	4000	15	Steel frame with metal cladding, pitched roof, HGV docks and roller shutter doors	Warehouse area, Customs cages, Changing rooms, Supervisors room, Mess room, WC
Drivers Amenity Building	200	3.5	Brick structure with pitched roof	Seating area, WC
Main substation	100	3.5	Brick structure with pitched roof	None

3.1.9 Lighting

1. Lighting for the proposed terminal would consist of luminaires mounted on 30m high mast lighting columns/towers where container equipment is manually operated with specific local lighting for all other areas. The use of high mast lighting for container stacking and operational areas is recommended to maintain the capacity for container storage, minimise land take up with lighting installations, provide a more uniform lighting distribution and minimise the potential damage from port and road transport vehicles (although any high mast lighting columns/towers will incorporate suitable vehicle collision protection barriers/kerbs around the base).

2. The lighting for the container storage would be designed to provide 5 lux minimum and 20 lux average to comply with the statutory requirements of the Docks Regulations 1988. Other areas where high activity occurs (interface of people and vehicles or plant work together for example) would be designed to provide between 50 -100 lux average depending on the hazard or working methods relevant to the lighting design guidance and codes. It is anticipated that the ship to shore cranes and other container handling equipment would be provided with sufficient levels of lighting within their working envelope to minimise the need for additional lighting on the high mast columns/towers, and reduce the potential impact of lighting from the port.

3. It is noted that the International Labour Organisation (ILO) has revised and updated its Code of Practice on safety and health in ports. This code of practice requires a minimum level of illumination of 10 lux for access routes for people, plant and vehicles, and in lorry parks and similar areas and a minimum of 50 lux in operational areas where people and vehicles or plant work together. This code of practice has not been ratified by the United Kingdom Government at present, but could be in the near future. Therefore the lighting for the terminal may need to incorporate these significant increases in lighting levels over the present minimum legislative requirements.

4. To reduce the overall environmental impact of the lighting, luminaires will be of flat glass construction with zero upward light output and minimum tilt angles to minimise the obtrusive light outwards and upwards to the port boundaries and into the surrounding environment. This design also reduces sky glow, light spill, glare, light intrusion and general light pollution.

3.1.10 Drainage

1. The proposed terminal levels will provide a general fall of nominally 1 in 100 from the rear of the terminal towards the quayside, with the pavement surface being level parallel to the quay.

2. It is envisaged that the drainage system would comprise channel drains with heavy duty gratings running parallel to the quay with outfall carrier pipes running perpendicular to the quay discharging generally through vented oil separators under/through the quay.

3. There would be five lines of channel drains. The first channel drain would be situated behind the rear crane rail and would collect surface water from the quay and from the hatch laydown area under the crane backreach. The second channel drain would be located in the roadway on the riverside of the first block stack of containers. The remaining lines of channel drains would be located at approximately 120m intervals in the roadways between the container block stacks.

3.1.11 Foul water and sewage pumping station

Service description

1. Foul water drainage and a sewage pumping station will support sanitary facilities in the following buildings:

- Administration building;
- Operations building;
- Workshop;
- Customs control building;
- Driver's amenity building;
- Site area toilets.

2. The foul system will also collect non-potable water from site interceptors and full retention separators associated with the following services:

- RTG service area;
- Mechanical transport fuelling facility;
- Chassis washing area; and,
- Workshop.

Existing services

3. There are currently no mains domestic sewage services in the location of the new container terminal development. Sewage from occupied buildings at TCT 1 is currently collected in a septic tank and removed by bowser as and when required.

4. The nearest sewage main is routed along Kinkerdale Road before turning south-east down Dabholm Road and connecting to Teesport Road, a distance of approximately 900 metres from the boundary of the new proposed development.

Sanitary waste

5. To enable the collection of domestic waste from sanitary facilities in occupied buildings and from toilets located within the container yard, it is proposed that a domestic waste service will be provided. This will consist of site collection pipework, a packaged sewage pumping station and pipework to connect to Northumbria Water's domestic waste mains at Teesport Road. The pumping station should include macerator pumps to support waste flow and minimise the potential for blockages. Connection to the domestic mains would be subject to approval by Northumbrian Water.

Non-potable water

6. It is proposed that water from site interceptors will be routed into the foul domestic waste main. This water includes washings and waste water associated with the operations at the RTG service area and workshop. For the chassis washing area and the mechanical transport fuelling facility, it is proposed that a fully bunded complete retention separator will be required. This will again discharge non-potable water from the separator into the foul water mains.

7. Due to the potential presence of hydrocarbons it will be necessary to discuss and obtain discharge consent with Northumbrian Water and the Environment Agency.

3.2 Operational phase

3.2.1 Terminal capacity

1. The total container throughput of the terminal will be approximately 1.5 million TEU per annum (as determined through modelling of terminal throughput) with the following anticipated mix:

- 10% of containers transhipped by sea or feeder vessels;
- 70% of containers carried by road; and,
- 20% of containers carried by rail.

2. The terminal will operate 365 days per year, 24 hours per day.

3. With respect to the predicted modal split, it is important to note that there is uncertainty as to what the actual modal split will be as this depends, amongst other factors, on the particular requirements of the customers. For the purposes of the EIA, the potential impacts of transporting 100% of containers by road have been assessed, in addition to the above split. This ensures that a worst case situation with respect to environmental impact is assessed (i.e. effects on road traffic and consequently noise and air quality effects) in the event that the aspirations for modal split are not achieved.

3.2.2 Internal plant

1. The operation of the proposed container terminal will require the following internal plant:

- 10 ship to shore quayside electric rail mount container cranes;
- 24 rubber tyred gantry cranes (RTG);
- 72 port tractor and trailer units (PTT);
- 6 rail mounted gantry cranes (RMG);
- 6 reach stacker empty container handlers; and
- 4 railhead reach stackers.

3.2.3 Terminal operation (RTG-Port Tractor Trailer Operation)

1. This mode of operation is currently the most widely employed in the world's major deep water container terminals and its widespread use is principally due to the combination of achieving good accessibility with high density stacking coupled with "scalability" of investment against revenues.

2. Laden containers are stacked in blocks parallel to the quay using RTGs, with PTTs shuttling containers between the quayside, the container stack areas and the railhead. External highway trucks deliver and collect containers directly from the laden and empty container stack areas via a terminal gate complex. Empty containers are stacked in blocks using Empty Container Handlers. Reefer containers are also stacked by RTG with access gantries being provided to permit safe access by reefer service operatives for the plugging/unplugging of electrical supplies and various monitoring activities. Hazardous cargoes may also be stacked using RTGs. Similarly, out-of-gauge consignments may also be "stacked" using RTGs, however, in this instance the "stacks" are only one high. The layout for this mode of operation is shown on Figure 1.4.

3. The RTG stacks are based on stacking 1 over 5 high (stacking 9'6" high containers up to 5 high and lifting a further 9'6" high container over this stack). Each stack has a truck bypass roadway outside of the RTG legs.

4. The layout shown on Figure 1.4 provides approximately 5,900 Twenty-foot Ground Slots (TGS) for general (dry) laden containers, 1,200 TGS for Empties, 210 TGS for Hazardous, 310 Forty-foot Ground Slots for Reefers, and a lay-down area for Out-of-Gauge consignments.

5. It is envisaged that Reefers would be stacked up to 3 high and that Empties are stacked up to 6 high.

3.2.4 Access and egress

1. Figure 1.3 shows the road access and egress arrangement to and from the proposed terminal to the local road network. Figure 1.3 also shows rail access to and from the proposed terminal.

2. In the event that the proposed terminal could not be accessed via the main gateway during an emergency situation, there is a provision for a secondary access to the terminal for the emergency services. Secondary access to Teesport is available via Corus land along a private road running parallel to the river (see Figure 1.7). Although not in general use, this access has been used on a number of occasions. This route also offers emergency access/egress and is known to the emergency services. Access is controlled by Corus security and the Harbour police. The PD Teesport Emergency Plan identifies a number of other emergency routes which have

been agreed with the emergency services. There is an existing agreed route from the Teesport to the Wilton site which is controlled by Sembcorp Security and the Harbour police.

3. In the event of an emergency, it is possible that the terminal would be closed. Provision has therefore been made for overflow parking of HGVs and is shown in Figure 1.3. The area illustrated is estimated to be able to accommodate approximately 650 HGVs. It is also estimated that approximately 115 HGVs could be accommodated in the terminal gate complex area itself, with the potential for approximately a further 100 HGVs parked on the inside lane of the new dual carriageway from the entrance roundabout to Freight Road. This gives a total capacity of over 800 HGVs, which is equivalent to approximately 6 hours worth of arrivals.

3.2.5 Maintenance dredging

1. There is an existing requirement for maintenance dredging of the approach channel and various berthing pockets in the lower Tees estuary. The existing maintenance dredging regime is well established and the locations, volumes and frequency of dredging are well recorded. These various aspects of the existing maintenance dredging are discussed in detail in the Tees Maintenance Dredging Baseline Document (ABPmer, 2005). Insofar as they are relevant to this ES, details of this document are taken into account in Section 6.

2. As a result of the proposed development, it is predicted that there will not be a requirement to adjust the maintenance dredging strategy (e.g. the annual volume dredged is not predicted to change significantly beyond the existing variability already managed by the port); this has been established through the hydraulic and sedimentary studies that have been undertaken as part of the EIA (see Section 6). It is proposed that maintenance dredgings would be disposed of at the existing disposal sites in Tees Bay, as currently occurs.

3.3 Consideration of alternatives

3.3.1 Introduction

1. This section sets out the consideration of alternatives in the following context:

a) Alternative locations for the proposed development that are within the control of PD Teesport; and,
b) Alternative methods of construction for the development at the preferred location.

2. With respect to b), a range of alternatives for various aspects of the proposed scheme have been considered from a technical, environmental and economic perspective including alternatives for:

- Method for quay construction;
- Approach channel and berthing pocket dredge depth;
- Disposal locations for dredged material;
- Relocation of the Riverside Ro-Ro facility;
- Terminal handling equipment; and
- Terminal design and phasing.

3. For certain aspects of the proposed scheme, a preferred option has been identified and in such instances, the reason for the selection of the preferred option is described.

3.3.2 Alternative locations within the control of PD Teesport

1. It is necessary to consider whether there are any alternative locations for the proposed development that are within the control of PD Teesport. In particular it is important to examine whether alternatives for the development exist that would potentially have a lesser environmental impact.

2. It is considered that operational land which is owned by PD Teesport can be classified as potential alternative locations within the control of the developer. Such areas of land are shown on Figure 3.5 and are described as:

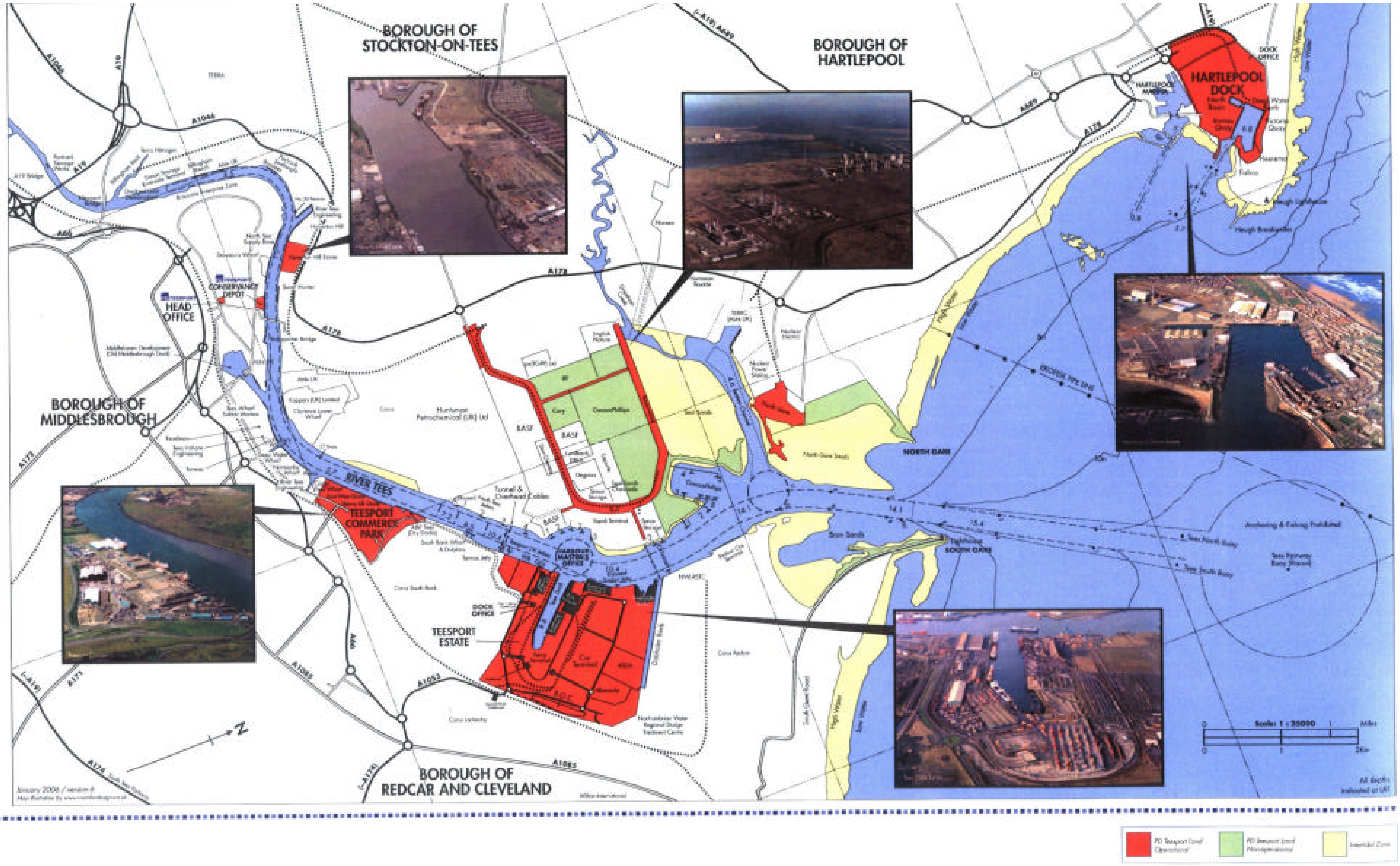
- Teesport Estate;
- Hartlepool;
- Seal Sands;
- Teesport Commerce Park;
- Haverton Hill.

Teesport Estate

3. This is the preferred and proposed location for the development and is the location assessed in this ES. Alternative approaches to various aspects of the construction of the proposed development at this location are discussed in Section 3.3.3.

Hartlepool

4. Hartlepool is not a realistic location for the proposed development since construction here would require dredging a new approach channel at the required depth and complete reconfiguration of the port. A significant issue preventing a development of the scale proposed at this location is that the harbour is too small to handle large container vessels. This alternative has, therefore, not been studied further, but it can be concluded, even if this alternative were technically feasible, that it would have a greater overall environmental impact compared with the proposed development location.



TITLE AREAS WITHIN THE CONTROL OF PD TEESPORT	PROJECT NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT	ROYAL HASKONING HASKONING UK Ltd. ELIZABETH HOUSE EMPEROR WAY EXETER, EX1 3QS Telephone +44 (0)1392 447999 Fax +44 (0)1392 446148 E-mail mail.exeter@royalhaskoning.com Internet www.royalhaskoning.com	Job No. 9R2629	DATE APRIL'06	SCALE N.T.S
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Seal Sands

5. There is insufficient space for a development of this scale at this location. Dredging a channel to the required depth would be likely to have more significant effects on the nearby designated mudflats. The overall level of disturbance of this area would also increase. This location is not, therefore, a realistic alternative option for both technical and environmental reasons.

Teesport Commerce Park

6. Teesport Commerce Park is located on the south bank of the Tees estuary, upstream of the proposed development location. This area of land is currently occupied by a number of companies offering mainly offshore-related services and ship repair facilities. In view of the existing operations at this site, this location is not considered a technically feasible alternative.

7. In the event that the land were available for development, the environmental impacts associated with developing at this location are likely to be greater than the proposed location. This is due to the greater dredging requirement associated with deepening the channel at the required depth up to this location. This location is not, therefore, a realistic alternative option for both technical and environmental reasons.

Haverton Hill

8. This area is located well upstream of the proposed development location on the north bank of the Tees estuary. It is not a realistic alternative in that the area of land available is not sufficient to accommodate a development of the scale that is proposed. The river is also very narrow and manoeuvring of large container vessels would be difficult if not impossible. In any event, the environmental impacts of siting a facility at this location would be greater than for the proposed development given the increased volume of the dredge that would be needed to create the navigation channel. This location is not, therefore, a realistic alternative option for both technical and environmental reasons.

Other locations

9. In addition to the above locations that are within the control of PD Teesport, there are numerous other positions throughout the Tees estuary with river frontages that could, in theory, accommodate the proposed development. However, in practice existing quays are utilised for other purposes and are under the ownership of private operators; therefore, availability of land is limited.

Conclusion

10. It is also concluded that the environmental implications associated with constructing the proposed development at another location in the Tees estuary would be at least as significant as those environmental impacts arising from the proposed development, and probably greater as it is likely that the dredging requirement would be greater. In addition, road and rail infrastructure is well developed at the proposed development site and larger scale works would be likely to be required to provide suitable infrastructure at another location.

3.3.3 Alternative methods for construction of the proposed development

Method for quay construction

1. As described in Section 3.1.2, there are two optimum forms of construction that could be adopted for the proposed quay; a mass concrete gravity wall and a piled suspended concrete deck. These forms of construction are shown in Figures 3.2 and 3.3. The form of construction to be adopted will be determined during the detailed design phase. In cases where the potential environmental impact would differ depending on the form of construction, the worst case has been assessed. For example, for the suspended concrete deck option extensive piling would be required and so the assessment of potential impact on noise has been undertaken on this basis.

2. The total footprint of the terminal (i.e. the area of the seabed that would be directly affected by the construction works) would be the same for both possible forms of construction. The indirect effects of these two possible options on the flow regime and wave climate would be similar in that, although the suspended concrete deck would be expected to be marginally less reflective than the mass concrete wall, the terminal frontage effectively represents a solid face which would reflect waves generated within the estuary.

3. Both forms of construction would involve reclamation using dredged material i.e. sand or marl (Mercia Mudstone). The volume of reclamation required for the suspended concrete deck structure would be slightly lower than for the mass concrete gravity wall, however for the piled suspended deck it would be necessary to construct a bund in the river located under the quay to retain the reclamation material behind the quay. Dredged material is unlikely to be suitable for this bund and hence imported material would be required to form the bund. In either case, reclamation would be undertaken by placing dredged material (sand) below low water. Above low water either compacted sand or compacted marl would be placed in the dry. For the mass concrete gravity wall there would be no need to construct a bund as dredged material could be placed directly behind the wall.

4. Piling for the suspended concrete deck quay structure would be bored concrete piles formed within steel tubes. The steel tubes would generally be vibrated down to rock

head level without noise associated with a piling hammer. However the assessment of noise generated during the construction phase has been undertaken on a worst case scenario and has assumed that piles would be driven.

Approach channel and berthing pocket dredge depth

5. The proposed dredged depth of 14.5m below CD in the navigation channel has been chosen to maximise the tidal window to which the quay and channels are accessible for vessels of particular drafts. The proposed depth of the berthing pocket (at 16.0m below CD) is required to enable berthing of vessels at the quayside throughout the tidal cycle.

Dredging plant

6. There is likely to be a requirement to utilise a number of different types of dredger depending on the nature of the material being dredged and the placement option for the material. Therefore, for different parts of the dredging it will be necessary to use a trailing suction hopper dredger or cutter suction dredger with possible use of backhoe dredger for specific small scale dredging tasks. The environmental implications of using these dredgers have been assessed and no other alternatives exist that could undertake the work.

Disposal of dredged material

7. A number of scenarios for the disposal of dredged material have been considered, each of which involves the placement of dredged material at a number of possible disposal (placement) locations.

8. The placement locations that have been considered are as follows:

- Teesport Estate;
- Former Leathers chemical works site at North Gare;
- Bran Sands lagoon on ICI land adjacent to the Teesport Estate (across Dabholm Gut); and
- Disposal at sea at either, or both, of the existing active disposal sites in Tees Bay.

9. Further details of each of these locations are provided in the following sub-sections, with a summary of the disposal scenarios that are assessed in this ES.

<u>Teesport Estate</u>

10. Historically, land on the Teesport Estate has been reclaimed and the disposal of material as part of the proposed project would comprise infilling behind the proposed quay wall (involving approximately 920,000m^3) and locally raising ground levels within the proposed terminal area (involving approximately 970,000m^3).

11. The disposal of material in this way would represent an option for the beneficial use of the granular material arising from the dredging of the lower channel and Seaton Channel turning circle and would allow the terminal to be constructed to the required level. This option for the beneficial use of dredged material therefore forms part of the scheme and is included in all disposal scenarios.

12. The total volume of material needed for reclamation would be approximately 1.8 million m^3 and, therefore, given that the capital dredging is expected to generate approximately 1 million m^3 of sand, additional material (approximately 800,000m^3) will be required for reclamation. A possible source is sandy material arising from routine maintenance dredging undertaken by PD Teesport, thus avoiding the need to import fill from elsewhere. Other disposal locations would be required for the balance of the capital dredged material (up to approximately 3.8 million m^3 given that the total dredge volume would be approximately 4.8 million m^3).

13. A further advantage of the disposal of dredged material within the Teesport Estate is its close proximity to part of the proposed dredge area and, therefore, the dredged material can be piped directly to the site. Additionally, the land within the existing Teesport Estate is already industrialised and, consequently, the use of material at this location would be expected to have a lower overall environmental impact compared with disposal at the other possible locations (see below).

14. No other areas within the Teesport Estate have been considered for the disposal of dredged material, largely due to the absence of areas of suitable size. Disposal of the dredged material on a constrained area of land would create a significant mound of material which would subsequently pose problems should the land be needed for other purposes.

<u>Former Leathers chemical works site</u>

15. This site has an area of approximately 10ha and is situated at North Gare. Historically, it is understood that the previous owners carried out land remediation works to bury existing contaminated material at this site. As a result of early discussions with English Nature, it was considered that the disposal of dredged material at this site could represent the beneficial use of dredged material, in that the material would cap and contain any existing contaminated material.

16. During informal consultation on the Environmental Scoping Report, a number of consultees (notably the Environment Agency and Teesmouth Bird Club) raised concerns over the potential use of this location due to its importance for nature conservation. Consequently, it is considered that this option would not, be beneficial and, therefore, the use of this site for the disposal of dredged material has been excluded from the scheme and is not considered further in the EIA.

Bran Sands lagoon

17. Bran Sands lagoon is situated on land immediately adjacent to the Teesport Estate (to the north-east) across Dabholm Gut. This site is not owned by PD Teesport and the current owner (ICI) has stated that they are not willing to sell the land at present due to ongoing landfill activities adjacent to the site. Nevertheless, PD Teesport would be interested in acquiring the site for operational purposes, should it become available. The infilling and reclamation of the lagoon could accommodate up to approximately 2.3 million m^3 of dredged material (mudstone). The use of this site, therefore, remains a possible option for the disposal of dredged material and the environmental implications of disposal at this site are included in this ES. It should, however, be emphasised that the applications to which this ES relate do not include disposal of dredged material in the Bran Sands lagoon.

Disposal at sea

18. There are two disposal sites within Tees Bay that could potentially receive material from the proposed channel dredging (Tees Bay C and Tees Bay A). Both of these sites have historically received capital and maintenance dredged material. It is proposed that dredged material (arising largely from the dredging of mudstone) will be disposed of at sea, as set out below.

19. The ES assesses the potential impacts associated with the disposal of dredged material at the two existing offshore disposal sites in Tees Bay. In summary, it is concluded that there would be no significant effects beyond the boundaries of the two disposal sites.

Summary of potential disposal scenarios and preferred option

20. In light of the above, there are two possible scenarios for the disposal of dredged material, both of which are assessed in this ES; these scenarios are summarised in Table 3.3.

Table 3.3 Possible scenarios for the disposal of dredged material arising from the project as assessed in this ES

Scenario	Reclamation (m^3)	Terminal area (m^3)	Bran Sands lagoon (m^3)	Sea disposal (m^3)
A	920,000	970,000	-	2,910,000
B	920,000	970,000	2,330,000	580,000

21. Given that the Bran Sands lagoon site is presently unavailable to PD Teesport, the only proposed scenario for the disposal of dredged material at present is Scenario A.

Replacement of the Riverside Ro-Ro facility

22. A number of possible options have been considered for the replacement of the Riverside Ro-Ro facility. These are as follows (see Figure 3.6):

- Northumbrian Water Jetty
- Head of Tees Dock
- Potash Berth
- QEII berth

Northumbrian Water jetty

23. This jetty is located downstream of the proposed development (see Figure 3.6). There are, however, a number of issues associated with this location, particularly in relation to the berth structures. The berth was originally designed for relatively small vessels and consequently it is likely to be inadequate for ro-ro vessels. Restructuring the berth by dredging deeper may destabilise it. Additionally, the transfer of cars from this location to the Tees Dock Estate would require a bridge to be built. This option would, therefore, be expensive.

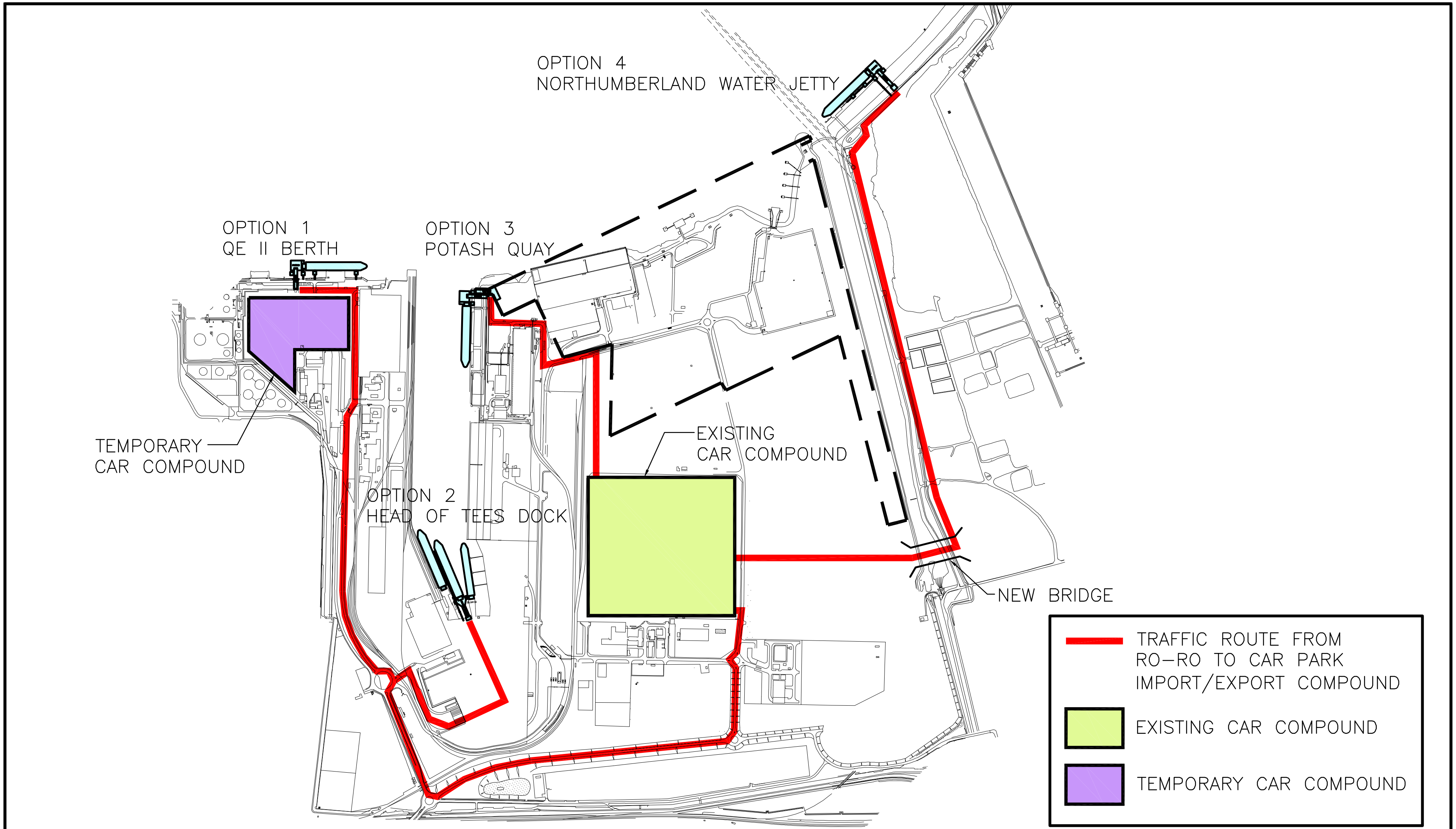
24. Environmentally, the requirement for dredging increases the potential impact on water quality of the Tees Estuary in terms of increases in suspended sediments and any associated contaminants which may exist within the sediments. They may also be short term disturbance in terms of noise associated with the construction since it is located closer to potentially sensitive areas.

Head of Tees Dock

25. The possibility of relocating the Ro-Ro berth to the head of Tees Dock (see Figure 3.6) has been considered and rejected on the grounds that there was insufficient space for safe navigation of vessels. Since dredging would not be required at this location, the only disturbance to the environment is likely to be that associated with single pile dolphins required for the mooring points. Its location away from any sensitive environmental locations would, however, mean that the potential impacts during construction are likely to be insignificant.

Potash Berth

26. The Potash Berth is located at the entrance to Tees Dock (see Figure 3.6). The advantages associated with the use of this site are that dredging would not be required and navigation and traffic access are good. However, this berth is used by another operator (Cleveland Potash) and the berth will not become available within the foreseeable future. As with the installation of the new Ro-Ro berth at the head of



TITLE
RO–RO REPLACEMENT OPTIONS

PROJECT
THE NORTHERN GATEWAY CONTAINER TERMINAL ENVIRONMENTAL STATEMENT

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DRAWN I.T.	SCALE N.T.S.
DATE MAY' 05	JOB No. 9R2629
DRG No. FIGURE 3.6	

Tees Dock, environmental impacts associated with the construction and operational phases of this berth would be relatively small. This is predominantly due to the sufficient existing depth of the berth which would not, therefore, require dredging. Some demolition work would be required but this would not be extensive.

<u>QE II berth</u>

27. The QE II berth is located immediately upstream of Tees Dock (see Figure 3.6). Although currently dredged to 10.4m below CD, some further dredging would be required close to the corner with Tees Dock. The major advantage to the use of this berth is its availability to PD Teesport.

28. Environmentally, the requirement for dredging increases the potential impact on the Tees Estuary associated with the resuspension of suspended solids. The dredging will only be required, however, over a very small area and the time period associated with the dredging will be limited.

29. Since all other alternative options considered have difficulties associated with current usage or accessibility for vessels, relocation of the Ro-Ro terminal to the QE II berth is the preferred option.

Terminal layout and operations

30. Various terminal layouts have been considered with the common aim of achieving a throughput of 1.5 million TEU per annum. The terminal operations (container stacking areas) considered from a technical operational point of view are summarised as follows:

- Rubber Tyred Gantry crane and Port Tractor Trailer operation (RTG-PTT);
- Straddle Carrier operation (SC);
- Rail Mounted Gantry crane and PTT or Automatically Guided Vehicle operation (RMG-PTT/AGV); and,
- Hybrid of RTG and RMG operations.

31. The operational performance of the various terminal layouts has been assessed using the terminal simulation software Posport CTS. The results of the simulations show that the RTG-PTT operation most closely achieves the required throughput capacity and levels of service. Therefore, the RTG-PTT operation is the most attractive as it can achieve the required throughput capacity of 1.5m million TEU per annum and achieve the required service levels whilst at the same time being a "scalable" investment. This is, therefore, the preferred option for the layout of the proposed terminal and this option is assessed.

32. In terms of the environmental implications associated with each of the above potential options for operational layout, it is concluded that there are unlikely to be

significant differences between the options. The type of layout adopted for the terminal would not result in a difference in the level of environmental impact experienced outside of the boundaries of the port. The only environmental impact which would vary is the level of noise generated during the operational phase. However, differences between the various modes of operation are not considered to be of material significance in selecting a preferred option given that the difference in noise experienced at sensitive receptors associated with the various options would be negligible.

Phasing of the development

33. Phasing of the development (specifically phasing of the construction of the quay wall) has been considered. Options include differing lengths for an initial phase of the development with the completion of the remaining length during a subsequent phase (or number of phases).

34. The length of quay to be constructed during Phase 1 (700m) has been chosen as this would allow the operations at the existing container terminal (TCT1) to continue whilst the new container terminal becomes operational. Subsequently, the final 300m of quay face would be developed to complete the proposed 1000m of quay face.

35. The phasing of the development as described above is the preferred option and no other options (in terms of potential environmental impact) are considered in this ES. However, the sensitivity of the environmental impacts to other phasing arrangements has been assessed and it is concluded that any difference in environmental impact would be negligible. This conclusion is based on the fact that, in order to make phasing the development economically feasible and viable from an operational point of view, it would be necessary to construct a first phase of at least 500m in length, followed by a second phase of 500m. A decrease of 200m in the first phase is considered to be negligible in terms of difference in potential environmental impact. Additionally, a longer first phase would not allow operations at TCT1 to continue and, therefore, is not a viable option.

4 PLANNING POLICY CONTEXT

1. PD Ports is committed to creating a deep sea container port at Teesport, requiring over £300m investment. The proposal to create a container terminal at Teesport directly supports regional and Government policy in relation to ports strategy, regional spatial strategy and integrated transport strategies to ease congestion on the roads. In addition, along with other recent port approvals, it will strengthen the UK's position in the global shipping market.

2. The deep sea container port development is predicted to create approximately 780 new dock-related positions, in addition to a significant number of indirect jobs within the ports, logistics and shipping sectors, estimated at approximately 1,380. Asda has recently started to construct a new distribution centre at the port and the Northern Gateway Container Terminal has the potential to attract other companies to construct import/distribution centres in the Tees area.

3. The proposal to create a Northern container port on an reclaimed brownfield site accords with the principles of sustainable development in that it involves the reuse of derelict land and has the potential to significantly reduce UK road freight mileage. The proposal is supported by local, regional and national policies and a detailed overview of planning policy and the implications of the proposed development in light of such policies is set out in the remainder of this section.

4.1 National policy context

4. It is considered that the following Planning Policy Statements (PPS) and Planning Policy Guidance Notes (PPG) are relevant to the development project:

- PPS 1 - Delivering Sustainable Development (2005)
- PPG 4 - Industrial, Commercial Development and Small Firms (1988)
- PPS 9 - Biodiversity and Geological Conservation (2005)
- PPG 13 - Transport (2001)
- PPG 16 – Archaeology and Planning (1990)
- PPG 20 - Coastal Planning (1992)
- PPS 23 - Planning and Pollution Control (2004)
- PPG 24 - Planning and Noise (1994)
- PPG 25 - Development and Flood Risk (2001)

5. A summary review of each of these as they apply to the proposed development is provided below.

4.1.1 <u>PPS 1: Delivering Sustainable Development and The Planning System: General Principles (2005)</u>

1. PPS 1, published in 2005, sets out the overarching planning policies on the delivery of sustainable development through the planning system, and 'The Planning System:

General Principles' provides guidance on the operation of the planning system. The guidance reiterates the commitment to a plan led system, whereby an application should be determined in accordance with the policies and proposals in the relevant development plan unless material considerations indicate otherwise. One such consideration will be whether the plan policies are relevant and up-to-date. In such occasions where they are not, and if the relevant national/regional planning policy is, then the relevant national/regional planning policy will supersede them.

Sustainable development

2. Sustainable development is identified as being the core principle underpinning planning, and in planning for sustainable development the guidance indicates that the following must be pursued:

- Social cohesion and inclusion;
- Protection and enhancement of the environment;
- The prudent use of natural resources; and,
- Sustainable economic development.

3. Local authorities are encouraged to take an approach based on integrating the four aims of sustainable development, as outlined above, for example by recognising that economic development (if properly planned) can have positive social and environmental benefits, rather than negative impacts.

4. In pursuing sustainable economic development, the Government is committed to promoting a strong, stable and productive economy that aims to bring jobs and prosperity for all. In following this objective, local planning authorities (LPA's) should have regard to the importance of supporting industrial and commercial development if the economy is to prosper and improve, for improved productivity, choice and competition, particularly when technological and the other requirements of modern businesses are changing.

5. Of relevance to the proposals, the guidance is clear that development policies should:

- Promote national, regional, sub-regional and local economies by providing a positive planning framework for sustainable economic growth to support efficient, competitive and innovative business, commercial and industrial sectors;
- Bring forward sufficient land of a suitable quality in appropriate locations to meet the expected needs for industrial development;
- Provide improved access for all to jobs by ensuring that new development is located where it is accessible by foot, bicycle or public transport;
- Enhance the environment as part of development proposals. Where adverse impacts are unavoidable, LPA's and developers should consider the possible mitigation measures. In short, adverse environmental, social or economic impacts should be avoided, mitigated or compensated for;

- Promote more sustainable consumption and production, and ensure that outputs are maximised whilst resources are minimised; and
- Promote the more efficient use of land and the use of suitably located previously developed land.

Design

6. PPS1 also recognises that good design is a key element in achieving sustainable development, and that good design should contribute positively to making places better for people. With regards to design, the Government aims to ensure that the design of new developments addresses the needs of people to access jobs and key services and also that good design principles are used to consider the direct and indirect impacts of a development on the natural environment.

Community involvement

7. Community involvement is also recognised as being important to planning and sustainable development. One of the Government's key objectives is to encourage an increase in community involvement in the planning process.

8. The requirement for community involvement has been fully addressed throughout the formulation of the Northern Gateway proposals and evidence of this is provided in the form of a Consultation Statement to be submitted as part of the planning application.

4.1.2 PPG 4: Industrial, Commercial Development and Small Firms (1988)

1. PPG 4 identifies the Government's key aim of encouraging continued economic development in a way which is compatible with its stated environmental objectives. The guidance explains that economic growth and a high quality environment have to be pursued together.

2. PPG 4 promotes locational factors that should be considered as key inputs in the potential siting of industry and commerce development, which includes: the demands of customers; access to suppliers; links with other businesses; the workforce catchment area; and various transport considerations. To this regard, PPG 4 provides the following criteria that should be taken into account when locating new industrial and commercial development:

- Encourage new development in locations which minimise the length and number of trips, especially by motor vehicles;
- Encourage new development in locations that can be served by more energy efficient modes of transport;
- Discourage new developments where it would be likely to add unacceptably to congestion;

- Locate development requiring access mainly to local roads away from trunk roads, to avoid unnecessary congestion on roads designed for longer distance movement.

3. The guidance is clear that the planning system should operate on the basis that applications for development should be allowed, having regard to the development plan and all other material considerations, unless the proposed development would cause demonstrable harm to interests of acknowledged importance. It states that "Development control should not place unjustifiable obstacles in the way of development which is necessary to provide homes, investment or jobs, or to meet wider national or international objectives." The current application proposals accord fully with the guidance in PPG 4 and will have significant benefits across the whole of the Northern region.

4.1.3 PPS 9: Biodiversity and Geological Conservation (2005)

1. PPS 9, adopted August 2005, seeks to ensure that the potential impacts of planning decisions on biodiversity and geological conservation are fully considered, and the guidance is clear that planning decisions should be based upon up-to-date information about the environmental characteristics of the area.

2. The guidance proposes that planning decisions should seek to maintain, and enhance, restore or add to biodiversity and geological conservation interests, and where development will result in unavoidable and significant adverse impacts; planning permission should only be granted where adequate mitigation measures are put in place. Where such impacts cannot be prevented, LPA's should normally seek appropriate compensation measures.

3. In the case of the current application the biodiversity and geological considerations which require to be addressed in the ES are as follows:

- Marine Sediment Quality
- Soil Quality and Geology
- Water Quality
- Marine Ecology
- Marine and Coastal Ornithology
- Terrestrial and Coastal Ecology
- Fisheries Resources

4. In order to assess the likely impact of the development on marine sediment quality thirteen samples were taken for analysis to determine the physical and chemical sediment characteristics. Eight samples were collected within the footprint of the proposed capital dredge and five were collected at sites which were considered potentially to be at risk from remobilised and potentially contaminated sediments. The assessment concluded that during the construction phase there would be an impact of negligible significance associated with the re-suspension of contaminated

sediments and their deposition at the receptor sites. However once the terminal become operational there will be a benefit of minor significance associated with the separation of the contaminated material from the environment by the new quay wall (i.e. effectively removing a source of potential contamination from the estuary system).

5. In order to assess likely impact on Soil Quality and Geology a range of intrusive site investigations and data analysis were undertaken. This included a range of boreholes and trial pits from which soil samples were tested. An assessment was then undertaken of the potential for any existing contaminants present on the site to impact upon human receptors, controlled waters, ecological receptors, neighbouring property and land use and buildings and infrastructure at the present time, during construction work and once the site becomes operational. The findings of this assessment can be summarised as follows:

Hazard	Existing Risk	Risk during construction	Risk once operational	*Comment*
Risk to human health	Low	Medium	Negligible	*During construction workers will be in direct contact with soil however once completed the site will be covered by hard standing which will minimise risk of human contact.*
Risk to shallow groundwater	Medium	Medium	Low	*Groundwater currently impacted by contamination but once hard standing in place reduced infiltration should limit the leaching of contaminants*
Risk to deep groundwater	Negligible	Negligible	Negligible	*Deep groundwater currently protected from contamination by impermeable mudstone and hard standing will further decrease likelihood of infiltration.*
Risk to surface water	Low	Medium	Low	*Potential for disturbance during construction to temporarily increase mobilisation of contaminants which could reach surface water. Hard standing will reduce potential for leaching*

				into surface water.
Risk to neighbouring property and land	Low	Low	Negligible	*Since neighbouring properties are largely industrial they are considered to be of low sensitivity.*
Risk to ecological receptors	Medium	Medium	Low	*The site lies in proximity to areas of ecological importance and hence there is the potential for leaching of contaminants at the existing time and during construction. Once hard standing in place reduced infiltration should limit the leaching of contaminants and lessen the potential impact on ecological receptors.*
Risk to buildings and structures	*Low*	*Medium*	*Medium*	*At present the site is largely open land. Construction will introduce new buildings onto the site and foundations may come into contact with contaminated material.*

6. On the basis of this assessment it is considered that the laying of hard standing will reduce the potential for contaminants to leach from soils at the site. On this basis, and since the few areas of elevated contaminant levels will be addressed at the time of construction, operation of the proposed development is considered to have an overall residual impact of minor beneficial significance.

7. In order to assess likely impact on water quality, data on existing water conditions was obtained from the Environment Agency. This data indicated that all bathing waters within the study area have passed the mandatory standards of the EC Bathing Waters Directive and that in general background suspended solids concentrations are low within the estuary but peaks occur during stormy periods and over spring tides. The assessment indicated that although sediment will be released into the water during capital dredging most is predicted to fall out of suspension within the immediate vicinity of the dredger. It was concluded that there may be an impact of minor adverse significance on contaminant levels in the water column but that no exceedances of environmental quality standards are predicted. No impacts are predicted to occur on the water quality at designated bathing sites.

8. To assess the impact of the application on marine ecology survey work was undertaken to describe the marine biological communities of the area potentially impacted by the proposed development. This survey work included an assessment of animals living within the sediment and species living on the surface of the sea bed. The assessment concluded that whilst dredging and reclamation involved in the development will result in an immediate loss of invertebrate species this would not result in the removal of a particular species group as similar groups exist outside of the area to be dredged. It was also concluded that re-colonisation would occur during the operational phase and hence the overall impact will be of minor adverse significance during the construction phase.

9. The background study to assess the likely impacts of the development on marine and coastal ornithology identified the presence of a number of sites designated for marine and coastal waterbird interests. These include the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site; the Seaton Dunes and Common Site of Special Scientific Interest (SSSI); South Gare and Coatham Sands SSSI; Seal Sands SSSI; and Cowpen Marsh SSSI all of which are located towards the mouth of the Tees estuary. The assessment of impacts concluded that the reclamation required to construct the terminal and the capital dredging of the main channel will not result in the direct loss of any area of intertidal mudflat and other impacts during construction such as changes to the tidal regime and increase in suspended solids in the water column impacting on feeding resources are predicted to be negligible. Should the Bran Sands lagoon site be reclaimed using dredged material, it is concluded that the impact would be of moderate adverse significance for waterbird populations, but the reinstatement of bird islands at Bran Sands will mitigate this potential impact to being of negligible significance. Once operational, negligible changes are predicted to occur on the waterbird population of Seal Sands as a result of changes to the morphology of intertidal habitats related to changes in hydrodynamics in the area. Increased shipping activity and hence shipwash is predicted to have a negligible impact on waterbird populations.

10. Ecological surveys were undertaken to establish the characteristics of the terrestrial and coastal habitats that have the potential to be impacted by the proposed development. These surveys considered: vegetation; habitats; invertebrates; mammals; amphibians/reptiles; and birds. In general the vegetation and habitat communities were not found to be of significant nature conservation value. Similarly the invertebrate communities did not record any species of particular value. Smooth newts and common toads were recorded but no reptiles were identified. No evidence of badgers, water voles or otters was found although bats were noted foraging over the Teesport Estate and brown hares are known to inhabit parts of the estate. The species of birds recorded were found to be typical of the habitats available in the coastal location. The most significant impact associated with the construction phase is that associated with the direct loss of ecological interest within the footprint of the proposed terminal. This is predicted to be of minor to moderate adverse significance; however mitigation measures are proposed and these will reduce the impact to be of minor adverse significance. Impacts of negligible significance are predicted to occur

on the coastal and terrestrial bird populations of the VOPAK foreshore and Bran Sands Lagoon. Once operational there are will be no activities taking place that have the potential to impact on the terrestrial ecological interest of the surrounding area.

11. Information was provided by the North Eastern Sea Fisheries Committee on existing fishing activities in the study area. This indicated that fishing within the Tees estuary is generally limited and the majority of activity occurs outside of the estuary. Salmon, sea trout and eels are present within the estuary but numbers caught are significantly lower than in other rivers in the region. The impact on fisheries associated with the construction phase is mainly a result of the increase in suspended solids concentration in the water column as a consequence of capital dredging. This could have a moderate impact on fish physiology due to the blocking of gill structures, largely due to the presence of migratory salmonids at certain times of the year and the potential for disruption to migration. It is recommended that the dredging is programmed to occur during the winter months to avoid impacts on migratory fish and, therefore, reduce the potential impact to being of minor adverse significance.

12. It is evident from the above discussion that a comprehensive assessment has been undertaken to ensure that biodiversity and conservation issues have been given full consideration and this assessment indicates that there are no significant adverse impacts predicted. This is in full accordance with the guidance in PPS 9.

4.1.4 <u>PPG 13: Transport (2001)</u>

1. PPG 13 provides guidance on the integration of transport and land use planning. The key aim of the guidance is to ensure that local authorities carry out their land use policies and transport programmes in ways which help to reduce the number of motorised journeys; encourage alternative means of travel which have less environmental impact; and hence reduce reliance on the private car.

2. The guidance set out in PPG 13 encourages development that will reduce road traffic, congestion, and pollution in order to promote sustainable distribution. The guidance asserts that a means of achieving this is through promoting more sustainable transport choices for both people and for moving freight. The principle of developing a container port to enable freight to access northern England by sea, rather than by road, is clearly in full accordance with the aims of PPG 13.

3. With specific regard to ports and shipping, the guidance again promotes the role of ports in sustainable distribution networks through encouraging good access to them by rail, waterways and road where possible, and by promoting interchange facilities and wharves and harbours where viable. The proposed use of rail for the transport of containers as part of the development proposals and the increased reliance on transportation by sea to the northern market through the strategic location of the port meet the aims of PPG 13 in terms of maximising the use of means of transport other than by road.

4. PPG 13 encourages the development of port sites in order to secure the economic and regeneration benefits that ports and port related uses can provide. However, PPG 13 states that particular care should be taken when allocating sites for port use in order to avoid causing unnecessary blight. In the case of the current application the restoration and redevelopment of the brownfield Teesport site will have no blight effect. The proposal will deliver economic and regeneration benefit by development of a container handling facility on an unused part of the port capitalising upon the success of the existing port operations in the vicinity.

5. PPG 13 also proposes that in order to avoid locating developments which are incompatible with nearby port operations, LPA's should undertake a rigorous appraisal of proposals for new facilities or the expansion of facilities that will include new land uptake, to ascertain the viability of any proposals. The guidance states that port sites that may in the future no longer be required should be re-used for sustainable transport uses in the first instance and then for uses that will promote regeneration.

6. The guidance also states that for transport proposals such as major roads, long distance rail lines, most airports and large ports, that an EIA is required in every case. This requirement has been met through the preparation of this document.

4.1.5 PPG 16: Archaeology and Planning (1990)

1. PPG 16 sets out the Government's policy on archaeological remains on land, and how they should be preserved or recorded both in an urban setting and in the countryside. It gives advice on the handling of archaeological remains and discoveries under the development plan and control systems, including the weight to be given to them in planning decisions and the use of planning conditions The guidance explains that the key to informed and reasonable planning decisions is for consideration to be given early, before formal planning applications are made, to the question whether archaeological remains exist on a site where development is planned and the implications for the development proposal.

2. As part of the ES process a desk based archaeological assessment was undertaken to ascertain the archaeological and cultural heritage resources which could be affected by the application proposals. This work concluded that the work to clear the site would only impact upon twentieth century structures relating to later port operations, none of which are of archaeological or heritage value. In terms of the impact of dredging, berth and quay wall construction, the study concluded that due to the use of the Tees as a port as far back as the Medieval period it is possible that maritime archaeology may be present in this area and could be disturbed or damaged by the development work. However in accordance with PPG 16 guidance mitigation is proposed in the form of borehole analysis to ascertain whether important remains exist in this area. Comments from both Tees Archaeology and English Heritage would be sought during the preparation of a written scheme of archaeological investigation to ensure that any buried archaeological or

palaeoecological remains which are present are identified and recorded. In this manner full consideration has been given to the requirements of PPG 16 in relation to the protection of the historic environment.

4.1.6 PPG 20: Coastal Planning (1992)

1. PPG 20 explains the Government's approach to Coastal Planning in the UK. The guidance emphasises that it is the role of the planning system, through development plan policies and planning decisions, to ensure that the need to protect, conserve and, where appropriate, improve the landscape, environmental quality, wildlife habitats and recreational opportunities of the coast is acknowledged.

2. With regard to major developments in coastal locations (such as ports), once the essential need for a coastal location has been demonstrated, planning applications should be determined in accordance with the development plan. However, the guidance asserts that in order to effectively assist on such decisions, development plan policies should be formulated on a well grounded understanding of natural processes in the coastal zone.

3. With regards to the above, PPG 20 provides information that should be considered when formulating development plans and determining planning decisions in relation to the potential impact of developments in the coastal zone. The information to be considered should include:

- An assessment of the impact of development on the environment;
- Identification of particular environmental sensitivities and types of development and activity likely to cause particular harm;
- Identification of sensitive locations or areas for key types of development.

4. This assessment has been undertaken through the ES process and it is considered that the impact of a container development in this location is desirable both in social and economic terms and acceptable in environmental terms.

4.1.7 PPS 23: Planning and Pollution Control (2004)

1. PPS 23 gives guidance on the relevance of pollution controls to the implementation of planning functions. The planning and pollution control systems are separate but complementary in that both are designed to protect the environment from potential harm caused by development and operations but with different objectives. In particular the guidance makes clear that LPA's should not seek to duplicate controls which are the statutory responsibility of other bodies (including local authorities in their non planning functions). It makes clear that close co-ordination among all concerned will be needed to ensure speedy decisions in a complex network of essential regulations and suggests that where it will save time and money, consideration should be given to submitting applications for planning permission and

pollution control permits in parallel and co-ordinating their consideration by the relevant authorities.

2. The Government attaches great importance to controlling and minimising pollution. Its commitment to the principles of sustainable development was set out in "A Better Quality of Life – A Strategy for Sustainable Development for the UK" The strategy is based on four core objectives:

- Maintenance of high and stable levels of economic growth and employment;
- Social progress which recognises the needs of everyone;
- Effective protection of the environment; and,
- Prudent use of natural resources.

3. The strategy sets out ten principles and approaches, the following of which are particularly relevant to the consideration of planning and pollution control:

- Putting people at the centre;
- Taking a long-term perspective;
- Taking account of costs and benefits;
- Respecting environmental limits;
- Applying the precautionary principle;
- Using scientific knowledge;
- Following procedures which are based on transparency, access to information, effective participation by stakeholders and access to justice; and,
- Making the polluter pay.

4. Development control decisions can have a significant effect on the environment, in some cases not only locally but also over considerable distances. The guidance states that to this regard LPA's must therefore be satisfied that planning permission can be granted on land use grounds after taking a full account of environmental impacts. This will require close co-operation with the Environment Agency and other relevant bodies to ensure that in the case of potentially polluting developments:

- The relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control frameworks; and,
- The effects of existing sources of pollution in and around the site are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable.

5. With specific regard to policies on land affected by contamination, PPS 23 explains that the presence of contaminated land can affect or restrict the beneficial use of previously developed sites, however it proposes that development can present an opportunity to address the problem and bring the land back into beneficial use and thus minimise the need to develop Greenfield land.

6. The Governments objectives for contaminated land are set out in the DETR Circular ‘Contaminated Land’ and are:

- 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.

7. The guidance asserts that the intending developers of land, that is known or suspected to be affected by contamination, should enter into pre-application discussions with the LPA, the environmental health departments of local authorities, and other authorities with a legitimate interest to identify whether the land is affected by contamination and the potential implications for the development proposals that this may have. The outcome of these pre-application discussions will inform the content of an EIA where required.

8. In relation to issues of air quality, PPS 23 makes clear that any air quality consideration that relates to land use and its development is capable of being a material planning consideration.

9. When considering an individual planning application, the guidance asserts that the LPA should ensure that the remediation of contaminated land through the granting of planning permission should secure the removal of unacceptable risk and make sure the site is suitable for its new use. The guidance explains that the appropriate remediation of contaminated land is defined as land that should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990.

10. In the case of the proposed development full consideration has been given to the following issues:

- Remobilisation, dispersion and redistribution of potentially contaminated sediment during capital dredging;
- Release of potentially contaminated sediment during quay construction;
- Run-off of potentially contaminated water from the reclamation works into the Tees estuary;
- Potential remobilisation of sediment by localised erosion resulting from changes in tidal flows and wave action;
- Potential risk to construction workers;
- Potential for contamination of groundwater and surface water;
- Potential for adverse effects upon air quality, both during construction and once the terminal is operational.

11. As a result of the capital dredging needed to create the new terminal and deepen the river channel, seabed sediments will become re-suspended and dispersed throughout the estuary. As a result, the ES identifies the potential for alterations to

the physical, chemical and microbiological characteristics of the areas to which the sediment disperses and subsequently settles. As a result of the heavy industrial nature of the Tees estuary, the assessment indicated that where sediment has remained undisturbed there may be scope for the presence of historical contamination to become an issue. The study concluded that whilst there might be an impact of minor adverse significance associated with the re-suspension of contaminated sediment during construction there would be a benefit of minor significance once operational as the contaminated material would be separated from the environment by the new quay wall.

12. As part of the assessment process consideration was given to the likelihood of particulate matter, nitrogen oxides, carbon monoxide and sulphur dioxide being released during the construction or operation phases of the scheme. These pollutants are known in certain concentrations to adversely affect human health and/or the environment.

13. During the construction period there will be some fugitive dust emissions from the site; however, since there are no sensitive public receptors within 1km of the site the assessment concluded that the release of dust during construction would not be a significant issue and thus did not require to be assessed further. Nevertheless, the ES identifies good practice measures which should be taken to ensure that dust is minimised. Taking into account these measures, the residual impacts are identified as of negligible significance.

14. In terms of other emissions during the construction period, the assessment identified the potential for pollutants from construction plant diesel engines. In most cases these are anticipated to be of negligible significance but in the case of sulphur dioxide to be of moderate adverse significance during the phase two construction period.

15. Once the container terminal is operational, the assessment indicated that in terms of nitrogen dioxide emissions slight increases were predicated to result from the increase in road traffic as a result of the increased capacity of the terminal; however, this impact was found to be significantly less then the reduction predicted to occur over this period (as a result of improvements in fuel specifications and more stringent emissions standards for new vehicles) and hence not likely to affect the achievement of national air quality objectives. In this respect the overall impact was considered to be of only minor adverse significance. The same was found to be true for the assessment of particulate matter. To ensure that the worst case scenario was considered the assessments were based on 100% of cargo being distributed by road. Overall cumulative impacts were found to be of negligible significance.

16. On the basis of this assessment therefore it is concluded that the Government's objectives in relation to minimising pollution have been adequately met.

4.1.8 PPG 24: Planning and Noise (1994)

1. PPG 24 recognises that noise can have a significant effect on the environment and on the quality of life enjoyed by individuals and communities and states that the impact of noise can be a material consideration in the determination of a planning application. The guidance also recognises that much of the development which is necessary for the creation of jobs etc. will generate noise and that the planning system should not place unjustifiable obstacles in the way of such development. Nevertheless, it is also clear that LPA's must ensure that development does not cause an unacceptable degree of disturbance. In assessing applications for industrial development, the character of noise should be taken into account as well as the level, and it is suggested that the local authority may wish to consider the use of appropriate conditions.

2. The ES devotes a chapter to the subject of noise and vibration and fully addresses these issues both during the construction phase and once the port becomes operational. This study concludes that the nearest residential properties are located approximately 2500m from the application site, at Wilton Avenue in Dormanstown and at Bolckow Road, Grangetown. Between the port and these residential areas are a mix of brownfield sites, open grassland and the Corus Steel woks. The A66/A1053 also passes between the residential areas and the port.

3. Detailed survey work was undertaken to assess the existing ambient noise levels in the area. This work indicated that ambient noise levels in this area are currently dominated by road noise and mixed industrial noise from the Wilton and Corus works. The assessment work indicated that for the majority of the construction period there will be no impact on noise levels at the nearest residential properties. During the construction periods that may require piling to be undertaken, the impact on sensitive receptors is predicted to be of negligible significance.

4. Consideration was also given to the impact of increased road traffic generation once the port becomes operational and its impact on ambient noise levels at the nearest residential areas. In order to assess the worst case situation the predictions were based on the assumption that 100% of freight movements would be by road. This work demonstrated that increased road traffic noise resulting from the operation of the container port will have a negligible impact on residential properties and hence no mitigation is required. Similar assessment work was undertaken for rail movements and the impact of increased rail travel was also found to be negligible in terms of noise generation.

5. Consideration was also given to the likely impact of port plant such as stackers and cranes. The assessment demonstrated that the predicted operational noise would be significantly below existing ambient levels and hence the port operations would have no impact at the nearest residential properties.

6. Finally in terms of vibration, due to the separation distance between the housing and the main port area, the assessment concluded that neither construction nor operational activities will give rise to perceptible airborne or ground borne vibration at the houses. This includes consideration of vibration resulting from increased traffic movements on the local road network and increased rail movements.

7. Overall, therefore, this assessment indicates compliance with Government policy in PPG 24.

4.1.9 PPG 25: Development and Flood Risk (2001)

1. PPG 25 provides guidance on how flood risk should be considered at all stages in the planning and development process in order to reduce future damage to property and loss of life. It sets out the importance the Government attaches to the management and reduction of flood risk in the land use planning process, to acting on a precautionary basis and to taking account of climate change. The document explains that the planning system should ensure that new development is safe and not exposed unnecessarily to flooding. It should seek where possible to reduce and certainly not increase flood risk. It should help ensure that flood plains are used for their natural purposes, continuing to function effectively and are protected from inappropriate development. Further detailed advice is provided in Draft PPS 25 which once adopted will replace PPG 25.

2. The key points of relevance to the proposed development are as follows:

- The susceptibility of land to flooding is a material consideration;
- The Environment Agency has the lead role in providing advice on flood issues, at a strategic level and in relation to planning applications;
- LPA's should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid such risk where possible and managing it elsewhere;
- Developers should fund the provision and maintenance of flood defences that are required because of the development.

3. PPG 25 advises that in preparing application proposals, applicants should discuss with the LPA the requirements they will be expected to meet to satisfy the authority on flood risk and the run off implications of the development proposed. They should consult the Environment Agency on the potential risks to their development, on the likely effects of their proposals on flood risk to others and on whether mitigation would be likely to be effective and acceptable. The developer should carry out an assessment of flood risk and the run off implications of their proposal that is appropriate to the scale and nature of the development and the risks involved and submit this with the application.

4. The Environment Agency is in the process of developing a flood risk management strategy for the tidal Tees and the scope of this study includes the application site.

The scoping report prepared in relation to this EA strategy was given full consideration in the preparation of a Flood Risk Assessment (FRA) that has been undertaken for the proposed development in accordance with PPG 25. The FRA accompanies the planning application and has informed the findings of the ES with respect to coastal protection and flood defence. The following issues have been assessed in the FRA and ES:

- Potential effect on coastal defence structures at the application site;
- Potential impact of capital dredging of flood defence assets;
- Potential impacts on flood defence assets due to changes in the hydraulic and sedimentary regime;
- Effect on the standard of flood defence at the development site; and
- Effect on flood risk to areas around the development site.

5. The above work has been undertaken in close discussion with the Environment Agency and it has demonstrated that the construction works do not have the potential to directly impact on any flood defences as no defences will be removed or altered during the construction phase. The assessment indicated the proposed works would be of benefit to the development area since the levels of the terminal will be raised thus increasing the level of flood defence. In terms of the impact on other areas of the estuary changes in flood risk as a result of changes in river flows and tidal ranges is predicted to be negligible. However a minor adverse impact is predicted in terms of a slight increase in the frequency of overtopping of the ConocoPhillips Dock area.

4.1.10 Other National Policy Documents

1. It is considered that the following national policy documents are relevant to the development project:

- Government White Paper: A New Deal for Transport (1998)
- British Shipping: Chartering a New Course (1998)
- Modern Ports: A UK Policy (2000)
- Focus on Ports (2000)
- Recent Developments and Prospects at UK Container Ports (2001)
- Transport Committee’s Report on Ports to the House of Commons (2003)
- A Project Appraisal Framework for Ports (2003)
- The Government’s Response to the Transport Committee’s Report on Ports (2004)
- Sustainable Distribution: A Strategy (1999, Modified 2004)

2. A summary review of each of these as they apply to the proposed development is provided below:

Government White Paper: A New Deal for Transport (1998)

3. The White Paper sets out the Government's approach to transport policy in the UK based on an integrated transport network. The objectives of the paper include: integrating different types of transport; the integration of transport and the protection of the environment; the integration of land use planning and transport at the national, regional and local level; and the integration of transport policies with policies for education, health and wealth.

4. The paper aims to encourage proposals for sustainable distribution through promoting the role of rail freight, inland waterways and coastal shipping in the movement of goods. The belief is that through this a greater choice for moving freight (as alternatives to moving freight by road) will be provided in order to promote a more efficient society and a better environment.

5. The paper encourages making better use of coastal shipping and inland waterways to achieve sustainable distribution networks and suggests that there is potential to divert 3.5% of the UK's road freight traffic to water. The 3.5% reduction of the UK's road freight will result from a split between ships re-routing to ports nearer to the origin and destination of their loads and the potential for the bulk and unit loads to shift the coastal traffic.

6. With regards to ports, the paper states that ports are a vital link in the supply chain to and from trading partners and must be integrated with wider transport networks. The aims of the White Paper policy, in relation to integrated ports are to:

- Promote UK and regional competitiveness by encouraging reliable and efficient distribution and access to markets;
- Enhance environmental and operational performance by encouraging the provision of multi-modal access to markets;
- Make best use of existing infrastructure, in preference to expansion wherever practicable;
- Promote best environmental standards in design and operation of ports, including where new development is justified.

7. The development of a deep water container port at Teesport accords fully with the aims and objectives of the White Paper.

British Shipping: Chartering a New Course (1998)

8. The paper sets out the Government's strategy for reviving the shipping industry within the context of the four main aims of an integrated shipping policy as set out in the Government White Paper on transport (discussed above).

9. The paper promotes the increased use of coastal and short-sea shipping as a sustainable, environmentally friendly alternative to road transport, which could have

the potential to divert up to 3.5% of the UK's road traffic to, which the paper suggests that this will represent considerable further opportunities for UK based shipping.

10. With regards to planning guidance, the paper proposes that the location of industry, warehousing and distribution centres is crucial in determining which mode(s) will be used for the transport of freight and a sustainable integrated transport system. With this in mind the Government encourages the revision of planning guidance to encourage more freight to be carried by rail and water and to give better protection to sites and routes which could be critical in developing freight infrastructure, including facilities for water transport. The application proposal accords with this strategy.

Modern Ports: A UK Policy (2000)

11. The document was produced by the Department for Transport and sets out the Governments aims and objectives with regards to the network of ports in the UK. The policy aims to maintain a balanced policy on port development which aims to make the best use of existing and former operational land, which secures high environmental standards, but supports sustainable projects for which there is a clear need. The document sets out key policies which the Government aims to pursue, which include:

- Ports should be encouraged to redevelop former operational land for purposes which exploit its transport connections to reduce traffic.
- Support sustainable port projects for which there is a clear need, with each looked at in detail on its merits; and
- Take full account of the need for good access to ports in developing policies and programmes for the various forms of transport and encourage the use of ports by coastal and short sea shipping services.

12. The document looks at the need for port capacity, potential need for new port development in the UK and the relationship between the ports industry and the planning system. With regards to containers, the document recognises that container ports which cannot meet the demands of global shipping alliances through lack of capacity stand to lose not only the future growth of their business, but substantial sections of their existing custom. The document also asserts that Gateway ports have become increasingly important to their local and regional economies and if they were to lose business it would have correspondingly substantial adverse consequences, which is a consideration of national importance. With regards to deep sea terminals, the document suggests that some ports have lost trade because the bigger ships cannot use them and also that there are only a few major facilities which can meet these demands in the UK, which increases the constant pressure on port handling capacity.

13. With regards to the expansion of ports, the document acknowledges that the pressure for expansion is greatest at ports which handle container and Ro-Ro traffic, which result in these ports needing to increase capacity to meet future demands. The

document suggests that to cater for this expansion, substantial new port development may be required, but that this requirement will only be for a relatively small number of ports. The document further states that, where the need for expansion is clear the Government will support sustainable port projects, but that each case will be looked at in detail on its merits.

14. In relation to the planning system, the document proposes that land use planning can help ports and port-related uses to develop sustainably, through balancing the economic advantages of development with the social and environmental implications. The document further states that LPA's should promote the role of ports in sustainable distribution, by promoting viable interchange facilities; encouraging sustainable access and full use of existing facilities; ensure rigorous appraisal for new facilities and expansion; and should avoid development incompatible with nearby port operations. The document also further asserts that the guidance set out in PPG 20, in relation to the protection of important nature conservation sites, deep water environments, and coastal zone management issues, needs to be considered in any new development proposals.

15. The document highlights the Governments approach to a sustainable distribution network in terms of encouraging integrated port facilities. It acknowledges that ports have always provided integrated transport facilities and are centres of distribution. The document encourages the transport of freight by water, as it states that shipping is one of the most environmentally sustainable means of transport and that the government shares the port industries natural interest in exploiting the potential of shipping on coastal and short sea routes, which would help to relieve congestion and pollution on the roads. The document also encourages the potential for operators to route ships to ports nearer to the origin or destination of goods and the potential for bulk and unit loads to shift to coastal highways. It is considered that the current application proposals are fully in accordance with the Governments' aim of creating a sustainable distribution network.

Focus on Ports (2000)

16. The document provides the statistical information which should be used in parallel with the Modern Ports document, summarised above, which was also produced by the Department of Transport in 2000.

17. With specific regard to Teesport, the document highlights that tonnage is up four fold since 1965 at the ports of the Tees and Hartlepool, with large volumes of bulk products and increasingly important container and Ro-Ro traffic. The document also acknowledges that in 2000 the Port was the third largest in the UK, the seventh largest in Northern Europe and that it has grown faster in recent years than any of the ports ranked higher than it at that time (London and Grimsby and Immingham). The document also recognises that the port was, in 2000, the largest in the UK for chemical traffic, ranked third for ores and scrap transport and also that fish landings at Hartlepool amounted to some £1.3 million in 1998.

Recent Developments and Prospects at UK Container Ports (2001)

18. The document, prepared in 2001 by the Department of Transport, forms part of the commitment made in Modern Ports: A UK Policy (outlined above) to create a clear picture of trends affecting the ports industry in the UK and the potential need for port investment. The paper asserts the department's policy that for environmental and other reasons, ports, as with other transport modes, should make the best use of existing natural and man-made capacity in preference to new infrastructure.

19. The document concludes that there will be pressure on capacity at UK container terminals within the next few years. With regards to deep-sea container terminals in the UK, the document identifies that there are currently pressures on the capacity of UK ports to deal with ships employed on deep-sea trades because there are few terminals in the UK which can deal with such vessels. The report states that the capability to expand the operations of deep-sea container trade is an important catalyst for decisions by port operators in relation to the future development at UK container ports.

20. The document also recognises that in line with a sustainable distribution policy, summarised below, that shipping lines and ports want to increase the share of inland distribution taken by rail, but there are perceived difficulties due to capacity limitations either in the vicinity of the port or over the wider network and also that there is currently a lack of optimism with regards to the prospects of coastal or short sea movement of containers.

A Project Appraisal Framework for Ports (2003)

21. The document, produced by the Department of Transport, aims to provide a framework to assist promoters of port developments, those affected by port developments, those required to make decisions on port developments, and others who may wish to make representations about port developments. The framework seeks to set out ways of organising information and analysis consistent with the Governments overall objectives for transport and specific policy objectives for ports.

22. The purpose of the document is to provide an appraisal framework for the future development of ports which is based on a full assessment of the criteria set out in the Government's objectives of safety, economy, environment, accessibility and integration (which are set out in this document). The document asserts that the location, size and effects of a port project are important determinants of whether the framework should be applied and, if the framework does apply, the scale of appraisal effort (whether all the above aspects need to be considered and the required detail). The framework potentially applies to developments at ports for operational purposes and will generally apply as follows:

- If a port developer is required to prepare an ES under the EIA procedures due to the effect on sensitive sites, size, or other reasons the framework applies in full.

- If a port developer is seeking public money, but the project does not require an ES, the appraisal framework may apply in full, or in part, if the programme to which they have applied, for example Freight Facility Grants or European Regional Development Fund, requires it.

- For all other port projects that require some form of public approval, any project with a capital cost in excess of £10m would be subject to the full framework. For projects with a capital cost below £10m, the full appraisal framework does not apply and a short qualitative description may be sufficient to meet the information needs of projects requiring some form of public approval. Impacts that are negative should be discussed in more detail. This qualitative assessment would apply to the proposal and the alternatives considered by the developer.

23. The requirements of the appraisal framework for ports have been fully addressed in developing the Teesport application.

Transport Committee's Report on Ports to the House of Commons (2003)

24. The paper was produced by the Transport Committee and presented to the House of Commons in November 2003. The report considers the structure of the port industry, Government policy towards the industry and its prospects for the future. The paper aims to provide information in order to facilitate a government policy which ensures that the UK port industry remains healthy and internationally competitive and provides a solid framework for its success. The paper also recognises the dependence on ports in relation to international trade and thus that ports are important to national and regional economies.

25. With regards to capacity the paper further asserts the information presented by the 'Modern Ports: A UK Policy' document, where it proposes that pressure for expansion at UK ports is greatest at those handling containers and Ro-Ro traffic and that the number of ultra-large container ships in service is growing rapidly. The documents asserts that ship sizes are sustainably increasing and therefore the available slots for these are becoming more limited, therefore suitable berths are essential if the UK is to retain direct shipping services, rather than being served by transhipment from continental ports. The development of a deep water container port at Teesport would assist in protecting the UK's attractiveness to direct shipping services.

26. With regards to the expansion of port sites, the paper states that the expansion of particular port facilities need to be taken together with decisions about the land based infrastructure which serves them. This approach relates to the sustainable distribution policies set out by the government where the aim is to increase the use of multi-modal transport nodes in order to reduce the reliance on road freight in the UK.

In this respect the rail infrastructure improvements which form part of the current planning application accord with national policy.

27. In relation to the role of the planning system, the paper stipulates that port developments will need to acknowledge the environmental, social and wider infrastructure considerations in deciding whether development should or shouldn't be permitted. The paper recognises the current planning process for port development is long and complex, where consent for major projects takes years rather than months. In response to this the paper proposes that the system should not impose undue delay, or allow procedural devices to be used to block development, as at the current time the length and cost of securing consent is having the potential to deter developers. The paper also asserts that the government should continue its commitment to expansion which can be defended on environmental grounds and engage in adequate planning to determine where compensatory habitats will be needed.

28. With regards to future recommendations in relation to the planning system, the document states that the government's approach to future applications should be integrated, where the government must consider individual applications in the context of a national policy, but that it should not consider single projects in isolation.

The Government's Response to the Transport Committee's Report on Ports (2004)

29. The paper, written by the Government in response to the recommendations presented by the Transport Committee (summarised above), acknowledges that ports are of vital importance to the continued economic well being of the nation and that they are a crucial element in an integrated transport system. The government re-affirms the guidance set out in 'Modern Ports: A UK Policy' and asserts that the government will continue to provide guidance and advice to the industry within the framework it proposes.

30. With regards to capacity, the Government agrees with the approach outlined by the Transport Committee, where is recognises that it is economically desirable for ships carrying UK imports and exports to have access to sufficient suitable berths to provide frequent direct shipping. The increase in suitable berths includes deep-sea container services, where services serving North West Europe will visit at least one UK port.

31. In relation to sustainable distribution, the Government also agrees with the approach presented by the Transport Committee, where the paper states that good connection from ports to the strategic road and rail networks are essential if ports are to serve regional and national markets effectively. The paper also asserts that the Government takes full responsibility for the provision of these inter-modal links.

32. With regards to the recommendations in relation to the planning system set out by the Transport Committee's report, the paper asserts that it is the Government's belief

that proposals for port expansion should be treated as far as possible in the same way as other commercial and industrial developments, having regard for the development plan, but also need to be considered in the context of the national planning policy set out in 'Modern Ports: A UK Policy' and the subsequent 'Project Appraisal Framework for Ports'. The paper states that it is the Government's aim to maintain a competitive supply of port facilities and services to meet demand, now and in the future, having due regard to environmental sustainability. The paper also acknowledges that the recognised port capacity constraint will soon start to impose costs on shippers, to the detriment of the national economy, however it still asserts that the quickest way currently to determine applications is through the planning and approval process.

Sustainable Distribution: A Strategy (1999, Modified 2004)

33. The document was produced by the Department of Transport in order to provide a sustainable distribution strategy with the main aim of ensuring that the future development of the distribution industry does not compromise the future needs of our society, economy and environment, with the objectives to:

- Improve the efficiency of distribution
- Minimise congestion
- Make better use of transport infrastructure
- Minimise pollution and reduce greenhouse gas emissions
- Manage development pressure on the landscape – both natural and man-made
- Reduce noise and disturbance from freight movements
- Reduce the number of accidents, injuries and cases of ill-health associated with freight movement.

34. The document sets out the role of the planning system in providing sustainable distribution networks in the UK. The document states that amendments to national planning policy will be made to encourage more freight to be carried by rail and water through the protection of rail connections and to consider opportunities for new developments which are served by waterways. The other major amendments will be made in order to encourage the protection of sites and routes which could be critical in developing infrastructure to widen road transport choices, such as interchange facilities allowing road to rail transfer or for water transport.

4.1.11 Summary

1. This review of adopted national planning policy and emerging Government strategies demonstrates that in principle the development of a deep water container port at Teesport is both desirable and sustainable and accords with national policy objectives.

4.2 Strategic and Regional Planning Guidance

1. The principle findings arising from a detailed consideration of regional planning policy and other regional policy documents of relevance to the proposed development are provided below.

2. It is considered that the following Regional Planning Policy documents are relevant to the development project:

- RPG 1: Regional Planning Guidance for the North East (2002)
- Draft Revision RSS: Regional Spatial Strategy for the North East (Submission Draft 2005)

3. A summary review of each of these as they apply to the proposed development is provided below.

4.2.1 <u>Regional Spatial Strategy (RPG 1: Regional Planning Guidance for the North East) (2002)</u>

1. RPG 1 was published in 2002 and sets out the development framework for the region based on sustainable development objectives. RPG1 is now the Regional Spatial Strategy but will in due course be superseded by a revised RSS, the consultation draft of which was published in 2005.

2. With regards to Ports, RSS encourages the movement of freight by rail and sea, and in this regard investment in the transport system of the region should be considered on a multi-modal basis at an international, national, intra-regional and local level in order to develop the role of the regions ports in the international accessibility of the region.

3. The guidance states that sites adjacent to ports and deep-water passages are unique assets and should be protected where they have potential for port related purposes. To this regard, Policy EL7 of RSS asserts that development plans and other strategies should safeguard development sites adjacent to existing ports for industries and port-related services that will benefit from these locations.

4. RSS promotes the important role of ports to the region's strategic transport network where it proposes that the movement of people and freight by sea has environmental benefits, over transport by road or air, and can help to reduce road congestion. The guidance also stipulates that there is currently a significant level of under-utilised capacity in the region's ports. In relation to this, RSS Policy T16 aims to:

- Safeguard land for port use where necessary, whilst ensuring the protection of sites of nature conservation importance;
- Safeguard sites adjacent to ports for development likely to maximise usage of the movement of goods by sea; and

- Seek to maintain and improve surface access to ports by both road and rail.

5. The current application proposals would accord with the general aims and objectives set out in RSS.

4.2.2 Draft Revision RSS: Regional Spatial Strategy for the North East (Submission Draft 2005)

1. The emerging RSS will, when adopted, supersede the existing RSS (RPG1) for the North East Region and form part of the statutory development plan for the area. Like the RPG and again in accordance with national planning policy, the RSS Submission Draft aims to promote the objectives of sustainable development in the region.

2. The guidance recognises the importance of Teesport as an international transport facility that makes a major contribution to the economy of the Tees Valley City Region and the Region as a whole and also states that port infrastructure provides the potential for unlocking regeneration opportunities in the Region.

3. The RSS highlights the potential role of the region's ports in sustainable distribution through the opportunity to increase short sea shipping movements which offer a more sustainable option to long distance road freight and thus help to take unnecessary traffic off the region's roads. Therefore maximising sustainable movement is encouraged through the development of multi-purpose freight interchanges including road-rail as well as sea-rail. However the RSS does also assert that a major constraint in relation to the future growth of the Port is the Region's rail infrastructure and that a programme of action is required to improve it in order to ensure that rail freight is a viable option. Extensive discussions have taken place with Network Rail to address this matter and this is fully outlined in the Transportation Assessment undertaken in support of the planning application.

4. As with national guidance, the RSS also aims to protect sites within and adjacent to ports for port related uses, however the RSS does state that not all land adjacent to ports may be needed for this, and therefore alternative uses should be encouraged when appropriate, to maximise the economic benefits of direct or spin off industries. The guidance also states that areas of international and national importance of nature conservation and environmental designations are protected and where possible enhanced, and where possible appropriate mitigation measures are introduced. Policy 22 of the Submission Draft RSS sets out the above factors in relation to the future development of ports. With regards to the development proposals, the policy states that strategies, plans and programmes should support the growth of the region's ports by:

- Recognising the significant economic investment generated at both the Port of Tyne and Teesport, both directly and indirectly;
- Supporting the development of short sea shipping connections to improve linkages between the region's ports and the wider European context;

- Promoting the development of port facilities to redress road transport problems associated with northbound cargo arriving at southern UK ports and berths;
- Ensuring any new proposed port development or expansion is subject to a full Sustainable Environmental Assessment;
- Safeguarding adjacent sites for port operational uses, where appropriate, whilst ensuring the protection of sites of nature conservation importance and features of heritage conservation importance; and
- Considering where appropriate, alternative land uses, particularly where this would contribute to the regeneration of the wider area.

5. Further to the above policy that specifically relates to ports, the RSS states that the region's ports are considered as important international gateways which are vital to the region's economic growth and that it is important that they are supported by a transport network which provides fast and reliable access to national and international destinations. With regards to international gateways, Policy 49 of the Submission Draft RSS, asserts that to support the region's ports, strategies plans and programmes should seek to maintain good surface access and multi-modal links to all the region's ports, with particular priorities to:

- Improve gauge enhancements from the East Coast Main Line to Teesport;
- Develop existing infrastructure at ports for strategic multi-modal road-rail, as well as rail-sea freight interchanges, together with passenger facilities; and
- Support proposals at Teesport to develop a deep sea container terminal

6. With regards to the above policies, the RSS aims to establish sustainable freight distribution in the region, through improving the inter-modal freight interchange capacity at existing operational facilities, including rail connected ports. The RSS recognises the opportunity to develop sustainable freight distribution through port developments, specifically through the development of Teesport as a deep sea container terminal, which would alleviate congestion capacity in the south and also to help contribute to the economic development of the region. Policy 57 of the submission Draft sets out the RSS guidance on this subject where it states that Local Transport Plans and other strategies, plans and programmes should, in relation to the development proposals:

- Prioritise strategic freight movements on the Regional Transport Corridors;
- Improve rail gauge enhancements to Teesport, particularly from the East Coast Main Line;
- Support and encourage the development of deep sea container facilities at Teesport;
- Safeguard existing rail freight lines, particularly where their reuse for passenger services would alleviate capacity on the East Coast Main Line, for example Ashington, Blyth, Tyne;
- Prioritise the development of new services and multi-modal freight interchange capacity at existing operational facilities, including rail-connected ports; and
- Encourage local authorities to enter into Freight Quality Partnerships with freight operators to improve the management and reduce the impacts of freight movements.

7. In all the above respects the RSS is fully supportive of the development of a deep water container port at Teesport.

4.2.3 Other Regional Policy Documents

1. It is considered that the following regional policy documents are relevant to the development project:

- Draft Regional Freight Strategy for the North East (2002)
- Regional Economic Strategy for the North East (2002)
- The Northern Way Growth Strategy (2004)
- North East Regional Economic Strategy – Consultation Document (2005)

2. A summary review of each of these as they apply to the proposed development is provided below:

Draft Regional Freight Strategy for the North East (2002)

3. The region's draft Freight Strategy was produced by the North East Assembly in order to support and guide the Regional Spatial Strategy, the Region's transport policy, and investment decisions with the overriding theme of sustainable distribution. The strategy looks at the region's current infrastructure for road, rail, sea and air transport.

4. In relation to ports, the strategy states that any policy relating to ports should focus on their potential to draw traffic off the region's roads and encourage the use of short sea shipping and that transport policies should place an emphasis on providing the necessary infrastructure that will facilitate the optimum use of ports and to take advantage of regional gateways. The strategy further asserts that the role of ports as existing road/rail inter-modal exchanges should be safeguarded by the clear requirement of future additional facilities located inland and also that priority for the development of future intermodal facilities should be given to the region's five rail connected ports, which includes Teesport.

5. With regards to short-sea shipping and feedering, the strategy encourages a policy approach that focuses on maximising the potential to influence long haul traffic away from the region's roads and encourage further use of the region's ports.

6. Taking the above into account, the strategy sets out an action plan for ports in the region with 5 key policy aims:

- To support investigation of the need for improved access by road and rail to the North East ports;
- To investigate an assessment of sites where significant opportunities exist for multimodal freight facilities with or adjacent to ports;

- To encourage the Regional Spatial Strategy to incorporate policies to safeguard land for development of multimodal facilities, wharfage and warehousing adjacent to ports;
- To instigate an investigation of the opportunities across the region for modal shift to coastal/short sea shipping for selected cargoes such as containers, bulk and waste;
- To promote the use of freight facilities grants so as to maximise the scope for the development of rail transhipment facilities.

Regional Economic Strategy for the North East (2002)

7. 'Realising Our Potential', the 2002 update to the Regional Economic Strategy (RES) produced by One North East, sets out six key objectives to succeed the aim of achieving a cohesive framework for economic progress in the region. One of these key objectives is 'Meeting 21st Century Transport, Communications and Property Needs', with the overall aim for the North East to by 2010 be 'more outward looking with excellent international air and rail services and expanding ports'.

8. The strategy asserts that in order to increase the rate of growth of the North East economy to narrow the economic gap with the rest of the UK, the Region needs to invest to improve air, rail and road connections, which will of course have significant implications on the accessibility of the regions ports. With specific regards to ports, the strategy recognises that further investment will be required if the North East is to remain a leading maritime centre and acknowledges that the port facilities on the Tees are of national significance.

The Northern Way Growth Strategy (2004)

9. The Northern Way Growth Strategy sets out a development strategy produced as a result of collaboration by the three northern regions of the UK. The strategy intends to establish the North of England as an area of exceptional opportunity, combining a world-class economy with a superb quality of life. In order to achieve this objective the strategy aims to accelerate economic growth across the North's city regions by concentrating on ten policy priorities; one of these is to invest in improving access to the North's sea ports, Policy C7.

10. As stated above, Policy C7 of the strategy focuses on improving access to the North's sea ports. The policy encourages the growth of northern ports as it asserts that this will contribute to the North's economic development. The policy recognises the potential to expand the role of northern ports through the growing rail and road congestion in the south and the resulting increasing cost of using southern ports due to this. The policy also recognises the potential growth of ports in the Region due to land around the northern ports being significantly cheaper and that currently all the major port operators in the Region are investing to further enhance their facilities.

11. In light of these opportunities, the strategy aims to increase the proportion of northern freight arriving and departing in northern ports and specifically seeks to increase ship arrivals at northern ports from 22% on the national total in 2002 to around 25% by 2010; and also to increase throughput of northern ports (tonnes) from 32% of the national total in 2002 to around 35% by 2010. The strategy encourages the improvement of road and rail access to major ports in order to achieve this.

12. The strategy encourages the Government's decision to review the policy framework on ports and believes that a national port strategy should be produced. Through the development of a National Ports Strategy the growth strategy proposes to: support and provide evidence of the essential need to increase further public investment to facilitate more usage of northern ports; to promote the role that ports play as economic growth poles; and to support the Government's efforts to make faster decisions on applications for port related developments.

13. With specific regards to the Tees Valley city region, Policy D7 of the strategy acknowledges the role of Teesport as a regional strength and states that in order to build on this regional strength, additional investment to increase the capacity of the rail lines, which serve the port are both needed and essential.

14. It is clear from this assessment that the development of the Northern Gateway Container Terminal is in full accordance with the objectives of the Northern Way Growth Strategy.

North East Regional Economic Strategy – Consultation Document (2005)

15. The role of this update to the 2002 RES, entitled 'Leading the Way' is to provide further guidance on the strategy for a sustainable and inclusive economic growth which is necessary to fulfil the overarching vision for the North East Region. The strategy recognises the role of ports in the region's economy and states that globalisation and growth in world trade and international air travel has highlighted the increased importance of ports and airports to regional and national economies.

16. The document states that transport investment should be designed to support increased economic activity, business location benefits, and improved regional competitiveness through greater productivity. The strategy recognises the need for an effective freight transport infrastructure in order to achieve the above and states that extending rail freight capacity, particularly around the Region's ports, while preserving existing freight corridors, is an essential element towards economic growth.

17. In relation to ports, the strategy follows the approach set out by the Northern Growth Strategy with regard to the potential of the region's ports (particularly Teesport) to expand and gain economic activity, while relieving pressure on the South East. The strategy asserts that the above considerations should be reflected in better

distribution of access investment towards the ports, where there is strong economic evidence to do so.

4.2.4 Summary

1. From this regional policy assessment there is no doubt that the application proposals accord fully with both existing and emerging regional planning policy. In this respect the regional benefits of the development of a deep water container port at Teesport can be clearly demonstrated.

4.3 Sub regional Policies

1. It is considered that the following Sub-Regional Policy documents are relevant to the development project:

- Tees Valley Structure Plan (2004)
- Tees Valley Vision (2004)
- Tees Valley City Region Development Programme (2005)

2. A summary review of each of these as they apply to the proposed development is provided below.

4.3.1 Tees Valley Structure Plan (2004)

1. The Tees Valley Structure Plan was prepared by the Tees Valley Joint Structure Unit on behalf of the Borough Councils of Darlington, Hartlepool, Middlesbrough, Redcar and Cleveland, and Stockton-on-Tees. The plan provides strategic planning guidance for development in the Tees Valley area until 2016. The Structure Plan currently forms part of the development plan for the five borough councils, however due to the changes made to the planning system, through the Planning and Compulsory Purchase Act of 2004, the Regional Spatial Strategy for the North East and the Local Development Frameworks of each of the Borough Councils, when adopted, will supersede the Structure Plan. However as the Regional Spatial Strategy for the North East and Local Development Frameworks of each of the five Borough Councils are still in the process of being adopted, the policies set out in the Structure Plan are still to be considered as part of the development plan.

2. The Structure Plan aims to set out a vision and strategy for sustainable development in the Tees Valley area. Policy SUS 1 of the Structure Plan provides general guidance for the sustainable development of new proposals where it states that new proposals must make a contribution to all three strands of sustainable development through enhancing ‘environmental quality, social well being and economic prosperity’. Policy SUS2 of the plan provides specific criteria that should be considered by Tees Valley authorities in order for new development proposals to achieve policy SUS1, with regards to new developments. The policy aims to: promote the re-use of previously developed land which makes the best use of existing

infrastructure; encourage the creation of accessible employment opportunities while protecting the environment and minimising pollution to land, air and water. The Northern Gateway proposal meets all these aims.

3. In relation to future economic development in the area, the Structure Plan promotes, under policy EMP1, the revitalisation of existing industrial estates, as it is considered that the improvement of all industrial estates and older industrial areas will help improve the range of premises and sites available to attract new businesses. Policy EMP2 provides further guidance on the location of future employment development, as it states that 'priority will be given to the development of business and industrial premises on brownfield sites which recycle underused, degraded or redundant land and buildings; are capable of being well served by public transport; and have good existing or proposed links with footpath and cycle way networks'.

4. With regards to port development the Structure Plan supports the economic role of the ports and accepts the need to identify land for future port use and development by port related industry and proposes that future investment will be concentrated on upgrading infrastructure in order to cater for the anticipated growth in future traffic flows. Policy EMP8 sets out the plan's approach to the location of future port development, where it proposes that priority will be given to port related industrial development in the areas of Hartlepool Docks; North of Seaton Channel; South Tees, Redcar and Cleveland; and Clarence Works, Stockton-on-Tees. The development of a deep sea container terminal at Teesport would accord with this policy.

5. The protection of the area's environment is an important objective of the Structure Plan. In relation to Coastal areas, the Structure Plan aims to protect the quality of surface, coastal or ground waters and states in policy ENV23 that development which prejudices this will not be permitted. Policy ENV26 of the Structure Plan sets out criteria that aim to strictly control development in the undeveloped floodplain, yet also provide guidance for new developments within developed areas of the flood plain and states that 'residential, commercial and industrial development may be permitted on land inside currently developed areas where there is risk of flooding provided there are appropriate mitigation measures put into place to minimise the risk of flooding elsewhere, the development is designed to resist flooding and there are suitable warning and evacuation procedures in place'. The flood risk assessment provided as part of the ES demonstrate that the current application meets the requirements of this policy.

6. The Structure Plan also provides guidance on hazard and pollution with the overall aim of reducing current levels of pollution within the plan area. With regards to noise, vibration and dust pollution, Policy ENV29 aims to minimise the potential environmental problems of these by locating new developments liable to cause nuisance at a suitable distance from residential and commercial area's and vice versa. Policy ENV30 of the plan concentrates on the development of contaminated land. The policy states that developments will only be permitted where: evidence is

submitted to show that the nature and extent of contamination has been properly investigated and taken into account; that remedial measures necessary to deal with the contamination are effective; and that there will be no detrimental affect on the environment or risk to the local population as a result of the remedial work, during or after the development. These issues have been fully addressed by this ES with recommendations for remediation measures made as appropriate.

7. An important objective of the Structure Plan is to create a sustainable transport network in Tees Valley to provide a safe and efficient transport network. Policy T1 sets out the criteria which will be used to evaluate future proposals in order to achieve the above objective, which include their potential contribution towards providing better sustainable transport choices, their contribution towards restricting the rate of traffic growth, the improvement to the environment and their contribution towards economic regeneration. The development of the new rail terminal at Teesport will assist in meeting this objective.

8. With regards to port development, the plan asserts that it is crucial that the area's ports continue to prosper for the benefit of the Tees Valley. In relation to this transport policy T16 encourages the development of port facilities on the Tees Estuary and at Hartlepool, and proposes that within these developments, opportunities to improve rail and road access should be taken, in order to meet the plan's aims of creating sustainable transport networks. Again the application proposals meet this objective.

4.3.2 Tees Valley Vision (2004)

1. The Tees Valley Vision was commissioned by English Partnerships, One North East and the five Tees Valley unitary authorities and was prepared by the Tees Valley Partnership. The central aims of the Vision are to provide strategic framework to raise the economic performance of the Tees Valley and to improve the quality of life of its people.

2. The Vision proposes that in order to achieve its central aims, the competitive advantage of the Tees Valley as a business location must be strengthened in order to secure significant improvements in the quality of life in the area. The document proposes that this can be achieved through creating attractive, distinctive places by investing in the existing assets of Tees Valley.

3. The Vision identifies Teesport as an existing asset of Tees Valley and proposes that further development of the port offers a major opportunity for the Region to increase its market share, avoiding the cost and congestion associated with other ports. With regards to future growth of the port and realising this opportunity, the Vision states that the Tees Valley Partnership will work with PD Teesport to realise the development of a deep water container terminal on the Tees over the next ten years, as this will elevate the port from a strong regional player into a major facility with a

significant global reach, which will contribute to the achievement of the Vision's central aims. The current application is the first step in the realisation of this objective.

4.3.3 Tees Valley City Region Development Programme (2005)

1. The Tees Valley City Region Development Programme was produced by the Tees Valley Joint Structure Unit to build on the work of the Tees Valley Vision, which aims to raise the economic performance of the Tees Valley, promote economic and social inclusion and create sustainable communities.

2. As stated above, an important element of the Programme is to improve the economic performance of the Tees Valley. The Programme proposes that one element of this can be achieved through building a strong diversified economy based on the city region's economic assets, the programme states that 'A world-class port – Teesport' is one of these.

3. The programme sets out six key 'economic drivers' in the city region, in relation to the development of the Region's economic assets. The programme identifies Teesport as one of these economic drivers and states that the development of Teesport is vital to the future economic performance of the Tees Valley and the UK as a whole. The programme acknowledges that Teesport's vital role is based on the following reasons:

- It is the second largest port in terms of volume in the UK,
- The port is essential to the well being of the chemical industry both in terms of export of feedstock and the import and export of chemicals,
- The requirement of Corus to export 2.7 million tonnes of steel slab will open up the South Bank Wharf for export and develop the potential for an environmental industries park next to the wharf,
- The port has a proposal to create a deep-sea container port ,
- The deep sea container terminal is the only deep sea port on the East Coast which can provide direct access to the sea without locks in 30 minutes, fast turnaround times for ships which cannot be achieved as quickly in the congested southern ports
- Containers bring in goods for assembly and for distribution to retailers in the UK.

4.3.4 Summary

1. It is evident from this assessment of sub-regional policy that the Teesport proposals benefit from significant sub-regional policy support and that the benefits to the region are considered to be substantial and far reaching.

4.4 Local policies

1. The principle findings arising from a detailed consideration of local planning policy and other policy documents of relevance to the development of the project site are provided below.

2. The current local planning policy for the development site is set out in the Redcar and Cleveland Local Plan (1999) however as the development proposals will have a wider impact, the local planning policy for the surrounding local authorities of Middlesbrough, Hartlepool and Stockton is also considered.

4.4.1 Redcar and Cleveland Local Planning Policy & Other Policy Documents

1. It is considered that the following Redcar and Cleveland Local Planning Policy and other policy documents are relevant to the development project:

- Redcar and Cleveland Local Plan (1999)
- Redcar and Cleveland Local Development Framework – Relevant Documents
- Redcar and Cleveland Local Transport Plan 2001-2006
- Redcar and Cleveland Local Transport Plan 2006-2011

2. A summary review of each of these as they apply to the proposed development is provided below:

Redcar and Cleveland Local Plan (1999)

3. The current local planning guidance, with regards to the project site, is set out in the Redcar and Cleveland Local Plan, which was adopted in June 1999. The Local Plan together with the Tees Valley Structure Plan makes up the current development plan for the project site. However the Council are currently in the process of producing a Local Development Framework for the area which, when adopted, will supersede the current Local Plan.

4. The Local Plan sets out general policies that apply to all planning applications in the Borough, these policies refer to sustainable development. Policy GEN 1 states that in determining all applications submitted to the Borough, the LPA will take into account the impact of the development on the local and global environment and the potential effect towards establishing a sustainable economy and way of life in the Borough, whilst protecting the natural environment, ensuring quality design, and by considering residential amenity and highway safety. Policy GEN 2 of the Plan relates to crime prevention in all new developments and aims to promote good design and layout to limit crime and to ensure personal security.

5. With regards to site specific policies outlined in the Plan, the project site is currently allocated under Policy IND 2 as an Industrial area that will 'continue to be reserved for port-related industrial development which particularly benefits from direct

waterside access'. The plan acknowledges that Teesport offers amongst the finest port facilities in the country and is well placed for trade with continental Europe. The plan also recognises that land fronting the river in the Borough is in limited supply and is it is thus important that the site is allocated and protected for industries and operations which would directly benefit from being located adjacent to deep water facilities. The current application proposals would accord fully with the aims and objectives of the local plan in this regard.

6. The project site is also allocated under policy T19 of the Plan, which sets out the Transport considerations in relation to port activity. The policy asserts that, subject to other policies in the Plan, the Council will support initiatives aimed at consolidating or improving facilities at the port and container rail freight interchange, as it would bring extra investment to the Borough. With regards to this, Policy T19 of the Plan states that 'proposals to improve and expand port and port related facilities at Teesport, including the container rail freight interchange at Wilton, will normally be granted planning permission'. The improvement of the rail network within the application site would accord with the aim of improving rail facilities at Teesport.

7. The site is also allocated within the Health and Safety Conservation Zone with regards to the location of certain and pipelines which are designated as notifiable installations by virtue of the quantities of hazardous substance stored or used. With regards to the above, Policies SER 7 (General Consultation Zone) and SER 9 (Pipeline Consultation Zone) apply to the subject site. Policy SER 7 states that 'the local planning authority will consult the health and safety executive on development proposals within the consultation zones shown on the proposals map in the interest of public safety. It may be necessary as a result of such consultations to refuse consent or restrict the type or density of development which can take place'. Policy SER 9 states the same as Policy SER 7 however it outlines the specific pipeline consultation zones that would need to be considered. Consultation with the HSE has been undertaken prior to the finalisation of the scheme design and hence their requirements have been addressed in the Northern Gateway application submission.

8. The project site is located adjacent to a Wildlife Corridor (on the river side), Policy ENV 29 of the Local Plan refers to this and states that 'development likely to sever any of the wildlife corridors shown on the proposals map will not normally be permitted, unless some form of the link can be retained. Developers should explore opportunities for further connections between Site of Nature Conservation Importance and wildlife corridors wherever possible'. As part of the ES process a terrestrial ecological baseline survey of land which has the potential to be impacted by the Northern Gateway development was undertaken. This survey included areas with potential to be impacted by the disposal of dredged material. The ecological assessment reached the following conclusions:

- All habitats present on the Teesport Estate or areas likely to be affected by disposal of dredged material are common and widespread both nationally and locally and thus are of low conservation value.

- All plant species surveyed are of low conservation importance.
- No great crested newts or reptiles were found on the site.
- The area is of very limited local importance for Common Pipistrelles and no roosts were identified. The area may be of some local importance to foraging nocturne bats although again no roosts were identified.
- Brown Hares are present on the Teesport Estate.
- No evidence of otters, badgers or water voles was found.
- The site is likely to be of local importance to some bird species.
- A range of invertebrate species were identified but none of particular noteworthiness.

9. In terms of the impact of the application proposals on wildlife interests there is clearly scope for direct loss of ecological interest within the footprint of the proposed terminal and dredging. This would impact on a number of habitats within the application site comprising small points, areas of tall herb dominated vegetation, scattered scrub, wasteland vegetation and rough grassland. Much of the terminal area (40-50%) however already comprises hard surfacing.

10. The assessment indicates that the loss of the terrestrial ecological interest is considered to be of minor to moderate adverse significance, with the most notable species being the presence of a number of Red List bird species. In terms of mitigation, of prime importance is the need to schedule reclamation work outside of the bird breeding season or managing the land in such a way that birds are discouraged from breeding on the site in advance of construction.

11. In relation to mammals no specific mitigation measures are proposed as survey work indicated a lack of mammals in the application site area.

12. Overall it was concluded that there would not be an unacceptable impact on the wildlife corridor and once the site is operational there are no activities which would impact upon the terrestrial ecological and wildlife interest of the surrounding area.

Redcar and Cleveland Local Development Framework

13. As stated above the existing Local Plan for the area is to be replaced with a Local Development Framework (LDF) for the Borough. The LDF and its variety of documents are currently been produced by the Council. The current documents that the Council are working on are considered below.

Redcar and Cleveland Local Development Scheme (July 2005)

14. The Local Development Scheme (LDS) is the management document which sets out the documents that will make up the LDF. With regards to the project site, and more specifically the LDF documents that will relate to it, the LDS sets out the timetable for when the documents that make up the LDF will be produced.

15. The following table sets out the documents to be prepared as part of the Redcar and Cleveland LDF and the timetable for their production.

Document Title	Status	Role and Content	Geographical Coverage	Chain of conformity	Date of public participation on preferred options (DPD)	Date for submission to Secretary of State	Date for start of public examination	Proposed date for adoption
Statement of community involvement	LDD	Document setting out standards and approach to involving the community and stakeholders in the production of the LDF	Authority area outside North York Moors National Park	N/A	January 2005	May 2005	August 2005	December 2005
Core Strategy	DPD	Sets out the spatial vision, spatial objectives and strategy for the development of the area.	Authority area outside North York Moors National Park	Consistent with national planning policy and general conformity with RSS. All other DPDs and SPDs to conform to Core Strategy	September 2005	April 2006	October 2006	May 2007
Development Policies	DPD	Sets out generic policies to provide a framework for development control	Authority area outside North York Moors National Park	To conform to the Core Strategy	September 2005	April 2006	October 2006	May 2007
Greater Eston Core Area Action Plan	DPD	Contains policies and proposals for district centre, community facilities and housing in and around the Low Grange Farm area of Eston.	The area in and around Low Grange Farm, Eston	To conform to the Core Strategy	December 2005	June 2006	December 2006	July 2007
Housing	DPD	Contains policies and proposals for housing development.	Authority area outside North York Moors National Park	To conform to the Core Strategy	April 2006	November 2006	May 2007	November 2007
Proposals Map	DPD	Map showing the location of all site specific allocations and sites covered by strategic policies	Authority area outside North York Moors National Park	To conform to the Core Strategy	April 2006	November 2006	May 2007	November 2007

Core Strategy: Preferred Options Paper (September 2005)

16. The Core Strategy sets out the strategic framework for the Local Development Framework and, as such, all the other documents must conform to it. The Core Strategy includes strategies for each part of the Borough and policies to help deliver the Council's vision for the Borough. It does not set out site-specific proposals; rather it looks at the broad locations for new development such as for housing, employment, transport, retail, public services. The preferred option stage, which the document is at, allows people to comment on the document and options that have been considered.

17. With specific reference to the project site, one of the main objectives of the document is to support the continued expansion of Teesport and other port-related businesses along the Tees. The document states that the LDF will support and promote the continued growth of the port and that land with direct access to the water will continue to be safeguarded for port operation uses, and that land nearby will be promoted for associated port activities (e.g. logistics). In this respect there is clear support for the application proposals.

18. The document also recognises that good and efficient access to the port will be essential to the future operation and expansion of freight movement. In relation to this the document states that proposals for improving the rail freight line and road network will be supported.

19. The above approach is set out in Preferred Option CS10 of the document, which states that 'the continued development and expansion of the chemical, steel and port industries will be supported and with regards to this, land will be safeguarded:

- At Wilton International for chemical related activities;
- At Corus Steel Works in South Tees, Redcar and Skinningrove for steel related activities; and
- Along the River Tees for port related development and where it is required for future improvements to the capacity of the freight rail line, road network and terminal associated with the port.'

Development Policies Document: Preferred Options Paper (September 2005)

20. The Development Policies document of the LDF sets out the detailed policies against which all planning applications submitted to the Council will be considered. The document sets out specific requirements and criteria for the development of buildings and land in the Borough and in regards to windfall sites that come forward in the Borough that are not allocated for a particular use. The policies will not allocate specific sites or land development, specific Housing and Employment individual development plan document will do this. Again as with the Core Strategy document, the document is at the preferred option stage, which allows people to comment on the document and options that have been considered.

21. With specific regards to the project site, it is anticipated that the site will be allocated for port-related industrial use within the specific development plan document that concentrates on the Borough's economy and employment, which the Council has not as yet started to produce. Until this is produced, the policies of the current Local Plan in relation to economic and employment issues (set out above) will still apply.

22. The document does set out general policies that apply to all planning applications for development within the Borough and therefore some of these policies are relevant to the project site. With regards to general site selection, Policy DP2 states that 'in selecting sites for new development the priority will be given to previously developed land and buildings within urban areas, then other land within urban areas, before greenfield sites are considered outside urban areas'. Development at Teesport would accord with this policy.

23. Policy DP5 of the document refers to 'Developer Contributions' and proposes that The Council will seek to negotiate planning obligations to secure necessary community benefits required as a consequence of the development and that the level of developer contribution will be commensurate with the scale and nature of the proposal. The policy identifies the type of contributions that will be sought by the Council and these include: Infrastructure, drainage and flood prevention measures; New roads and highway improvements; environmental protection and improvements including landscaping both on and off site; and Employment skills and training.

24. The document sets out a procedure note that asserts that depending on the location, type and scale of development, applicants will be required to submit assessments or statements with their application so the Council can fully assess the impacts of the scheme. The procedure note states that applicants will be required to submit specific assessments alongside the planning application and that the following assessments may apply:

- A Design Statement within which the level of design details provided will be dependent on the scale and nature of the development and the sensitivity of its location. Due to the nature and location of the current application a standalone design statement has not been prepared however issues of design and visual impact are fully addressed in the ES.

- For major applications (10 dwellings (0.5ha) or 1000sqm or more) and other applications likely to have significant sustainability implications, a Sustainability Statement must be submitted. A sustainability assessment is included as part of the ES;

- Where development will have significant transport implications, a Transport Assessment and a Travel Plan will be required. Applicants are advised to consult PPG13 on Transport. This requirement has also been addressed as part of the application package;

- Where an application is located within a flood risk area or could increase the risk of flooding elsewhere, a Flood Risk Assessment (FRA) will be required that is appropriate to the scale and nature of the development and the risks involved. The Council will seek advice from the Environment Agency. Applicants are advised to consult PPG25 on Development and Flood Risk. This issues is addressed as part of the ES and the FRA ;

- Where an application may have a significant impact on the environment, as specified in the Town and Country Planning (Environmental Impact Assessments) Regulations 1999, an Environmental Impact Assessment will be required. This document has been prepared to meet these requirements;

- Where an application involves potentially contaminated land, a thorough examination will be required to assess the potential for contamination, any risks arising and an appraisal of the options for remediation, if required. Applicants are advised to consult PPS23 on Planning and Pollution Control. This has been addressed through the ES;

- For major applications (10 dwellings (0.5ha) or 1000m^2 or more), a Consultation Statement must be submitted detailing what community involvement has been undertaken and how the responses have been taken into account. A separate statement of community involvement has been prepared to accompany the application.

25. Policy DP7 of the document sets out the Council's intended approach in relation to Flood Risk in the Borough. The policy states that flood protection and prevention measures will operate as follows: Development, including raising the level of land, will not be permitted in areas at risk from flooding unless suitable flood protection measures are carried out as part of the development; and Development will not be permitted if it would affect surface water run-off to the extent that it increased the risk of flooding elsewhere, unless suitable measures to overcome the increased risk are secured by conditions or planning obligation. The issue of flooding has been addressed fully through the ES in accordance with national planning policy guidance.

26. Policy DP8 of the document sets out the future approach to pollution in the Borough and states that development that would give rise to increased levels of noise or vibration or which would add to air, land or water pollution, by itself or in accumulation with existing or other proposed uses, will only be permitted it is acceptable in terms of: human health and safety; environment; and general amenity. The policy further adds that where pollution is unavoidable, mitigation measures to reduce pollution levels will be required in order to meet acceptable limits. Again this matter has been fully and satisfactorily addressed through the ES.

27. In relation to potentially contaminated and unstable land, policy DP9 asserts that development on or near potentially contaminated or unstable land will not be

permitted unless effective measures have been taken to deal with any contamination or instability to prevent: an unacceptable risk to users of the site and surrounding land, particularly occupiers of dwellings and gardens; a threat to the structural stability of buildings on the site and surrounding land; and any contamination of land, watercourse, seawaters, still waters or aquifers. The ES has demonstrated that all these issues can be adequately addressed.

Redcar and Cleveland Local Transport Plan 2001-2006

28. The Local Transport Plan (LTP) was produced by the Council in 2000. The LTP is a strategy document that sets out what Redcar & Cleveland Council would like to achieve in terms of highways and transport within the 5-year period 2001-2006. It has been developed in consultation with key stakeholders to integrate transport improvements with the development of wider service delivery. It does not contain comprehensive details of individual schemes, but rather sets out an outline action plan with examples of the types of measures that will be implemented if sufficient resources are available. The plan will be replaced by the new Local Transport Plan 2006-2011 (LTP2) when adopted, the provisional LTP2 was submitted to the Secretary of State in 2005.

29. The LTP identifies challenges posed by existing transport networks in the Borough. Teesport is identified as one of these challenges. The LPT supports the growth of the port and acknowledges that Teesport has good road network and rail freight connections. The LTP anticipates that the Tees Valley regeneration strategy will add to the level of Port use and suggests rail expansion as an integral part of future Port development and growth.

30. With regards to freight, the LTP aims to maintain efficient roads and railways linking the docks and industrial areas with other parts of the country and encourage major freight generators to employ sustainable freight management policies. The LTP states that efficient freight transport is important to business success and thus the economic stability of the area and that road and rail freight transports used significantly in this area. The LTP encourages the increased use of port and rail facilities which are being promoted through land use planning and contacts with local businesses. The Northern Gateway proposals accord fully with the aims of the LTP.

Redcar and Cleveland Local Transport Plan 2006-2011

31. Again as with the Local Transport Plan of 2001-2006, the provisional Local Transport Plan for 2006-2011 (LTP2) is a strategy document that sets out what Redcar & Cleveland Council would like to achieve in terms of highways and transport within the 5-year plan period. The LTP2 was submitted to the Secretary of State in July 2005 and is anticipated that the final plan will be submitted to the Secretary of State in March 2006.

32. The LTP2 proposes that In Redcar and Cleveland, Teesport and other identified regeneration sites will underpin a turn round in economic performance, so good road and rail connections to the national network will be essential. The LTP2 supports the further expansion of facilities at Teesport as it will create local jobs in the Borough and that such developments will also reduce the distance goods are transported around the country compared with the use of Southern ports. The LTP2 does however recognise that local transport issues on the approaches to the Port will need to be managed in partnership with the Highways Agency in order to properly facilitate for this expansion.

33. The LTP2 also acknowledges that even though the above proposals will create new jobs in deprived areas and bring about an improvement to quality of life, they will also generate transport implications that need to be carefully planned for in conjunction with partners in industry, in terms of goods vehicle movements and access to new jobs. As it is presumed that the expansion could create pressures for vehicle movements on the strategic road network, particularly at roundabouts on and between the A66, A1053(T), A174(T) and A19(T). This matter has been fully addressed in the ES and the accompanying Transport Assessment which has shown that only limited junction improvements will be required to address the increase in traffic resulting from the development of the container terminal.

34. The potential pressures of future growth are also addressed in the LTP2, where the plan states that they will need to be addressed to enable full economic advantage to be taken of the regeneration, but in a manner that does not undermine strategies for the growth of sustainable transport use. A new Tees Crossing is a long-term proposal that is been considered in order to improve access in the area by enabling vehicle movements to and from north of the river to avoid bottlenecks on the A66 and A19 around Middlesbrough and Stockton-on-Tees.

35. The LTP2 also recognises PD Teesport's aspirations to increase the proportion of containers distributed from the port by rail, but suggests that this is dependent on the upgrading of major sections of the wider rail network. Indeed the LTP 2 states with regards to this that the current rail network in the Tees Valley is approaching its capacity as a result of increasing import volumes of raw materials and export of steel from the adjacent Corus works. With regards to funding the LTP2 asserts that the Freight Facilities Grant system is currently discontinued, and to date any alternative funding to allow this improvement to take place have been declined, however the plan states that the Council will continue to support efforts and bids to have rail facilities improved. Again these matters have been fully addressed through the application submission and through the development of a new rail interchange within the Teesport Estate.

4.4.2 Middlesbrough and Hartlepool Local Planning Policy & Other Policy Documents

1. As stated above, as the development proposals will have an influential affect on a wider context, the local planning policy for the surrounding local authorities of

Middlesbrough, Hartlepool and Stockton will also need to be considered. In this respect, it is considered that the following local planning policy and other policy documents are relevant to the development project:

- Middlesbrough Local Plan (August 1999)
- Hartlepool Local Plan (1994)
- Revised Hartlepool Local Plan (August 2003)
- Proposed Modification to the Hartlepool Local Plan (September 2005)
- Hartlepool Local Development Scheme (March 2005)
- Stockton-on-Tees Local Plan (June 1997)
- Stockton-on-Tees Local Development Scheme (March 2005)

2. A summary review of each of these as they apply to the proposed development is provided below:

Middlesbrough Local Plan (August 1999)

3. The Middlesbrough Local Plan, adopted by the Council in 1999, sets out the local planning policies for the City, with the overarching aim of sustainability. Those policies which the Teesport development could have an impact on are considered below.

4. With regards to port related development in Middlesbrough, the Plan reflects the guidance of the Cleveland Structure Plan, which was superseded by the Tees Valley Structure Plan. The Cleveland Structure Plan identified areas along the river suitable for port related development and areas which should be reserved for such uses, Middlesbrough contains no areas which were considered suitable and therefore no land is specifically allocated for port related development in the Local Plan. However the plan does support the use of the Tees as a transportation corridor and states that its use for the transportation of freight 'should be encouraged where possible and appropriate'.

5. The Local Plan sets out planning policy in relation to future freight developments in the area. Policy TR26 states that proposals involving the provision of new rail sidings and riverside freight to serve industrial development will normally be permitted where appropriate. The policy considers the environmental impact of reducing the road freight and thus encourages new industrial developments to use river and rail transport where possible.

6. The section of the Local Plan which considers natural resources and pollution sets out two policies which are relevant to the project proposals. Policy E52 states that development should not adversely affect water resources and that permission will be given if a development would not have a detrimental effect upon water quality via the polluting effects of discharges into watercourse, water bodies or groundwater. Policy E53 states that proposals for development with the potential to cause pollution, will be granted permission if they are judged to not have a 'detrimental affect on the

environment, health, safety and the amenity of people, resulting from releases into water, land or air, or due to emission of noise, dust, vibration light or heat, or other forms of radiation'.

7. Policy EM20 of the Plan also sets out guidance with regards to developments that could potential cause pollution. The policy specifically relates to industrial development and states that development involving industry or processes which are potentially polluting or hazardous will not be permitted unless: it would not involve risk to safety of employees, visitors or neighbouring residents; it would be detrimental to the local environment or amenities; the redevelopment of adjacent land is not affected; the development would not be out of keeping with the character and appearance of the area; and its is on allocated for employment use in the Local Plan.

8. It is evident from this assessment that there is no conflict between the Northern Gateway Container Terminal and the policies of the Middlesbrough Local Plan.

9. Middlesbrough Borough Council is in the process of producing a variety of documents that will be included within the Middlesbrough Local Development Framework, which will supersede the policies in this plan when adopted.

10. The Council commenced work on the Core Strategy, which sets out the strategic framework for the area, in June 2005. They are currently at the early stage of production and do not intend having the document ready for adoption until November 2007.

11. The LDS discloses that a Regeneration Development Plan Document, which will allocate sites in the area for future regeneration, will be produced by the Council as part of the LDF. Production started on the document in June 2005 and adoption is anticipated by February 2008.

12. The Council also intend to produce an Environment Development Plan Document, detailing the Council's future approach to environmental planning policy in the area. Production of the document is scheduled to begin in June 2006, with a Preferred Options consultation paper planned for May 2008 and adoption anticipated in June 2009.

Hartlepool Local Plan (1994)

13. The Council are currently in the final stages of producing a new Local Plan for the Borough that will replace the 1994 Local Plan. However, until the new Local Plan is adopted, the policies set out in the 1994 Local Plan are still relevant and considered as part of the Hartlepool Development Plan. Therefore in relation to this policy review, the documents of both of these plans need to be considered.

14. The Hartlepool Local Plan, adopted by the Council in May 1994, sets out the Borough's Local Planning Policies with the overall aim of improving the quality of life

in Hartlepool. With regards to the development site, policy Ec6 of the Local Plan, which relates to port-related industrial sites, states that port developments will be permitted in the designated sites on the proposals maps, but also states that port-related industries which would have a significant detrimental effect on the amenities of the occupiers of housing close to the north docks or on the operation of existing industry in the vicinity of north Seaton Channel will not normally be permitted. The ES has demonstrated that no problems of this nature will be caused as a result of the proposed container terminal.

15. The Local Plan does not set out a specific policy with regards to port-related transport, but within the transport chapter, the plan does encourage the use of other modes of freight transportation other than by road, which can 'have a detrimental effect on the environment particularly in residential areas, and can cause damage to buildings and roadways through the use of inappropriate routes'. The objective of the Northern Gateway Container Terminal proposal is to attract deep sea shipping calls direct to the region (instead of through the southern ports) and this, together with the anticipated 20% modal split for freight distribution by rail, would accord with this policy objective.

16. Policy En21 of the Local Plan sets out the Council's approach to the control of pollution in the Borough. The policy asserts that development proposals will not normally be permitted where the resulting pollution would have a detrimental effect on the amenities of local residents and/or the occupiers of adjoining land. It has been demonstrated in the ES that this will not be the case.

Revised Hartlepool Local Plan (August 2003)

17. The revised Local Plan was published at the deposit stage in 2003. An examination in public has been held and the inspector's recommendations have been received by the Council.

18. With regards to the project site, the revised Local Plan encourages the role of the Borough's ports to the economy of Hartlepool, and Policy Ind7 sets out the Council's approach to future port-related development in the Borough. The policy states that port developments in allocated areas will be permitted where they protect areas of international nature conservation, will not be detrimental to the nuclear power station and if they have taken account of policy DCo2 which relates to flood risk.

19. As discussed above, Policy DCo2 of the revised Local Plan sets out the Council's approach with regards to Flood Risk. The policy asserts that the Council will pay regard to the advice of the Environment Agency in considering proposals for development within flood risk areas and where appropriate a flood risk assessment will be required. The policy further states that where development is approved, the developer may be required to undertake flood mitigation measures where appropriate, however the policy also states that if the proposed development would

be at risk from flooding or significantly increase the risk of flooding elsewhere and mitigation measures are not practicable, then the development will not be permitted.

20. As with the current adopted Local Plan (1994), the revised Local Plan again does not set out a policy with regards to port-related transport, but does support the use of other modes of rail transport other than by road, and again states that the movement of heavy freight by road ‘can have a detrimental effect on the environment particularly residential areas, and can cause damage to buildings and roadways through the use of inappropriate routes’.

21. The revised Local Plan sets out planning policy in relation to the control of pollution in the Borough. Policy GEP4 states that development in the Borough will not be approved where resulting pollution: would have a detrimental effect on the environment or amenities of local residents and adjacent occupiers of land; would have a detrimental impact on water courses, wetlands, coastal waters, the aquifer and the water supply system; would significantly affect air quality; or would necessarily constrain the development of neighbouring land.

22. There is no conflict between the proposals for the new deep sea container terminal at Teesport and any of the policies in the revised local plan.

Proposed Modification to the Hartlepool Local Plan (September 2005)

23. The proposed modifications to the revised Hartlepool Local Plan, following the recommendations of the inspectors report, were published by the Council in 2005. With regards to the policies of the revised Local Plan which apply to the subject site, set out above, no changes have been made and thus the above policy is anticipated to be adopted by the Council in April 2006.

Hartlepool Local Development Scheme (March 2005)

24. As the new Local Plan is in line with current national and regional planning policy, Hartlepool Council believe that the document will be relevant for some time and that production of Development Plan Documents of the LDF should be considered when the production of a new Regional Spatial Strategy (RSS) is well under way. The only Development Plan Document that the Council is planning to produce, which relates to the project site, is the Core Strategy document. Production of this document is scheduled to begin in September 2006, however as stated above an adoption date is yet to be decided as the Council are waiting on developments of the new RSS.

Further Proposed Modification to the Hartlepool Local Plan (January 2006)

25. The further proposed modifications to the revised Hartlepool Local Plan, following the response to the initial proposed modifications document, were published by the Council in January 2006. With regards to the policies of the revised Local Plan, the further proposed modification document puts forward a minor amendment to policy

DCo2 which sets out the Council's approach to Flood Risk. The amended policy now states that flood risk assessments will be needed for proposals located within medium and high risk areas, and also within the vicinity of designated rivers. There have also been minor changes to the wording of the policy where it now reads 'development which is likely to increase the risk of flooding (was previously 'significantly increase the risk of flooding' see above revised local plan policy DCo2) and where flood mitigation measures are impracticable will not be permitted by the Council'. Changes have also been made to the supporting text of the policy. The proposed modifications document now asserts that ''The Environment Agency also requires Flood Risk Assessment to include consideration of surface water run off impacts where development proposals are over 1 hectare in size'. The Council again aim to have the above policy adopted by April 2006. There is still not considered to be any conflict with the requirements of this policy.

Stockton-on-Tees Local Plan (June 1997)

26. The current local planning policy for the Stockton-on-Tees Borough is set out in the Stockton-on-Tees Local Plan, which was adopted by the Council in June 1997. The Council are currently in the process of adopting proposed alterations to the adopted Local Plan. These alterations relate to issues of flood risk and retail developments in the Borough, however there are no alterations which are directly affect the Teesport site at present. The Council are also in the process of producing a Local Development Framework for the area to replace the current Local Plan, the Council's Local Development Scheme is therefore also summarised below.

27. As stated above, the current local planning policy for the area is set out in the Stockton-on-Tees Local Plan which was adopted by the Council in 1997. With regards to port-related developments, the Local Plan acknowledges, in the supporting text of Policy IN3 which allocates sites for future port development in the Borough, that large flat sites adjoining the river (River Tees), particularly if they have a deep water frontage, are valuable for port-related development. The section also supports proposals for the development of these sites for those industries which require a location beside the river, or which will benefit from the option that such sites present for the transport of bulk loads by sea.

28. With regards to transport planning policy in relation to port development in the Borough, Objective 6 of the transport chapter aims to 'support the maintenance and improvement of rail and port facilities for carrying freight'. The supporting text provides further indication of the Borough's support as it asserts that Council wishes to see more freight carried by rail and sea to reduce the growth in noisy and polluting road haulage and also states that future port developments should be located directly adjacent to rail lines and navigable deep water, where warehousing and distribution could operate more sustainably. The current application proposals accord fully with this policy objective.

29. In relation to pollution control, the Council's approach is set out in policy EN31 which states that Development which may cause pollution will only be permitted if it includes mitigation measures to prevent any potential adverse impacts on the environment and that, where appropriate, proposals will need to be supported by an environmental statement. The Proposed Modification Document, identified above, sets out further guidance with regards to flood risk and water pollution that is at present not covered in great detail within the current local plan; however none of the policies set out in this document are directly relevant to the Teesport proposals at present.

Stockton-on-Tees Local Development Scheme (March 2005)

30. The Stockton-on-Tees Local Development Scheme was submitted to the Secretary of State in March 2005. With regards to the Teesport proposals the documents timetabled to be produced as part of the LDF of relevance are: The Core Strategy; a Regeneration DPD; and an Environment DPD.

31. With regards to the Core Strategy, the Council anticipates that a preferred option paper will be available for consultation by June 2006, with the document predicted to be adopted by October 2008.

32. The Regeneration Development Plan Document (DPD) will set out site specific allocations for future transport related uses/proposals and will provide site specific policies for the determination of development relating to housing, employment, mixed use developments and all land use development where there may be an affect on modes of patterns of transport. The Council aims to have a preferred options paper out for consultation by June 2006, with the adoption of the document being predicted for January 2009.

33. The Environment DPD will set out Borough wide policies and identify sites concerning the built and natural environment of the Borough, which includes Green Wedges, nature conservation sites, open spaces and the historic environment. The Council anticipates that a preferred options paper will be available for consultation by April 2008 with the document predicted to be adopted by August 2010. On this basis none of the emerging Stockton LDF documents will be in the public domain when the Northern Gateway application is submitted.

4.4.3 <u>Summary</u>

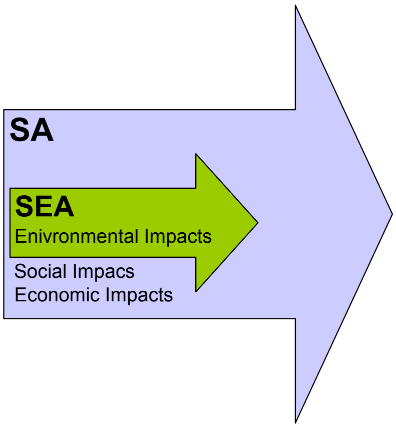
1. It is evident from the above analysis of local planning policy that the application proposals accord fully with both the aims and objectives of the adopted Redcar and Cleveland Local Plan and the draft policies set out in the emerging LDF. The application proposals also accord with the policy aims and objectives of the neighbouring local authority areas and pre-application consultation with these authorities indicates that they are fully supportive of the Teesport proposals and the benefits they will bring to the wider area.

5 SUSTAINABILITY APPRAISAL

5.1 Introduction

1. Sustainability Appraisal (SA) is a method of assessing the extent to which a plan, programme or strategy contributes to sustainable development. The requirement for SA is set out in the Planning and Compulsory Purchase Act 2004. SA can incorporate the requirements of the European Directive on Strategic Environmental Assessment (SEA). The SEA methodology aims to assess the significant environmental impacts that arise from plans, programmes and strategies, and to ensure that these are taken into account by decision-makers. In the simplest terms, SEAs seek to ascertain the impacts of a plan or programme on the environment, whilst SAs seek to ascertain the impacts of a plan or programme on the environment and have regard to social and economic impacts. Current governmental guidance provided by the Office of the Deputy Prime Minister (ODPM) seeks to ensure that in providing an SA, the actual obligations of the SEA Directive are met. It therefore follows that by undertaking an SA in accordance with ODPM guidance, SEA is also provided as a fully integrated, functional component of the appraisal.

Integration of SEA within the SA Process



2. The provision of an SA for a development proposal is not a requirement under the 2004 Act, the SEA Directive or ODPM guidance. However an assessment of the extent to which the proposals contribute to sustainable development has been provided to aid the evaluation of this proposal on the basis that the actual provision of expanded port activity on this site has significant impacts on land use planning within the region. Additionally, if the proposal was an active part of emerging planning policy, it would be evaluated amongst other policies in this manner. It is therefore reasonable to assume that the proposal would have a significant impact on plan provision and policy formulation in the region, and in regard to this, although not mandatory, this assessment has been provided to enable the impacts of the proposal on the sustainable development of the region to be better understood.

3. This assessment has taken account of the guidance published by the Office of the Deputy Prime Minister 'Sustainability Appraisal of Regional Spatial Strategies and Local Development Frameworks' (ODPM Sept 2004). The assessment offered has, however, been provided at a scale commensurate with the assessment of this singular proposal which is itself accompanied by a formal planning application and

ES (i.e. this document). Accordingly, the assessment has not followed the process of offering a Scoping Report for consultation accompanied by a detailed baseline assessment since it is considered that the work ancillary to the production of the EIA has already accounted for these steps. This section therefore seeks to ensure that the proposal is evaluated in regard to the sustainability issues for the local, regional and national areas.

4. The purpose of this assessment is to evaluate the proposal against a series of clearly defined sustainability criteria. The consideration of the proposal in this manner, using a sustainability framework (built on sustainability objectives derived from existing national, regional and local policy) provides a focused evaluation of the impacts of the proposal on the sustainability based initiatives of the region.

5.2 Key issues summary

1. In accordance with the advice offered by ODPM, the key sustainability issues for the area around Teesport, have been derived from an assessment of the issues identified in the following documents

- RPG1 Regional Planning Guidance for the North East;
- Regional Spatial Strategy (RSS) for the North East (Submission Draft);
- Tees Valley Structure Plan;
- The Core Strategy for Redcar and Cleveland Borough Council;
- The existing Local Plan for Hartlepool Borough Council;
- The Core Strategy for Middlesbrough Council; and
- The Core Strategy for Stockton-on-Tees Borough Council

2. Additionally, SAs have been provided for the all the above documents, with the exception of RPG1 and the Hartlepool Borough Local Plan. The actual plans and strategies, and any available SA studies have been fully examined to specify the sustainability issues for their respective area.

3. On the basis of the review of the key sustainability issues, a series of consistent themes can be identified which collectively summarise the central sustainability issues for the Teesport area. These issues represent the central focus which any SA should address and the sustainability objectives provided in the sustainability framework, have therefore been considered and provided with explicit regard to addressing the issues outlined below:

5.2.1 Key socio-economic issues

- The need to ensure that land adjacent to the foreshore is reserved for coastally dependent uses.
- To ensure that port activities and their associated transport links are maintained or enhanced to support the specifics of the local economy.
- The need to diversify the local economy.

- To reduce unemployment and provide a stable economic base.
- To provide housing in areas that provide a high quality of life and enable sustainable transport patterns.
- To ensure that access to the housing market is accessible to all.
- To provide equitable access to services.
- To reduce crime.
- To increase levels of recycling.
- To improve public health and wellbeing.
- To reduce risks to health from hazardous substances.

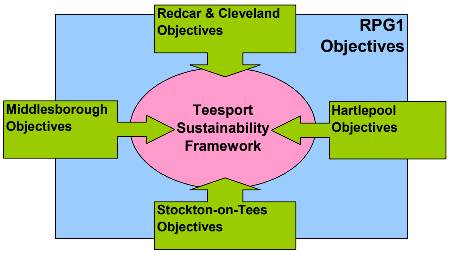
5.2.2 Key environmental issues

- To maximise the use of previously developed land.
- To improve the environment of the urban and rural environment.
- To protect local heritage features.
- To protect the environment (designated and non-designated).
- To promote development that makes sustainable use of water and is located outside of areas of risk from flooding.
- To promote recycling.
- To ensure that residents are protected from noise nuisance and to provide adequate levels of local air quality.

5.3 The sustainability framework

1. The sustainability framework for the evaluation of the proposal has been constructed (Table 5.1) on the basis of the issues identified in regional documents (RPG 1 and emerging RSS for the region) and from work undertaken to support the production of local planning policy. The sustainability issues highlighted in the previous section have been refined into sustainability objectives for use in the construction of the sustainability framework. This has mirrored the approach of the composite local authorities in producing SAs for their emerging documents.

Construction of Sustainability Framework



2. The framework provided (Table 5.1) therefore represents a mechanism to consider the manner in which the proposed development sits within the regional and local context of initiatives to foster sustainable development. This is not an exercise in policy compliance; it is a focused attempt to establish the degree to which the proposal is sustainable in the broader context, rather than the narrower, specific context of policy background.

Table 5.1 Sustainability framework for the evaluation of the proposed development

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
PROTECTION OF THE NATURAL AND BUILT ENVIRONMENT			
Protection of Biodiversity and Geodiversity	To protect and enhance biodiversity and geodiversity	The environmental impacts of the proposal are fully addressed within this Environmental Statement. The site itself is of limited nature conservation value, but has some biodiversity interest. It is considered that impacts on biodiversity can be full addressed via appropriate mitigation measures.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect and enhance the regions biodiversity		
	To protect and enhance the biodiversity and geodiversity of Middlesbrough		
	To protect and enhance the biodiversity of the natural environment and ensure the careful use of natural resources		
	To protect and improve local biodiversity		
Protection of the Urban and Rural Landscape	To protect and enhance the quality and distinctiveness of the area's landscapes and open spaces, townscapes and streetscape	The proposal will result in a visual effect on the local area, but does not introduce a new landscape element into the industrialised surroundings. Therefore, no significant impacts are predicted.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect and enhance the quality and distinctiveness of the region's rural and urban landscapes		
	To protect and enhance the natural and rural landscape in and surrounding Middlesbrough		
	To encourage a high standard of design and the provision of high quality environment in developments and particularly those on prominent sites, along the main road and rail corridors, and along the coast	The final design of the proposed development will be appropriate given the existing context of the immediate port and industrial facilities. It is not considered that the proposal would degrade the coastal landscape, given this context.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect as far as possible existing open space, and to encourage further landscaping and tree planting where appropriate	Given the nature of the site and its industrial context, it is not envisaged that there is a need for extensive landscaping associated with this proposal.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect and enhance local distinctiveness of the Borough's rural landscape	The proposed development at this site is considered to be entirely in keeping with the character of the local area	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect and enhance the local distinctiveness of the Borough's urban landscape	The proposed development at this site is considered to be entirely in keeping with the character of the local area.	Northern Gateway Container Terminal Environmental

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
			Statement (Royal Haskoning)
Protection of Key Built, Historical or Archaeological Interest and Cultural Heritage.	To preserve, protect and enhance buildings, sites, features and areas of archaeological, historical and architectural interest and diversity	There are no such sites or features at or in the immediate vicinity of the proposed development site and, therefore, no impacts are anticipated. There is the potential for impact on marine archaeology, but this potential is considered to be low given that the capital dredging is within an existing dredged channel.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To preserve, conserve and enhance, as appropriate, archaeological sites, historic buildings, conservation areas, historic parks and gardens and other historically important features and areas and their settings		
	To protect and enhance the regions cultural heritage and diversity	The proposed development will provide a continuation of the areas tradition and heritage as an international port.	
Protection of Communities from Hazardous Activities and Adverse Impacts of Development	To reduce adverse impacts on global communities	This objective is not relevant for the proposed development.	-
	To ensure that industrial and other potentially polluting or hazardous activities do not have a significant detrimental effect on the adjacent population or workforce and do not have a damaging effect on the environment.	The anticipated activities on the site are considered to be an expansion of existing port activity. There would be no increased risk to surrounding areas as a consequence of the proposed development.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
PRUDENT USE OF NATURAL RESOURCES			
Promotion of Prudent Use of Resources and Renewable	To make better use of natural resources in Middlesbrough	The proposal is an activity which requires a waterside location; therefore the use of coastal land for coastal purposes is entirely consistent with the prudent land use measures.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To make better use of our resources		
	To make better use of resources		
	To promote the use of renewable energy resources*		
Protection of Air Quality	To ensure good air quality for all in Middlesbrough	There are no significant predicted impacts on air quality, noise or lighting associated with the proposed development. In the broader context, the location of the proposed container terminal in the north of England is predicted to result in a significant reduction in road miles in the nationally, with associated beneficial effects on air quality and noise.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To ensure good local air quality for all		
	To ensure good local air quality for all		
	To reduce the amount of activities which would lead to atmospheric pollution*		
	To ensure that development proposals do not lead to an increase in noise or light pollution*		
Protection of Water Quality and Water Resources	To protect and improve the quality of all controlled waters	Water quality issues are largely associated with the construction phase and have been fully addressed within the Environmental Statement. It is not considered that the proposed development will result in the degradation of water quality within the Tees estuary in the longer term, with short term issues predicted to arise during the capital dredging.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect and enhance the quality of the region's ground, river and sea waters		

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
	To protect and enhance the quality of Middlesbrough's groundwater and rivers, in particular the River Tees		
	To promote sustainable use of water resources*		
	To protect and enhance the quality of the Borough's ground, river and sea waters		
Climate Change	To reduce the causes of adverse climate change	There are negligible impacts associated with the proposed development, although the proposed development has the potential to give rise to a positive effect in that it will result in a reduction in road miles nationally.	-
	To reduce the causes and impacts of climate change		
	To reduce the causes and the impacts of climate change		
	To reduce the emissions of greenhouse gases		
	To protect existing levels of tree cover which can fix carbon dioxide*		
Reduction in the Risk of Flooding	To minimise the risk of flooding	A Flood Risk Assessment has been undertaken and the proposed development does not increase flood risk to surrounding areas. The standard of flood defence at the proposed development site would be increased due to the increased level of the quay compared to the existing land.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To reduce the risk of flooding and the resulting detriment to people and property		
Reduction in Waste Production and Promotion of Recycling	To reduce the amount of waste produced and increase the amount recycled, reused and recovered	The proposed development would have a negligible impact on overall levels of recycling in the area, since goods loaded or unloaded are not packed or unpacked on site. Given the nature of the proposed development, no significant quantity of waste will be generated.	-
	To reduce the amount of waste produced and increase the amount recycled		
	To reduce the amount of waste produced in Middlesbrough and increase the amount recycled		
	To reduce the amount of waste produced and increase the amount recycled		
Promotion of Sustainable Land Management	To promote the re-use of previously developed land	This proposal demonstrates a prudent use of land on two counts; first the proposed development site is a brownfield site in an industrial location and, second, the proposal is a coastally dependent use on a land with a tidal interface.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To protect and enhance the quality of land (soils) in Middlesbrough		
	To protect greenfield sites and promote the re-use of brownfield sites*		
ENABLING COMMUNITY SUPPORT AND INVOLVEMENT			

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
Provision of Equitable Sustainable Housing Provision and Access	To ensure that the housing needs and aspirations of the community are met locally	There are negligible impacts associated with the proposed development, although the generation of significant direct and indirect employment can be considered a positive impact with respect to these objectives.	-
	To ensure that everyone has the opportunity of living in a decent and affordable home		
	To ensure that everyone in Middlesbrough has the opportunity of living in a decent and affordable home		
	To ensure that everyone has the opportunity of living in a decent and affordable home		
Provision of Equitable Access to Education	To raise educational achievement across the region	There are negligible impacts associated with the proposed development, although the generation of significant direct and indirect employment can be considered a positive impact with respect to these objectives.	-
	To improve the opportunity and achievement on education and lifelong learning		
	To enable the development of new and improved educational facilities		
	To raise educational achievement in Middlesbrough and ensure that everyone has access to skills knowledge and information		
	To implement regional gateways that contribute to and deliver sustainable economic growth		
Crime Reduction	To create safe communities	There are negligible impacts associated with the proposed development, although the generation of significant direct and indirect employment can be considered a positive impact with respect to these objectives.	-
	To reduce crime and the fear of crime		
	To reduce crime, disorder and the fear of crime in Middlesbrough		
	To provide safer communities and to reduce and prevent crime and reduce fear of crime		
Promotion of a Healthy Lifestyle	To provide opportunities for physical activity to promote healthy lifestyles	There are negligible impacts associated with the proposed development, although the generation of significant direct and indirect employment can be considered a positive impact with respect to these objectives.	-
	To reduce crime and the fear of crime		
	To improve health and well-being in Middlesbrough and reduce inequalities in health		
	To improve the health of Borough's residents and to reduce inequalities in health		
To Encourage Social Inclusion	To promote social inclusion	The proposed development would provide a wide range of jobs accessible to all the community.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To ensure good accessibility for all to jobs, facilities, goods and services in the region		
	To ensure good accessibility for all to jobs, facilities, goods, services, green space and leisure opportunities in Middlesbrough		

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
	To ensure accessibility for all to job facilities, goods and services across the Borough		
	To increase public involvement in decision making and civic activity	There are negligible impacts associated with the proposed development.	-
	To maintain and improve the accessibility and quality of key services and facilities	There are negligible impacts associated with the proposed development.	
	To encourage in accessible locations the provision of sport, recreational, leisure and cultural developments to cater for the whole community	There are negligible impacts associated with the proposed development.	
Promotion of Sustainable Transport Patterns	To provide reliable, efficient and convenient public transport in Middlesbrough which is accessible to all	There are negligible impacts associated with the proposed development.	
	To promote sustainable forms of transport*	This proposal has addressed the impacts on the local transport infrastructure and the regional and national transport networks. At a national level it is considered that the proposal would actively enable more sustainable patterns of transportation in regard to the distribution of freight in the north of England and Scotland.	Northern Gateway Container Terminal Transport Assessment (Accompanying Document 2 to the ES)
	To provide sustainable levels of local vehicular traffic*	The levels of increase in vehicular traffic have been established for Phases 1 and 2 of the proposed development. It is considered that although local vehicular traffic would increase (particularly in Middlesbrough and Redcar and Cleveland) this is in line with the increase in activity on the site. Impacts on local junctions have identified junctions where improvements are required to achieve nil detriment to their operation.	Northern Gateway Container Terminal Transport Assessment (Accompanying Document 2 to the ES)
	To promote developments in locations which support existing transport infrastructure, which minimise the need to travel, and which are accessible by all modes of transport	The proposed development is located on an existing port facility and measures have been provided to ensure that existing transport linkages are improved as required to accommodate growth. The site itself, due it its location is difficult to provide access for bicycle or pedestrian traffic; this is however a historic legacy rather than a symptom of the proposed expansion. A Travel Plan accompanies the application and aims to promote accessibility by various forms of transport.	Northern Gateway Container Terminal Transport Assessment (Accompanying Document 2 to the ES)
	To ensure that developments attracting large numbers of people locate in existing centres which are highly accessible by means other than the private car		
	To reduce the number and length of car journey's within Hartlepool*	The proposed development would lead to an increase in the number of car journeys in Hartlepool, however this is proportional to the increased employment levels on the site.	Northern Gateway Container Terminal Transport Assessment (Accompanying Document 2 to the ES)

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
SUPPORTING THE ECONOMY			
Provision of High and Stable Employment Levels	To improve access to employment	The proposal is expected to increase total employment levels through generating additional direct and indirect employment.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To ensure high and stable levels of employment so everyone can share and contribute to greater prosperity		
	To ensure high and stable levels of employment so that everyone can share and contribute to greater prosperity		
	To achieve high and sustainable levels of economic growth		
	To stem out migration from Middlesbrough	On the assumption that local employment is contributory to retaining population levels, the proposed development is predicted to contribute positively towards this objective	
	To ensure stable levels of employment and achieve high and sustainable levels of economic growth	The proposal is expected to increase total employment levels through generating additional direct and indirect employment.	
	To support and facilitate economic growth and provide opportunities for employment		
Provision of a Diverse and Flexible Employment Base	To encourage the provision of more and higher quality job opportunities	The proposal is expected to increase total employment levels through generating additional direct and indirect employment.	
	To diversify the economy of the rural areas	There are negligible impacts associated with the proposed development.	-
	To ensure that sites are available for the full range of industrial and commercial activities so as to enable the diversification of employment opportunities	This proposal represents an expansion of an existing use which is central to the regional economic base, and it is considered that this proposal is therefore consistent with this objective.	-
	To achieve high and sustainable levels of economic growth, by supporting existing businesses and encouraging new businesses to set up in Middlesbrough.	The proposal is expected to increase total employment levels through generating additional direct and indirect employment.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To ensure that there is an adequate infrastructure to serve new and existing development	The improvements to the existing transport infrastructure have been specified in the ES and the Transport Assessment. It is considered that this objective has therefore been addressed.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning) and Northern Gateway Container Terminal Transport Assessment (Accompanying Document 2 to the

Sustainability Issue	Sustainability Objective	Potential impact of the proposed scheme	Source Evaluative Document
			ES)
	To improve the viability and environment of older housing, commercial and industrial areas	This proposal represents an expansion of an existing use which is central to the regional economic base, and it is considered that this proposal is therefore consistent with this objective.	Northern Gateway Container Terminal Environmental Statement (Royal Haskoning)
	To promote the growth of tourism	There are negligible impacts associated with the proposed development.	-

*Asterisked objectives are refined from local plan or LDF objectives

KEY
RSS for the North East Objectives
Redcar and Cleveland Sustainability Objectives
Hartlepool Sustainability Objectives
Middlesbrough Sustainability Objectives
Stockton-on-Tees Sustainability Objectives

5.4 Conclusions

1. Although the use of a SA is usually reserved for policy evaluation purposes, the assessment for the proposed development has provided a focused insight on the impacts of the proposed development on the overall sustainability issues of the region.

2. The intent has not been to determine the overall policy compliance of the proposed development (this has been addressed in Section 4); rather it has been to determine how this proposal would have been assessed had it been a component part of emerging planning policy. This appraisal has, therefore, provided an assessment of the sustainability of the proposal in the specific context of existing and emerging planning policy, rather than an evaluation of the overall generic sustainability of the proposal. This is wholly consistent with Government guidance, which seeks to establish the issues relating to sustainability in the local context.

3. The proposal is demonstrably in harmony with the sustainability criteria which have been collected in this framework. The proposed development is compatible with objectives to provide a stable economic base and to reduce unemployment in the region. With regard to the specific sustainability issues of the region, the proposed development can be assessed as follows.

5.4.1 <u>Protection of the natural and built environment</u>

Protection of biodiversity and geodiversity

1. As the broader content of this ES demonstrates, the impacts on biodiversity and geodiversity are not considered to be significant, partly due to the location of the proposed development site in a heavily modified, industrialised environment. Where environmental impacts have been identified, it is concluded that mitigation measures can be implemented to ameliorate adverse environmental impacts.

Protection of the urban and rural landscape

2. The importance of protecting the character and quality of the local landscape is recognised as being important insofar as this relates to quality of life and articulating the regional identity. The predominant character of the local area is, however, one of an industrial landscape, juxtaposed with the natural and semi-natural landscapes of the estuary itself. It is not therefore, considered that the expansion of an existing use, at this scale, would demonstrably impact the character of the local landscape in an adverse manner.

Protection of key built, historical or archaeological interest and cultural heritage

3. The proposed development is not considered likely to have a significant impact on such heritage given that lack of interest at the proposed development site.

There is the potential for impact on marine archaeology due to capital dredging, but the potential for effect is considered low given that the dredging is within an existing dredged channel.

Protection of communities from hazardous activities and adverse impacts of development

4. Since the proposed development is not considered to represent an increased hazard to the area, there is no conflict with this objective.

5.4.2 Prudent use of natural resources

Promotion of prudent use of resources and renewables

1. A fundamental consideration of prudent coastal management is to ensure that uses which require a foreshore location are able to locate on the foreshore, and foreshore land is reserved wherever possible for such uses. It is, therefore, considered that the use of this site for a development of the type proposed represents a prudent use of this land. Additionally, the proposed development represents an efficient use of existing infrastructure.

Protection of air quality

2. As outlined in this ES (Section 20) the predicted effects of the proposed development on air quality are considered to be of minor adverse significance at worst.

Protection of water quality and water resources

3. Water resource issues are not directly relevant to this proposal. As outlined in Section 8 of this ES, the water quality issues associated with the construction phase have been fully assessed. It is concluded that the most significant effects are associated with the increase in suspended sediment concentrations in the water column associated with capital dredging, particularly when dredging marl in the vicinity of the proposed reclamation area. However, there would be no lasting deterioration in water quality of the Tees estuary associated with the proposed development.

Climate change

4. It is considered that the proposed development would not have any significant impact on regional initiatives to address the causes and impacts of induced climate change. The provision of the proposed development in the North of England will however, lead to a reduction in vehicular freight miles nationally, and, therefore, contribute to a reduction in road based emissions within the UK.

Reduction in the risk of flooding

5. The Flood Risk Assessment concludes that there are no adverse impacts associated with the proposed development.

Reduction in waste production and promotion of recycling

6. There are no predicted impacts on waste management and recycling initiatives associated with the proposed development.

Promotion of sustainable land management

7. As described above under 'Promotion of prudent use of resources and renewables', the proposed development, it's coastally dependent nature, and it's location on the foreshore is in accordance with this objective.

5.4.3 Enabling community support and involvement

Provision of equitable sustainable housing provision and access

1. It is predicted that there will be no impacts on housing associated with the proposed development. The proposed development site is in an industrialised area which is not allocated, or suitable for, residential development.

Provision of equitable access to education

2. The proposed development does not have the potential to impact on this objective.

Crime reduction

3. The proposed development represents a consolidation of port activity in the area, thereby enabling more efficient use of on-site security measures to reduce specific crime.

Promotion of a healthy lifestyle

4. The proposed development does not have the potential to impact on this objective.

To encourage social inclusion

5. The proposed development would provide a wide range of direct and indirect employment creation benefits. This has been identified in this ES. The proposed development is clearly not able to further the wider aspects of social inclusion, but can provide continued, diverse economic opportunities for regional residents.

Promotion of sustainable transport patterns

6. The provision of the proposed development in the north of England has the potential to offer more sustainable patterns of freight distribution around the UK. This is, however, dependent on the manner in which the port is accessible to and from the regional and national infrastructure network. The integration of this

facility with the existing transport network has been fully assessed in the Transport Assessment (Accompanying Document 2 to the ES) and Travel Plan which accompanies the application.

5.4.4 Supporting the economy

Provision of high and stable employment levels

1. As described above under 'Social inclusion', the employment benefits associated with the proposed development have been fully evaluated in this ES. The proposed development provides a demonstrable expansion of the economic base, with an anticipated increase in total employment levels. The proposal is, therefore, expected to provide a long term, stable employment base for the region and actively enables the provision of this objective.

Provision of a diverse and flexible employment base

2. Further to the above, this ES provides a considered account of all employment benefits, not only those directly relating to port operations. In this respect, the wider impacts of the proposed development, and its effect in encouraging a diverse economic base, have been considered. The proposed development is clearly expected to provide enhanced employment levels and opportunities.

5.5 Summary

1. The proposed development is wholly consistent with regional and local sustainability initiatives. Further, the proposed development actively enables and addresses many of the regions sustainability issues and does not detract from efforts to improve the quality of life and sustainable development patterns within the region.

2. The proposed development has wider sustainability benefits in that it provides expanded port facilities adjacent to an existing port operation and infrastructure, with no significant adverse impacts on the local environment. The proposed development would provide increased levels of stable job provision which would be accessible to all elements of the community. In addition, the proposed development also provides for the use of coastally dependent activities on a foreshore location and is therefore, a prudent use of coastal land. Accordingly, the proposed development is not contrary to any sustainability initiatives within the region.

6 HYDRODYNAMIC AND SEDIMENTARY REGIME

6.1 Introduction

1. This chapter describes the studies undertaken to define the changes to the hydrodynamic and sediment regime of the Tees estuary arising from the proposed channel deepening and reclamation. It should be noted that this section defines *predicted changes* to the physical regime of the estuary (e.g. wave climate, flow regime, sediment transport pathways, etc) and it is not appropriate to assess such changes in terms of their significance in the way that is described in Section 1.5. The approach adopted is to describe and, where possible, quantify these predicted changes. The implications of the predicted changes to the physical environment are then assessed in terms of the *significance of the potential impact* on various environmental parameters (e.g. marine ecology, ornithology, water quality, etc) in the relevant chapter. Similarly, any mitigation measures that may be required in order to mitigate a potential impact on a receptor arising from a predicted effect on the physical environment are described in the relevant chapter.

2. As part of their ongoing work to understand the Tees estuary and Bay, PD Teesport has commissioned various studies to gather available understanding to assemble a conceptual model of the estuary processes (ABPmer, 2002). They have also been required to commission a maintenance dredging baseline document (ABPmer, 2005). These reports, along with other previous studies undertaken by HR Wallingford (HR Wallingford 1989, 1992, 2002), have provided much of the background to the present studies to support the EIA.

6.1.1 <u>Historical context</u>

1. The morphology of the coast in the vicinity of the Tees estuary is constrained by the Permian Magnesium Limestone outcrop at the Heugh at Hartlepool and a sandstone outcrop at Redcar. Between these outcrops, Tees Bay has few rock exposures and mostly consists of boulder clay and alluvial deposits up to 30m thick overlying Sandstone and topped by beach sand.

2. Prior to the mid 19th century the Tees estuary was a wide, shallow estuary bordered by extensive wetlands and had tidal ingress for about 44km from the mouth. Since this time, the estuary has undergone substantial anthropogenic changes as the channel was trained, land was reclaimed and the channel deepened to its present depth. The reclamations are summarised in Table 6.1.

3. Historical charts suggest that the natural channel level at the mouth of the Tees estuary is around -10m OD(N) (7.15m below CD). As a result of training works and deepening by dredging, the current depth at the mouth is about double this natural level. Dredging and training works have occurred since the establishment of the first dredged channel of 4.3m from Middlesbrough Docks to the sea after 1853. The present dredged channel has declared depths of 15.4m below CD in the approach channel (i.e. in Tees Bay), 14.1m below CD to upstream of Redcar Ore Terminal, 10.4m below CD up to Teesport and then

progressively less depth up to 4.5m below CD in Billingham Reach. Parts of the channel now declared at 14.1m below CD were originally dredged to a deeper depth. The present channel has a backlog of maintenance dredging and some parts of the channel are above the declared depths.

Table 6.1 Anthropogenic changes to Tees Estuary since 1740 (HR Wallingford, 2002)

Dates	Amount reclaimed (ha)	Description
1740 – 1808	590	Saltholme, Cowpen, Greatham, Haverton and Billingham
1808 – 1832	212	Mainly filling of old channels after the construction of the Mandale Cut from Bluehouse Point to Portrack in 1808/09 and a further cut (“Portrack” or “Prices”) from Bluehouse Point to Newport completed in 1830
1852 - 1906	1134	Gradual but extensive reclamation along the foreshore, mainly as a convenient way to dispose of blast furnace slag from the rapidly expanding iron and steel industry on both sides of the river
1906 - 1920	219	Various reclamations arising from disposal of maintenance dredgings
1928 - 1953	107	First stage reclamation of Seal Sands, mainly to reduce cost of disposal of maintenance dredged material
1965 - 1967	77	Extension to the Shell area using material from capital deepening and widening and upstream extension of the navigable channel, and the turning circle for Phillips Imperial
1971 - 1973	105	Mainly reclamation for steelworks development. Some continuing reclamation of Seal Sands
1973 - 1974	200	Major (Stage 2) reclamation of Seal Sands
Total	**3100**	
Intertidal remaining	*456*	*Approximate figure for remaining for total intertidal area, includes about 34 ha of saltmarsh*

4. The most recent major anthropogenic influence on the Tees estuary has been the construction of the Tees Barrage in the mid-1990s. The barrage (at Blue House Point) has truncated the tidal section (about 16.5km into the former estuary) and has reduced the tidal volume upstream of South Gare by about 7% (ABPmer, 2002).

5. In summary, anthropogenic activities over the last 150 years have resulted in an estuary that is essentially a narrow ‘canalised’ channel bordered near the estuary mouth by sandy intertidal areas partly trained by various historic training works. Within this area a remnant of the originally large Seal Sands is divided from the other intertidal areas by Seaton Channel.

6.2 Existing environment

1. As the present study is focused on any changes to the regime of the estuary following the proposed development, the baseline conditions considered are taken as the state of the estuary since the construction of the Tees barrage. Details of the pre-barrage hydrodynamic and sedimentological regimes in the Tees have been described elsewhere (ABPmer, 2002).

6.2.1 Hydrodynamics

Tides and water level

1. The tide at the mouth of the Tees estuary is observed to be very close to sinusoidal in shape with ranges of 4.6m and 2.3m for means spring and neap tides respectively (UKHO, 2006). The other tidal parameters of the estuary mouth are as follows (ABPmer 2002).

Table 6.2 Tidal levels for the Tees estuary

Description	Level (m CD)
Highest recorded water level	6.86
Highest astronomical tide	6.10
Mean High water spring tide	5.50
Mean high water neap tide	4.30
Mean sea level	3.20
Mean low water neap tide	2.00
Mean low water spring tide	0.90
Lowest astronomical tide	0.00
Lowest recorded water level	-0.38

2. The variation between the astronomical maximum and minimum and the highest and lowest levels recorded indicate that the level can be strongly influenced by meteorological effects, such as winds, surge and waves.

Fluvial flow

3. The river Tees has its source about 160km from the sea on Cross Fell in the Pennines and drains a catchment of 1932km^2. The main freshwater input to the estuary is measured at Low Moor. HR Wallingford (1992) calculated the long term monthly mean flows for the period 1981-88 as shown in Table 6.3.

Table 6.3 Monthly mean flow at Low Moor

Month	Mean daily flow (m^3/s)	Month	Mean daily flow (m^3/s)
Jan	36.7	Jul	8.6
Feb	21.2	Aug	11.2
Mar	26.6	Sep	12.5
Apr	19.6	Oct	22
May	12.5	Nov	26.1
Jun	9.3	Dec	30

4. Lewis *et al* (1998), also looked at the flows at Low Moor and presented a long term average flow of 20m^3/s, a maximum recorded flow of 563m^3/s, a minimum of les than 3 m^3/s and a 10% exceedence flow of about 47m^3/s.

5. This flow is further regulated by the Tees Barrage which is operated to maintain upstream water levels and prevent the upstream penetration of saline water. The flow through the Barrage is, therefore, very unlike the natural flow especially as the flows are no longer continuous. Figure 6.1 shows the time history of recorded discharge through the barrage during April 2005.

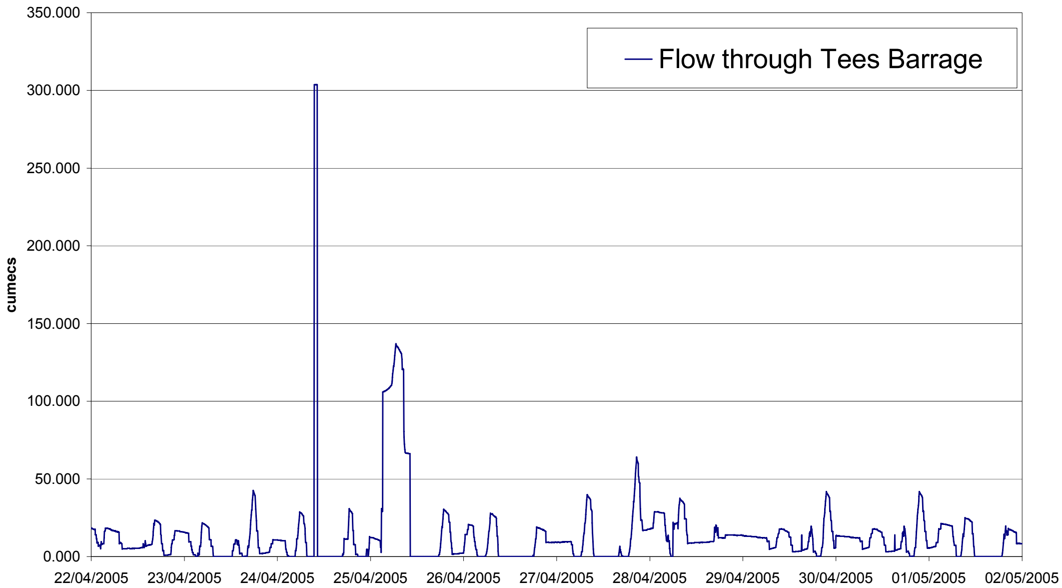


Figure 6.1 Flow measured through the Tees Barrage April 2005

Density effects

6. The regulated (as a result of the barrage) freshwater flow enters the estuary and partially mixes with saline water entering through the estuary mouth. This partial mixing and the longitudinal salinity gradient both contribute to a density driven gravitational circulation. This effect is a result of the density changing the vertical profile of the flow such that the ebb flows are strong at the surface whereas the flood flows are more evenly spread through depth. In the Tees

estuary, under many circumstances this effect becomes dominant such that continuous near-bed upstream (flood) flows are observed.

6.2.2 Waves

1. Wave conditions in the Tees estuary are a combination of offshore swell and locally generated wind waves. The direction from which swell can enter the estuary is limited by the North Gare and South Gare Breakwaters. The majority of offshore swell in the region was found in a previous study (HR Wallingford, 2002) to come from a northerly direction.

Wind climate

2. An analysis of wind speeds observed at South Gare between 1999 and 2005 undertaken as part of the present study (HR Wallingford, 2005) shows the most common winds are from the south-west (210-270^{o}N) but the most common large wind events (> 40 m/s) are from the north.

Wave climate

3. From the wave climate observed at the waverider buoy north of Tees North Buoy the following return periods for significant wave heights were calculated (HR Wallingford, 2005).

Table 6.4 Calculated wave return periods at waverider buoy locations

Return period (years)	Significant wave height (Hs (m))
0.1	3.87
1	6.03
10	8.63
50	10.69

4. Into the estuary, upstream of the ConocoPhillips Dock area, only remnants of the swell wave energy combined with short period local wind waves are to be expected due to the limitation in the penetration of swell waves into the estuary as a result of the North Gare and South Gare breakwaters.

6.2.3 Sediment

1. In general, suspended sediment concentrations are low within the estuary and within the Bay. The highest observed values tend to occur on spring tides. This relationship is not strong, but the extreme values are also attributed to either high rainfall or storm events. In general, the suspended sediment concentrations appear to be dominated by freshwater inputs above Middlesbrough Reach and marine influences further downstream. In the vicinity of the proposed development (i.e. in the Tees Dock area) suspended sediment concentrations are, for the most part, less than 20mg/l with short-term peaks from 40-80mg/l. In terms of the tidal sequence, the highest suspended sediment levels occur close to high water. After storm periods, higher concentrations of suspended sediment have been noted around the Shell Jetty, but with little

penetration further up the estuary. On other occasions the reverse has been true, thus the effect of storm events is not consistent within the estuary.

2. The sources of material into the estuary system are fluvial inputs coming through the Tees barrage, material entering from Tees Bay and any industrial inputs. These inputs are in addition to material eroded from the estuary bed. Within the system the driving forces for sediment transport are the tidal flows, density driven currents, wave induced currents, vessel induced forces and resuspension by dredging operations. These last two were postulated by HR Wallingford (1989a) as a means by which material entering the system from offshore can be resuspended and moved further upstream into the estuary.

Fluvial input

3. HR Wallingford (1989a) outlined the pre-barrage conditions for fluvial input with general very low concentrations (<10 mg/l) which rose to about 200 mg/l during occasional floods. The inputs were suggested to be closely linked to large fluvial events with about 8,000 dry tonnes entering the estuary during the 1:1 year flood (300 cumecs at Low Moor, 44km up estuary of South Gare). The average total inputs were estimated at 40,000 dry tonnes per year; however the close link to high fluvial events would suggest that this could vary considerably from year to year. Most of this material is assumed to be trapped in the estuary.

4. The construction of the Tees Barrage was assumed to not greatly alter the input of fluvial sediment into the estuary. ABPmer (2005) reported that considerable siltation has occurred upstream of the barrage with the implication that fluvial sediment input to the estuary has reduced. However, even the pre-barrage fluvial input is small when compared to marine inputs (see below).

Industrial input

5. Up to 22,000 dry tonnes per year has been discharged under license from ICI Wilton at Redcar (ABPmer, 2002). This industrial material is discharged in the Dabholm Gut (directly downstream of the proposed development). This is the remaining major industrial source of material to the Tees estuary.

Marine input

6. Comparison of the above figures with the present knowledge of the dredging requirements in the area (presently approximately 1.35 million m^3 (Andrew Ridley, PD Teesport, *pers. comm.*) shows that the remaining source of material, from Tees Bay, is the predominant source of sediment in to the system. This material comes in on the flood tide, particularly during times when concentrations in Tees Bay are raised by the resuspension of material from the sea bed during storm events. The coarser material, mostly sand, is then able to settle out in the lower estuary, whereas the finer material is drawn further up the estuary by the gravitational circulation.

7. Bed sampling undertaken by Bridgland (shown in Halcrow, 1991) and reproduced in Figure 6.2 shows the mix of sands, clay and silt in the various

chart areas used by PD Teesport to manage their maintenance dredging activity. Over recent years the fines content (silts and clay) are of the order of 50-60% of the total siltation (of the order of 300,000-500,000 m^3 per year).

8. The most recent evidence for types of maintenance dredging material from PD Teesport (*pers. comm.*) suggests that out of the 1.35 million m^3 dredged annually 250,000 m^3 is mud, mostly found in the upstream reaches beyond the Transporter Bridge. Of the remainder, 80% is clean, fine sand (~880,000 m^3) and 20% silty sand (~220,000m^3). Assuming the silty sands have a 15-35% fines content, the total fine material input is 280,000 – 330,000 m^3 per year.

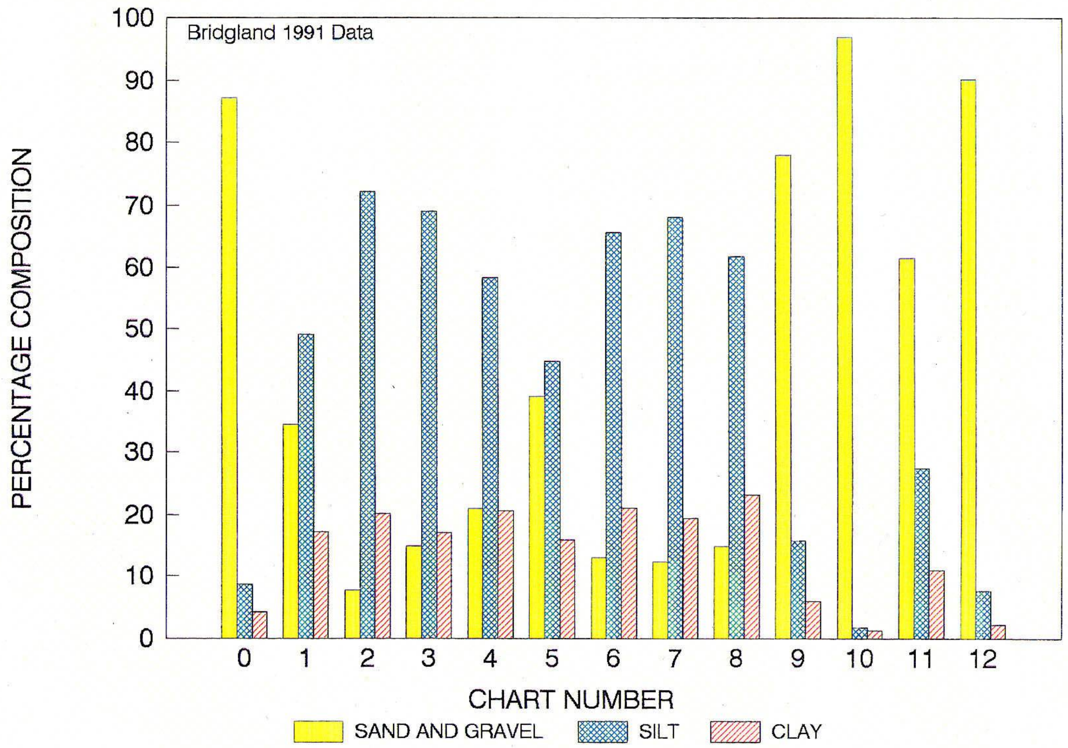


Figure 6.2 Bed types of material dredged in 1991

6.2.4 <u>Estuary morphology</u>

1. The present estuary morphology can be considered to be almost entirely man-made; 150 years of channel and entrance training works, reclamation and dredging have resulted in an estuary that is essentially a narrow 'canalised' channel.

2. Overall approximately 15% of the intertidal area calculated for the pre-1800 situation remains. Seal Sands covers 140ha with approximately 300ha covered by Bran and North Gare Sands at the estuary mouth. The remnant intertidal areas are partly constrained by training works.

6.3 Prediction of construction effects

6.3.1 Dispersion of material during capital dredging

1. PD Teesport commissioned Dredging Research Ltd (DRL) to undertake a study of available dredging methods for the capital dredging. DRL were also commissioned to determine the various parameters which would act as inputs to the studies on the dispersion of the sediment plume arising during dredging, as well as providing further information on the likely construction process for the development.

2. The main conclusions of the DRL study were as follows:

a) There are three potential types of dredger that might be used in the works. These are the Cutter Suction Dredger (CSD), the Trailing Suction Hopper Dredger (TSHD) and the Backhoe Dredger (BD). All have their advantages and disadvantages for dealing with separate zones of dredging.

b) Taking the entire dredging requirement into consideration, it is probable that each of the methods given in (a) above will be used at some time (for the reasons set out in c) below).

c) The choice of dredger will depend to a great extent on the location of the material to be dredged, its strength and thickness, and the impact of the operations on shipping. In addition, the economics and availability of different types of dredgers will also play a significant role in making this choice.

d) Losses of suspended sediment are inevitable at the dredging face or draghead, where hoppers or barges are being loaded and also from run-off from reclamation. The losses from loading the hoppers and barges are generally an order of magnitude greater than those occurring at the dredging face or draghead.

e) Rates of productivity, and hence rates of loss, tend to be similar for both CSDs and THSDs in these conditions. Hence, the choice of dredger type is unlikely to be influenced by the overflow loss rates. In any case, mitigation of these rates is not possible due to the fact that smaller dredgers would be ineffective in the stronger materials to be dredged.

3. Of the three types of dredger that might be used, the BD has a working rate that is considerably slower than the other two (CSD and TSHD) resulting in much less instantaneous release of solids. Therefore, sediment plume studies were restricted to the simulation of the CSD and TSHD. In addition, in view of the above, the BD would only be used for a very limited proportion of the dredging.

4. The TSHD sails up and down a section of the area to be dredged sucking up a mixture of sediment and water from the sea bed and discharging this mixture into a hopper on the dredger. The proportion of sediment loaded into the hopper can be increased by continuing to dredge after the hopper is initially filled with a solids/water mixture to increase the solids contained in the hopper. The excess water is discharged overboard from the hopper and contains a proportion of the finer sediment fractions. This overspilled sediment will either fall to the bed or

remain in suspension, forming a sediment plume. The plume from the overspill discharge is an order of magnitude greater than sediment resuspension from the dredger draghead and so it is the only sediment source considered for sediment plume simulations.

5. The CSD involves an integrated cutter and suction device. The cut bed material (and water) is sucked to the dredger before being discharged either ashore or most likely (in this case) to a pontoon from where barges will be filled. Similarly to the TSHD the proportion of sediment loaded into the barge can be increased by continuing to dredge after the plant is filled with the overspill resulting in plumes of suspended fine sediment. Importantly the TSHD will result in a source of fine sediment released along the path of the dredging activity (i.e. in the main channel) whereas the CSD will result in overflow from a fixed location (the barge loading pontoon) at the side of the channel (at a location with water depths greater than about 6m below CD to accommodate the size of barge likely to be used).

6. It is proposed that a TSHD will be used for the dredging and reclamation of granular material (approximately 1 million m^3) from the Seaton Channel Turning Circle and the downstream reaches of the Channel (Areas C and D; see Table 3.1)). It is proposed that a CSD loading into barges will be used for the bulk of the dredging of the mudstone (approximately 3.8 million m^3). If mudstone is to be pumped ashore this can also be undertaken by the CSD when operating close to the reclamation area.

7. The HR Wallingford developed model SEDPLUME-RW(3D) was used to simulate the dispersion, deposition and resuspension of the released sediment within the Tees Estuary. SEDPLUME-RW(3D) used tidal currents computed by TELEMAC-3D to determine the advection of material within the water column and calculates areas in which suspended particles may settle on the bed, either temporarily (around slack water) or longer-term. In this way, areas where discharged solids are deposited may be identified. Dispersion in the direction of flow is simulated in the model by the shear action of differential speeds through the water column, while turbulent dispersion is parameterised using a random walk technique. The deposition and resuspension of particles at the seabed are modelled by assuming critical shear stresses for erosion and deposition.

8. Parameters for the sediment plume simulations for the CSD were established from the DRL report, as follows:

<u>Cutter Suction Dredger</u>

Barge filling time	= 27 mins
Overflow time	= 224 mins
Release rate	= 44 kg/s

(Production Rate approximately 18,600m^3/day)
(Loss rate (fines) approximately 3,400 dry tonnes/day)

9. Parameters for the sediment plume simulations for the TSHD were established, as follows:

Trailing Suction Hopper Dredger (6,000m^3 capacity)

Dredge cycle time	= 190 mins
Total dredge time	= 60 mins
Overflow time	= 60 mins
Release rate (overflow)	= 173 kg/s
Release rate (run-off)	= 87kg/s
Transect length	= 1km
Speed of dredger when dredging	= 0.75 m/s (1.5 knots)

(Production Rate approximately 38,400m^3/day)
(Loss rate (fines) approximately 7,500 dry tonnes/day)

10. For the EIA investigations the SEDPLUME-RW(3D) model was used to simulate three dredging scenarios. Two of these scenarios represented a CSD loading barges with mudstone at two different locations (see Figure 6.3). The third scenario represented a 6,000m^3 TSHD removing sandy material in the lower channel (see Figure 6.3). In this scenario, the TSHD worked on the northern side of the channel during the ebb tide and the southern side of the channel on the flood tide. Overflow for one hour during the dredging was represented along with run-off from the reclamation during the put ashore period. Pumping ashore commenced 30 minutes after the overflow ceased.

11. All the simulations were run for three spring tidal cycles with low river flow with the dredgers and barge overflow releasing material into the bottom metre of the water column throughout the overflow period. This release point is chosen because the sediment enters the water firstly in a dynamic plume phase (i.e. not being significantly influenced by the ambient flow). Subsequently, as the sediment mixes with the water it behaves as a passive plume that is transported by the currents; this passive phase is simulated in the modelling. The simulations assume that by the passive plume phase occurs at about 1m above the bed. The run-off in the TSHD scenario was simulated as entering the surface waters as this represents how the activity would be undertaken

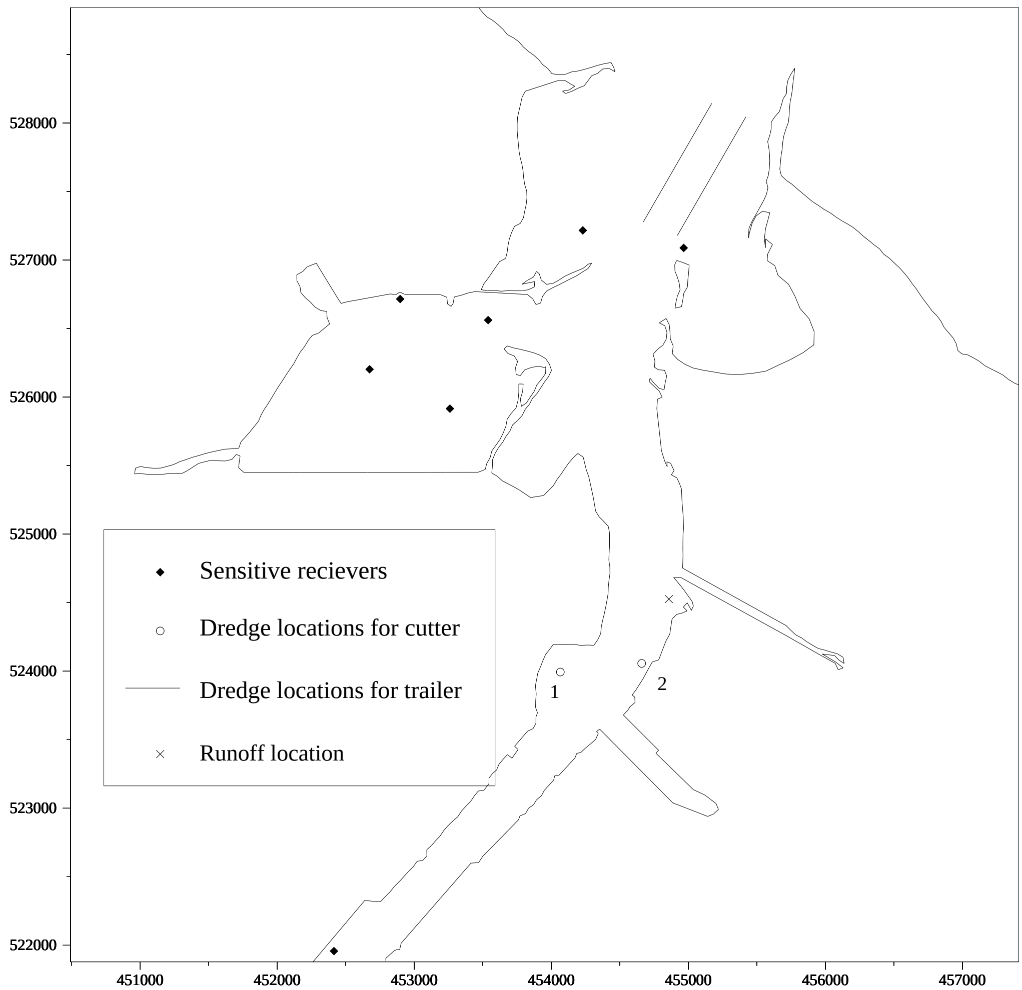
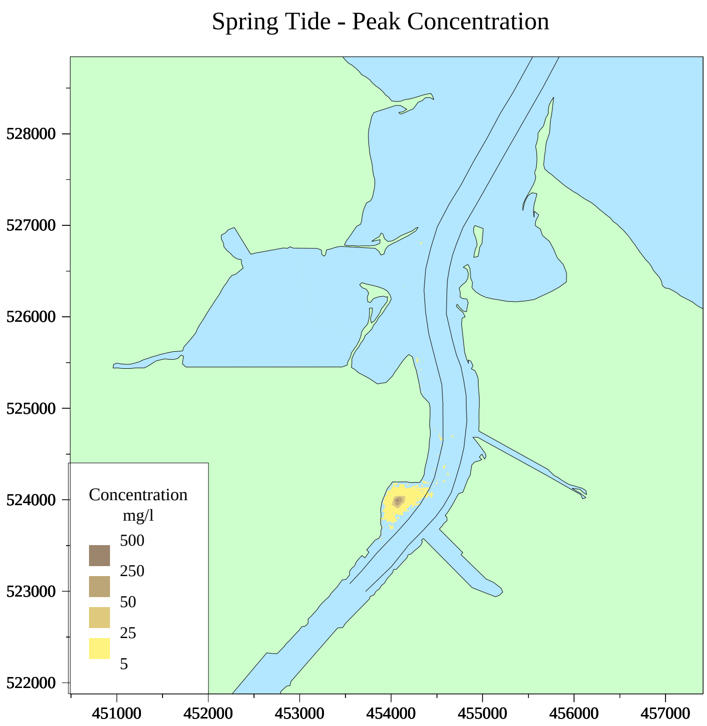


Figure 6.3 Simulated dredge locations for CSD and THDS and 'sensitive' receptor points

Implications of dredging using a cutter suction dredger

12. For all the dredger simulations, the largest rise in peak concentrations and deposition were in the immediate vicinity of the dredger, centred either at the location of the barge loading pontoon or along the line of the trailing suction dredger track. Figures 6.4 to 6.5 show the results from the simulation of the CSD in terms of predicted peak concentration of suspended sediments and peak deposition on the seabed arising from dredging at the two upstream locations.



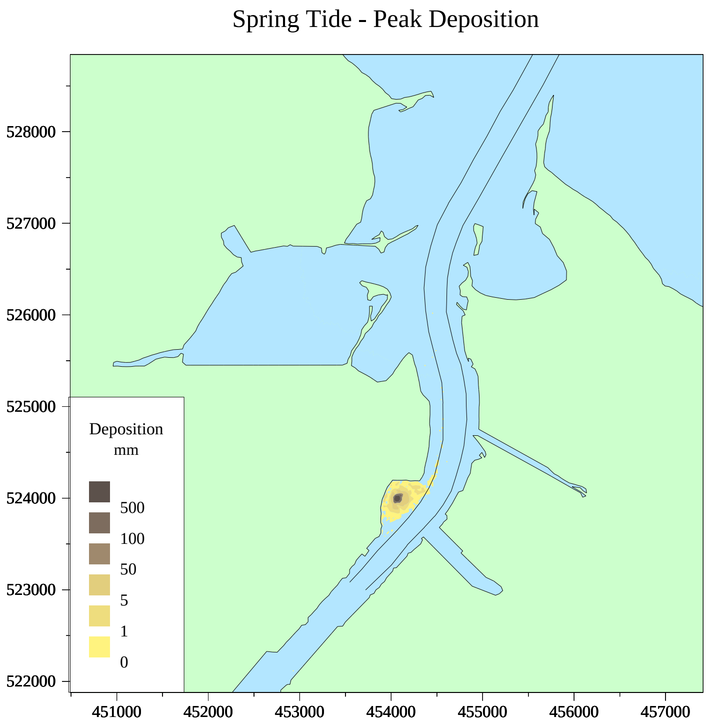
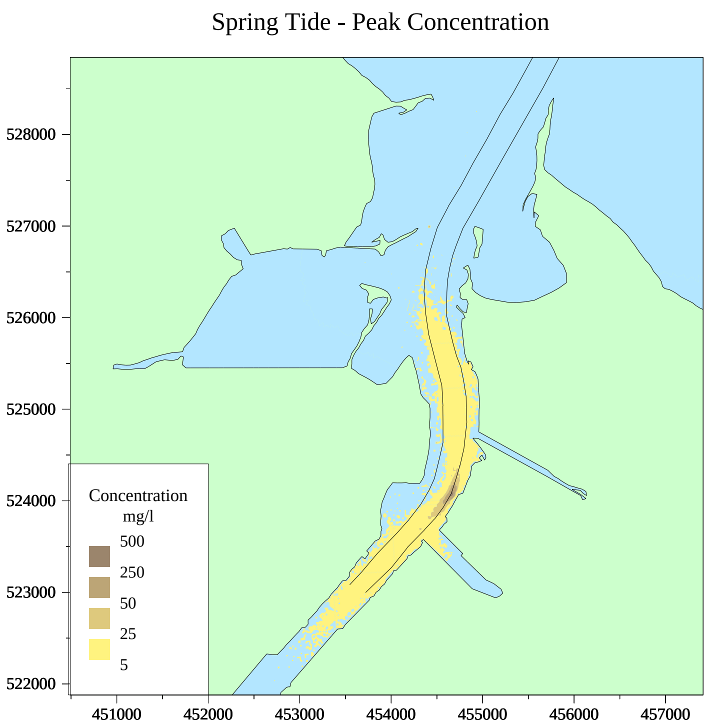


Figure 6.4 Peak concentration and peak deposition for cutter suction dredger at location 1, spring tide, low flow



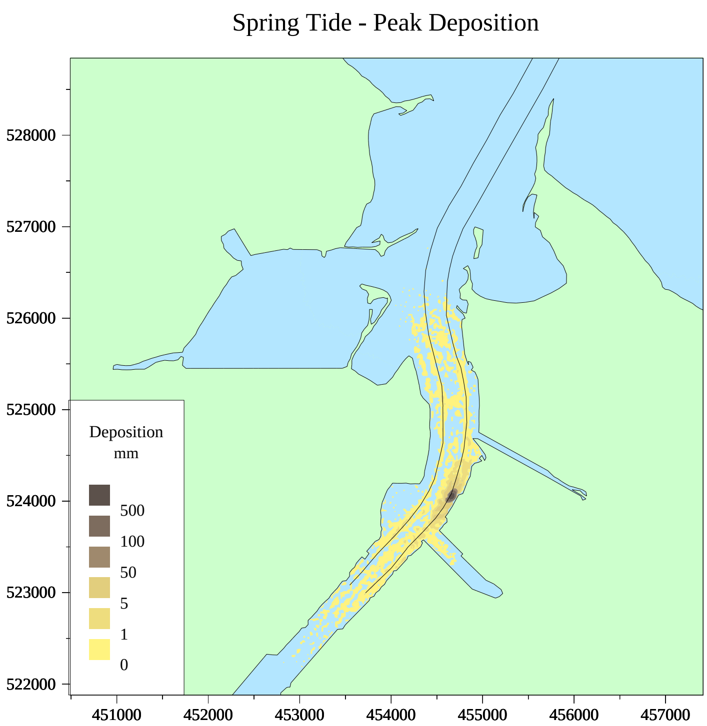


Figure 6.5 Peak concentration and peak deposition for cutter suction dredger at location 2, spring tide, low flow

13. The use of the CSD in the area of the reclamation and Tees Dock turning circle is predicted to increase suspended sediment concentrations by 500mg/l in the immediate vicinity of the barge loading site but beyond this immediate zone, the increase in concentration is predicted to be of the order of 25mg/l or less (see Figures 6.4 and 6.5).

14. Furthermore, peak deposition of material onto the seabed is also very localised to the barge loading site when dredging the Tees Dock turning circle (Figure 6.4). When dredging the area adjacent to the proposed reclamation, peak deposition of material onto the seabed is generally less than 5mm, with greater deposition in the immediate vicinity of the dredging activity (Figure 6.5). It should be noted that much of the material is predicted to deposit within the footprint of the dredging and/or reclamation and as such it would be re-dredged or would deposit within an area which has already been dredged.

15. The use of the CSD loading into barges on one or other side of the main channel limited the cross-channel dispersion of fines and a significant reduction in peak concentrations from one side of the channel to the other was predicted with the most dispersion along the main direction of flow. This would suggest that locations across the channel from the barge loading site would not receive as much sediment as those along the channel.

16. In the CSD scenarios simulated, the dredging of mudstone (with a single CSD) will take about 200 days. The total release of fine material into the estuary will be about 680,000 dry tonnes. The bulk of the released material is expected to accumulate in the subtidal areas of the Tees Estuary (there will be less dispersion on neap tides). Depending on the degree to which the released material consolidates and/or mixes with sandier material the volume of additional material (over and above normal maintenance requirements) arising from this source could be as much as 1,400,000m^3. This material would need to be redredged as part of the capital works or subsequent maintenance dredging and disposed offshore. Some accumulation of this material in the deepened berths adjacent to the channel is to be expected.

Implications of dredging using a trailing suction hopper dredger

17. For spring tide conditions with low freshwater flow, the effect of dredging sandy material with a TSHD in the approach channel and pumping ashore at the reclamation site is shown in Figure 6.6. It can be seen that peak concentrations between 500mg/l and 1000mg/l occur along the dredger track and in the vicinity of the run-off from the reclamation. Increases in suspended sediment concentrations above those occurring with the CSD are predicted. Concentrations of up to 50mg/l are also predicted over parts of Seal Sands and up to 25mg/l in the Seaton Channel. This scenario results in a fraction of a millimetre of deposition on Seal Sands per tide (up to 0.05mm for the three tides simulated) (see Figure 6.7). The effect of dredging in the approach channel on suspended sediment concentrations over Seal Sands and in the Seaton Channel is further illustrated by reference to Figure 6.8 and 6.9.

18. In the scenario simulated, the dredging of sand will take about 30 days. The total release of fine material into the estuary will be about 225,000 dry tonnes. Of this material it is predicted that about 0.2% will accumulate over the approximate $1km^2$ of Seal Sands. The SEDPLUME model assumes that the accumulations of material occur with a dry density of $500kg/m^3$. Thus if the 0.2% of the released material were distributed uniformly over Seal Sands it would form a deposit about 1mm in thickness.

19. This deposit would form over spring tide periods only and if significant wind wave action occurred it would be expected to be resuspended. A similar proportion of the released fine material is predicted to accumulate in Seaton Channel (approximately $500m^3$). The bulk of the released material (80-90%) is expected to accumulate in the subtidal areas of the Tees Estuary. Depending on the degree to which the released material consolidates and/or mixes with sandier material the volume of additional material (over and above normal maintenance requirements) arising form this source could be as much as $400,000m^3$. This material would need to be redredged as part of the capital works or subsequent maintenance dredging and disposed offshore. Some accumulation of this material in the deepened berths adjacent to the channel is to be expected.

20. As for the CSD, the use of a TSHD is predicted to have little influence on suspended sediment concentrations and deposition at Bran Sands and North Gare Sands.

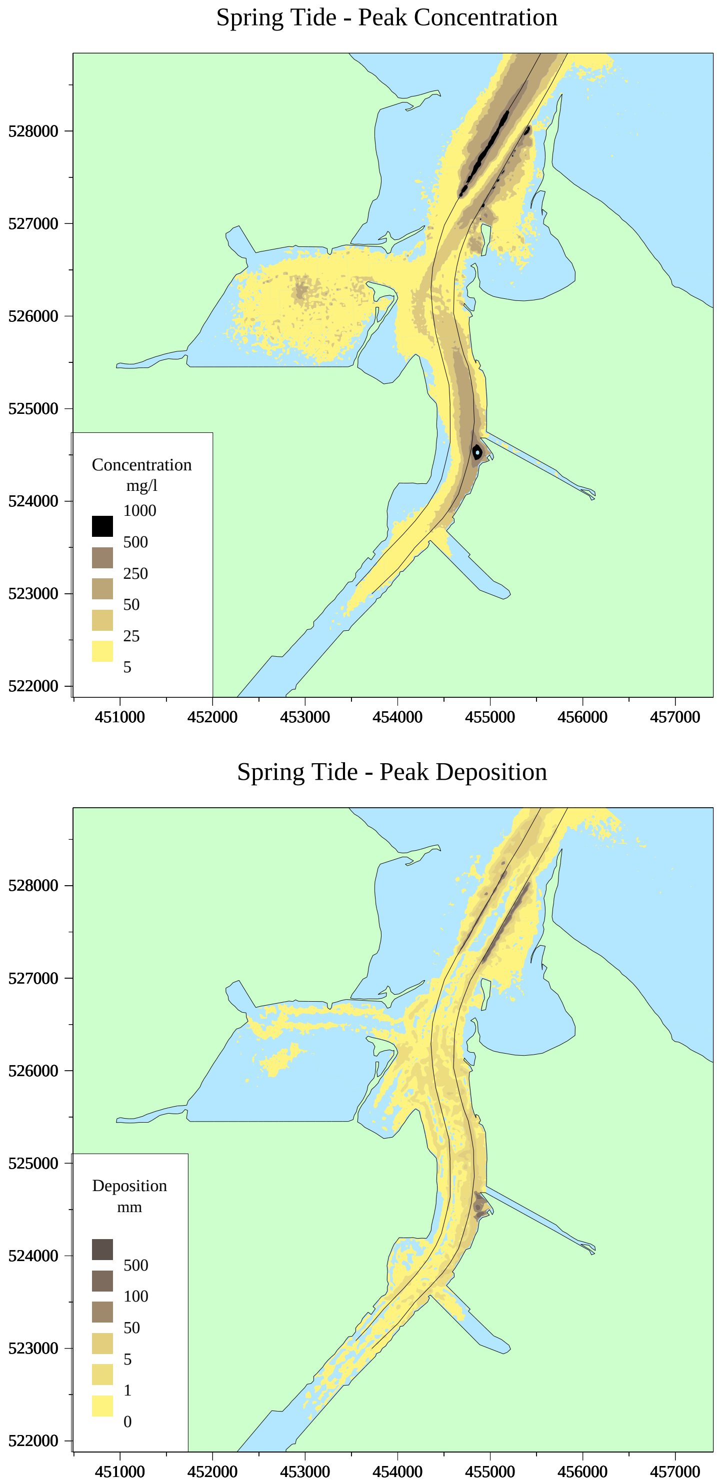


Figure 6.6 Peak concentration and deposition for TSHD dredging sand in the approach channel, spring tide, low flow conditions

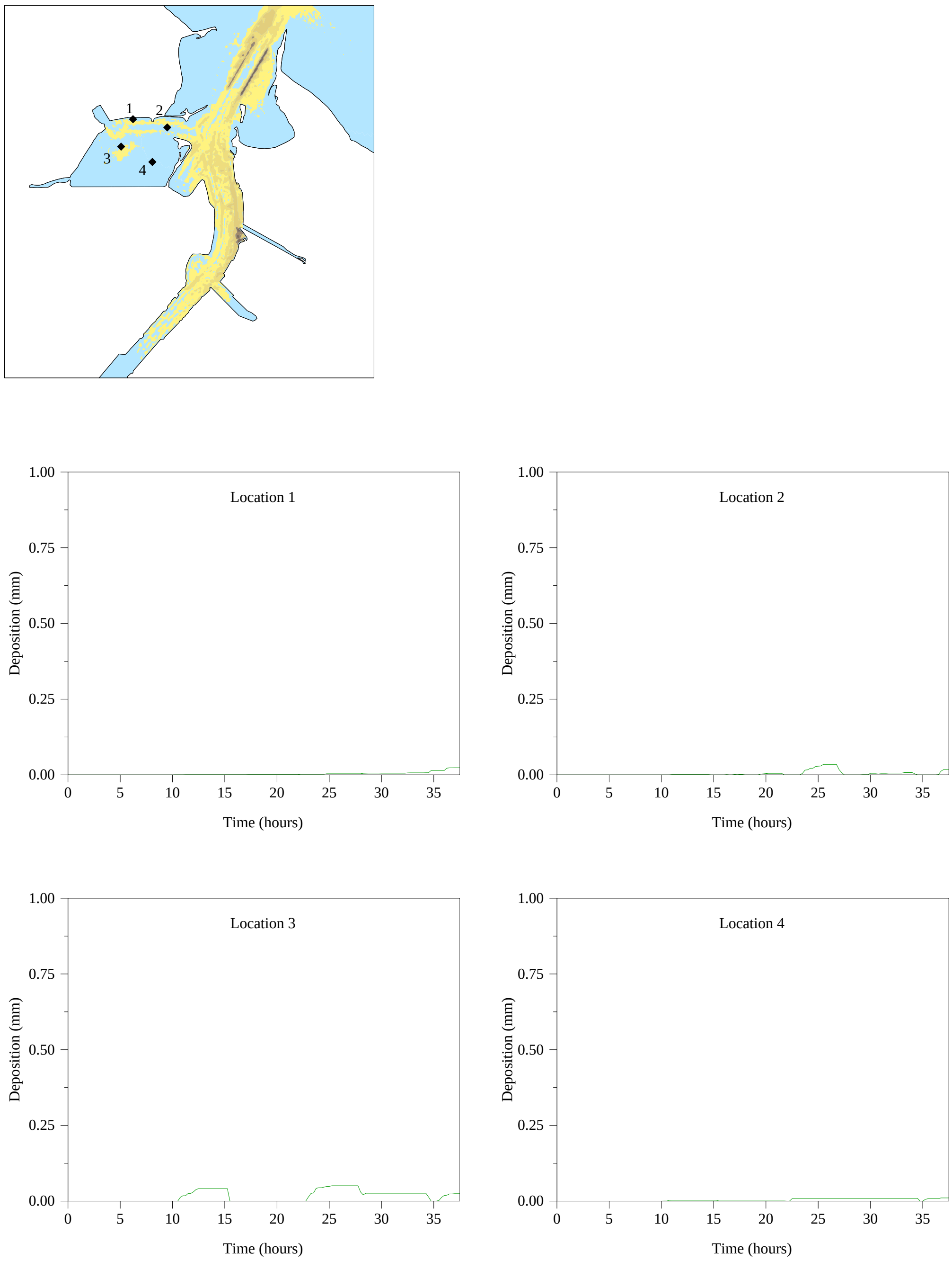


Figure 6.7 Time histories of deposition in Seaton Channel (Locations 1 and 2) and Seal Sands (Locations 3 and 4) for TSHD dredging sand in the approach channel, spring tide, low flow conditions

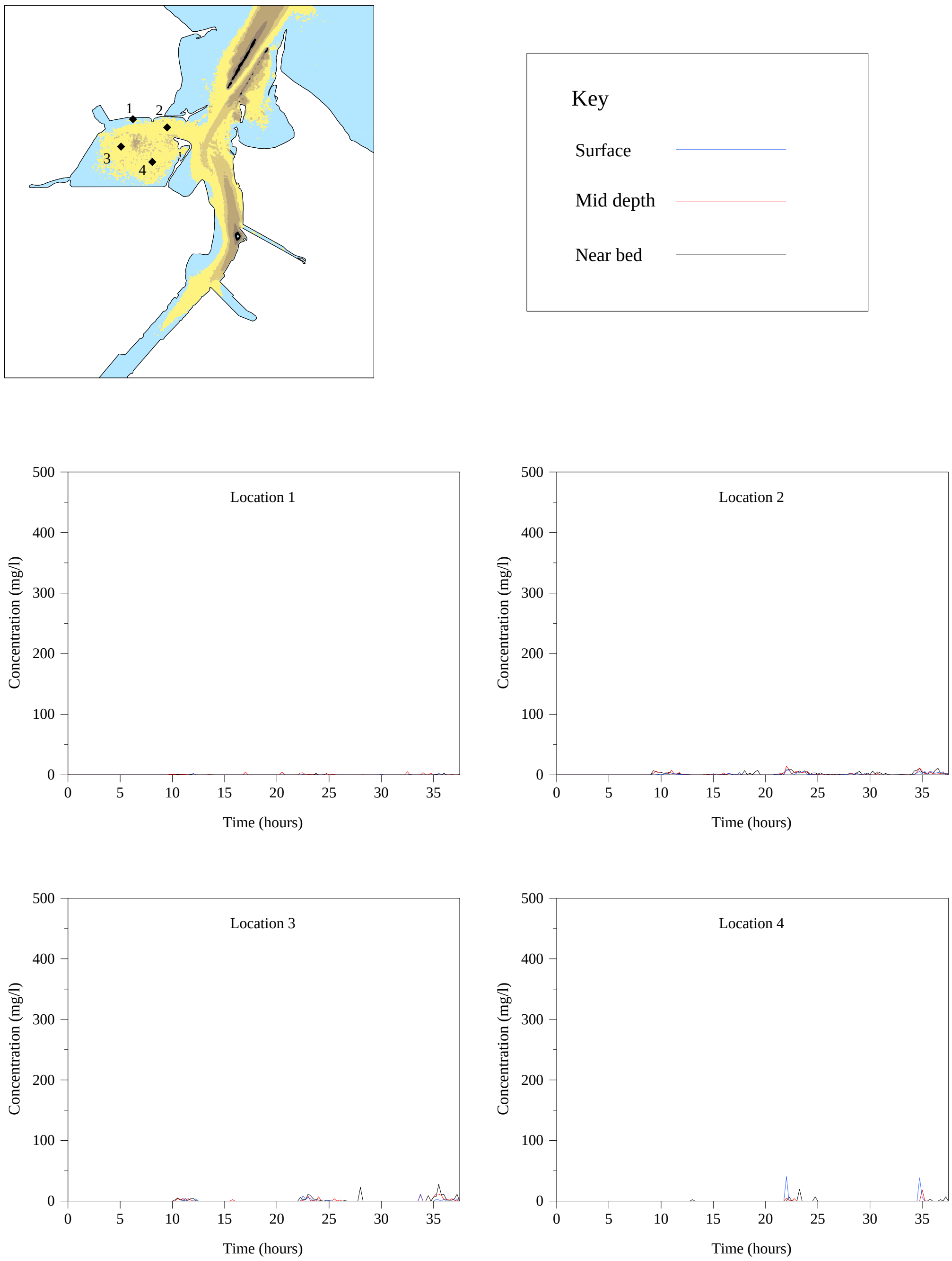


Figure 6.8 **Time histories of concentration in Seaton Channel (Locations 1 and 2) and Seal Sands (Locations 3 and 4) for TSHD dredging sand in the approach channel, spring tide, low flow conditions**

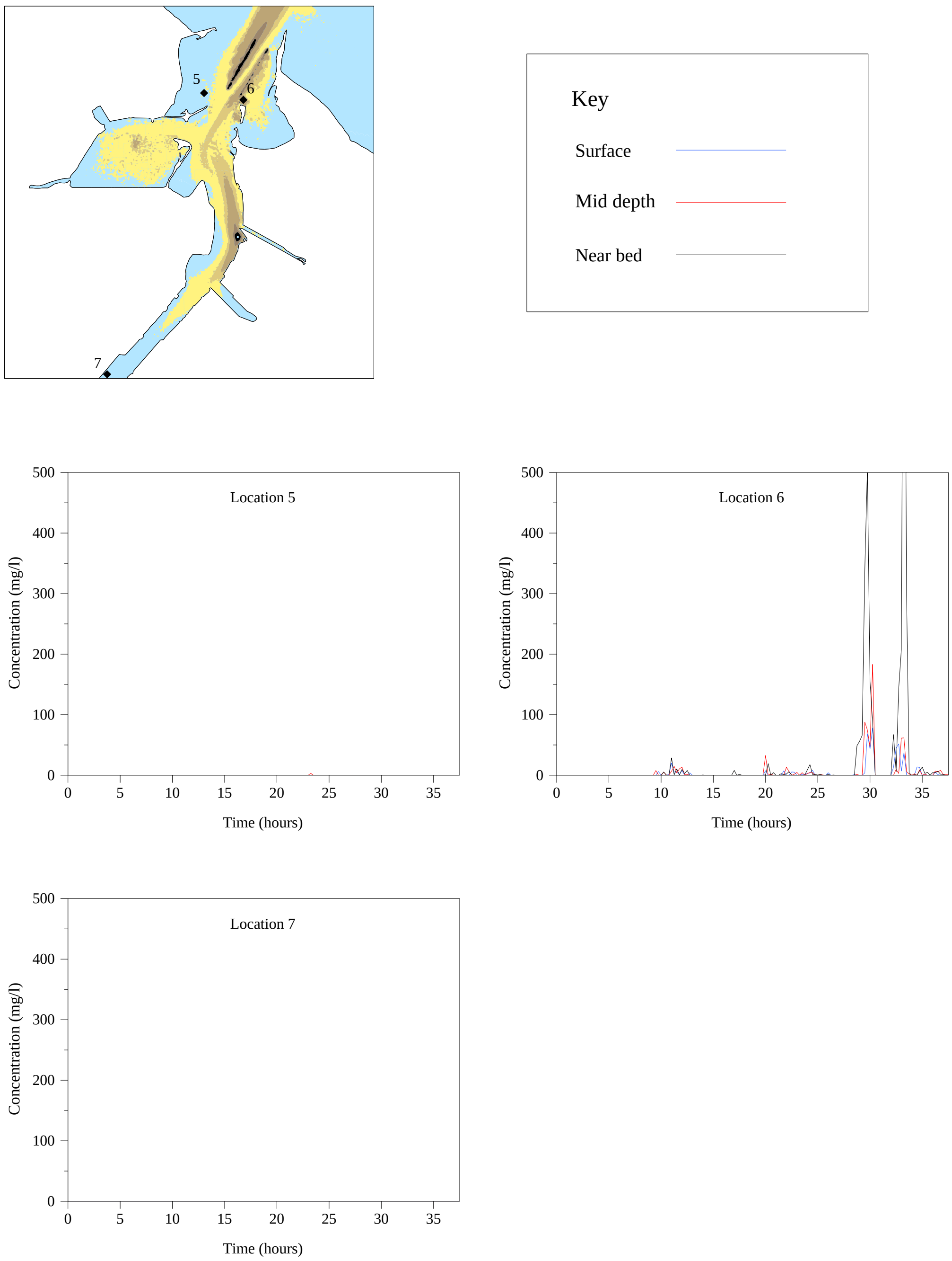


Figure 6.9 **Time histories of concentration at Bran and North Gare Sands for TSHD dredging sand in approach channel, spring tide low flow conditions**

21. The full results of the simulated scenarios are presented in HR Wallingford (2005) (Accompanying Document 1).

6.4 Prediction of post construction effects

6.4.1 Introduction

1. The proposed development has the potential to influence the hydrodynamic regime of the Tees estuary and its approaches due primarily to the deepening of the approach channel. The deepening has the potential to affect the tidal and gravitationally driven currents with knock on effects for sediment transport and patterns of erosion and deposition.

2. The studies described in this section are covered in more detail in the technical report of the hydrodynamic and sedimentological studies to support the EIA (HR Wallingford, 2005; Accompanying Document 1).

6.4.2 Tidal flow studies

Model establishment

1. A TELEMAC-3D flow model was set up to simulate currents in the Tees Estuary and Tees Bay. TELEMAC-3D is a state-of-the-art finite element flow model, originally developed by LNHE Paris, which uses a completely unstructured grid enabling the accurate simulation of water movement in complex shaped areas. TELEMAC-3D also includes vertical layers, enabling three-dimensional flow structures in the river to be accurately represented. Distribution of salinity, and its evolution, can be modelled. Further details of the TELEMAC-3D model are provided in Malcherek et al (1996).

2. The model's upstream limit is at the Tees Barrage, and extends to 6.5km offshore in Tees Bay, covering an area of approximately 80km^2. The mesh resolution varied from 800m at the seaward model boundary, to 50m over most of the estuary, and 30m in narrow sections. The model domain and detail of the model mesh are shown in Figures 6.10 and 6.11 respectively.

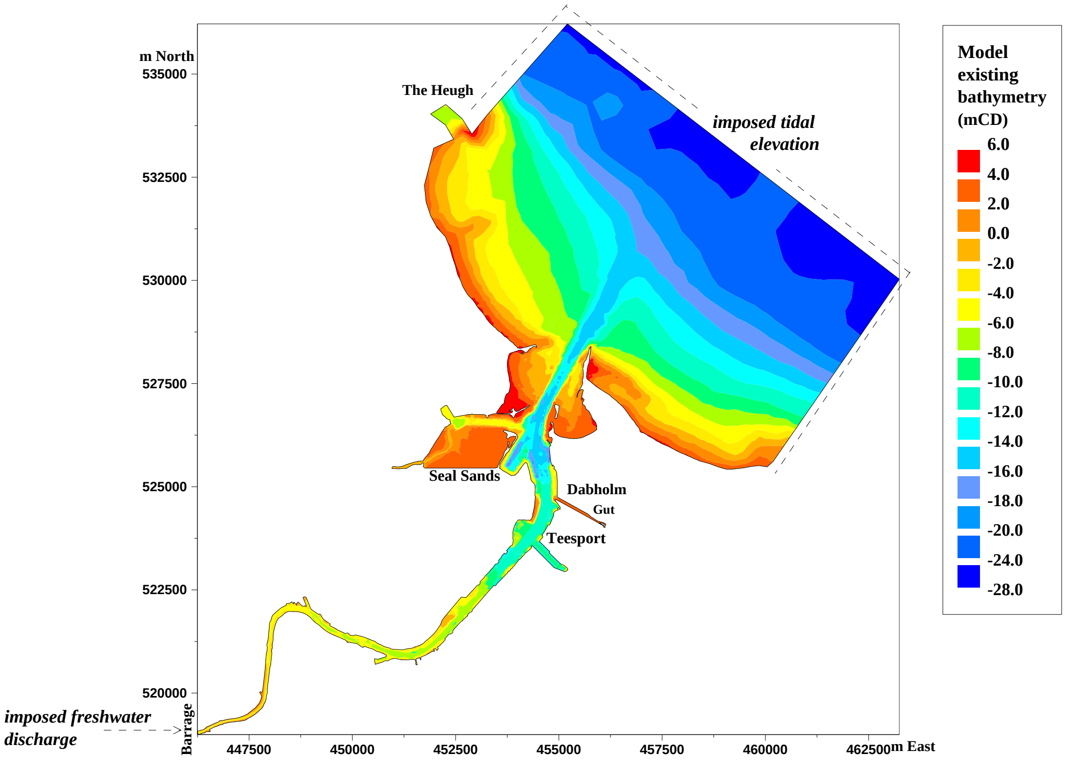


Figure 6.10 Flow model domain

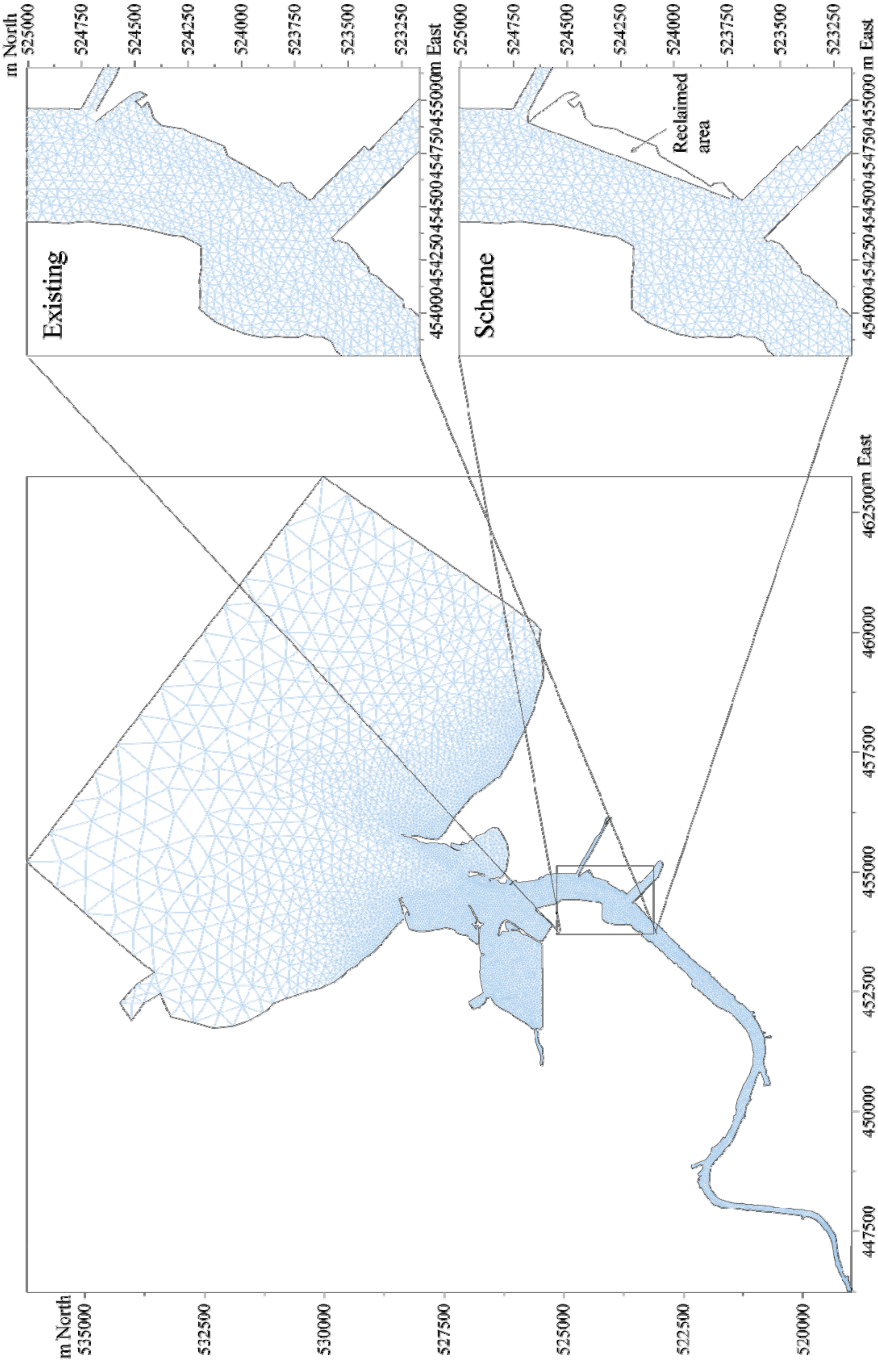


Figure 6.11 Model mesh (existing and with the scheme in place)

3. The credibility of the model is assessed by comparison with observations made in the estuary. The model parameters are adjusted until the closest match between model and observations (i.e. calibration) is achieved. When the model is rerun with the same parameters but for a different set of conditions (e.g. a different tide/freshwater input), and a satisfactory match with corresponding observations is still achieved, the model is considered to be validated.

4. The model was compared to low flow conditions measured by Acoustic Doppler Current Profiler (ADCP) undertaken on 15th and 16th June 1995 (after the construction of the barrage) (see HR Wallingford (1995) for further detail about these observations). The large spring tidal range at the time of the observations was approximately 5.0m (compared to a mean spring tide range of 4.6m). Freshwater discharge at the time was negligible. The model was further compared to high flow conditions measured between 22nd and 30th April 2005, during various tidal and freshwater conditions. Figure 6.12 shows the locations of the eleven ADCP transects, together with seventeen points extracted for time-series comparison with the model.

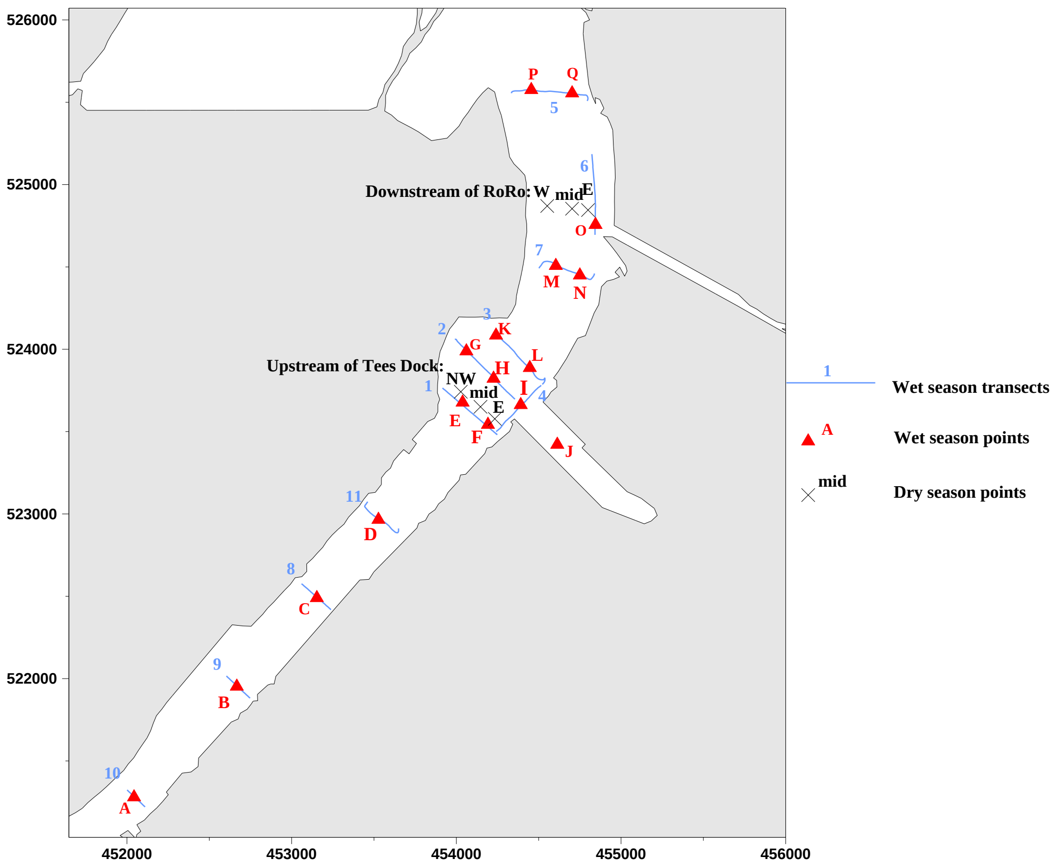


Figure 6.12 Locations of ADCP transects

5. Table 6.5 describes the dates, tides and freshwater discharges for the days of measurement.

Table 6.5 Details of April 2005 measurement program

Date (April 2005)	Transects	Tidal range (m)	Barrage discharge (cumecs)		
			Min	Max	Mean
22nd	1,2,3,4	3.5m	0.8	23.2	10.8
25th	-	4.5m	0	131.5	36.4
26th	5,6,7	4.6m	0	27.5	7.7
27th	8,9,10	4.5m	0	64.1	11.3
28th	11,1,2,3,4	4.1m	0	37.5	15.9
29th	5,6,7	3.7m	0	41.2	11.6
30th	3,5,7	3.2m	0	41.2	11.6

6. Vectors of depth-averaged observations (Transects 1 to 4, 28th April) are shown with the equivalent model results (mean spring tide, 14 cumecs freshwater) in Figures 6.13 and 6.14 for four hours after and before HW respectively. The model is shown to capture well the qualitative nature of the flow on both the ebb and flood – the strength and direction of currents, and the presence and position of eddies in the depth-mean flow are well represented by the model.

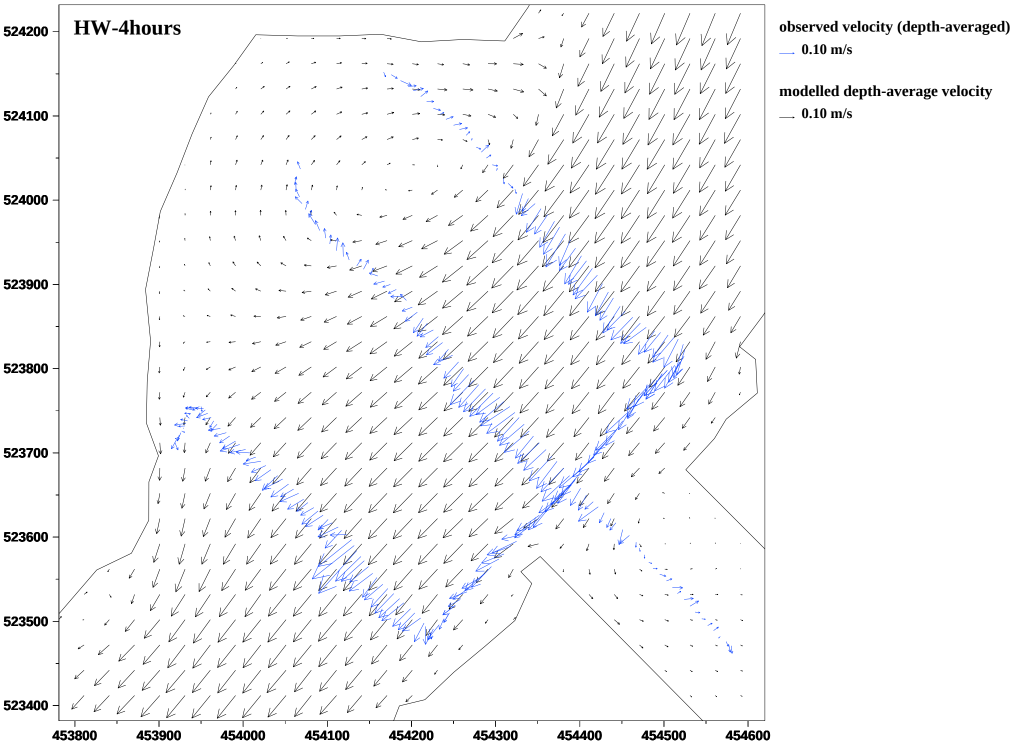


Figure 6.13 Comparison of observed and simulated depth average current at peak flood

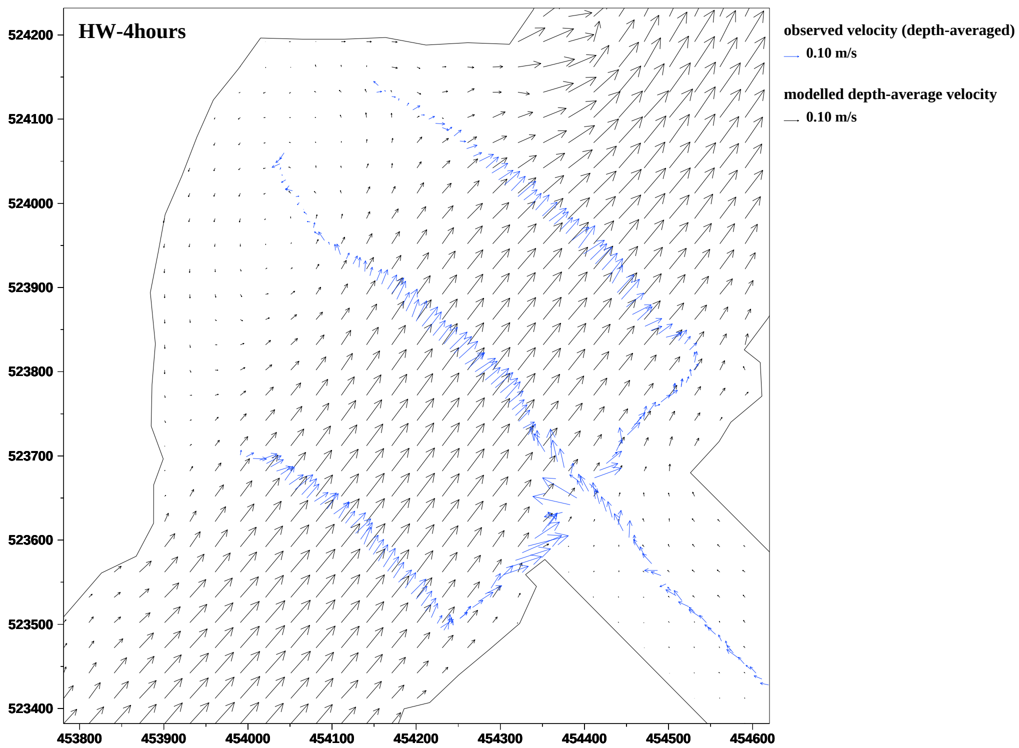


Figure 6.14 Comparison of observed and simulated depth average current at peak ebb

7. Further comparison between the model and measurements can be made by considering time histories of speeds and directions at the selected points. An example of the three-dimensional behaviour of the model is also assessed in Figure 6.15, below, which shows near-surface, mid-depth and near-bed currents

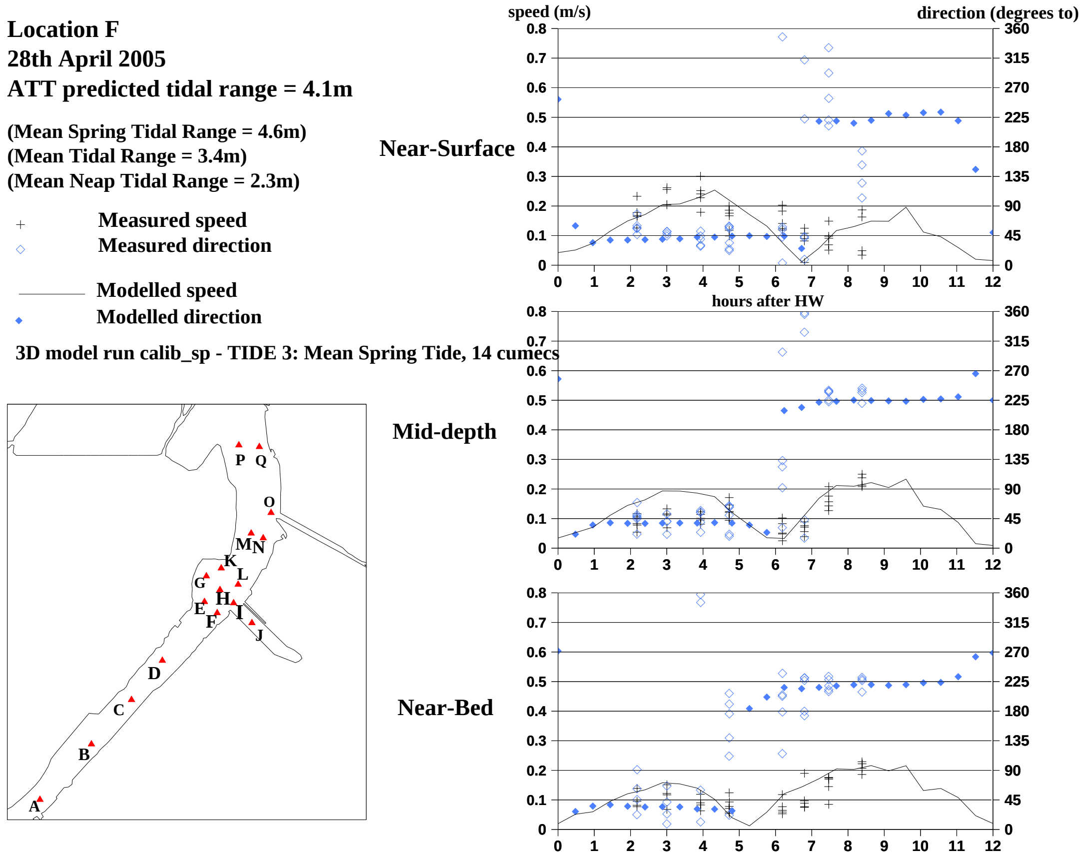


Figure 6.15 Example of model comparison with time series data

8. The vertical structure of the flow is reproduced well by the model. On days where the freshwater has a significant impact on flow, a different vertical structure occurs during the ebb and flood (seen in 27th and 28th April):

- At the surface, ebb flow often exceeds flood flow, since the less dense, downstream-flowing freshwater, enhances the ebb flow whilst opposing the flood.
- At the bed, flood flow often exceeds ebb, since the inflowing denser salty water is confined to the lower part of the water column, and must compensate for the reduced flood flow at the surface.

Predicted effects of the development

9. Having achieved adequate comparison with the observed currents for high and low flow cases for a variety of tide ranges the model was adjusted to include the

presence of the proposed channel dredging and reclamation. The model was then run for spring and neap tides for high and low flow cases.

10. The peak ebb depth average currents with and without the development for low flow spring tide case is shown in Figure 6.16. This gives a general idea of the footprint of direct effect of the proposed development on tidal currents.

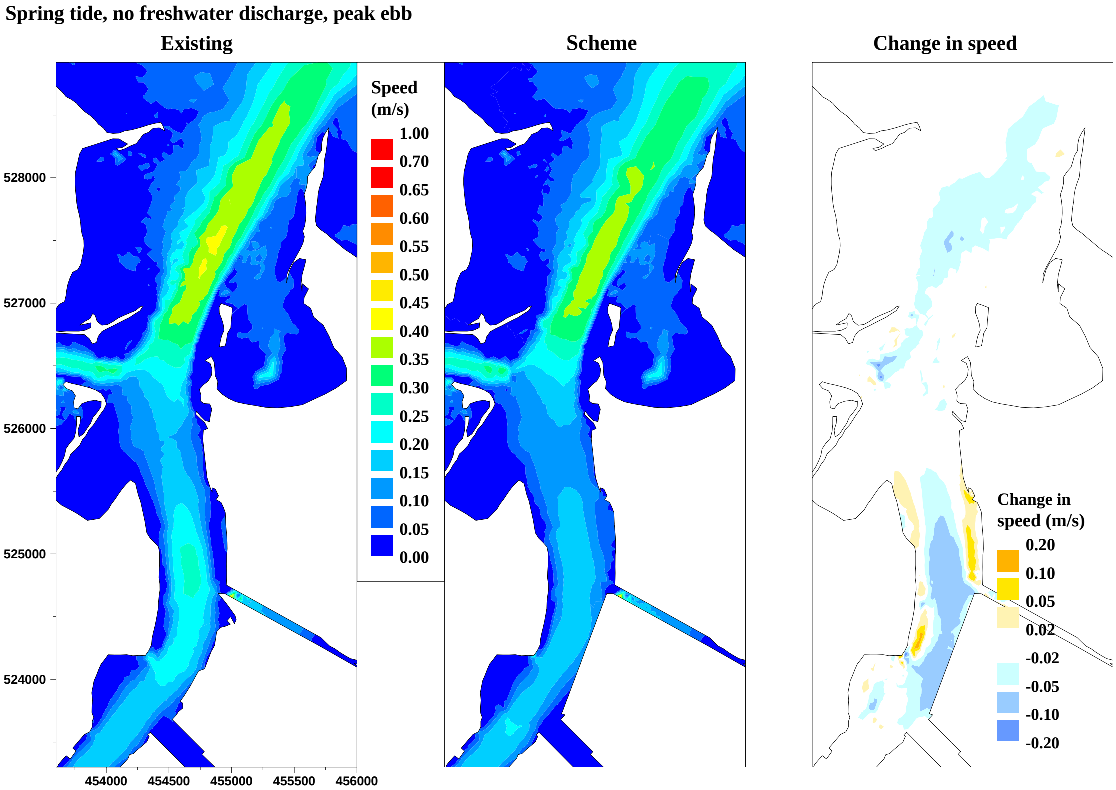


Figure 6.16 Speed magnitude changes from scheme for peak ebb spring tide, low freshwater flow

11. Further results from the tidal flow modelling studies are presented below. The following plots show the effects of the scheme on tidal flow speeds under different conditions. Figure 6.16 shows peak flood depth average currents for the low flow spring tide case. Figures 6.17 and 6.18 show the predicted effects of the proposed scheme on tidal currents for high flow (i.e. 'wet' conditions) on spring tides. Results for neap tide conditions under high and low flow scenarios have also been produced and are presented in Accompanying Document 1. In summary, the results for neap tide conditions show less widespread effects on tidal current speeds than for spring tide conditions.

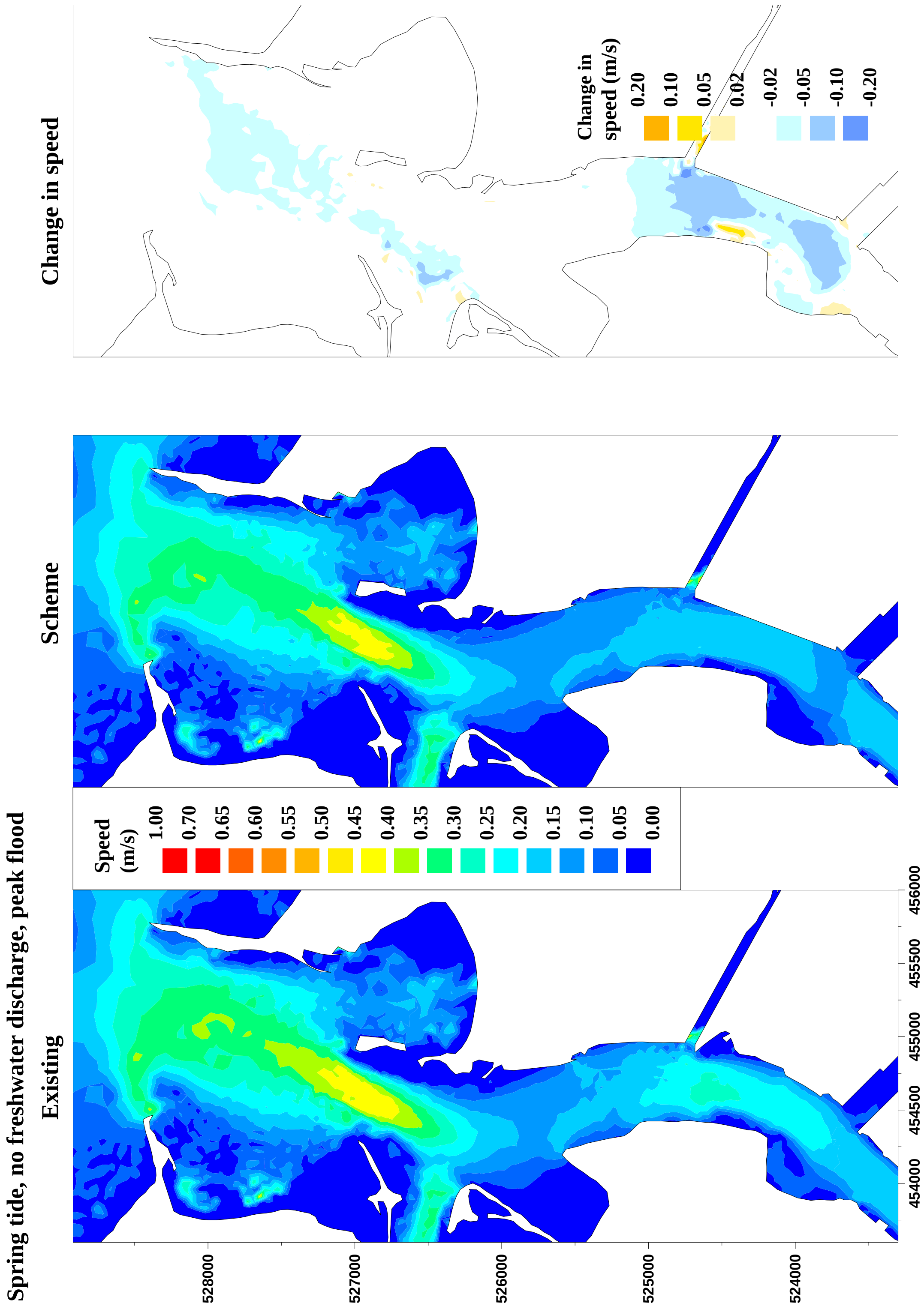


Figure 6.17 Dry spring conditions: depth-mean flood speed (existing, scheme, difference)

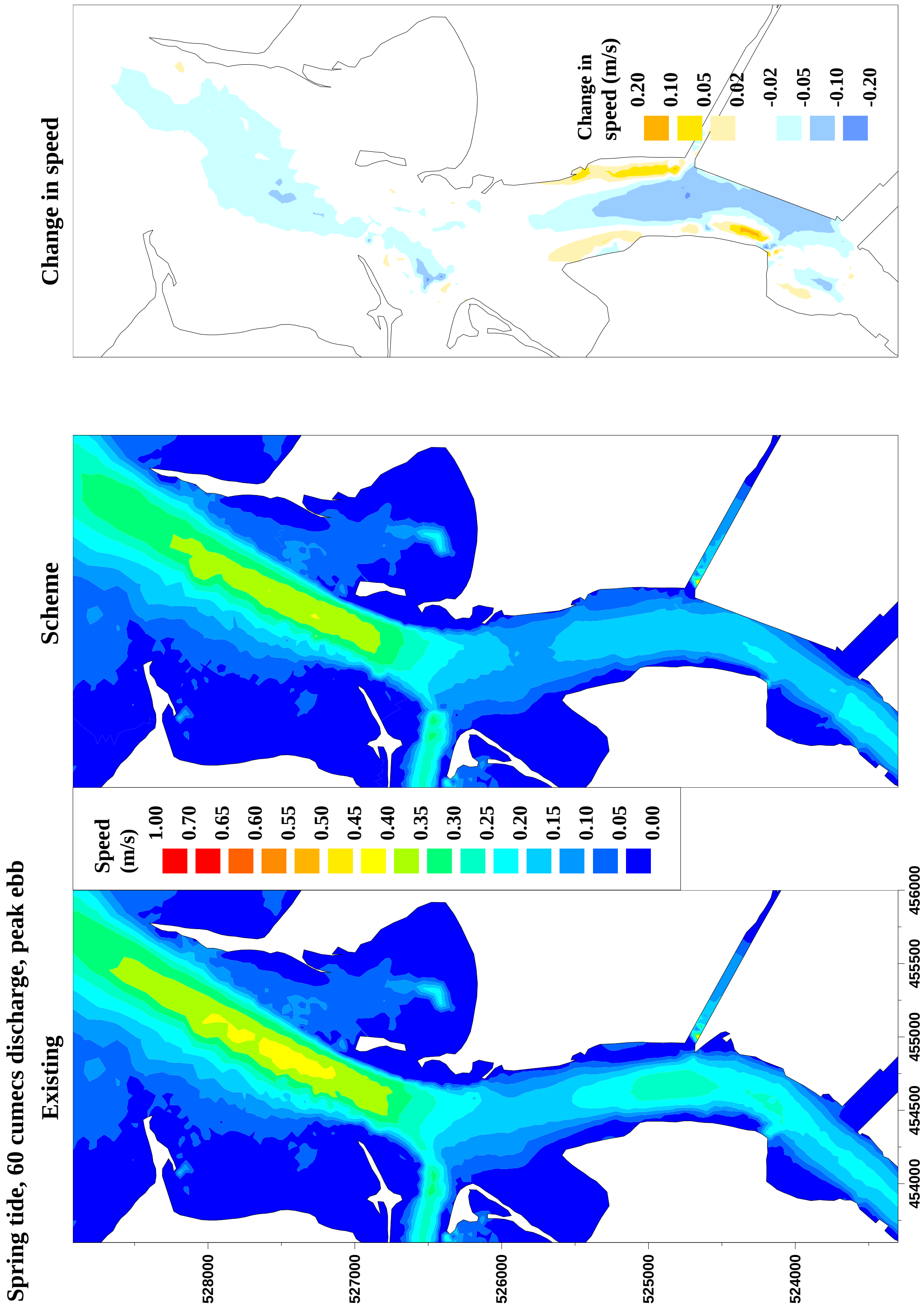


Figure 6.18 Wet spring conditions: depth-mean ebb speed (existing, scheme, difference)

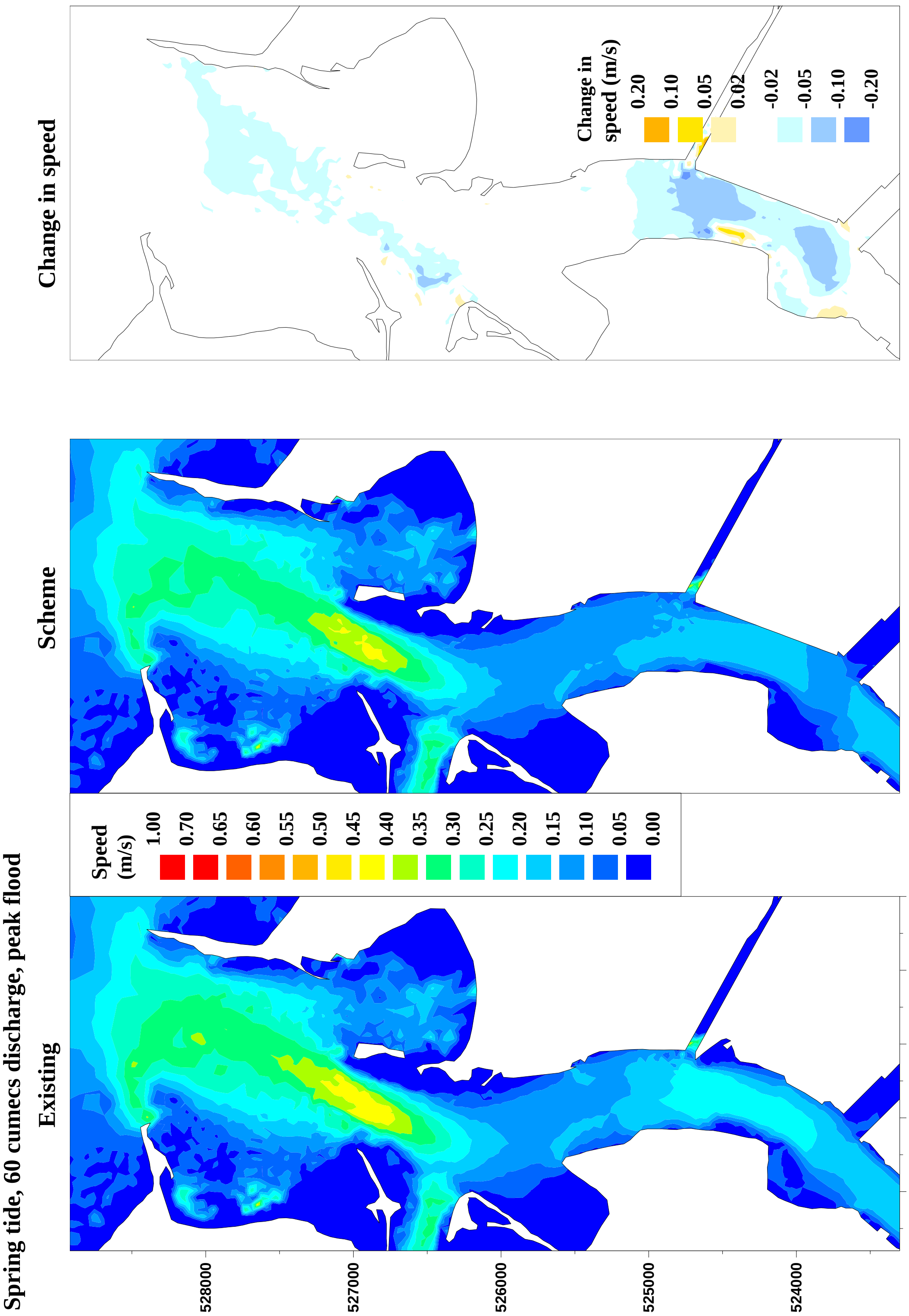


Figure 6.19 Wet spring conditions: depth-mean flood speed (existing, scheme, difference)

12. It can be seen that the pattern of change in tidal current speeds as a consequence of the proposed scheme is not dissimilar for dry (i.e. low flow) and wet (i.e. high flow) conditions. In all cases, changes in current speeds are predicted in the estuary in the vicinity of the proposed development and at the mouth of the estuary. Overall, the predicted effect on current speeds can be described as being of low magnitude.

13. In the vicinity of the proposed development, the general result is for a predicted decrease in current speeds of up to 0.10m/s, with localised decreases of up to 0.20m/s under wet conditions. Increases in current speeds of a similar order of magnitude are predicted for closer to the shores of the estuary. This area (adjacent to the proposed reclamation) experiences the greatest effect on flows.

14. Further downstream at the mouth of the estuary, very little effect on tidal current speeds is predicted. The general prediction here is for decreases in current speeds of the order of 0.05m/s.

15. The patterns of speed change would not be significantly altered by the presence of the proposed dredged side trenches in the area upstream of Redcar.

16. Further detail in assessing the effect of the development on the density driven current is shown by plotting a time series of current for near surface, mid-depth and near bed currents opposite the ConocoPhillips Oil terminal (location 454582mE, 525505mN). Figure 6.20 shows the current for existing and proposed conditions. At this site, where a very distinctive freshwater-induced depth variation in flow is seen, the surface flood tide currents are suppressed by the scheme, whilst the near bed flood current is enhanced. This result would suggest that the deepening will enhance the near bed landward flow for conditions with significant freshwater flow. For low flow cases a more straightforward reduction in tidal currents is predicted at all depths.

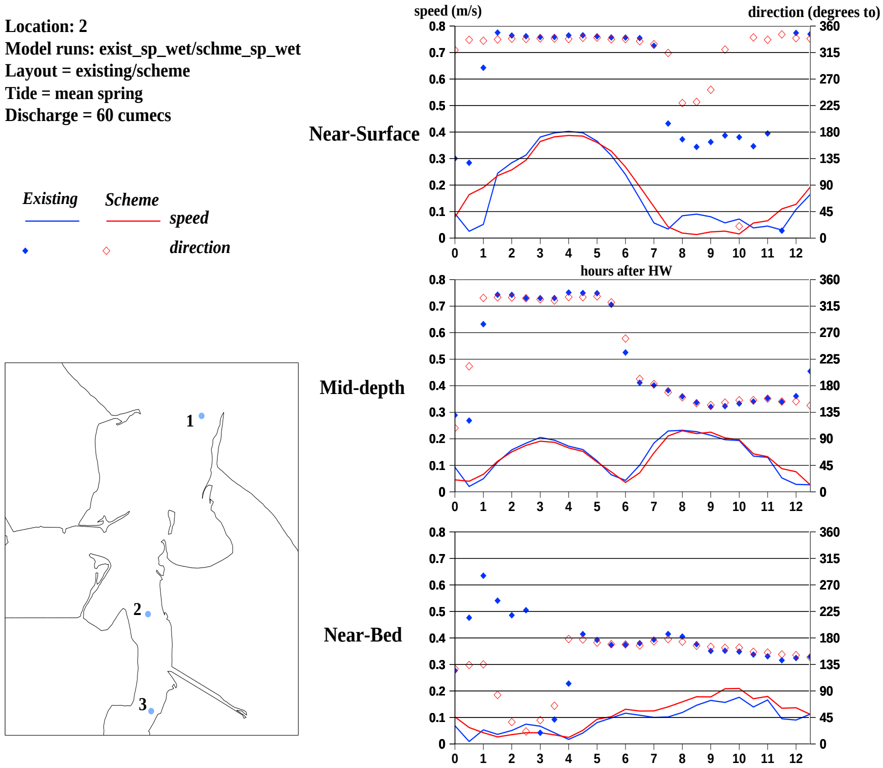


Figure 6.20 Change in time vertical structure of velocity from scheme, spring tide, high flow

17. In the immediate area of the reclamation some changes to current direction are predicted as the overall cross sectional shape of the estuary is changed. This feature is most markedly shown in Figure 6.21 which shows vectors for wet spring ebb flows respectively. A more striking impact is seen on the flow pattern, with fast surface ebb flows favouring a straighter route around the channel bend adjacent to the reclamation, whilst deep ebb flows are slowed over much of the area.

18. The effect of the scheme on three dimensional currents would not be expected to be altered by the presence of the proposed side trenches in the channel upstream of Redcar.

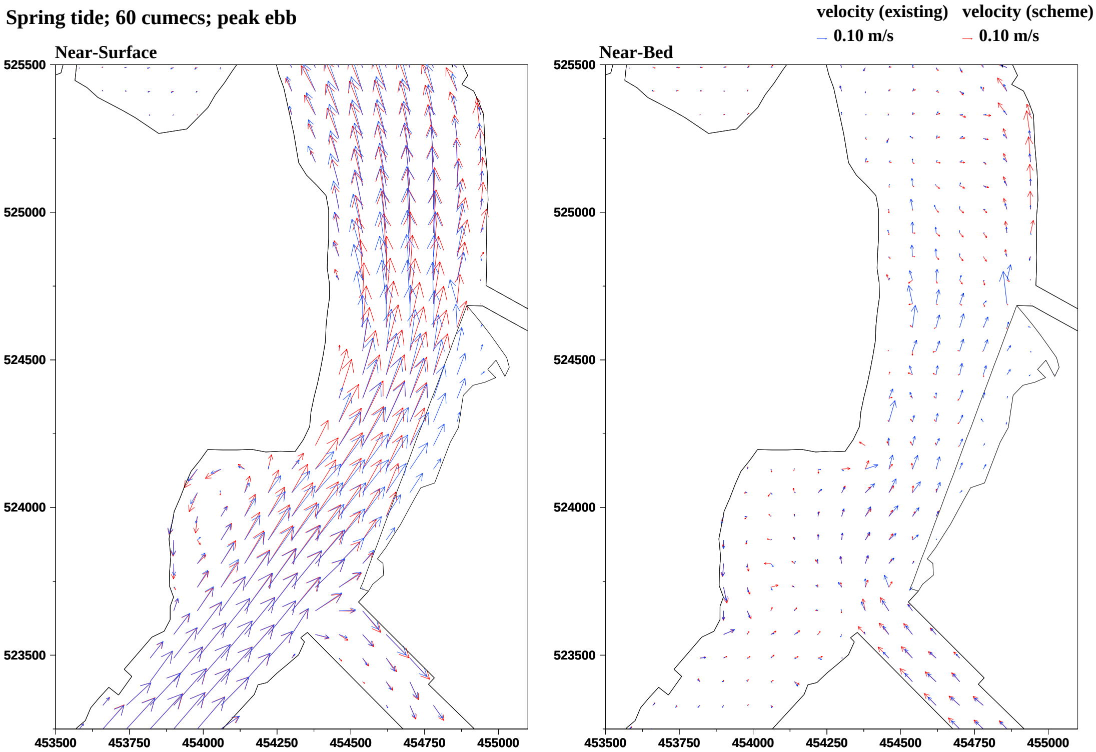


Figure 6.21 **Change in near surface and near bed current pattern from Scheme, spring tide, high flow case**

19. The scheme is predicted to have a very small effect on water levels as shown in Table 6.6. Tidal range is increased by less than 4mm; the tide arrives up to 2 minutes earlier. This effect is not expected to be changed by the presence of dredged trenches at the edges of the channel.

Table 6.6 Impact of scheme on height and timing of high and low waters

	Tees Approach Channel (Location 1)		Adjacent to proposed reclamation (Location 3)		Near barrage	
	Elevation	*Timing*	*Elevation*	*Timing*	*Elevation*	*Timing*
HW	No change	No change	0.001m higher	No change	0.002m higher	2 minutes earlier
LW	No change	No change	0.002m higher	1 minute earlier	0.002m lower	2 minutes earlier

6.4.3 Wave studies

Model establishment

1. As part of the studies, the implications of the proposed scheme on wave conditions in the area have been studied using a third generation wave model (SWAN, acronym for **S**imulating **WA**ves **N**earshore).

2. SWAN includes the effect of reflection from structures, refraction and shoaling, friction, wave breaking and wave-wave interactions. The model also includes wave generation by wind within the model area.

3. The wind and wave conditions tested in the model were derived from the wind and wave climates presented above (Section 6.2.2). These conditions were combined into a series of representative wind-wave combinations covering a range of directions and magnitudes for each.

Predicted effects of the development

4. The effects of the scheme are best illustrated by considering the wind and swell components separately. Wind waves that are generated within the estuary (short period waves) are predicted to be affected by the reflective properties of the container terminal but, as they are short period waves, they are unaffected by the increased depth of the channel. Swell waves (long period waves from offshore) do not penetrate far into the estuary and, therefore, are not affected by the container terminal. Swell waves are, however, affected by the increased depth of the channel in the lower estuary. Predicted changes to the wave climate are described below.

5. The prevailing south-westerly winds run along the Tees estuary and reflect northwards off the south bank of the estuary in the Teesport area. The wind speed applied here (20 m/s) has an exceedence of 1.2%. Figure 6.22 shows the reflection pattern, which extends as far as the North Gare breakwater. However, the change in significant wave height is small, being less than 10cm throughout. Tests with 30m/s south-westerly winds showed stronger waves, with the same pattern of change and a maximum increase in significant wave height of 10cm. This pattern would not be altered by the presence of dredged trenches at the edges of the channel as the water depth in the deepened channel already exceeds the depth at which the short period waves are affected by further increases to the bed depth.

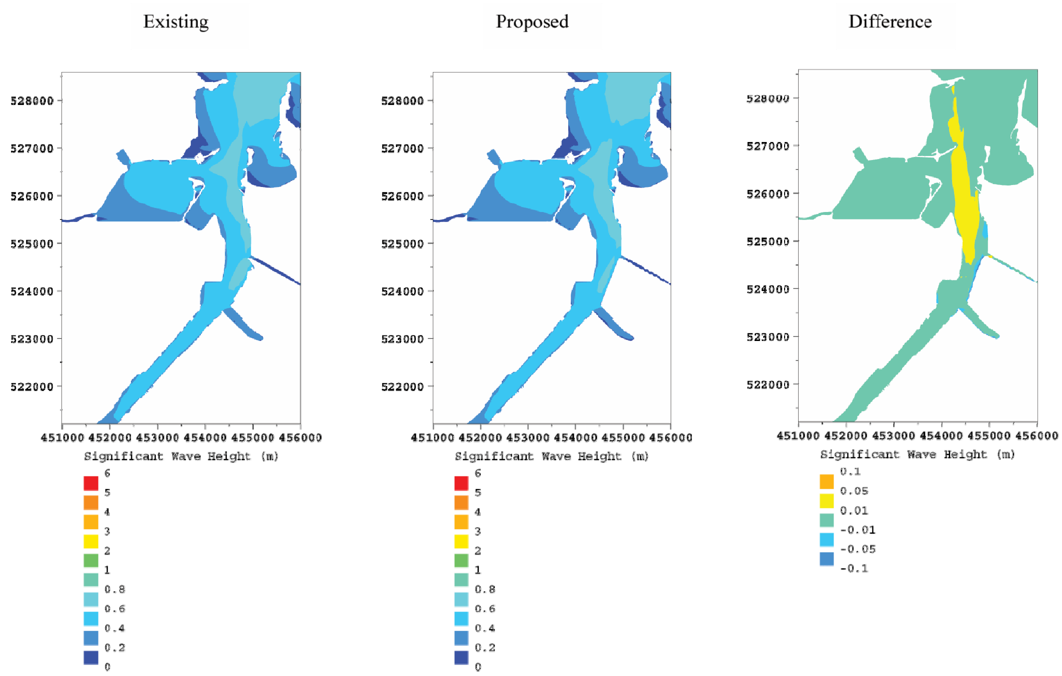


Figure 6.22 Change in wind induced waves for 20 m/s wind from SW

6. Figure 6.23 shows the effect of the proposed scheme on swell from offshore with significant wave height 6m approaching from 30°N. This condition has an estimated return period of 1 year. These long period waves are reflected on the side of the dredged channel and reach the area around the ConocoPhillips Oil Terminal, increasing the significant wave height on the western side of the ConocoPhillips Oil Terminal in ConocoPhillips Dock by up to 30cm. The increased reflection is due to the deepening of the channel (surveyed to be shallower than the stated 14.1m below CD in places) to 14.5m below CD. The increased reflection within the channel leads to a slight decrease in significant wave height for swell waves on North Gare Sands and Bran Sands. The pattern of change was similar for all return periods modelled, with increases of up to 30cm at the ConocoPhillips Oil Terminal for an incident 6m swell wave. This equates to an increase in of approximately 25% in significant wave height over existing conditions for these extreme cases. The direction of the incoming swell had only a slight effect on the changes to significant wave height as a consequence of the channel deepening.

7. The predicted changes to swell have heights would not be significantly changed by the inclusion of dredged side trenches in the channel upstream of Redcar as very little of the swell wave energy penetrates that far into the Estuary.

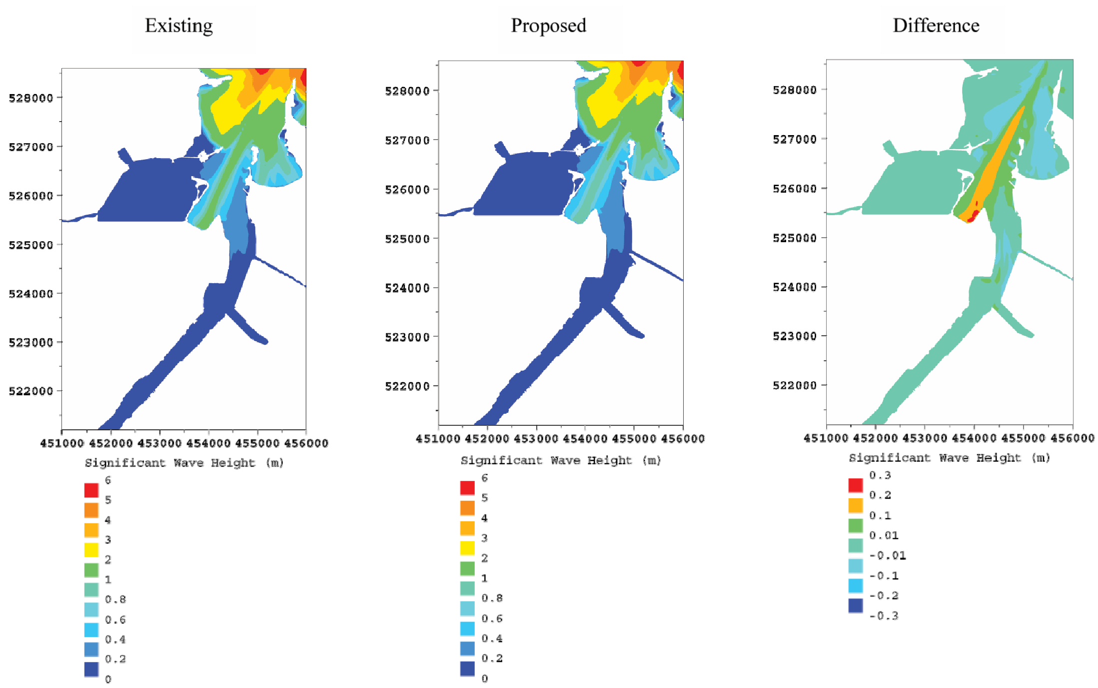


Figure 6.23 Change in swell wave heights for 6m swell wave from 30° N

8. Much of the predicted change in wave conditions at the mouth arises from the fact that there is presently a backlog of maintenance dredging at this location in the channel. A sensitivity test was undertaken to illustrate the effect of reinstating the channel to the presently declared depth of 14.1m below CD. This sensitivity test was run for 6m swell from 15°N. The results showed that about half of the increase in wave height in the channel and reduction of wave height over Bran Sands and North Gare Sands was due to the re-establishment of the channel edges to the declared depth. The implication of this sensitivity test is that the presented changes in the wave climate from changing the channel depth from 14.1 to 14.5m below CD are enhanced because the baseline case included in the model was shallower than 14.1m below CD along the edge of the channel. PD Teesport could dredge to 14.1m below CD at this location at present without consent and would be expected to do so to maintain the current port operation. The effect, therefore, of the proposed scheme on wave heights is in reality half that described above.

6.4.4 <u>Non-cohesive sediment studies</u>

1. Sand transport simulations were performed with the HR Wallingford model, SANDFLOW. SANDFLOW is a dynamic non-cohesive sediment (sand) transport model that simulates the advection and dispersion of suspended sediment due to the effects of both currents and waves. The sediment transport algorithm is based on a formula developed by Soulsby (1997).

2. SANDFLOW was used to simulate the sediment transport patterns throughout the Tees estuary due to tidal conditions alone, and including the effects of wave stirring for typical (representative) waves and for storm waves. The resulting infill in the approach channel was calculated for the existing scenario and

subsequently including the proposed scheme. Comparison with average recorded dredging volumes for the outer areas of the navigation channel (areas 9 to 13) confirmed that the processes responsible for the channel infill are in fact storm-related, whereby the larger storm waves give rise to wave-driven currents which serve to drive sand into the outer channel. Sandy sedimentation rates in the area around the Seaton Turning Circle (Chart 9) are also significantly contributed to by sedimentary events, involving the slippage of sediment that has built up on the side slopes of the maintained areas. The results of the model simulations indicated that there will be only a small change in volume of infill due to tides and wave stirring, so that storm infill will remain the dominant mechanism.

3. Under storm wave conditions a small reduction in wave energy over the adjacent intertidal areas at the estuary mouth is predicted following deepening of the channel, but otherwise the development does not alter the wave dynamics substantially. On this basis it is concluded that the principle mechanism for infill in the dredged areas will be largely unchanged by the development and hence the infill rates in the operational phase will be very similar to the present day. Sand infill in the outer parts of the navigation channel is not, therefore, expected to increase substantially. This is to be expected given the relatively small increase in the channel depth for this area.

6.4.5 Cohesive sediment studies

Model establishment

1. As described in Section 6.2.3 the fines content (silts and clay) of materials dredged are of the order of 20-25% of the total accumulation (PDT, *pers. comm.*).

2. Mud transport modelling has been undertaken to examine the behaviour of the mud fraction following the proposed channel deepening in order to examine the potential for effect on the maintenance dredging requirement in the estuary and potentially, as a consequence, the sediment dynamics of intertidal areas.

3. As described in Section 6.2, the bulk of fine sediment enters the system during the flood tide period having been resuspended from the seabed in Tees Bay (i.e. the main source is offshore). Once within the estuary, fine sediment is pushed further landward by the gravitational circulation present, possibly with additional resuspension and upstream movement as a result of agitation by dredging activities or vessel passage.

4. The chosen model for the study of fine sediment transport was SUBIEF3D which is a post processing transport model within the TELEMAC system. SUBIEF3D uses the hydrodynamics generated by TELEMAC3D to transport fine sediment with allowance for the deposition and erosion of material on the bed. Full details for the software are given in Luck (2002).

5. The selection of conditions simulated was as used for the Tees Barrage study (HR Wallingford 1989a) which divided the year into two periods; ‘winter’ /

'equinoctial' conditions (October to April) with the high fluvial flow and mud concentrations in Tees Bay of 125, 250 and 600 mg/l and 'summer' conditions with low fluvial flow and mud concentrations in Tees Bay of 125 and 250 mg/l.

6. This combination of conditions was run and a total infill rate of 560,000m^3/year was predicted (100,000m^3 in summer, 380,000m^3 in winter and 80,000m^3 from fluvial sources). This total is of the right order compared to *in situ* dredged volumes (approximately 300,000m^3/year fines) allowing for the use of a single assumed density of deposited material of 500kg/m^3, the modelled assumption of a large freshwater flow into the River Tees over the seven month period and the consequent larger than average gravitational circulation. This simulation suggests approximately 80% of the infill occurs during the seven month winter/equinoctial period (assuming most of the fluvial input is in the winter).

Predicted effects of the development

7. The simulated change in annual accretion of fine material is an increase of 60,000m^3/year; this represents an increase of about 10% over the prediction for the existing situation. The interesting result here is that the summer accretion volumes are predicted to decrease (to 60,000m^3) and the winter/equinoctial periods are predicted to increase (to 480,000m^3). This suggests a balance between two effects: with overall tidal currents reduced in the estuary mouth due to the deepening (leading to a reduction in summer infill) but with enhanced gravitational circulation leading to larger near bed landwards residual flows and an increase in infill during the winter/equinoctial periods.

8. Since the simulations undertaken covered more extreme freshwater flow conditions (60 cumecs for high flow and 0 cumecs for low flow) the predicted impacts (increase in winter period and decrease in summer period) are considered to be at the upper and lower limits of likely changes.

6.4.6 Plume studies of Dabholm Gut outflow

1. The dispersion of suspended solids released into Dabholm Gut through licensed discharges was simulated using the HR Wallingford developed model SEDPLUME-RW(3D). It should be noted that, as a consequence of the construction and operational phases of the proposed development, no additional discharges will be made to Dabholm Gut. The aim of the modelling was to examine whether the proposed development would result in a change to the dispersion characteristics of the discharge and, therefore, whether there was a potential for the development to result in a deterioration in water quality within the Tees estuary. The modelling comprised simulating the dispersion and deposition of particles introduced as a source at the head of Dabholm Gut.

2. The model predictions indicate that the distributions of suspended and deposited particulates from Dabholm Gut will be similar following the proposed development when compared to existing conditions. The main differences are that following the proposed development the core of the plume of suspended particles tends to be closer to the east bank of the Tees estuary than under existing conditions, so that deposition is enhanced near the eastern shore to the

north of Dabholm Gut. For spring tide conditions, deposition in the deepened Tees Dock turning circle is somewhat enhanced for the proposed layout, particularly in winter. However, although more material may deposit in various places compared to the present situation, the footprint of deposition will be unchanged.

6.5 Prediction of morphological change

6.5.1 Estuary-wide assessment of morphological change

1. The preceding sections present the findings of the flow, wave and sediment (mud and sand) transport studies. The effects that are predicted and described have the potential to impact on habitats throughout the estuary system during the operational phase and as such, are of importance for a number of aspects for example, marine ecology and ornithology. The overall effects on estuarine morphology are summarised below, with the implications for other environmental parameters described in the relevant sections of the ES.

2. The changes to the physical processes that have the potential to affect estuary morphology are summarised as follows:

- Reduced large-scale flows in the main deepened channel;
- Increased near bed landward residual flow;
- Slightly increased tidal range towards the Tees Barrage;
- Increased import of fine sediments resuspended in Tees Bay;
- Increased reflection of wind waves within the estuary from the reclamation;
- Increased swell wave heights in the deepened channel; and
- Reduced swell wave heights over the intertidals at the mouth of the estuary.

3. The implications of these predicted changes to the physical processes are described below for various zones within the estuary.

4. It should be noted that in the context of the Tees estuary, the seaward part of the proposed capital dredge introduces only minor changes to the existing bathymetry and consequently the extent of hydrodynamic change is small. However, the orientation of the estuary mouth is sensitive to storm wave direction and minor changes to the slopes of the entrance channel are predicted to result in increased wave penetration into the Phillips Basin and corresponding reductions in wave energy over North Gare and Bran Sands. There is considerable variability in storm wave action and severity from one storm to the next and throughout one year to another. Consequently the significance of the impact on storm waves must be considered against this context.

Subtidal area between the proposed development and the Tees Barrage

5. The tidal range is predicted to increase by a very small amount (4mm for spring tide conditions) and the timing of the tides is expected to be advanced by 2 minutes. No significant change to current speed magnitudes is predicted beyond the immediate area of the deepening. The strengthened gravitational circulation in the deepened area is predicted to have a slight effect directly

upstream of the deepening. However the increased siltation is expected to be restricted within the deepened area, at least partly due to the change in bed level between the deepened area (14.5m below CD) and directly upstream (depths of 10.4m below CD then 8.5m below CD).

6. Slightly more wave energy from swell waves entering the estuary mouth directly from offshore is predicted to reach the upstream channel (approximately 3%).

Intertidal area upstream of the development (North Tees mudflat)

7. The change in tidal high water will not affect the intertidal area as at this stage of the tide the water level will be against the river walls. The predicted increase in low water has the potential to convert about 160m^2 of intertidal to subtidal, assuming approximately 1600m length and a 1:50 intertidal slope. The implications of this change in terms of area available for feeding waterbirds are described in Section 11.2.3.

8. Wind induced waves are predicted to be unchanged for wind speeds up to 20 m/s.

9. Slightly more of the largest swell wave energy may get into the area upstream of the development (e.g. 6m offshore waves from 15^{o}N are predicted to increase Hs to 0.98m (3% increase)). However, this small increase under extreme conditions is not likely to have a significant effect on the morphology of the Estuary in this area.

Tees Dock and turning circle

10. Reduced through-depth flows, but an increase in near bed net landward flows, are predicted to lead to an increase in fine material infill of the order of 10%. A local redistribution of wave energy is predicted, with reductions between the BASF terminal and intertidal area opposite the new quay for wind induced waves. No increase for swell waves entering the system. There is a potential for a slight increase in the proportion of material from Dabholm Gut depositing in the Tees Dock turning circle.

Proposed container terminal

11. Reduced through depth flows, but an increase in near bed net flow, lead to increased infill of fine material of the order of 10%, possibly concentrated towards the proposed berth pocket. Both wind and swell induced waves are predicted to decrease (by 4-8% for tested conditions).

Dabholm Gut

12. The dredging will increase the bed slope outside the entrance to Dabholm Gut and some readjustment of the slope may occur, depending on the nature of the bed material. Current conditions are predicted to decrease at, and upstream of, the entrance to Dabholm Gut with small increases predicted downstream. A very small (mm) predicted raising of high and low waters will change the detail of

the time of inundation and drying of the channel intertidal areas, but it will not be noticeable.

Deepened approach channel

13. Reduced through depth flows are predicted which, combined with the strengthened near bed landward flow, are predicted to result in increased import of fine material with the potential to increase the maintenance dredging requirements by about 10%. The distribution of the infill is expected to broadly reflect the present pattern. No increase in sandy infill is predicted. Some increase of swell wave penetration is predicted, mostly towards the ConocoPhillips Oil Terminal (H_s 20% for 6m Hs waves from 15^o).

14. Increased swell wave energy is predicted seawards from ConocoPhillips Dock along the approach channel for swell waves coming directly from offshore.

Enlarged Seaton Channel turning circle

15. No increase in sand infill is predicted in the Seaton Channel turning circle. However the enlarged turning area will increase the length of slope liable to slumping which will act as an increased (short-term) source of sandy material for Seaton Channel. Reduced storm wave action over North Gare (which would reduce the mobilisation of sand from this location) may counter this affect. Wave conditions for wind induced waves from the south-west are predicted to slightly increase (4%) in the intertidal area to the north of the turning circle which may also change the supply of sand from the side slopes although the wave magnitudes are small (approximately 0.6m for 20 m/s winds). The overall increase in fine material import into the estuary will increase the proportion of fine material removed by maintenance dredging operations from the turning circle.

Seaton Channel

16. No changes to tidal or wave conditions within the channel are predicted. An increased infill rate of fine material of a similar order to the Tees channel is predicted (approximately 10%). No increase in infill from marine sand is predicted. However the enlarged turning area will increase the length of slope liable to slumping acting as an increased source of sandy material in the short-term. The predicted reductions in storm wave action over North Gare may counter this effect reducing the sediment supply from North Gare Sands into the Seaton Channel turning circle.

Seal Sands

17. Analysis of bed sediment shown in HR Wallingford (2002) suggests that in Seaton Channel the bed sediment tends to be finer (>70% particles < 63um) whereas on Seal Sands bed sediments over most of the area comprise sediment of less than 50%, fines, particularly towards the east. Of this amount of fine material, 15-20% was identified as clay with the remaining material being silt. The material showed a pattern with the sandiest sediment occurring at

higher elevations and muddier sediment in gullies and deeper pockets on the top of Seal Sands. The sands in the area are reported as very fine with D85 0.1 – 0.2 mm.

18. Det Norske Veritas (2004) quoted a study by the University of Durham (Donoghue *et al*, 2003) which estimated net accretion of 3.5mm/year over Seal Sands and a general increase in the percentage of fines over the period (1992 - 2003). This conclusion would be in line with evidence that the material removed from the maintained areas of the Tees Channel have become finer, but in contrary to HR Wallingford (2002) which reported that sediment on Seal Sands was getting coarser.

19. A number of reasons for the accretion on Seal Sands were postulated in HR Wallingford (2002). They were broken in to the consideration of changes to the sediment supply and changes to the processes occurring on Seal Sands.

20. Changes to sediment supply:

- Changes in coastal drift, probably due to changes in wave climate;
- Demise of the slag shoal off the North Gare Breakwater;
- Breaches in the slag embankment protecting the Seaton Channel from incursion from North Gare Sands;
- Increased sedimentation in the turning area probably due to a combination of the build up on North Gare Sands and more favourable conditions for sedimentation as an effect of the barrage (more infill leading to more raised concentrations from dredger operations).

21. The main change to the processes on Seal Sand was a general reduction in erosive forces:

- Reduced intertidal area since most of Seal Sands was reclaimed - reduced currents
- Reduced fetch because of reclamation reducing wind generated wave heights. This would reduce erosion;
- The rainfall has generally declined over the relevant period. This would also have the effect of reducing erosion;
- The formation of *Enteromorpha*. The literature gives clear guidance that this is likely to reduce erodability by increasing shear resistance. An increased abundance of *Enteromorpha* over the last decade is also reported in Donoghue (2003).

22. Of these processes, the proposed development is predicted to alter the situation in the following ways:

- Short term deposition during dredging operations (up to 3% of material dredged in outer channel is expected to accumulate on Seal Sands).
- Potential short term increased sand supply to the enlarged Seaton Channel turning area if the new dredged side slopes need to adjust themselves to reach stable gradients – or a potential short term reduction in supply if the enlarged turning area is initially stable and acts as a sink for sand.

- Reduced sand flux across North Gare Sands leading to less long term sand incursion into the turning area.
- No change to tidal currents, tidal range or wave conditions in Seal Sands.
- Increased import (aproximately10%) of fine sediments to Seaton Channel with a proportionate increase in fine sediment supply to Seal Sands.

North Gare and Bran Sands

23. The intertidal areas at the mouth of the estuary are outside any changes in tidal hydrodynamics. Swell wave conditions are predicted to be unchanged or decrease for the conditions tested. No change to the tide range or phasing is predicted.

24. Since no change in sandy infill is predicted for the channel it is expected that the overall volume of the intertidals will be unchanged. However, the changes to the pattern of extreme wave conditions may result in local redistribution of bed material and either an increase in net accumulation or a reduction in net erosion.

25. The deepening of the entrance channel will in places result in changes to the side slopes of the entrance channel adjacent to designated intertidal areas and various training walls in the lower estuary. Although the potential for effect on the stability of training walls and designated intertidal areas in the lower estuary as a result of the proposed channel deepening is low, the design of the lower channel dredging was amended in order to ensure that no adverse effect would arise. These channel design changes are summarised as follows:

- Narrowing the proposed deepened channel by 5m on its southern edge;
- Redesigning the deepened Seaton Channel turning circle to avoid dredging adjacent to intertidal areas.

26. Whilst providing a benefit in terms of removing any potential for effect on designated intertidal areas and the stability of training walls, the proposed design changes are of very small magnitude and are considered negligible in terms of affecting the findings of the numerical modelling. Nevertheless, a sensitivity test was undertaken to verify this conclusion; the findings are presented in Section 6.6.

6.6 Sensitivity test of the implications of changes to the proposed channel design

1. The numerical flow model was amended to include the proposed layout of the capital dredging in the lower channel and run for spring tide conditions under high fluvial flow. These conditions were chosen to demonstrate the effect of the change on the highest typical currents in the area.

2. The model results are shown in Figures 6.24 and 6.25 which show the tidal current magnitudes at times of peak ebb and flood tide and the predicted difference to the results as a consequence of the <u>changes</u> to the proposed dredging in the lower channel (i.e. not the effect of the channel dredging in total; such effects are presented throughout the remainder of Section 6). The

differences can be seen to be localised to the areas where changes to channel design are proposed, with the only consistent change being speed reductions in the small deepened areas. Figure 6.26 shows the pattern of depth-averaged tidal currents at the times of peak ebb and flood tide; this figure confirms the small and localised effect of the minor changes to the design of the approach channel.

3. On the basis of the sensitivity test it is concluded that the impacts of the proposed capital dredging are not affected by the proposed minor changes to the design of the approach channel.

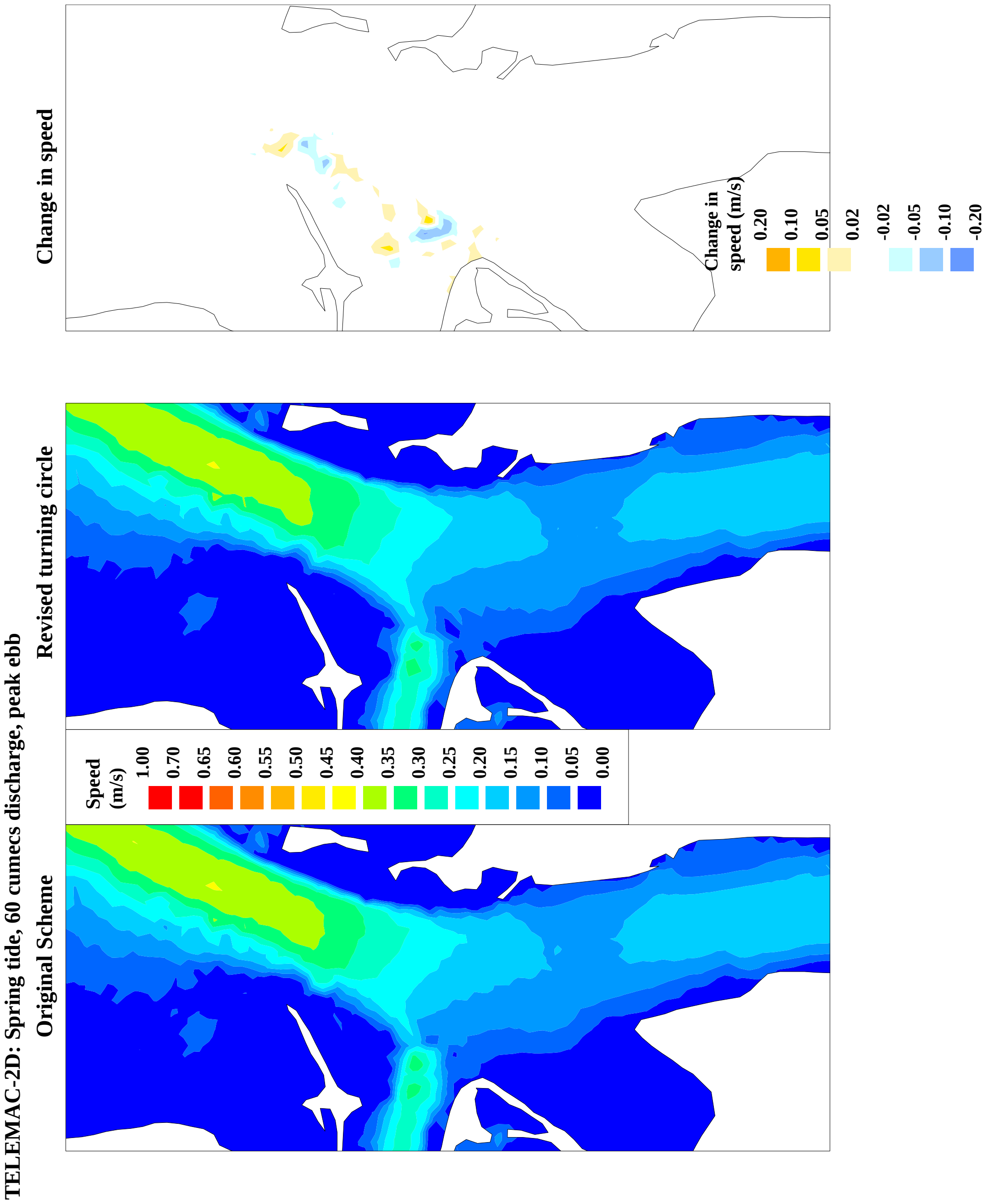


Figure 6.24 The predicted effect of proposed changes to the design of the capital dredging in the lower channel on peak current speeds at peak ebb

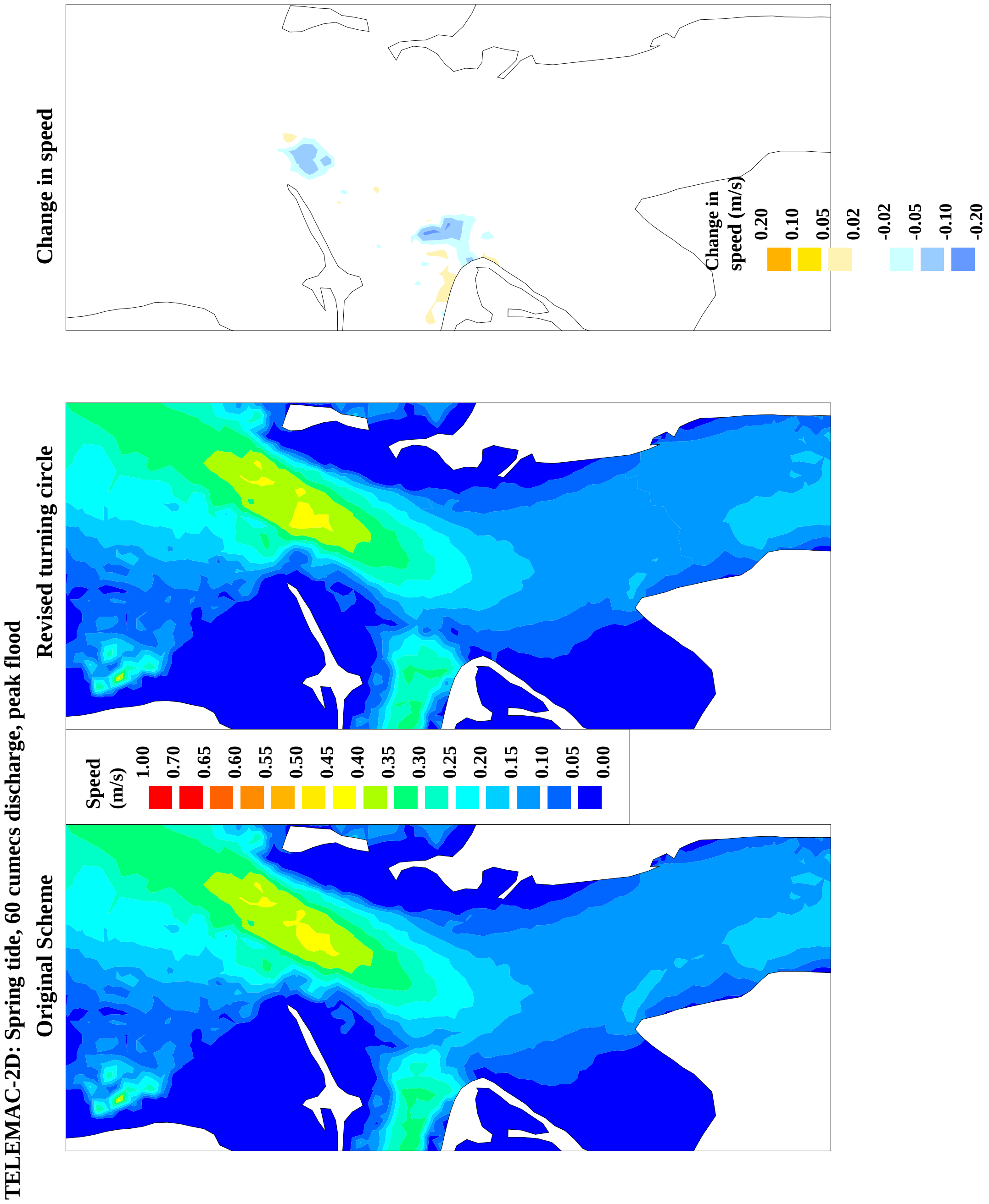


Figure 6.25 The predicted effect of proposed changes to the design of the capital dredging in the lower channel on peak current speeds at peak flood

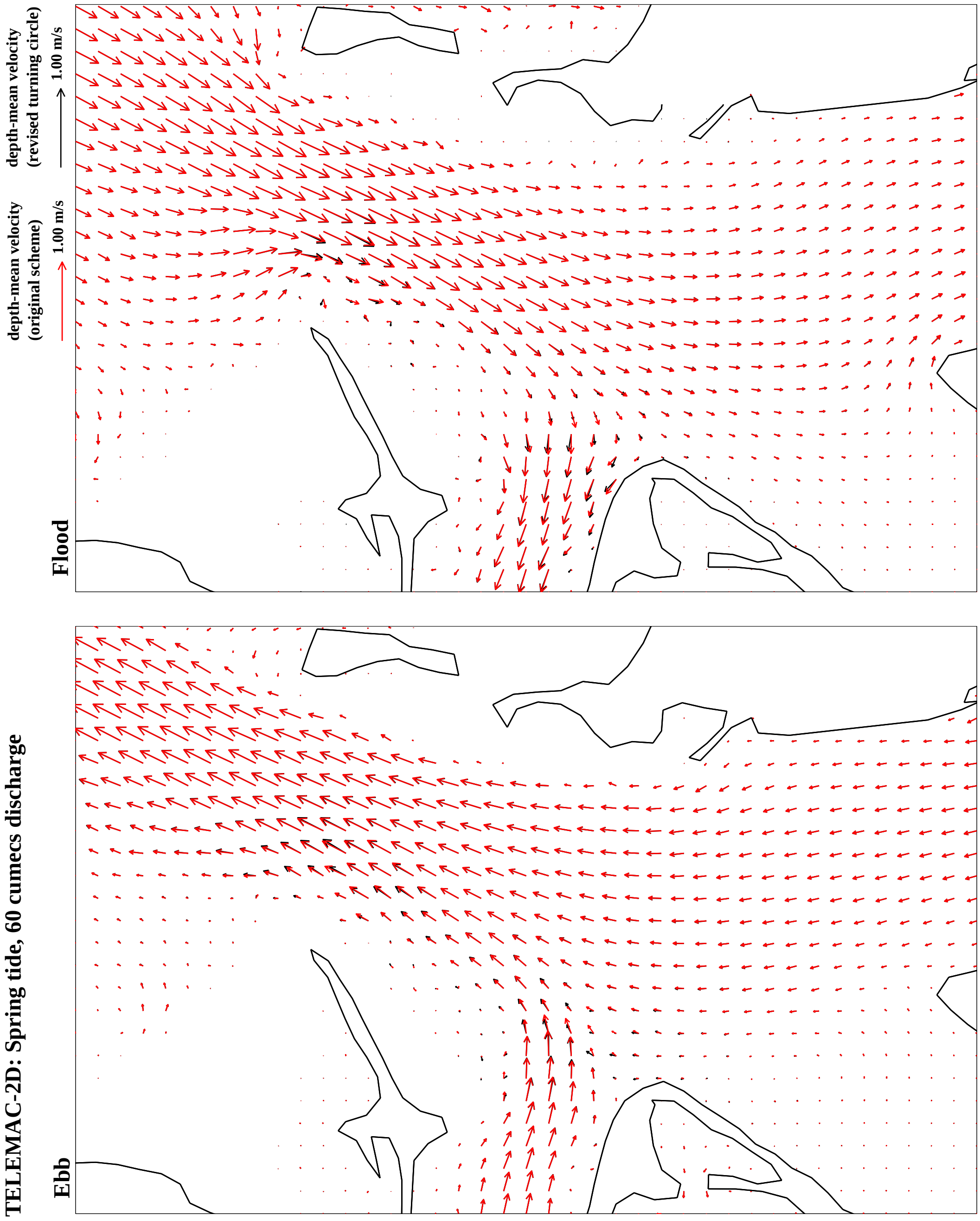


Figure 6.26 **The predicted effect of proposed changes to the design of the capital dredging in the lower channel on depth-averaged tidal currents**

7 MARINE SEDIMENT QUALITY

1. The capital dredging will resuspend seabed sediments and enable sediment to be dispersed throughout the water column and Tees estuary, with subsequent settlement onto the seabed in certain areas of the estuary. As a consequence, the dredging has the potential to lead to alterations in the physical, chemical and microbiological characteristics of the areas to which the sediment disperses and subsequently settles. The main routes whereby sediment is released into the water column during the dredging activity are through sediment disturbance at the dredge head and the overflow of water (containing suspended sediments) from the dredger. The dispersion and settlement of fine sediment during capital dredging has been modelled by HR Wallingford (see Section 6.3, with full details provided in Accompanying Document 1).

2. This section identifies the physical, chemical and biological characteristics of the sediments both within the area to be dredged and areas in the lower Tees estuary to which sediments have the potential to disperse and settle (termed 'receptor sites'). Additionally this section assesses the significance of the changes associated with the operational phase of the proposed scheme.

7.1 Existing environment

7.1.1 Overview of sediment quality based on existing sources

1. As a heavily industrialised estuary with a large surrounding population, the Tees estuary has historically received a considerable amount of waste discharges containing high concentrations of contaminants. Over the years, therefore, estuarine sediments have acted as a sink for these contaminants. Improvements in the last 20 years have significantly decreased the amount of contamination entering the estuary; however where estuarine sediments have remained undisturbed (other than *in situ* geological material), the presence of historical contamination can still be an issue. It therefore follows that, generally, where sediments have been removed through capital and maintenance dredging programmes, the risk of contaminated sediment remaining is decreased, although this clearly depends on the depth to which sediments have been removed.

2. There have been a number of sediment quality studies undertaken in the Tees estuary and sediment quality data are available for the area in the vicinity of the proposed terminal. In summary, these studies indicate that analysis of sediments in the Tees estuary has shown that various parts of the estuary have, over the years, had above background levels of heavy metals. These levels however, have in the majority of cases, continued to fall since 1995 (Tansley, 2003). Additionally, studies by the NRA (1995) indicated that poly cholorinated biphenol (PCBs) and polyaromatic hydrocarbon (PAHs) contamination is distributed throughout the estuary to varying degrees.

3. The baseline survey carried out for the Riverside Ro-Ro terminal and bulk handling facility by Posford Duvivier (1995) indicated that copper was the only metal found in significant quantities along the Teesport river frontage and in

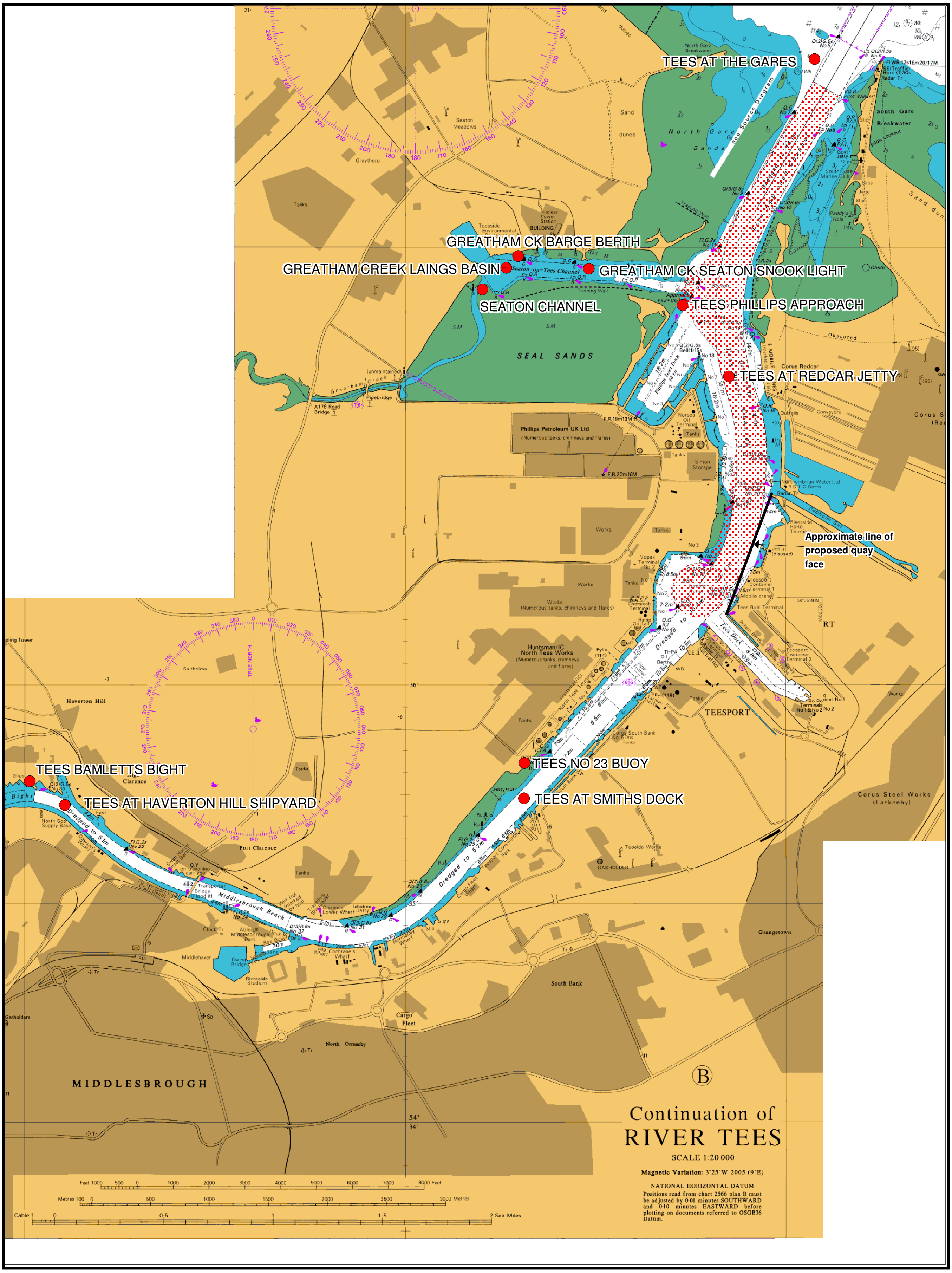
Dabholm Gut. Additionally PCB Aroclor congeners 1242, 1254 and 1260 and the organochlorine pesticide heptachlor were found in significant concentrations. In the intertidal areas fronting the Teesport Estate, metals (mercury and copper) were deemed to be above that acceptable as background conditions. Unlike the Teesport river front, the presence of PCBs or heptachlor was not detected.

4. Further sampling and analysis was undertaken in 1998 in and around Tees Dock as a consequence of the requirement to undertake maintenance dredging in this area. This analysis indicated elevated levels of the heavy metals zinc and copper. Sampling results for PCBs, however, indicated levels below the limit of detection.

5. As part of the National Marine Monitoring Programme (NMMP), the Environment Agency collects sediment quality data annually at various sites within the Tees estuary and tributaries. This programme aims to detect long-term trends in physical, biological and chemical variables at selected estuarine and coastal sites. This is mainly aimed at establishing if regulatory measures are effective in protecting the marine environment. A summary of this information is presented for nine sites located within the Tees estuary in Table 7.1. For the purposes of providing a summary, the data for the period 1996 to 2004 was averaged at each site for each determinand. Where 'less than' values were recorded (i.e. values recorded below the limit of detection), the data was taken at half face value. The locations of the monitoring stations are shown in Figure 7.1.

Table 7.1 National Marine Monitoring Programme sediment chemistry data supplied by the Environment Agency

Location	As mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Pb mg/kg	Hg mg/kg	Ni mg/kg	∑ PCB (7) mg/kg	Zn mg/kg
The Gares	32.8	0.70	29.1	31.3	49.8	0.2	18.0	13.5	86.3
Smiths Dock	24.4	0.95	92.8	114.6	185.6	1.19	31.3	8.7	282.9
Seaton Snook	30.0	0.75	49.7	52.6	74.0	0.41	25.2	6.6	117.9
Laings Basin	27.5	0.54	63.2	65.2	89.2	0.65	27.9	6.8	135.9
Bamletts Bight	15.3	1.48	161.8	78.3	455.7	1.18	43.3	12.1	406.5
Buoy 23	26.9	1.56	207.2	133.1	295	2.2	48.9	15.5	498.2
Phillips Approach	30.7	0.31	83.5	42.2	91.1	0.32	36.7	4.2	163.3
Haverton Hill Shipyard	20.6	1.40	170.6	100.9	373.3	1.94	29.6	8.6	307.7
Redcar Jetty	28.8	0.48	44.7	49.3	77.4	0.4	24.2	6.0	115.8



Key:

Proposed Dredge Footprint

Source: ARCS Charts under licence from UKHO

National Marine Monitoring Programme Sediment Sampling Sites (EA)

Northern Gateway Container Terminal
Environmental Statement

PD Teesport

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1 cm = 0.5 km

Figure 7.1

ROYAL HASKONING

6. Of the above monitoring stations, the only site directly located in the area of the proposed capital dredging is Redcar Jetty. The Gares and Phillips Approach monitoring sites are located just outside of the proposed dredging area. All other sites are located some distance from the proposed dredging area.

7. In summary, this data shows that all areas have some level of sediment contamination. The site at Redcar Jetty (located within the footprint of the proposed dredge), however, shows relatively low levels of contamination in comparison to other monitoring stations located outside of the area to be dredged. This is probably related to the continual removal of sediments via maintenance dredging that has occurred over the years.

7.1.2 Surveys undertaken for the EIA

1. A survey was undertaken as part of the EIA to establish the baseline physical, chemical and microbiological conditions for sediments within the footprint of the proposed capital dredge. In total, of the ten sites proposed, eight sites were sampled; two locations could not be sampled due to recent dredging activity over one site and restricted tidal accessibility to the other. Additional samples were also collected at five intertidal 'receptor areas' which could potentially be subject to deposition of sediment that will be disturbed during the capital dredging. These receptor areas correspond with sites that are designated for their nature conservation importance.

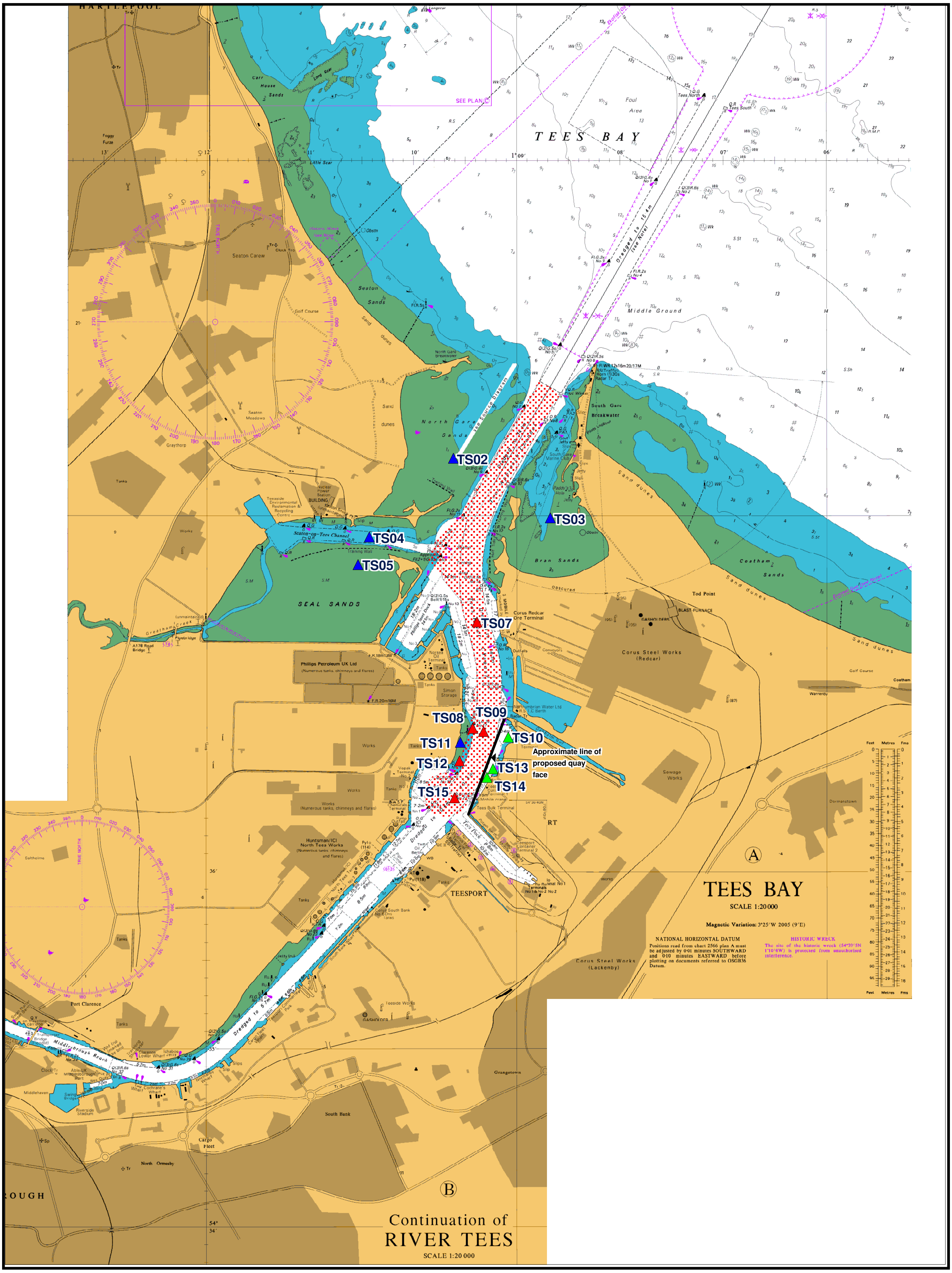
2. Samples were collected using a stainless steel grab during the marine biological survey. The physical, chemical and microbiological characteristics of the sediment samples were determined through analysis, as detailed below.

3. The proposed scope of the analysis and the survey methodology was presented in the Environmental Scoping Report and through consultation with English Nature, CEFAS and the Environment Agency.

4. To assist in the presentation of data, the information collected during the sediment quality survey has been divided into three groups; 'main channel', 'reclamation area' (vicinity of proposed new quay wall) and the 'receptor sites'. This is based on the expected sediment quality of the various sites; for example, the area for the new quay wall has been considered separately due to the expectation that the presence of fine sediment, which has not been dredged historically, has the potential to have higher concentrations of contaminants compared with the main channel which has been extensively dredged in the past. Figure 7.2 presents the locations of all the sampling sites and shows the split of these sites into the three groups.

7.1.3 Physical characteristics

1. Physical parameters are analysed to enable the comparison of the physical characteristics of the material to be dredged to be compared with the characteristics of the material present in the receptor sites. Additionally,



Key:

- ▲ (red) Main Channel
- ▲ (green) Reclamation Area
- ▲ (blue) Receptor Sites

Source: ARCS Charts under licence from UKHO

Sediment Sample Locations

Northern Gateway Container Terminal
Environmental Statement

Client:
PD Teesport

April 2006

Scale:
1 cm = 0.5 km

Figure 7.2

ROYAL HASKONING

physical parameters control the processes involved with the mobilisation of sediment-associated contaminants (CIRIA, 2000).

2. The predominant characteristics influencing the immobilisation and mobilisation of sediment-bound contaminants were determined, and are listed as follows:

- Particle size distribution;
- Basic sediment types (i.e. silt, sand or gravel); and,
- Total organic carbon content (TOC).

3. For physical characteristics, there are no sediment quality standards. The assessment criteria (i.e. the determination as to whether or not an impact would arise) are, therefore, the physical conditions at the receptor sites. Physical characteristics are also used to inform the impact assessment of chemical contaminants.

4. The results of the particle size analysis are presented in Tables 7.2 (receptor sites) and 7.3 (reclamation area and main channel sites).

Table 7.2 Data from particle size analysis of sediments from the receptor sites

Classification (% of each)	Sample site				
	TS02	TS03	TS04	TS05	TS11
Clay	2	8	16	5	3
Silt			62	18	82
Sand	80	92	22	77	15
Gravel	18	0	0	0	0
Cobbles	0	0	0	0	0
Boulders	0	0	0	0	0
Organic carbon	0.4	0.8	6.4	5.9	0.7

Table 7.3 Data from particle size analysis of sediments within the main channel and reclamation areas

Classification (% of each)	Sample site							
	TS07	TS08	TS09	*TS10*	TS12	*TS13*	*TS14*	TS15
Clay	16	10	32	*22*	3	*28*	*29*	28
Silt	50	22	48	*63*		*61*	*65*	63
Sand	34	67	20	*15*	97	*11*	*6*	8
Gravel	0	1	0	*0*	0	*0*	*0*	1
Cobbles	0	0	0	*0*	0	*0*	*0*	0
Boulders	0	0	0	*0*	0	*0*	*0*	0
Organic carbon	4.4	5	8.7	*1.2*	8.4	*4*	*7.8*	8.6

5. Sediments in the receptor sites in the intertidal areas close to the estuary mouth (TS02, TS03, TS05) predominantly comprise of sandy material (>75%) with low amounts of silt (<20%). Receptor sites located in existing channels (TS04 and TS11), however, comprise of more silty sediments (>60%) with varying amounts of clay and gravel. The percentage of organic matter varies between 0.4% and 6.4%.

6. Sediments in the area to be reclaimed (TS10, TS13 and TS14; shown in italics in Table 7.3) comprise of relatively high percentages of silty material (>60%) and percentages of clay varying between 22% and 29%. Small amounts of gravel are also present and percentage composition varies between 6% and 15%.

7. Sediments in the main channel are quite variable in nature; however, most contain high percentages of clay and silt (i.e. in total >60%). In contrast, sites TS08 and TS12 located opposite to the new quay wall area contain greater percentages of sand (i.e. >60%).

8. Organic matter content at these sites varies between 1.2% and 8.7%.

7.1.4 Chemical characteristics

1. Contaminants within the sediments to be dredged can, depending on the physical characteristics of the sediments (see Section 7.1.3), be mobilised and pose a risk to the environment. By undertaking a literature review, and in discussion with consultees, the following determinands were identified as being of concern:

- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) and other metals (aluminium, boron, iron, manganese, selenium, silver and vanadium);
- Organotins (Tributyl tin (TBT) and dibutyl tin (DBT);
- Total petroleum hydrocarbons (TPH);
- Polyaromatic hydrocarbons (PAHs) (USEPA 16);
- Polychlorinated biphenyls (PCBs) including 25 congeners;
- Organochlorine pesticides (hexachlorohexanes (HCHs), drins, dichlorodiphenyltrichloroethane and derivatives (DDTs));
- Ammonia;
- Sulphide;
- Brominated flame retardants; and,
- Nonalyphenols (Endocrine Disruptors).

2. Sediment analysis for the above parameters was undertaken at each of the 13 sites. The analysis for brominated flame retardants was undertaken at five randomly selected sites throughout the estuary. The raw data is presented in Appendix 3.

3. The principle approach to assessing sediment quality impacts is to compare survey results against assessment criteria established as sediment quality guidelines. Published research and baseline environmental conditions at the receptor sites can also be used.

4. Unlike water quality, there are no quantified UK environmental quality standards (EQSs) for *in situ* sediment quality. The only guidance for sediment quality is defined as “standstill (no deterioration)” and is required for most of the EC Dangerous Substances List 1 parameters. In the absence of any UK standards, the Canadian interim sediment quality guidelines (ISQG) have been used. These guidelines were developed by the Canadian Council of Ministers of the Environment as broadly protective tools to support the functioning of healthy aquatic ecosystems (CCME, 2001). They are based on field research programmes that have demonstrated associations between chemicals and biological effects by establishing cause and effect relationships in particular organisms.

5. Comparison of measured concentrations of various contaminants within the sediments with these guideline values will, therefore, provide a basic indication on the degree of contamination. Additionally, Section 10 (marine ecology) will use this comparison to make an initial assessment as to whether the organisms present within the Tees estuary sediments are at risk from sediment contamination.

6. The Canadian ISQGs should be used with caution and the findings treated as indicative. This is because they are designed specifically for the country in which they were developed. However, it has become commonplace for these guidelines to be used in the UK.

7. The guidelines consist of threshold effect levels (TELs) and probable effect levels (PELs). The TELs and PELs are used to identify the following three ranges of chemical concentrations with regard to biological effects. It is likely that the TELs will be adopted as the ISQGs (CCME, 2001):

- Below the TEL - the minimal effect range within which adverse effects rarely occur.
- Between the TEL and PEL - the possible effect range within which adverse effects occasionally occur
- Above the PEL - the probable effect range within which adverse effects frequently occur.

8. Table 7.4 lists the existing sediment quality guidelines for some of the parameters monitoring during this survey (i.e. those parameters for which sediment quality guidelines exist).

Table 7.4 Interim marine sediment quality guidelines (ISQGs)/threshold effect levels (TELs) and probable effect levels (PELs) (dry weights)

Substance	Units	ISQG/TEL	PEL
Arsenic	mg/kg	7.24	41.6
Cadmium	mg/kg	0.7	4.2
Chromium	mg/kg	52.3	160
Copper	mg/kg	18.7	108
Lead	mg/kg	30.2	112
Mercury	mg/kg	0.13	0.7
Zinc	mg/kg	124	271
DDD*	µg/kg	1.22	7.81
DDE*	µg/kg	2.07	374
DDT*	µg/kg	1.19	4.77
Dieldrin	µg/kg	0.71	4.3
Endrin	µg/kg	2.67	62.4
Heptachlor epoxide	µg/kg	0.6	2.74
Lindane (HCH)	µg/kg	0.32	0.99
Nonylphenol	µg/kg	1.0	-
PCBs: total PCBs	µg/kg	21.5	189
Acenaphthene	µg/kg	6.71	88.9
Acenaphthylene	µg/kg	5.87	128
Anthracene	µg/kg	46.9	245
Benz(a)anthracene	µg/kg	74.8	693
Benzo(a)pyrene	µg/kg	88.8	763
Chrysene	µg/kg	108	846
Dibenz(a,h)anthracene	µg/kg	6.22	135
Fluoranthene	µg/kg	113	1494
Fluorene	µg/kg	21.2	144
2-Methylnaphthalene	µg/kg	20.2	201
Naphthalene	µg/kg	34.6	391
Phenanthrene	µg/kg	86.7	544
Pyrene	µg/kg	153	1398

9. There are no ISQGs for the following determinands which were also tested for:

- Metals (Aluminium, Boron, Iron, Manganese, Nickel, Selenium, Silver, Vanadium);
- Tributyl Tin;
- Dibutyl Tin;
- Total petroleum hydrocarbons (C6-C30);
- Aldrin;
- Endosulfan;
- Benzo (k) fluoranthene;
- Indeno (1-2-3-cd) anthracene; and,
- Benzo (ghi) perylene
- Brominated Flame Retardants

Summary of sediment quality data

10. Table 7.5 (main channel and reclamation area) and Table 7.6 (receptor sites) summarise the sediment quality from the survey.

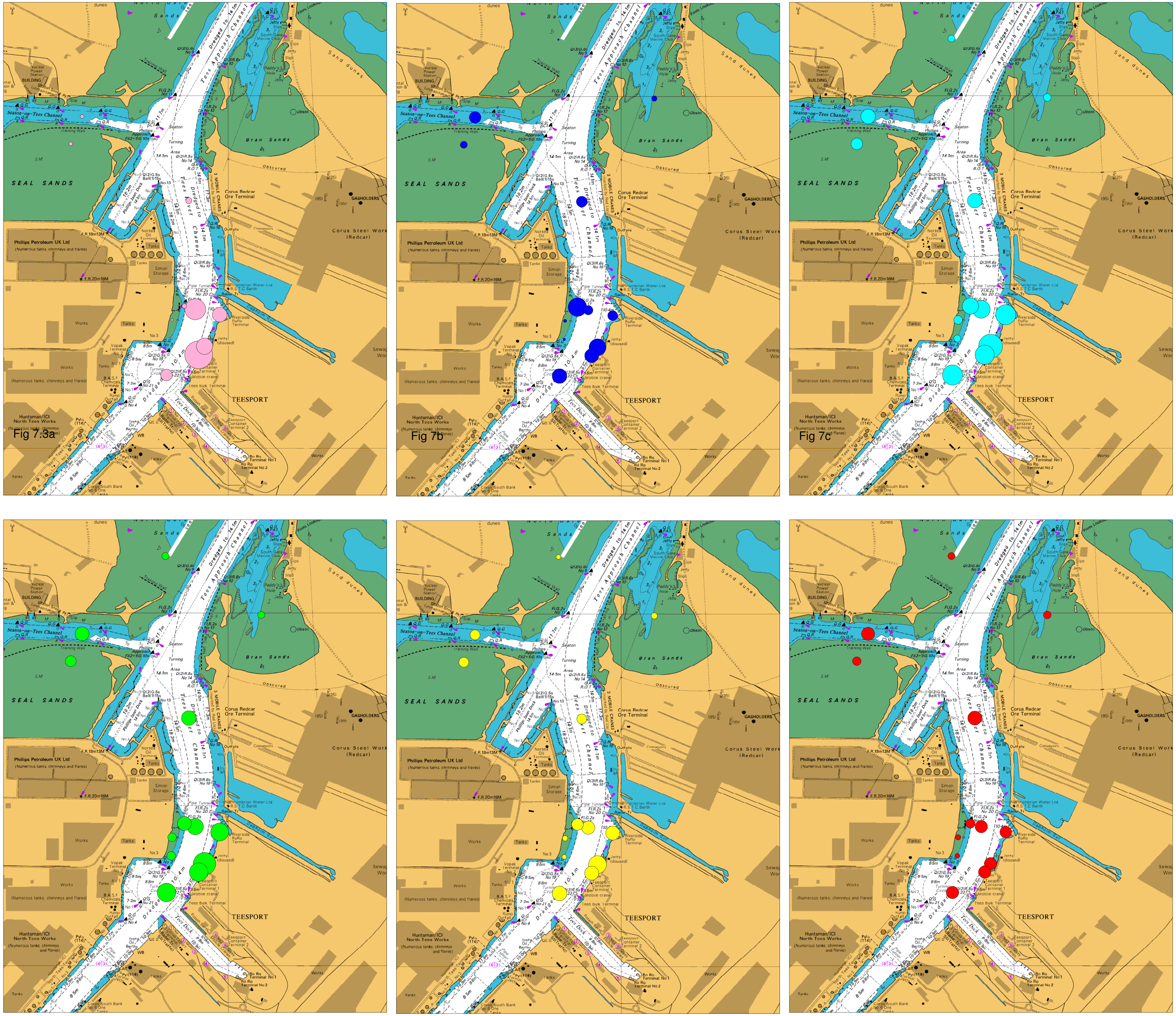
Table 7.5 Summary of sediment quality data for marine sediments within the main channel and reclamation area (ND denotes not detected)

Substance	Units	Concentration range for main channel (TS07,08,09,12,15)			Concentration range in vicinity of reclamation area (TS010,13,14)		
		Min	Max	Mean	Min	Max	Mean
Metals							
Arsenic	mg/kg	4.7	30	19.3	21	24	23
Cadmium	mg/kg	ND	0.72	0.34	0.57	1.1	0.75
Chromium	mg/kg	7.5	52	40.1	58	91	70
Copper	mg/kg	4.3	94	50.86	77	150	104
Lead	mg/kg	35	150	97.6	140	200	163
Mercury	mg/kg	ND	0.73	0.5	0.8	1.3	0.98
Zinc	mg/kg	34	220	142.8	210	310	250
Organotins							
Tri-butyl tin	mg/kg	ND	ND	ND	ND	ND	ND
Di-butyl tin	mg/kg	ND	ND	ND	ND	ND	ND
Total petroleum hydrocarbons							
TPH (Total)	mg/kg	ND	260	161	310	400	343
Organochlorine pesticides (OCP)							
DDD	μg/kg	ND	ND	ND	ND	ND	ND
DDE	μg/kg	ND	ND	ND	ND	ND	ND
DDT	μg/kg	ND	ND	ND	ND	ND	ND
Dieldrin	μg/kg	ND	ND	ND	ND	ND	ND
Endrin	μg/kg	ND	ND	ND	ND	ND	ND
Heptachor epoxide	μg/kg	ND	ND	ND	ND	ND	ND
Lindane (HCH - β)	μg/kg	33	310	61	130	310	148
Polychlorinated biphenyls (PCB)							
PCBs: total PCBs	μg/kg	-	16	-	-	24.1	-
Polyaromatic Hydrocarbons (PAH)							
PAHs (Total)	μg/kg	580	25000	11800	8600	21000	14867
Acenaphthylene	μg/kg	23	420	247	220	790	473
Anthracene	μg/kg	16	970	430	260	900	578
Benz(a)anthracene	μg/kg	29	1500	702	450	850	470
Benzo(a)pyrene	μg/kg	21	1200	559	460	1200	783
Chrysene	μg/kg	34	1700	797	560	1300	943
Fluoranthene	μg/kg	27	720	385	880	2300	1593
Naphthalene	μg/kg	68	2500	1574	990	2400	1863
Phenanthrene	μg/kg	54	2900	1387	830	2300	1610
Benzo(b)fluoranthene	μg/kg	38	1600	766	740	1600	1147
Benzo(k)fluoranthene	μg/kg	23	1100	507	350	800	567
Pyrene	μg/kg	59	2900	1240	840	2300	1547
Alkyphenols							
Nonylphenols	μg/kg	13	1880	583	1020	3160	1793
Brominated flame retardants							
DecabromoDPE#209	μg/kg	ND	150	-	-	340	-
TBBP- A	μg/kg	0.2	1.6	-	2.2	-	-

Table 7.6 Summary of sediment quality data for marine sediments within the potential receptor sites

Substance	Units	Concentration range for receptor sites (TS02,03,04,05,11)		
		Min	Max	Mean
Metals				
Arsenic	mg/kg	5	28	13
Cadmium	mg/kg	ND	ND	-
Chromium	mg/kg	11	34	20
Copper	mg/kg	ND	36	15
Lead	mg/kg	24	91	47
Mercury	mg/kg	ND	0.59	
Zinc	mg/kg	36	130	46
Organotins				
Tri-butyl tin	mg/kg	ND	ND	ND
Di-butyl tin	mg/kg	ND	ND	ND
Total petroleum hydrocarbons (TPH)				
TPH (total)	mg/kg	ND	160	69
Organochlorine pesticides (OCP)				
DDD*	µg/kg	ND	ND	ND
DDE*	µg/kg	ND	ND	ND
DDT*	µg/kg	ND	ND	ND
Dieldrin	µg/kg	ND	ND	ND
Endrin	µg/kg	ND	ND	ND
Heptachor epoxide	µg/kg	ND	ND	ND
Lindane (HCH)	µg/kg	ND	34	11
Polychlorinated biphenyls (PCB)				
PCBs: total PCBs	µg/kg	ND	9.45	-
Polyaromatic hydrocarbons (PAH)				
PAHs (Total)	µg/kg	410	11000	4042
Acenaphthylene	µg/kg	12	120	54
Anthracene	µg/kg	15	320	63
Benz(a)anthracene	µg/kg	14	480	185
Benzo(a)pyrene	µg/kg	ND	460	168
Chrysene	µg/kg	18	640	241
Fluoranthene	µg/kg	38	1100	232
Naphthalene	µg/kg	110	2200	774
Phenanthrene	µg/kg	76	1600	549
Benzo(b)fluoranthene	µg/kg	22	570	239
Benzo(k)fluoranthene	µg/kg	ND	340	135
Pyrene	µg/kg	33	980	383
Alkyphenols				
Nonylphenols	µg/kg	21	97	53

Figure 7.3 illustrates the concentrations of a number of parameters in the various locations.



Key:

Nonylphenols (ug/kg)	Lead (mg/kg)
3,200	300
1,600	150
320	30

PAH (mg/kg)	Chromium (mg/kg)
50,000	200
25,000	100
5,000	20

Zinc (mg/kg)	Arsenic (mg/kg)
400	100
200	50
40	10

Results of Sediment Analysis for Selected Parameters

Northern Gateway Container Terminal Environmental Statement

PD Teesport

April 2006

1 cm = 0.15 km

Figures 7.3

ROYAL HASKONING

Metals

11. Metals are of concern because of their toxicity, persistence and tendency to bioaccumulate in living organisms. Based on the survey results, metal concentrations in the sediments of the Tees estuary are discussed and where a standard exists, compared to the Canadian sediment guidelines.

12. The majority of the samples for arsenic in all three areas record values between the ISQG/TEL and PEL. The samples from the new quay wall area show slightly elevated concentrations when compared to the receptor and main channel areas however these are significantly below the higher effect level (PEL). Conversely, the majority of sites show cadmium levels below the ISQG/TEL. Only two sites exceed the ISQG/TEL and these sites were located in the Tees Dock turning circle (TS15) and in the proposed location of the quay wall (TS13). These two results however, are significantly below the PEL.

13. Chromium concentrations are not found to be above ISQG/TEL in either the main channel or at the receptor sites. Levels exceeding the ISQG/TEL but not the PEL are recorded at all 3 sites in the area of the proposed quay wall.

14. The majority of sites (including the receptor sites) exceed the ISQG/TEL for copper and lead. Although only one sample exceeds the PEL for copper (site TS13), several sites exceed the PEL for lead. These are mainly located within the area proposed for the new quay wall. Mercury levels also exceed the PEL at all three sites located in the area of the new quay wall and at one site in the main channel (TS15).

Tri Butyl Tin (TBT)

15. TBT is of concern due to its sub-lethal effects at very low concentrations. In the baseline survey, all data for the Tees estuary survey recorded values below the limit of detection. TBT is, therefore, not considered to be of concern in this instance.

Poly aromatic hydrocarbons (PAH)

16. PAHs are of particular concern due to their persistence in the environment. Data from the survey indicate that most of sites exceed the ISQG/TEL where ISQG/TELs exist, including those samples collected from the receptor areas. Additionally, a significant number of samples exceed the higher PEL. It must therefore be concluded that levels of PAHs across the estuary, including a number of the receptor areas, are elevated.

Polychlorinated Biphenyls (PCB)

17. Due to their hydrophobic nature, PCBs tend to be adsorbed quickly by organic matter. Again concern arises from their persistence and potential to bioaccumulate within the food chain. Concentrations of PCBs in the sediments indicate levels either under the ISQC/TEL or just above.

Organochlorine pesticides (OCP)

18. Pesticides are designed to be toxic and distribute in the environment to find target pests. Concern arises from their potential to bioaccumulate to toxic

concentrations, predominantly within fish. Results from the survey recorded 'not detected' for the majority of substances. Only Lindane (HCH) recorded positive results with the highest result measured in the reclamation area. All results recorded for Lindane exceeded the PEL; therefore levels of Lindane, where recorded, are considered to be elevated.

Total Petroleum Hydrocarbons (TPH)

19. Petroleum products are complex mixtures containing many hundreds of individual compounds, the majority of which are usually hydrocarbons. As a consequence, it is extremely difficult to analyse for individual components. The parameter 'total petroleum hydrocarbon' (TPH) is therefore used as a surrogate for estimating the petroleum contamination of the sediments.

20. TPH concentrations vary across the sites from 'not detected' in three of the receptor sites to 400mg/kg in the area to be reclaimed. The majority of sample results are greater than 100mg/kg therefore levels of TPHs in the sediments are considered to be elevated.

Nonalyphenols

21. Nonalyphenols are used in industry as surfactants and have been reported to act as endocrine disrupting chemicals. Concentrations varied quite significantly across the study area and ranged from 13µg/kg in the receptor areas to 3160µg/kg in the area to be reclaimed. There is a standard of 1.0mg/kg listed in the Canadian sediment quality guidelines; however a PEL is not defined. It can therefore be concluded that the concentration of nonalyphenol exceeds the ISQG/TEL in the site to be reclaimed. All other sites however, recorded values at or less than 1 mg/kg.

Brominated Flame Retardants

22. Brominated flame retardants are a diverse group of chemicals used to retard the combustibility of commercial goods. As a consequence, these compounds can be found in a large range of everyday products. The most widely used materials fall into three groups;

- Tetrabromobisphenol A (TBBPA) and its derivatives;
- Polybrominated diphenyl ethers (PBDE); and
- Hexabromocyclododecane (HBCD)

23. Information on the potential of brominated flame retardants to enter the environment and consequently to cause pollution is limited. There are, therefore, no guidelines to ascertain at what level these substances become harmful. Information gathered from a literature search for PDBEs states that measured levels are considered to be low if they are less than 100µg/kg of dry sediments. Samples for PBDEs taken from the Tees estuary are therefore predominantly low and are in the range <0.1µg/kg and 9µg/kg of sediment for each congener. There were however two readings at site TS07 and TS10 which recorded values of 150µg/kg and 340µg/kg of Decabromo DPE respectively. Total concentrations of PBDEs are however small in comparison to total values recorded for other areas of the Tees estuary. For example, over 1200 µg/kg has been detected at Bamletts Bight which is located a considerable distance

upstream of the proposed development (Directoraat-Generaal Rikjkswaterstaat, 2000).

24. The highest result for TBBPA was measured at sampling station TS10 which recorded 2.2µg/kg. Again, these concentrations are small in comparison to those measured previously in other areas. For example concentrations of between 25 and 510µg/kg have been found in the River Tees up stream of the development (Law *et al.*, 2005).

7.1.5 Microbiological parameters

1. Due to the proximity of the proposed dredging works to the bathing waters, sediments were analysed for bacterial content. The following parameters were monitored:

- Total coliforms; and,
- Faecal enterococci

2. Results for the majority of sediment sampling sites were reported below the limit of detection (i.e. less than 10 bacteria per gram of sediment). Sites TS05 and TS11 recorded positive values of 20 and 10 faecal enterococci respectively. Bacterial contamination of the estuarine sediments is, therefore, considered to be relatively low. Individual results for all sites are included in Appendix 3.

7.2 Potential impacts during the construction phase

7.2.1 Impact of dispersion and redistribution of sediments on the physical composition of the receptor sites

1. Changes to sediment quality could occur when sediment is released into the water column by dredging, dispersed by tidal currents and subsequently settles onto the seabed. The deposited material may therefore change the physical composition of the seabed sediments at locations in which it is predicted to settle. Changes to sediment chemistry as a consequence of this predicted effect are addressed in Section 7.2.2.

2. In summary, the sediments at the 'receptor' sites predominantly comprise of either silty/clay or sandy silt. Silt predominates in the more sheltered areas (i.e. in the main channel, away from the estuary mouth). Sampling during the sediment survey (see Section 7.1.2) indicates that Seal Sands comprises approximately 20% of fine sediments, the remainder being sand. Other historic data shows, however, that sediment composition over Seal Sands is variable (University of Durham, undated) and, therefore, some areas of Seal Sands are likely to be composed of predominantly finer material (i.e. silts) and some predominantly sand.

3. Coarser sediments predominate in the more exposed areas such as close to the estuary mouth at North Gare Sands and Bran Sands. At these two potential receptor sites there is also a small percentage of silt present in the sediments.

4. The dispersion and deposition of sediment caused by the capital dredging is described in Section 6.3. Two types of dredger were considered in the plume dispersion studies; a Cutter Suction Dredger (CSD) dredging mudstone (which would generate fine material when dredged) in the channel in the vicinity of the reclamation) and a Trailing Suction Hopper Dredger (TSHD) dredging sand in the lower channel and in the Seaton Channel turning circle area. For the TSHD simulation the runoff from the dredger pumping ashore at the reclamation site was also included in the simulations.

5. The plume dispersion studies predict that, during the dredging of sand in the lower channel using a TSHD, some deposition is predicted at Seal Sands, in the immediate vicinity of the dredger and elsewhere in the subtidal areas. At Seal Sands, deposition of a fraction of a millimetre of fine material per tide is predicted (up to 0.05mm for three tides) with total deposition of approximately 1mm for the duration of dredging in the lower channel. Fine material would only reach Seal Sands when dredging on spring tides.

6. Dredging using a CSD further upstream (e.g. in the vicinity of the reclamation) would not result in the deposition of fine material in intertidal areas. For the CSD, deposition of fine material would be focussed in the immediate vicinity of the dredger, with deposition of less than 5mm elsewhere in the subtidal area.

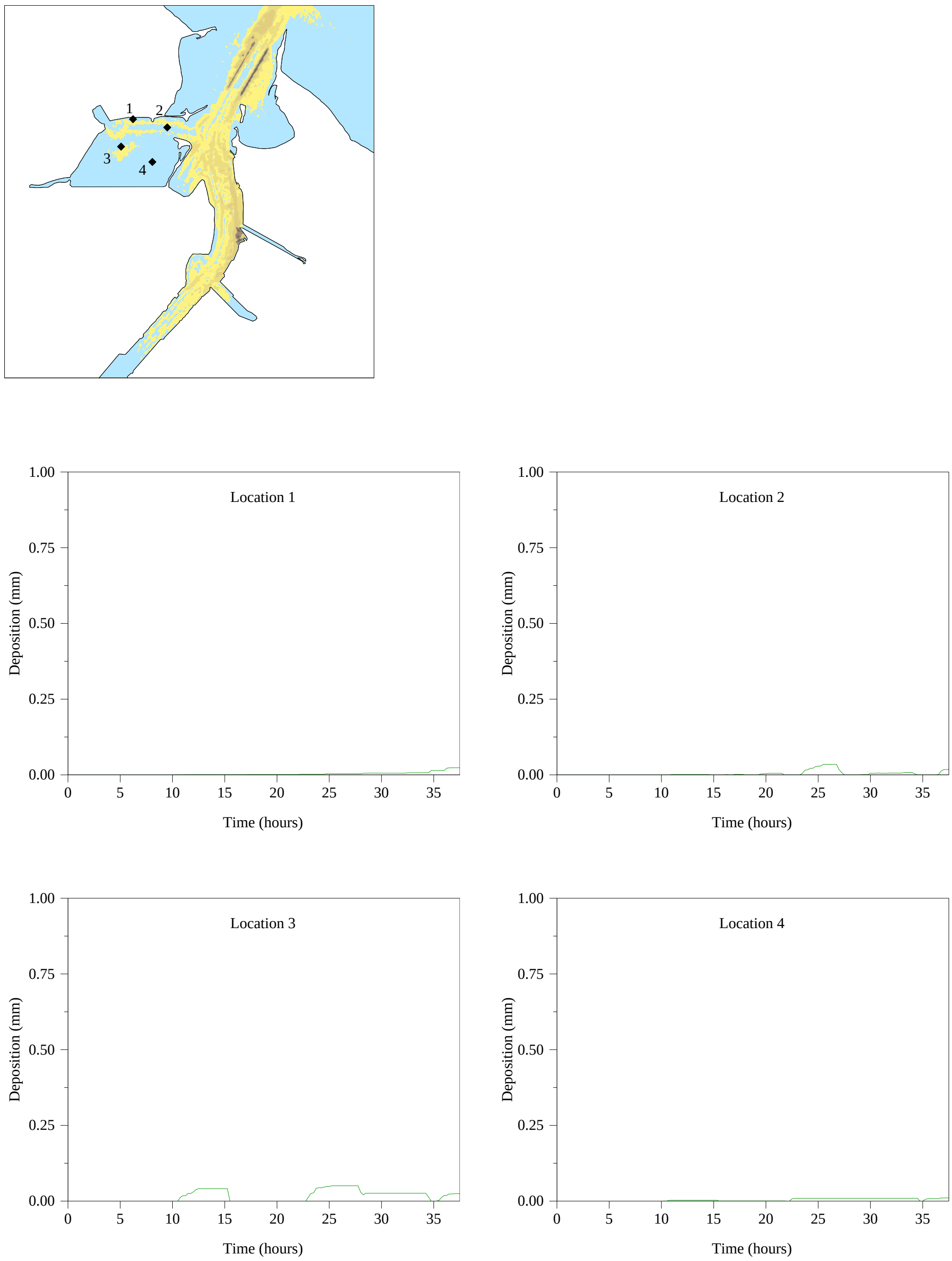


Figure 7.4 Time histories of deposition in Seaton Channel (Locations 1 and 2) and Seal Sands (Locations 3 and 4) for TSHD dredging sand in Tees Approach Channel, spring tide, low flow conditions

7. The deposition that is predicted in the immediate vicinity of the dredger is not considered to represent a significant effect since these locations form part of the capital dredging area (and would, therefore, already be significantly disturbed) and depositing sediment would be re-dredged. In addition, these areas are not environmentally sensitive in terms of their physical composition.

8. For the intertidal areas, the magnitude of sediment deposition over the course of the dredging operations is predicted to be a maximum of 1mm. The rate of deposition and the overall magnitude of deposition is considered to be low.

9. When assessing the significance of the potential impact on intertidal areas, it is important to consider the processes affecting deposition and the behaviour of the material following deposition. Figure 7.4 demonstrates the nature of the deposition on Seal Sands. As the tide rises, suspended material is carried in the water column over the intertidal area and a proportion of this material settles out at slack water (in this instance, it is predicted that less than 0.05mm per tide will settle). Some of this material will subsequently be resuspended and redistributed by tidal currents on the following tide given that it will not be consolidated material. Over time, therefore, a proportion of the material settling on Seal Sands would be expected to disperse.

10. Notwithstanding the above, the capital dredging is likely to result in an overall slight increase in the proportion of fine material on Seal Sands as some of the material that settles will be reworked into the substratum (i.e. the sediment would be expected to become more muddy). The presence of an extensive *Enteromorpha* mat on Seal Sands during the summer months would be expected to encourage the accumulation of fine sediment through physical trapping of fine sediment and would exacerbate the tendency of the substratum to become finer. The net effect of the dredging, however, is not to introduce an entirely different type of sediment into a receptor area.

11. Given the above, the physical impact of sediment deposited as a result of capital dredging on receptor areas is considered to be low and the potential impact is deemed to be of **negligible significance**.

Mitigation and residual impact

12. Since no further measures can be taken to reduce the impact, the residual impact would be of **negligible significance**.

7.2.2 Remobilisation, dispersion and redistribution of potentially contaminated sediment during capital dredging

1. The chemical contaminants of the areas to be dredged are described in Section 7.1.4. A comparison of the survey data with the sediment quality guidelines indicates that the sediments in the main channel and in the area which will be reclaimed as a consequence of the construction of the container terminal contain moderate levels of metals and generally elevated levels of PAHs, Lindane and TPHs.

2. No dredging will be undertaken in the area behind the proposed quay wall (i.e. the reclamation area) and, therefore, the sediments in this area would be effectively removed from the estuary system as they will be covered by the reclamation. Additionally, reclamation will be undertaken using dredged material predominantly made up of sand. Due to the nature of the material to be placed, the risk of further contamination is very low.

3. A comparison of survey data from the receptor sites with the sediment quality guidelines indicates that the sediments at these sites contain detectable levels of contaminants but the concentrations generally tend to be marginally lower than those measured in the channel area. Sediments released during dredging from the main channel could therefore, potentially impact on the sediment quality of the receptor sites, particularly Seal Sands where minor deposition is predicted to occur. No deposition is predicted at all other potential receptor sites (e.g. Bran Sands and North Gare Sands).

4. Due to the relatively minor differences in contaminant levels for most parameters measured in the main channel compared to those measured at Seal Sands, and the potential for dilution and re-suspension following deposition, it is unlikely that significant changes in sediment quality at the receptor sites will occur as a consequence of the dredging. This is particularly the case given that Seal Sands will only be affected by deposition during dredging of certain sections of the channel (i.e. the outer portions of the channel) where existing contaminant levels are likely to be low due to the fact that the sediments in this area are relatively coarse and mobile. Seal Sands is not predicted to be subject to deposition during dredging of the inner channel adjacent to the proposed reclamation where contamination levels are generally higher than elsewhere in the channel.

5. The impact of the capital dredging on sediment chemistry of the receptor sites at Seal Sands is therefore predicted to be of **negligible significance**.

Mitigation and residual impact

6. Since no further measures can be taken to reduce the impact, the residual impact would be of **negligible significance**.

7.2.3 Remobilisation, dispersion and redistribution of potentially biologically contaminated sediment during capital dredging

1. The majority of samples recorded values less than the detection limits for both total coliforms and faecal enterococci. Contamination of the sediments by bacteria is therefore considered to be low. Additionally, the bathing waters are located outside of the estuary mouth so any bacterial contamination resulting from the dredging is likely to be significantly diluted before it reaches the designated monitoring points. There is also the potential for bacterial die-off to occur over the time period between sediment being transported and permanently deposited. **No impact** in terms of biological impact on the designated bathing waters is therefore predicted.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact.**

7.3 Potential impacts during the operational phase

7.3.1 Potential change in sediment quality

1. During the operational phase, there would be no change to the exiting situation in terms of inputs of pollutants to the environment. There will, however, be a positive impact in that the area to be reclaimed contains the most elevated levels of contaminants and this area will be effectively removed from the system due to the reclamation.

2. It is predicted, therefore, that there will be an overall impact of **minor beneficial significance**.

Mitigation and residual impact

3. No mitigation measures are required and the residual impact is of **minor beneficial significance**.

7.3.2 Potential effects on the sediment quality of the receptor sites due to maintenance dredging required as a consequence of the proposed development

1. The implications of the proposed scheme on the maintenance dredging strategy have been established as part of the numerical modelling studies. It is concluded that the effect of the scheme on the maintenance dredging will be insignificant, with no requirement to change the current strategy. As such, it is concluded that there would be **no impact** on sediment quality as a consequence of maintenance dredging that is required as a consequence of the proposed scheme given that the overall volume of material requiring dredging would not be significantly increased, its composition will be very similar to that dredged at present and no increase in the frequency of dredging will be required.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact**.

8 SOIL QUALITY AND GEOLOGY

8.1 Existing environment

8.1.1 Geology and hydrogeology

1. The British Geological Survey solid and drift geology Sheet 33 (Stockton) indicates that the geology underlying the site comprises Made Ground and estuarine marine Alluvium of post-glacial origin. It is likely that the notation of Made Ground relates to that part of the foreshore which has been reclaimed. Over the majority of the Teesport Estate the Alluvium is underlain by the Mercia Mudstone Group of Triassic age. The Mercia Mudstone Group generally comprises continental red and yellow mudstones and sandstones.

2. However, a thin band of the Penarth Group is noted to run along the north-eastern part of the Teesport Estate lying between the Alluvium and the underlying Mercia Mudstone Group. The Penarth Group comprises grey marine mudstones, limestones and thin bone beds and is thought to reflect a major marine transgression. The basal beds of the Mercia Mudstone Group, the Seaton Carew Formation, are present overlying the Sherwood Sandstone Group.

3. The site is underlain by a minor aquifer, which is indicated by the Environment Agency Groundwater Vulnerability Map (Sheet No. 5: Tyne & Tees) to refer to the Alluvium. The Sherwood Sandstone Formation is indicated by the Environment Agency Groundwater Vulnerability Map to be a major aquifer, which is overlain by the Mercia Mudstone Group, which is shown to be a non-aquifer of negligible permeability. It is probable that shallow groundwater within the Alluvium at the site is in hydraulic continuity with the adjacent Tees Estuary. Groundwater flow within the Alluvium is estimated to be towards the Tees Estuary in a north-westerly direction and is likely to be tidally influenced.

8.1.2 Hydrology

1. There are two surface water courses in close proximity to the site. The Tees estuary is adjacent to the western site boundary and Dabholm Gut is located between the Teesport Estate and the Bran Sands lagoon.

2. Dabholm Gut is culverted over part of its length. The Gut is tidal and at low water, can be mostly dry.

8.1.3 Landfill sites

1. A number of landfill sites are recorded within the immediate vicinity of the proposed development site. The site of the Bran Sands lagoon is located adjacent to Bran Sands landfill site. The records indicate that the licence for this landfill was issued to ICI Chemicals and Polymers Limited in May 1997 for the disposal of (effectively) special waste. The allowable input at this time was classed as 'large', which allowed the landfill to accept more than 75,000 tonnes

of waste per year. This licence is noted to have been modified in June 2002. No indication of the allowable waste types is given for this period.

2. In October 1980 a second licence was issued for the Bran Sands landfill site to ICI Petrochemicals Division. The licence allowed a ‘very large’ input of waste (i.e. greater than 250,000 tonnes per year). The list of authorised waste would suggest that the landfill was allowed to accept special and/or hazardous wastes. This licence was, however, superseded in July 1998 by another licence which reduced the maximum waste input into the landfill to ‘small’ (i.e. equal to or greater than 10,000 tonnes per year and less than 25,000 tonnes per year). This licence reduced the list of authorised wastes and also provides a list of unauthorised waste which includes but is not limited to arsenates and arsenites, inorganic and organic peroxides, polychlorinated biphenyls, halogenated organics, sulphides, tetra ethyl lead and tetra methyl lead and soluble complex cyanides etc.

3. Two landfill sites are noted in the area known as Teesport Estate. The first is located in the area of the Riverside Ro-Ro facility. This landfill site was operated by Shell UK Oil Limited and relates to a sludge land farm associated with the former oil refinery. The allowable input is noted to be ‘large’ (i.e. equal to or greater than 75,000 tonnes per year and less than 250,000 tonnes per year). Stipulations of the licence indicate that the site may only landfill waste produced on site, the authorised wastes being oil and water mixtures. This licence is now surrendered. Previous site investigations state that the land farm tip ceased in 1987 and prior to the closure of the refinery material contaminated with oil was excavated and disposed of at ‘another licensed site’, though its location is unknown. However, it is understood that Shell UK did not undertake a ground investigation to determine if all contaminated material was removed.

4. A second landfill site is recorded on the Teesport Estate, in the area of the existing container terminal and encompasses the southern part of the site of the Riverside Ro-Ro facility. This landfill site was operated by Tees and Hartlepool Port Authority from October 1978. The site was licensed to have a ‘large’ waste input and was authorised to accept construction and demolition waste, road sweepings including litter and slag, boiler and flue cleanings. This licence has been surrendered.

8.1.4 <u>Explosive site</u>

1. The site of the existing TCT 1 is noted to store explosive materials.

8.1.5 <u>Overview of intrusive site investigation and data analysis</u>

1. An intrusive investigation was undertaken by Royal Haskoning in October 2005 which comprised the sinking of 5 cable percussive boreholes and excavation of ten trial pits by mechanical excavator. The aim of the investigation was to target areas known to comprise potential sources of contamination, both currently and historically. Information from previous site investigations and the desk-based study completed by Royal Haskoning as part of the ESR (2005) were used to identify potentially contaminated areas of the site.

2. The boreholes (BH-01 to BH-05) were sunk to a maximum depth of 9.0 metres below ground level (BGL). The trial pits (TP-01 toTP-10) were excavated to a maximum depth of 3.2m BGL. A plan of the borehole and trial pit locations is provided in Appendix 4. All trial pits were backfilled with arisings upon completion. The trial pits were excavated with due regard for underground and overhead services.

3. The borehole and trial pit logs are presented in Appendix 4, detailing the nature of each separately identified stratum encountered. Physical measurements and chemical sampling was undertaken at periodic intervals and physical samples were collected for geotechnical and chemical sampling; these were also at periodic intervals. Soil samples were stored within the relevant sampling vessel and stored immediately within a cool box prior to being dispatched to the laboratory. *In situ* testing of pH, electrical conductivity, redox potential and dissolved oxygen content of the groundwater was undertaken at all five boreholes and after purging of one to three well volumes of water. The results are presented in Appendix 4.

4. A total of 29 samples were taken during this most recent investigation from ten individually referenced locations. A table detailing the samples obtained, the results of the analysis and sample descriptions are presented in Appendix 4. Samples from nine of the ten locations were analysed, with analysis being performed at an MCERTS and UKAS accredited laboratory for a number of contaminants. Samples from trial pits where evidence of hydrocarbon contamination was noted during the ground investigation were analysed.

5. The soil samples were tested for the following determinands:

- Extractable Petroleum Hydrocarbons (EPH) (C10-C40);
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Speciated Phenols;
- Volatile Organic Compounds;
- Semi-Volatile Organic Compounds;
- Metals (As, B, Cd, Cr, Cu, Pb, Ni, Se, Zn, Hg);
- pH;
- Sulphate;
- Cyanide; and,
- Fraction of Organic Matter.

6. In order to assess whether the samples were in soluble form and have the potential to impact groundwater resources beneath the site, leachate tests were performed on a number of samples, the results of which are presented in Appendix 4. The following determinants were analysed in the leachate:

- Extractable Petroleum Hydrocarbons (C10-C40);
- Speciated Polycyclic Aromatic Hydrocarbons (PAH);
- Speciated Phenols;
- Metals (As, B, Cd, Cr, Cu, Pb, Ni, Se, Zn, Hg);
- pH;

- Sulphate; and,
- Cyanide.

7. In order to assess extent of any groundwater contamination groundwater samples were collected and analysed for the following determinands, the results of which are presented in Appendix 4.

- Extractable Petroleum Hydrocarbons (C10-C40);
- Total Phenols;
- Metals (As, B, Cd, Cr, Cu, Pb, Ni, Se, Zn, Hg);
- pH;
- Sulphate; and,
- Cyanide.

Ground conditions

8. Based on information provided in the borehole and trial pit logs, it is concluded that the site is predominantly comprised of made ground consisting of firm brown sandy gravely clay containing brick, sandstone, slag, cinder and mudstone. The material was present in all five boreholes to a minimum depth of 0.20 metres and a maximum depth of 7.0 metres.

9. A band of black silt 0.5m to 1.1m thick underlies the made ground at various locations, possibly as isolated pockets of fill. Underlying the made ground across the site is an alluvial stratum made up of brown clayey sand. This stratum thickens to the south of the site but was identified in all boreholes and most trial pits. In the northern part of the site a layer of yellow brown clayey gravely sand with sandy clay lenses was identified.

10. A band of red sandy gravely clay was detected between 7 and 8 metres within boreholes 2 and 3 and mudstone, known to be the predominant underlying bedrock geology, was detected in borehole 1 at a depth of 6.10m.

11. A summary of the ground conditions is provided in Table 8.1

Table 8.1 Summary of ground conditions

Stratum	Depth below ground level to top of stratum		Thickness		Description
	Minimum (m)	Maximum (m)	Minimum (m)	Maximum (m)	
Made Ground	0.0	0.0	0.6	7.0	Firm brown sandy gravely clay containing brick, sandstone, slag, cinder and mudstone. Identified across entire site
Made Ground	1.6	5.4	0.5	1.10	Black silt band encountered only at boreholes 1 and 3 and trial pits 03 and 08.
Alluvium	2.6	2.6	1.5	1.5	Yellow brown clayey gravely sand with sandy clay lenses. Identified only within Borehole 1 and trial pit 1
Alluvium	4.10	7.00	1.10	Not proved	Brown Clayey Sand. Strata thickening to the south of the site.
Clay	7.0	7.5	Not proved	Not proved	Firm stiff brown red sandy gravely clay. Identified in borehole 2 and 3.
Mudstone	6.1	6.1	Not proved	Not proved	Only identified within Borehole 1

Groundwater conditions

12. Groundwater was struck during the installation of all of the five boreholes and within two of the 10 trial pits. Depths of strike below ground level varied between 2.0 metres (trial pit 8) and 6.9 metres (borehole 5).

13. The site is adjacent to the Tees estuary and it is likely that there is hydraulic conductivity with the estuary; however no significant fluctuations in groundwater depths over time have been recorded. Water depths from ground level were recorded within all five boreholes and five of the ten trial pits between 17th October 2005 and 7th December 2005. Four of the five trial pits were dry at every sampling visit; groundwater within trial pit 8 was recorded at 2.18m to 2.25m during the final 3 monitoring visits.

14. Groundwater levels were reported to be lower (below ground level) at the south and east of the site. However the land appears to be raised relative to ordnance datum to the south and east of the site possibly accounting for this.

15. A ground investigation, undertaken by Exploration Associates (1991) detected groundwater struck at between 3.0m and 5.6m below ground level (bgl) in the north north east of the site, adjacent to Dabholm Gut and at between 4.0m and 5.1m bgl in the south west of the site, in the vicinity of Tees Dock. Close to

Dabholm Gut, the groundwater rose by a maximum of 1.10m in 20 minutes; whereas in the vicinity of Tees Dock, the groundwater rose by a maximum of 0.8m.

16. A further ground investigation undertaken in 1995 by AEG focused mainly in the northern half of the site and reported groundwater struck at between 4m and 6m which rose by a maximum of 2.82m

Chemical analysis

17. Chemical testing of soil, leachate and groundwater samples was undertaken as part of the latest ground investigation (October to December 2005). In addition, the results from previous site investigations, carried out in 1991 and 1995 (Exploration Associated (1991), Posford Duvivier Environment (1995)) have also been considered in the Chemical Testing and Risk Assessment sections of this assessment.

18. For the assessment of risk to human health from contaminants in soil, the relevant analytical values have been compared to CLEA Soil Guideline Values (SGVs) where available. SGVs are generic soil guideline values that can be used as screening tools. Where sample results fall below a relevant generic screening value it is deemed that the levels are acceptable. The SGVs are selected for the intended end land use. In this case the land use selected is commercial/industrial. Where there is no relevant SGV, alternative guideline values have been applied. These have been drawn from the Sludge (Use in Agriculture) Regulations 1989 and from the Canada-wide Standards for Petroleum Hydrocarbons in Soil (CCME, 2001b) for initial screening purposes.

19. In order to assess the risk to surface water or groundwater, the relevant Drinking Water Standard (DWS) from the Water Supply (Water Quality) Regulations, 2000, and the Environmental Quality Standard from the EC Dangerous Substances Directive have been applied.

8.1.6 <u>In situ results</u>

1. The pH of the groundwater was found to vary from 6.94 to 7.44 and electrical conductivity was recorded in the range 304mS to 2301mS, with the highest conductivities being recorded in the south of the site, close to Tees Dock.

2. Redox potential was mostly positive, indicating oxidising conditions, in all but borehole BH02, where a negative (reducing) potential was recorded. However, the values recorded were generally low. Following purging of three well volumes, the highest dissolved oxygen content was found at BH02 (4.34%) and the lowest at BH05 (1.72%).

3. During the 1991 ground investigation, pH was recorded between 5.78 and 8.3 in the groundwater.

8.1.7 Soil analysis results

1. A summary of the results from chemical analysis associated with the three site investigations is presented in Table 8.2.

Table 8.2 Soil sample chemical analyses

Determinand	Source of Guideline Value (mg/kg)	Guideline value (mg/kg)	Total no. of samples	Min. conc. (mg/kg)	Max. conc. (mg/kg)	No. of samples exceeding Guidance Value	US_{95} – exceeds Guidance Value (Yes/No)***
Arsenic	CLEA SGV	500	29	1	49	0	No
Boron (water soluble)	--	--	29	0.7	24	N/A	N/A
Cadmium	CLEA SGV	1400	29	<0.1	5	0	No
Chromium	CLEA SGV	5000	29	<0.1	847	0	No
Mercury	CLEA SGV	480	29	<0.5	20	0	No
Nickel	CLEA SGV	5000	29	3	36	0	No
Selenium	CLEA SGV	8000	29	<0.1	<3	0	No
Lead	CLEA SGV	750	29	23	923	1	No
Copper	Sludge Regs 1989	200	29	4	721	6	N/A
Zinc	Sludge Regs	450	29	40	1846	5	N/A
Sulphate	--	--	27	10	20400	N/A	N/A
pH	N/A	N/A	41	6.87	9.19	N/A	N/A
FOC (as fraction)	N/A	N/A	5	0.004	0.054	N/A	N/A
Benzene	--	--	2	0.004	0.006	N/A	N/A
Toluene	CLEA SGV	150@1%SOM 350@2.5%SOM 680@5%SOM	2	0.004	0.006	0	N/A
Ethylbenzene	CLEA SGV	48000	2	0.004	0.043	0	No
Xylenes (o,m,p)	--	--	2	0.015	0.053	N/A	N/A
Phenol	CLEA SGV	21,900@1%SOM 43,000@2.5%SOM 78,100@5%SOM	29	<0.01	26	0	No
Benzo(a)pyrene	--	--	6	0.018	0.888	N/A	N/A
EPH (C_{10}-C_{12})	Canadian	760*	6	<1	60	0	N/A
EPH (C_{12}-C_{16})	Canadian	760*	6	1	260	0	N/A
EPH (C_{16}-C_{21})	Canadian	1700**	6	2	504	0	N/A
EPH (C_{21}-C_{40})	Canadian	1700**	6	7	1669	0	N/A

* Tier 1 Level for surface coarse-grained soil with industrial land use C_{10}-C_{16}, Canada-wide Standards for Petroleum Hydrocarbons (PHC) in Soil, Canadian Council of Ministers for the Environment, 2001.

** Tier 1 Level for surface coarse-grained soil with industrial land use C_{16}-C_{34}, Canada-wide Standards for Petroleum Hydrocarbons (PHC) in Soil, Canadian Council of Ministers for the Environment, 2001.

*** Contaminant concentrations vary across a site and the measured mean concentration, derived from a limited number of samples, may not equal the 'true' mean; and in any event it will have uncertainty associated with it. Because of this, simple comparisons of the measured mean value with the Soil Guideline Value could be misleading. The approach here is to identify the 95% confidence limits of the measured mean and to compare the upper 95th percentile (US_{95}) with the Soil Guideline Value

2. Analyses for the majority of contaminants showed no exceedances of the relevant Tier 1 screening guideline value. There were six exceedances of the copper guideline value and five exceedances of the zinc guideline value. These exceedances are considered to be significant, although both metals are considered to be predominantly phytotoxic (poisonous to plants) contaminants.

3. During the site investigation carried out in October 1995, four composite sediment samples, taken from over water boreholes adjacent to the north north east corner of the site, were analysed for kerosene, diesel oil and lubricating oil. All results were below the limit of detection, except for one sample which contained hydrocarbon, tentatively identified as lubricating oil, at a concentration of 27.1mg/kg.

4. There are no suitable published guideline values for boron, benzene, xylenes or benzo(a)pyrene. However, the concentrations of these contaminants found at the site are considered to be low, hence it is not proposed to undertake detailed quantitative risk assessments for these contaminants.

5. During the analysis of soil samples, a number of tentative identifications of compounds were made. These included C_{12-28} hydrocarbons, pentamethylheptane, diphenylether, nonylphenol isomers, diphenylmethylpentene, phthalates, biphenyl and an unknown compound. The identifications are presented in Appendix 4, with the concentrations ascribed to them. It should be noted that these tentative identifications may already have been included in the quantification within other analyses.

8.1.8 Leachate analysis

1. A summary of the results from chemical analysis associated with the three site investigations is given in Table 8.3.

2. Analyses for the majority of contaminants showed no exceedances of the DWS or EQS where these standards have been published. There were two exceedances of the chromium EQS, two exceedances of the copper EQS and two exceedances of the zinc EQS, although none exceed the relevant DWS. Whilst it is recognised that the EQS is the more appropriate standard for comparison given the location of the site, the lack of any exceedance of the respective DWS is a key indicator that these exceedances are minor in nature. However, these exceedances do demonstrate that some metals are present in leachable form.

3. There is no DWS or EQS associated with phenol. However, phenol was not recorded above the limit of detection at the site. EPH at different carbon banding was detected (e.g.C_{10}-C_{40} at 0.676mg/kg) at one location demonstrating that some hydrocarbons are present in leachable form, although concentrations are minor in nature. This corresponds with hydrocarbon odour noted in the trial pit log for this location (TP05). However, no hydrocarbons were found above the laboratory limit of detection at the other locations tested, suggesting that there is no significant widespread impact.

8.1.9 Groundwater analysis

1. A summary of the results from chemical analysis associated with the three site investigations is given in Table 8.4.

Table 8.3 Leachate sample chemical analyses

Determinand	Drinking Water Standard (DWS) / mg/l	Environmental Quality Standard (EQS) / mg/l	No. of samples	Min. conc. (mg/l)	Max. conc. (mg/l)	No. of samples exceeding DWS	No. of samples exceeding EQS
Arsenic	0.010	0.025	3	0.004	0.006	0	0
Boron	1	7	3	0.201	0.964	0	0
Cadmium	0.005	0.0025	3	<0.0004	<0.0004	0	0
Chromium	0.050	0.015	3	<0.0001	0.04	0	2
Mercury	0.001	0.0003	3	<0.00005	<0.00005	0	0
Nickel	0.020	0.03	3	<0.001	0.012	0	0
Selenium	0.010	--	3	0.002	0.004	0	N/A
Lead	0.025	0.025	3	0.001	0.002	0	0
Copper	2	0.005	3	0.004	0.012	0	2
Zinc	--	0.04	3	0.024	0.052	N/A	2
pH	6.5-10	6-8.5	3	6.94	8.14	0	0
Phenol	--	--	3	<0.01	<0.01	N/A	N/A
Naphthalene	--	0.005	3	$<1x10^{-5}$	0.0006	N/A	0
Benzo(a)pyrene	0.01	0.005*	3	$<1x10^{-5}$	$<1x10^{-5}$	0	0
EPH (C_{10}-C_{40})	--	--	3	<0.01	0.676	N/A	N/A
EPH (C_{10}-C_{12})	--	--	3	<0.01	0.032	N/A	N/A
EPH (C_{12}-C_{16})	--	--	3	<0.01	0.149	N/A	N/A
EPH (C_{16}-C_{21})	--	--	3	<0.01	0.279	N/A	N/A
EPH (C_{21}-C_{40})	--	--	3	<0.01	0.216	N/A	N/A

*EQS for naphthalene

Table 8.4 Groundwater sample chemical analyses

Determinand	Drinking Water Standard (DWS) / mg/l	Environmental Quality Standard (EQS) / mg/l	No. of samples	Min. conc. (mg/l)	Max. conc. (mg/l)	No. of samples exceeding DWS	No. of samples exceeding EQS
Arsenic	0.010	0.025	14	0.003	<0.100	8*	8*
Boron	1	7	14	0.7	5.4	12	0
Cadmium	0.005	0.0025	14	<0.0004	<0.100	9*	9*
Chromium	0.050	0.015	14	0.002	0.511	11**	13**
Mercury	0.001	0.0003	14	<0.00005	<0.005	9*	9*
Nickel	0.020	0.030	14	0.004	1.33	11**	11**
Selenium	0.010	--	14	0.002	<0.100	12**	N/A
Lead	0.025	0.025	14	<0.001	<0.100	8*	8*
Copper	2	0.005	14	0.001	0.100	0	13**
Zinc	--	0.040	14	0.017	0.107	N/A	10**
pH	6.5-10	6-8.5	15	7.70	8.66	0	0
Benzene	0.001	0.030	2	<0.001	<0.001	0	0
Toluene	--	0.040	2	<0.001	<0.001	N/A	0
Ethylbenzene	--	--	2	<0.001	<0.001	N/A	N/A
Xylenes (o,m,p)	--	0.030	2	<0.001	<0.001	N/A	0
Phenol	--	--	2	<0.001	<0.001	N/A	N/A
Naphthalene	--	0.005	5	$<1x10^{-5}$	0.0001	N/A	0
Benzo(a)pyrene	0.010	0.005*	5	$<1x10^{-5}$	$<1x10^{-5}$	0	0
EPH (C_{10}-C_{40})	--	--	5	<0.01	0.277	N/A	N/A
EPH (C_{10}-C_{12})	--	--	5	<0.01	<0.01	N/A	N/A
EPH (C_{12}-C_{16})	--	--	5	<0.01	<0.019	N/A	N/A
EPH (C_{16}-C_{21})	--	--	5	<0.01	<0.044	N/A	N/A
EPH (C_{21}-C_{40})	--	--	5	<0.01	<0.208	N/A	N/A

***All of exceedances result from the limit of detection being higher than the DWS and EQS in analyses from the 1995 site investigation and may not represent true exceedances.**

The majority **of exceedances result from the limit of detection being higher than the DWS and EQS in analyses from the 1995 site investigation and may not represent true exceedances.

2. In a number of cases, the limits of detection from analyses of groundwater associated with previous site investigations were higher than the current DWS or EQS for the contaminant. It is not possible under these circumstances to adequately assess the significance of these results. However, in the analysis of samples from the 2005 site investigation undertaken as part of this EIA, where an appropriate limit of detection was applied, one sample significantly exceeded both the DWS and EQS (0.511mg/l at BH04).

3. In addition to those results where the limit of detection precludes detailed evaluation of the results, minor exceedances of both the DWS and EQS for nickel (up to 0.161mg/l), three exceedances of the EQS for both copper (up to 0.017mg/l) and two for zinc (up to 0.107mg/l) were recorded. Three exceedances of the DWS for selenium were also recorded, although it is noted that there is no equivalent EQS, therefore the use of the DWS constitutes a very conservative assessment. It is considered that these concentrations are unlikely to result in significant impact at the River Tees.

4. There are no DWS or EQS associated with ethylbenzene or phenol. However, these were not recorded above the limit of detection. A single elevated concentration of EPH (C_{10}-C_{40}) was detected at 0.277mg/l.

5. Elevated concentrations of sulphate were detected in the groundwater, which may pose a risk to buildings and structures at the site. Reference should be made to BRE Special Digest 1 – Concrete in aggressive ground (see Section 8.2.1).

8.1.10 Ground gas monitoring

1. Monitoring was undertaken on four occasions following the most recent ground investigation at four boreholes and five trial pits, using a GA 94 infrared gas analyser. The gas was analysed *in situ* for methane, carbon dioxide, oxygen, hydrogen sulphide and flow rate.

2. Methane was not recorded above the limit of detection at any monitoring position. Carbon dioxide was detected at concentrations up to 1.6% (BH02) and hydrogen sulphide was detected at low concentrations at all locations except BH02. The maximum concentration detected was 4ppm. Oxygen levels were generally normal, with the lowest concentration detected being 13.5% at TP07. No flow was detected above 0.1l/hr at any monitoring point.

3. Based on these results, it is not considered that ground gases pose a significant risk to receptors on or near the site.

8.1.11 Risk assessment

1. In accordance with the Environmental Protection Act 1990, for contaminated land to exist there should be a source of contamination, a receptor where 'significant harm' or 'significant possibility of harm' may be caused or significant pollution of controlled waters is being or likely to be caused and a pathway which connects the two. Should any element of this contaminant linkage not be

present (or be severed) then the land may not be regarded as contaminated land, as defined in Part IIA of the Environmental Protection Act 1990.

2. In accordance with the above approach, a conceptual model of the site has been produced and a risk assessment undertaken to assess the potential for source-pathway-receptor linkages to occur at the site as a result of the proposed development.

3. The risk rating terms used to describe the risks identified at the site are based upon the Department of Environment (now Department for Environment, Food and Rural Affairs), Contaminated Land Research Report series (CLR Report No. 6, 1995) site prioritisation and categorisation rating system, as defined below:

Contamination risk rating terminology:	
High risk	▪ Significant contamination represents an unacceptable risk to identified targets across much of the site ▪ Site not suitable for current / proposed use without significant remediation ▪ Enforcement action possible ▪ Urgent action required
Medium risk	▪ Contaminants may represent an unacceptable risk to identified targets across part of the site ▪ Site probably not suitable for current / proposed use without remediation ▪ Action required in the medium term
Low risk	▪ Contaminants may be present but unlikely to create unacceptable risk to identified targets ▪ Site probably suitable for current, may require localised remediation for proposed use ▪ Action unlikely to be needed whilst site remains in current use.
Negligible risk	▪ If contamination sources are present they are considered to be minor in nature and extent and not likely to present a risk to identified targets ▪ Site suitable for current / proposed use ▪ No further action required
Based upon the DoE CLR report No. 6 'Prioritisation and categorisation procedure for sites which may be contaminated' (1995)	

4. The following sections develop a conceptual model for the site of Teesside Estate and incorporate an assessment of the likely risks based on the information obtained during the desk based study and refined following the intrusive site investigation.

8.1.12 Conceptual Site Model

Potential sources

1. The historical and current uses of the site suggest the following potential contamination sources:

- Oil refinery spillages and leaks (i.e. hydrocarbons) from tanks, pipe tracks and process vessels etc.
- Drainage systems and service trenches (previous investigation identified a manhole with a hydrocarbon odour).
- Made Ground containing concrete, slag, sandy clay with occasional brick fragments, organic humic material, ash and timber.

- Ancillary process areas e.g. chimneys and flare stack areas.
- Two on-site landfill sites (an oily waste landfill and a THPA landfill site authorised to accept construction and demolition waste, road sweepings including litter and slag, boiler and flue cleanings).
- Bran Sands landfill site (operated by ICI Limited) located adjacent to the northern site boundary of the Teesside Estate. The landfill site has the potential to, and based on existing site investigation data, is producing landfill gas, which has the potential to migrate beneath the Teesside Estate. The landfill may also impact the groundwater quality beneath the site as a result of contaminated leachate entering groundwater.

2. Contaminants detected at elevated concentrations during the site investigations included:

- Copper;
- Chromium;
- Nickel;
- Selenium;
- Zinc;
- Diesel range hydrocarbons; and,
- Lubricating oil.

Current pathways

- Permeable soils – The ground conditions at the site, which include gravelly and sandy made ground may enable migration of contaminants in gaseous or aqueous form.
- Shallow groundwater – Groundwater is known to be present between approximately 2m and 7m below ground level.
- Direct Contact – Ingestion or dermal contact of contaminants at or near the surface or which become exposed through excavation.
- Inhalation - From airborne particles, which might be present on site or migrate through services. No evidence was found for the presence of ground gases and vapours at the site.

Current receptors

- Human targets

– *Site workforce* – The proposed development site is currently derelict, although there may be workers visiting the site.

- Controlled waters

– *Shallow groundwater* – The existing perched groundwater is impacted in some areas by the contamination contained within the made ground.

– *Deep groundwater* – The Sherwood Sandstone Formation is indicated by the Environment Agency Groundwater Vulnerability Map to be a major aquifer. However, this is overlain by the Mercia Mudstone Group, which is shown to be a non-aquifer of negligible permeability, and which is likely to restrict the vertical migration of contaminants. In addition, the site does not lie within a Source Protection Zone. Therefore the underlying groundwater is not considered to be a highly sensitive receptor.

  - *Surface water* – The River Tees borders the site to the south and south west and Dabholm Gut forms the northern boundary of the site. These are considered to be sensitive receptors.

- Ecological receptors – The site lies in proximity to the Teesmouth and Cleveland Coast Ramsar site and Special Protection Area and the South Gare and Coatham Sands Site of Special Scientific Interest, the closest of which is located on the opposite bank of the River Tees. These sites are therefore considered to be of moderate sensitivity.
- Neighbouring property and Land use - Neighbouring properties are largely industrial and hence are considered to be of low sensitivity.
- Buildings and Infrastructure – The vast majority of the site is open, reclaimed land. The only buildings currently on the site are small, commercial buildings associated with the Container Terminal and Ro-Ro operations.

Existing baseline risk assessment

3. Table 8.5 identifies the risks that the site presents in its current state relative to contaminated land issues.

Table 8.5 Summary of existing risks

Hazard	Risk	Comment
Risk to human health – current site users	*Low*	Much of the proposed development site is currently derelict, reclaimed land. In the west of the site there is an operating container terminal and, at the riverside in the north of the site, a Ro-Ro facility, both of which are staffed. Although some limited areas of contaminants have been found in the soil and water at the site, current site workers are likely to be protected from exposure to these by hard standing on the operational sites.
Risk to shallow groundwater	*Medium*	The existing perched groundwater appears to be impacted in some areas by the contamination contained within the made ground. However, some contaminants have been found in leachable form, hence there is the potential for further leaching of contaminants.
Risk to deep groundwater	*Negligible*	Any deep groundwater at the site is protected by the relatively impermeable overlying Mercia Mudstone Group which is reportedly very thick. It is therefore unlikely that any leachable contaminants would reach the deep groundwater.
Risk to surface water	*Low*	The Tees estuary borders the site to the north and Dabholm Gut forms the north eastern boundary of the site. Some contaminants have been found in leachable form, hence there is the potential for further leaching of contaminants, possibly reaching surface water.
Risk to neighbouring property and land use	*Low*	Neighbouring properties are largely industrial and hence are considered to be of low sensitivity.
Risk to ecological receptors	*Medium*	The site lies in proximity to areas of ecological importance. Some contaminants have been found in leachable form, hence there is the potential for further leaching of contaminants.
Risks to buildings and structures	*Low*	The vast majority of the site is open, reclaimed land. The only buildings currently on the site are small, commercial buildings associated with the TCT 1 and Ro-Ro operations.

8.2 Potential impacts during the construction phase

8.2.1 Potential for risk to humans and the environment during the construction phase

Construction phase related pathways

1. The following are potential pathways during the construction phase:

- Dermal contact – During the construction phase the potential for site workers to come into direct contact with contaminants present within the ground is significant.

- Inhalation of airborne particles – There is a risk that contaminated soil particles may be entrained in the air on-site, and potentially carried off site, due to disturbance of the ground. The scale and extent to which such airborne migration may take place will be dependant on prevailing weather conditions and mitigation measures in place.

- Permeable strata – The construction phase will cause disturbance to the ground. This will, for the construction period, enable greater percolation of rainfall across the site and may enable the mobilisation of some contaminants. It is likely that the majority of the metal contamination within the made ground will remain relatively immobile, as metals tend to be relatively immobile under neutral conditions (prevalent at the site), however, under acidic conditions (occasional areas) they can be more mobile. The organic contamination will be more susceptible to mobilisation. However, due to the presence of the attenuating alluvial clayey sand underlying the made ground, it is not anticipated that significant concentrations of contaminant will be able to leach to surface water or deeper groundwater.

- The redevelopment may, however, necessitate the construction of pile foundations. There is the potential that the installation of piles may transport contaminated material and create migration pathways between strata, unless carefully designed and installed.

- Groundwater – Contaminants may be able to migrate in soluble, free or dissolved phase along predominant groundwater flow pathways, if they reach the water table.

Construction phase related targets

2. The following are potential targets during the construction phase:

- Human targets

– *Construction workers* – Site workers will be in close/direct contact with the soils at the site, for a relatively short length of time. Site workers are therefore considered to be a short term sensitive receptor.

- Controlled waters

– *Shallow Groundwater* - The site is underlain by a minor aquifer, which is indicated by the Environment Agency Groundwater Vulnerability Map (Sheet No. 5: Tyne & Tees) to refer to the Alluvium. The shallow groundwater is already impacted, in places, by the contamination contained within the ground. The construction phase may increase the mobilisation of mainly organic contaminants which may further impact the perched groundwater.

– *Deep Groundwater* –The Sherwood Sandstone Formation is indicated by the Environment Agency Groundwater Vulnerability Map to be a major aquifer. However, this is overlain by the Mercia Mudstone Group, which is shown to be a non-aquifer of negligible permeability, and which is likely to restrict the vertical migration of contaminants. In addition, the site does not lie within a Source Protection Zone. Therefore the underlying groundwater is not considered to be a highly sensitive receptor.

- *Surface water* – It is considered that there will be no additional risk to the Tees Estuary or Dabholm Gut during the construction phase provided that adequate pollution prevention and remediation measures are employed.

- Ecological receptors – The site lies in proximity to the Teesmouth and Cleveland Coast SPA and Ramsar site, part of which is located on the opposite bank of the River Tees. This site is therefore considered to be of moderate sensitivity.

- Neighbouring property and Land use - Neighbouring properties are largely industrial and hence are considered to be of low sensitivity

- Buildings and Infrastructure – it is possible that foundations will need to be laid which come into contact with contaminated or aggressive material present within the soils or groundwater during development.

3. Table 8.6 presents the various risks arising during the construction phase

Table 8.6 Risk assessment for the construction phase

Hazard	Risk	Comments
Risk to human health – construction workers	Medium	During the construction phase, site workers will be in close/direct contact with the soils at the site, for a relatively short length of time. Analysis of the soils has shown isolated elevated concentrations of some metals and hydrocarbons.
Risk to shallow groundwater	Medium	The existing perched groundwater appears to be impacted in some areas by the contamination contained within the made ground. However, some contaminants have been found in leachable form, and disturbance of the ground during the construction phase may temporarily increase the mobilisation of mainly organic contaminants which may further impact the shallow groundwater.
Risk to deep groundwater	Negligible	Any deep groundwater at the site is protected by the relatively impermeable overlying Mercia Mudstone Group. It is unlikely that any leachable contaminants would reach the deep groundwater.
Risk to surface water	Medium	The Tees estuary borders the site and Dabholm Gut forms the north eastern boundary of the site. Some contaminants have been found in leachable form, and disturbance of the ground during redevelopment phase may temporarily increase the mobilisation of mainly organic contaminants which may have the potential to reach surface water
Risk to neighbouring property and land use	Low	Neighbouring properties are largely industrial and hence are considered to be of low sensitivity.
Risk to ecological receptors	Medium	The site lies in proximity to areas of ecological importance. Some contaminants have been found in leachable form and disturbance of the ground during redevelopment phase may temporarily increase the mobilisation of mainly organic contaminants.
Risks to buildings and structures	Medium	Aggressive ground conditions have been found at the site. It is possible that foundations will need to be laid which come into contact with contaminated or aggressive material present within the soils or groundwater during development

4. Based on the risk assessment, the construction phase of the proposed development is considered to present a **moderate adverse significance** with regard to land quality.

Mitigation and residual impact

5. Some limited contamination has been detected, which is consistent with the site's industrial usage to date. As discussed in Section 8.2.1, it is possible that the mobility of some contaminants may be temporarily increased by disturbance of the ground during construction of the proposed development. However, construction will be phased so that the length of time that the ground is left disturbed and exposed is minimised.

6. The localised areas of contamination indicated by the site investigations should be delineated and addressed via appropriate risk management or remediation during the early stages of construction.

7. During redevelopment work, contractors and designers should ensure that sound environmental practices are adopted. Health and Safety precautions should be adopted to protect workers from contaminants within the near surface environment, including appropriate use of personnel protective equipment.

8. Care should be taken during any construction work to prevent run-off of waters that may contain suspended solids, fuels to other contaminants and consequently pollute the local surface water gullies.

9. The ground conditions on site conform to design sulphate class DS3; aggressive chemical environment AC-3, in accordance with BRE Special Digest 1: Concrete in aggressive ground. It should be ensured that the building materials used are suitable for these ground conditions.

10. The construction will necessitate the construction of pile foundations. There is the potential that the installation of these piles may transport contaminated material and create pathways between strata, unless carefully designed and installed. Therefore, it is recommended that a piling risk assessment be undertaken prior to the commencement of any piling activities in line with Environment Agency guidelines.

11. Any services (e.g. water, gas and drainage) should be installed so as not to create new migration pathways. In addition, due regard to the resistance and suitability of materials (i.e. water pipes) relative to in ground contaminants is required.

12. Given the generally low levels of contamination found on the site and provided that the above mitigation measures are adhered to, the residual impact is considered to be of **minor adverse significance**.

8.3 Potential impacts during the operational phase

8.3.1 Potential for risk to humans and the environment during the operational phase

Operational phase related pathways

1. The following are potential pathways during the operational phase:

- Dermal contact – Following development, practically the entirety of the proposed development site will be covered with either building or hardstanding. It is therefore considered that potential for direct contact with any remaining contaminants present within the ground beneath the surface is regarded as low to negligible.

- Inhalation of airborne particles – As the majority of the development will comprise of buildings and hardstanding, the potential for contaminated soil particles to be entrained in the air on-site or transported off-site is considered to be low to negligible.

- Permeable strata – Upon completion of the development, the site will be covered with buildings and hardstanding, which is planned to be drained to either the surface water sewer or river via a drainage system. This will significantly reduce the amount of rainfall percolation into the made ground, therefore, reducing potential leachate formation. This will reduce the potential for further contaminant migration, both laterally and vertically.

- Human targets

– *Workers* – The future use of the site will be industrial. Future site users will be adults working at the site and are regarded as a moderately sensitive receptor. The site will be entirely covered by hardstanding, therefore, future users are unlikely to be at risk from dermal contact, ingestion or inhalation of contaminants in shallow soil, water or vapours.

- Controlled Waters

– *Shallow groundwater* – The shallow groundwater will still be present in the ground underlying the development and the groundwater in the Alluvium is indicated by the Environment Agency Groundwater Vulnerability Map (Sheet No. 5: Tyne & Tees) to constitute a minor aquifer of variable permeability. However, as the site will be mainly covered by hardstanding or drained to a surface water drainage system it is likely to receive far less infiltration and resulting in less mobilization of contaminants. Therefore the shallow groundwater is not considered a sensitive target.

– *Deep Groundwater* – The Sherwood Sandstone Formation is indicated by the Environment Agency Groundwater Vulnerability Map to be a major aquifer. However, this is overlain by the Mercia Mudstone Group, which is shown to be a non-aquifer of negligible permeability, and which is likely to restrict the vertical migration of contaminants. In addition, the site does not lie within a Source Protection Zone. Therefore the underlying groundwater is not considered to be a highly sensitive receptor.

- *Surface water* – Surface water drainage from the hardstanding development may be discharged to the river. The River Tees is a major navigable river and may be classed as a moderately sensitive target.

- Ecological receptors – The site lies in proximity to the Teesmouth and Cleveland Coast SPA and Ramsar site, part of which is located on the opposite bank of the Tees Estuary. These sites are therefore considered to be of moderate sensitivity.
- Neighbouring property and Land use - Neighbouring properties are largely industrial and hence are considered to be of low sensitivity.
- Buildings and Infrastructure – are considered to be of moderate sensitivity since it is possible that foundations will need to be laid which come into contact with contaminated or aggressive material present within the soils or groundwater during development.

2. Table 8.7 presents the various risks arising during the construction phase

Table 8.7 Risk assessment for the operational phase

Hazard	Risk	Comments
Risk to human health – future site users	Negligible	Following redevelopment, the site will be entirely covered by hardstanding, therefore, future users are unlikely to be at risk from dermal contact, ingestion or inhalation of contaminants in shallow soil, water or vapours.
Risk to shallow groundwater	Low	The existing perched groundwater appears to be impacted in some areas by the contamination contained within the made ground. However, some contaminants have been found in leachable form. Following redevelopment, the site will be entirely covered by hardstanding, therefore reduced infiltration is likely to limit the leaching of contaminants.
Risk to deep groundwater	Negligible	Any deep groundwater at the site is protected by the relatively impermeable overlying Mercia Mudstone Group. It is unlikely that any leachable contaminants would reach the deep groundwater. In addition, following redevelopment, the site will be entirely covered by hardstanding, therefore reduced infiltration is likely to limit the leaching of contaminants.
Risk to surface water	Low	The River Tees estuary borders the and Dabholm Gut forms the north eastern boundary of the site. Some contaminants have been found in leachable form. However, following redevelopment, the site will be entirely covered by hardstanding, therefore reduced infiltration is likely to limit the leaching of contaminants.
Risk to neighbouring property and land use	Negligible	Neighbouring properties are largely industrial and hence are considered to be of low sensitivity.
Risk to ecological receptors	Low	The site lies in proximity to areas of ecological importance. Some contaminants have been found in leachable form. However, following redevelopment, the site will be entirely covered by hardstanding, therefore reduced infiltration is likely to limit the leaching of contaminants.
Risks to buildings and structures	Medium	Aggressive ground conditions have been found at the site. It is possible that foundations will need to be laid which come into contact with contaminated or aggressive material present within the soils or groundwater during development

3. Based on the risk assessment, the operational phase of the proposed development is considered to present a **minor adverse significance** with regard to land quality.

Mitigation and residual impact

4. The proposed development will incorporate the covering of the majority of the site with hard standing. In order to protect future site users from the any elevated concentrations of contaminants noted at the site, it should be ensured that this layer of hard standing (or alternative such as clean landscaped areas) is present across all areas of the site where site users might be exposed to residual contamination present in the ground. Hardstanding areas should be drained to an appropriate system designed to avoid mobilisation of contaminants within the soils at the site (where present).

5. The hardstanding will also reduce the potential for contaminants to leach from the soils at the site. On this basis, and since the few areas of elevated contaminant levels should be addressed at the time of construction, operation of the proposed development is considered to have an overall residual impact of **minor beneficial significance**.

6. In order for the site to constitute Contaminated Land under Part IIA, there would have to be 'significant harm', the 'significant possibility of such harm', 'pollution of controlled waters', or the 'significant possibility of such pollution' being caused. Although ultimately the decisions rest with the Local Authority and Environment Agency, based on the results contained in the ES, there appears to be no widespread contamination which might result in the above. Since the site will be almost entirely covered by hardstanding, there should be no pathway intact which would allow exposure of human receptors to the significant possibility of significant harm and the risks to controlled waters appear to be limited based on the impact assessment in the ES, if the mitigation measures stated above are adhered to during and after construction.

9 WATER QUALITY

1. The capital dredging will result in the suspension of sediment into the water column and, therefore has the potential to impact on the physical, chemical and microbiological water quality characteristics of the study area. Effects on water quality will also occur as a consequence of dewatering of dredged material that is used within the reclamation area. This section identifies the existing water quality characteristics of the Tees estuary and assesses the magnitude and significance of changes associated with the proposed development with reference to a number of EC Directives concerning water quality.

9.1 Existing environment

9.1.1 Introduction

1. The Tees estuary has historically been subjected to direct, untreated inputs of industrial and domestic waste. Since the 1970's however, the water quality in the Tees estuary has improved significantly mainly due to industries reducing the amount of oxygen consuming effluent (in terms of biochemical oxygen demand) discharged from over 500 tonnes per day in 1970 to around 25 tonnes per day in 2003 (Environment Agency, 2005). Substantial reductions in inputs of ammonia, organic chemicals and metals have also been achieved over a similar period. Improved water quality has led to significant environmental and ecological improvements.

2. There are numerous licensed abstractions (although none within 1km of the proposed development site) and over 300 consented discharges into the Tees and its tributaries.

3. Two discharge consents are located within 500m of the site. These relate to the discharge of treated sewage effluent to soakaway from the entrance facility and the amenity block of the Riverside Ro-Ro facility. Both were issued in April 1999.

4. The construction of the Tees Barrage in 1995 reduced the estuarine extent from 40km to 17km and changed many of the characteristics of the estuary. It substantially reduced dynamic energy in the system and increased stratification resulting in a reduction of oxygen input in some stretches. The containment of silt upstream of the barrage also resulted in the coarsening of sediments downstream and the salt water residence times increased with the penetration of the salt wedge further up the estuary (NMMP, 2004).

5. Up until 2000, estuaries in England and Wales were classified every five years as good, fair, poor or bad based on their:

- Biological quality - presence of certain species of fish;
- Aesthetic quality - evidence of aesthetic pollution, for example sewage-derived litter;
- Water quality - in terms of levels of dissolved oxygen.

6. Classification schemes are now being developed for the Water Framework Directive (WFD) which will replace this scheme and assess a much wider range of pressures impacting on the marine environment. The schemes will classify the status of transitional and coastal waters using information on the ecological, chemical and hydromorphological quality of a body of water. Monitoring for the Water Framework Directive and the subsequent classification of data will start in 2006.

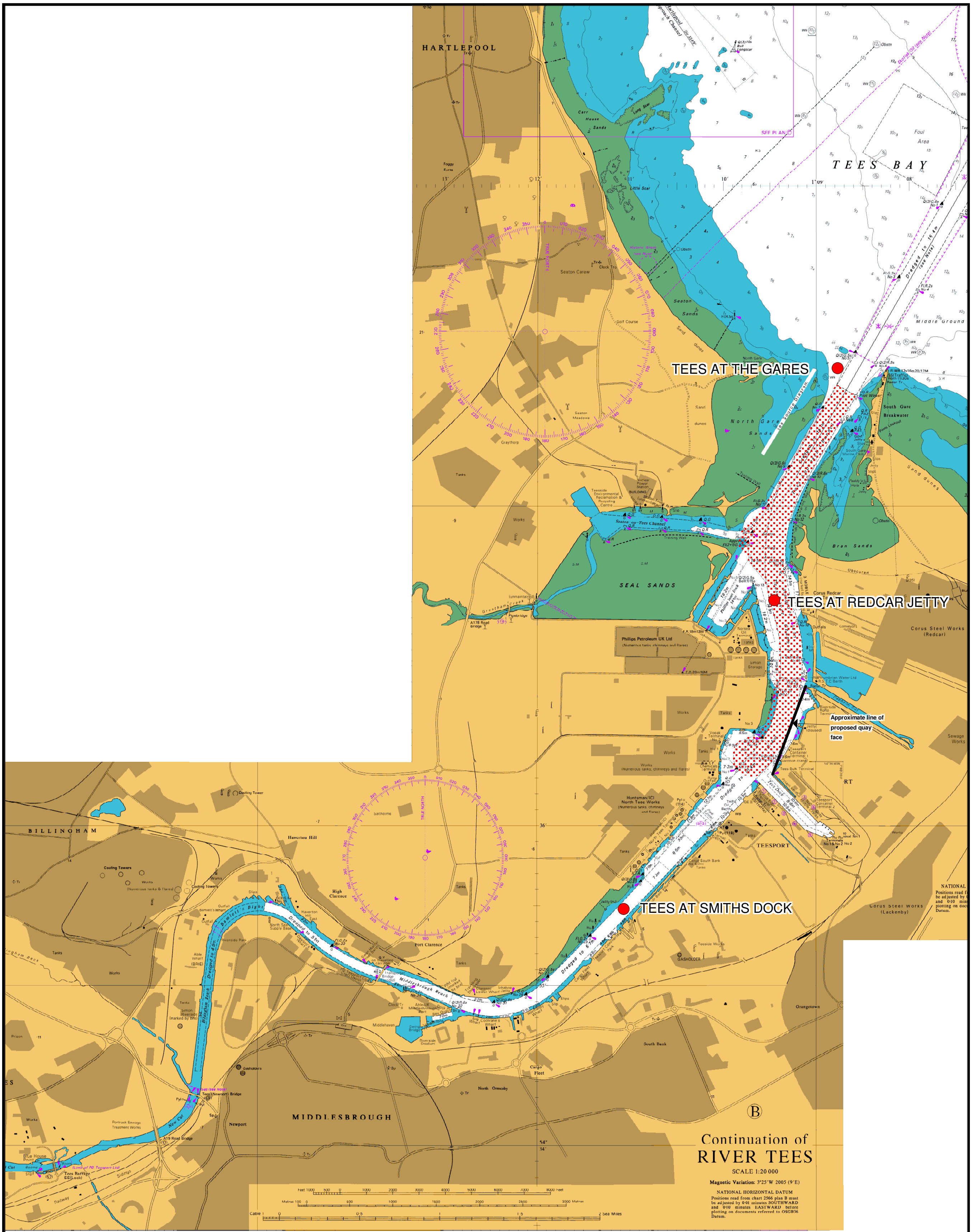
7. Since there are no up to date classification criteria for the estuary and coastal waters around the Tees, the principle approach to assessing water quality effects associated with the proposed development is to predict potential impacts against the assessment criteria established as water quality standards under the EC Directives (and relevant UK legislation). For the Tees estuary, applicable legislation covers dangerous substances, urban waste water and bathing waters.

9.1.2 General background

1. The Environment Agency routinely monitors at various locations along the river and estuary. This monitoring is predominantly undertaken to assess water quality against the Dangerous Substances Directive and for Estuary Classification. Water quality monitoring data for the years 2000-2005 is summarised as mean values in Table 9.1 for five sites located along the estuary from the mouth at The Gares to the Tees Barrage (Figure 9.1).

Table 9.1 Summarised water quality data (Environment Agency 2000-2005)

Determinand	The Gares	Redcar Jetty	Smiths Dock	Transporter Bridge	Tees Barrage
Temperature (^oC)	11.9	12.1	11.9	11.7	11.3
Salinity (g/kg)	32.3	26.9	25.7	22.2	17.3
pH	7.9	7.9	7.8	7.7	7.8
Susp. solids (mg/l)	13.2	8.8	8.2	-	-
Turbidity (FTUs)	19.6	24.4	22.2	21.7	17.6
Chlorophyll a (μg/l)	4.7	11.1	4.3	-	-
DO (% saturaton)	93.9	84.5	85.4	81.4	84.3
Nitrate (mg/l)	0.59	1.6	1.3	1.98	1.59
Nitrite (mg/l)	0.02	0.09	0.05	0.07	0.03
Ammonia (mg/l)	0.49	1.52	0.98	1.4	0.29
Orthophos. (mg/l)	0.079	0.31	0.16	0.24	0.14



Key:

Source: ARCS Charts under licence from UKHO

National Marine Monitoring Programme Water Sampling Sites (EA)

Northern Gateway Container Terminal Environmental Statement

PD Teesport

April 2006

1 cm = 0.5 km

Figure 9.1

ROYAL HASKONING

Dangerous Substances

2. The EC Dangerous Substances Directive was adopted in 1976 to control pollution caused by certain dangerous substances on the aquatic environment. The Directive established List I substances, which are regarded as particularly dangerous because of their toxicity, persistence and bioaccumulation. Pollution by these substances must be eliminated. List II substances are regarded as less dangerous but have a deleterious effect on the aquatic environment; input of these substances must be reduced.

3. The Dangerous Substances Directive stipulates uniform emission standards (UESs, also known as limit values) and environmental quality standards (EQSs) as approaches for the control of List I substances. For List II substances, all member states are required to establish EQSs on a national level. EQSs for List II substances have been implemented in the UK by the Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and 1998. The EQSs for List I and List II substances form the assessment criteria for water quality concerning dangerous substances.

The EQSs for selected List I substances are shown in Table 9.2.

Table 9.2 Selected List I dangerous substances*

Substance**	**EQS Type**	**Estuarine EQS*** (annual average, µg/l)**
Mercury (dissolved)	Annual average	0.5
Cadmium (dissolved)	Annual average	5
HCH (Lindane) ******	Annual average	0.02
Total DDT	Annual average	0.025
ppDDT	Annual average	0.01
Pentachorophenol	Annual average	2
Aldrin	Annual average	0.01
Dieldrin	Annual average	0.01
Endrin	Annual average	0.005
Isodrin	Annual average	0.005
Total 'Drins'	Annual average	0.03
Hexachlorobenzene	Annual average	0.03
Hexachlorobutadiene	Annual average	0.1
Carbon tetrachloride	Annual average	12
Chloroform	Annual average	12
1,2-dichloroethane	Annual average	10
Trichloroethyleme	Annual average	10
Perchloroethylene	Annual average	10
Trichlorobenzene	Annual average	0.4

* EQS List I taken from
www.environment-agency.gov.uk
**total concentration (i.e. without filtration) unless specified
*** all HCH isomers, including Lindane

4. EQSs for List II substances have been implemented in the UK by the Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and 1998. The EQSs for selected List II substances are shown in Table 9.3.

Table 9.3 Selected List II dangerous substances*

Substance	EQS Type	Estuarine EQS (annual average, µg/l)
Arsenic (dissolved)	Annual average	25
Chromium (dissolved)	Annual average	15
Copper (dissolved)	Annual average	5
Lead (dissolved)	Annual average	25
Nickel (dissolved)	Annual average	30
Tributyl tin	Maximum concentration	0.002
Zinc (total)	Annual average	40

*The full EQS List II is available on www.environment-agency.gov.uk

5. Water quality monitoring data for the years 2000 to 2005 was provided by the Environment Agency. For the purposes of describing the existing conditions, three sites were chosen (see Figure 9.1). Sample information from Smith's Dock was collated to represent water quality upstream of the proposed development and dredge area, Redcar Jetty is located within the dredge area and The Gares is located close to the mouth of the Tees. Tables 9.4 to 9.6 summarise this information and compare the collated data to the EQSs.

6. It should be noted that much of the data from the monitoring is for the purposes of compliance monitoring only. Detection limits are, therefore, set with that purpose in mind. For assessment purposes, in instances where the recorded value was below the limit of detection, the limit of detection value was halved in order to provide an input value to the summary statistics. This is in line with the approach adopted by the Environment Agency.

7. Where the majority of samples have recorded below the limit of detection, for a particular parameter, minimum and maximum values only are listed and means are not calculated.

Table 9.4 Summarised dangerous substances data for the Gares sampling site

Determinand	Minimum (µg/l)	Maximum (µg/l)	Mean (µg/l)	EQS (µg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	0.04	0.37	0.06	5	46	25	0
Mercury	0.01	0.03	-	0.5	54	48	0
Arsenic	1.0	2.07	1.09	25	51	13	0
Chromium	0.35	98.0	3.14	15	54	21	2
Copper	0.55	2.97	1.24	5	52	0	0
Lead	0.14	2.44	0.61	25	55	1	0
Nickel	0.43	3.97	1.6	30	51	1	0
Zinc	2.72	39.9	13.5	40	51	0	0
HCH (Lindane – 3 isomers)	0.003	0.018	-	0.02	54	44	0
ppDDT	Not detected			0.01	55	55	0
Pentachlorophenol	Not detected			2	52	52	0
Chloroform	0.1	0.5	0.13	12	54	33	0
Carbon tetrachloride	Not detected			12	55	55	0
TBT	0.004	0.02	0.005	0.002	55	27	*
Total 'Drins'	0.007	0.016	-	0.03	55	44	0
Hexachlorobenzene	-	0.004	-	0.03	55	54	0
Hexachlorobutadiene	Not detected			0.1	54	54	0

*The detection limit for TBT for each of the sites is higher than the EQS.

Table 9.5 Summarised dangerous substances data for the Redcar Jetty sampling site

Determinand	Minimum (µg/l)	Maximum (µg/l)	Mean µg/l)	EQS (µg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	0.04	4.09	0.13	5	53	27	0
Mercury	0.01	0.04	-	0.5	55	44	0
Arsenic	1.0	2.1	1.12	25	53	13	0
Chromium	0.35	11.3	1.26	15	54	12	0
Copper	0.4	6.9	1.72	5	54	1	1
Lead	0.08	2.94	0.84	25	55	0	0
Nickel	0.98	8.01	2.44	30	51	0	0
Zinc	4.88	655.0	27.7	40	54	0	2
HCH (Lindane – 3 isomers)	0.003	0.015	-	0.02	54	38	0
ppDDT	Not detected			0.01	54	54	0
Pentachlorophenol	Not detected			2	53	53	0
Chloroform	0.1	4.0	0.75	12	49	10	0
Carbon tetrachloride	Not detected			12	55	55	0
TBT	0.004	0.028	0.006	0.002	51	26	*
Total 'Drins'	0.007	0.016	-	0.03	54	38	0
Hexachlorobenzene	-	0.001	-	0.03	54	53	0
Hexachlorobutadiene	Not detected			0.1	53	53	0

*The detection limit for TBT for each of the sites is higher than the EQS.

Table 9.6 Summarised dangerous substances data for the Smith's Dock sampling site

Determinand	Minimum (μg/l)	Maximum (μg/l)	Mean (μg/l)	EQS* (μg/l)	No. of Data	No of < than data	No. of Data Exceeding EQS
Cadmium	0.04	1.06	0.083	5	47	23	0
Mercury	0.01	0.033	-	0.5	54	48	0
Arsenic	1.0	2.38	1.039	25	54	21	0
Chromium	0.35	7.95	1.09	15	55	14	0
Copper	0.521	2.94	1.65	5	54	0	0
Lead	0.136	4.38	1.02	25	55	0	0
Nickel	0.78	4.95	2.15	30	50	0	0
Zinc	6.0	186.0	17.33	40	52	0	1
HCH (Lindane – 3 isomers)	0.003	0.024	-	0.02	55	42	0
ppDDT	Not detected			0.01	55	55	0
Pentachlorophenol	Not detected			2	52	52	0
Chloroform	0.1	2.0	0.16	12	49	26	0
Carbon tetrachloride	Not detected			12	53	53	0
TBT	0.004	0.087	0.008	0.002	50	27	*
Total 'Drins'	0.007	0.016	-	0.03	55	42	0
Hexachlorobenzene	Not detected			0.03	55	55	0
Hexachlorobutadiene	Not detected			0.1	54	54	0

*The detection limit for TBT for each of the sites is higher than the EQS.

<u>The Gares</u>

1. The information provided by the Environment Agency indicates generally low levels of the various substances. For pesticides and herbicides (HCH, ppDDT, Drins etc) the majority of values are below detection limits. For metals, only two EQS exceedances were highlighted and these were both for chromium which exceeded in July 2001 and then again in February 2002. There have been no recorded exceedances of these parameters since. Although the limit of detection is higher than the EQS, examination of the raw data highlights that concentrations of TBT regularly exceed the EQS.

<u>Redcar Jetty</u>

2. The information provided by the Environment Agency again indicates generally low levels of dangerous substances. There have however, been several exceedances for metals. Concentrations of copper exceeded in June 2000 and concentrations of zinc exceeded on the same day in June and again, in July 2000. There have been no recorded exceedances of these parameters since 2000. All data for pesticides and herbicides (HCH, ppDDT, Drins etc) are below detection limits. Although the limit of detection is higher than the EQS,

examination of the raw data highlights that concentrations of TBT regularly exceed the EQS.

Smith's Dock

3. As for Redcar Jetty and The Gares, the information provided by the Environment Agency indicates generally low levels of dangerous substances at this location. There has however been one exceedance for Zinc in July 2000. There have been no further exceedances of these parameters since 2000. All data for pesticides and herbicides (HCH, ppDDT, Drins etc) are below detection limits. Although the limit of detection is higher than the EQS, examination of the raw data highlights that concentrations of TBT regularly exceed the EQS.

Urban Waste Water Treatment Directive

4. This Directive was adopted by Member States in May 1991 and transposed into legislation across the UK in 1994 to form the Urban Waste Water Treatment (England and Wales) Regulations. These regulations were amended in 2003. Its objective is to protect the environment from the adverse effects of sewage discharges. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. Waters can be designated 'sensitive' under the Directive for the following reasons:

- Natural freshwaters, other freshwater bodies, estuaries and coastal waters which have a high level of nitrates. These can cause a high growth of algae and other plants which can affect species living in the water, and the quality of the water overall. These water bodies are called eutrophic. Areas which could become eutrophic if no action is taken are also covered. These are designated Sensitive Areas (Eutrophic).

- Surface freshwaters used for drinking water that could contain more nitrates than allowed by EC directive on drinking water. These are designated Sensitive Areas (Nitrate).

- Areas where the water needs treatment further to secondary treatment to fulfil the requirements of other EC directives. These are designated Sensitive Areas (Bathing Waters) and Sensitive Areas (Shellfish waters).

5. Where areas are identified 'Sensitive (Eutrophic)', additional treatment is required on discharges from sewage works serving communities with populations greater than 10,000. For discharges to estuarine waters, additional treatment usually involves reducing levels of nitrogen to standards set out in the Directive.

6. Seal Sands was designated as Sensitive (Eutrophic) under this Directive in June 2002. As a consequence, Billingham sewage treatment works and Bran Sands sewage treatment works have been identified to receive treatment to reduce the levels of nitrogen and phosphorus in the final effluent by 2008.

Bathing Water Quality

7. There are 6 bathing waters within the study area and all are located on the open coast outside of the estuary. The locations of these bathing waters are shown in Figure 9.2. The bathing waters are shown as individual points on the map and reflect the Environment Agency's monitoring point for each designated bathing water. Bathing water quality is assessed by standards listed in the EC Bathing Waters Directive. The Directive was adopted by the Council of the European Communities in 1975 and transposed into law for England and Wales in August 1991 to form the Bathing Waters (Classification) Regulations 1991. The Directive is concerned with the quality of bathing waters for the purpose of protecting public health and requires monitoring of microbiological parameters and a small number of physical parameters (visible oil etc).

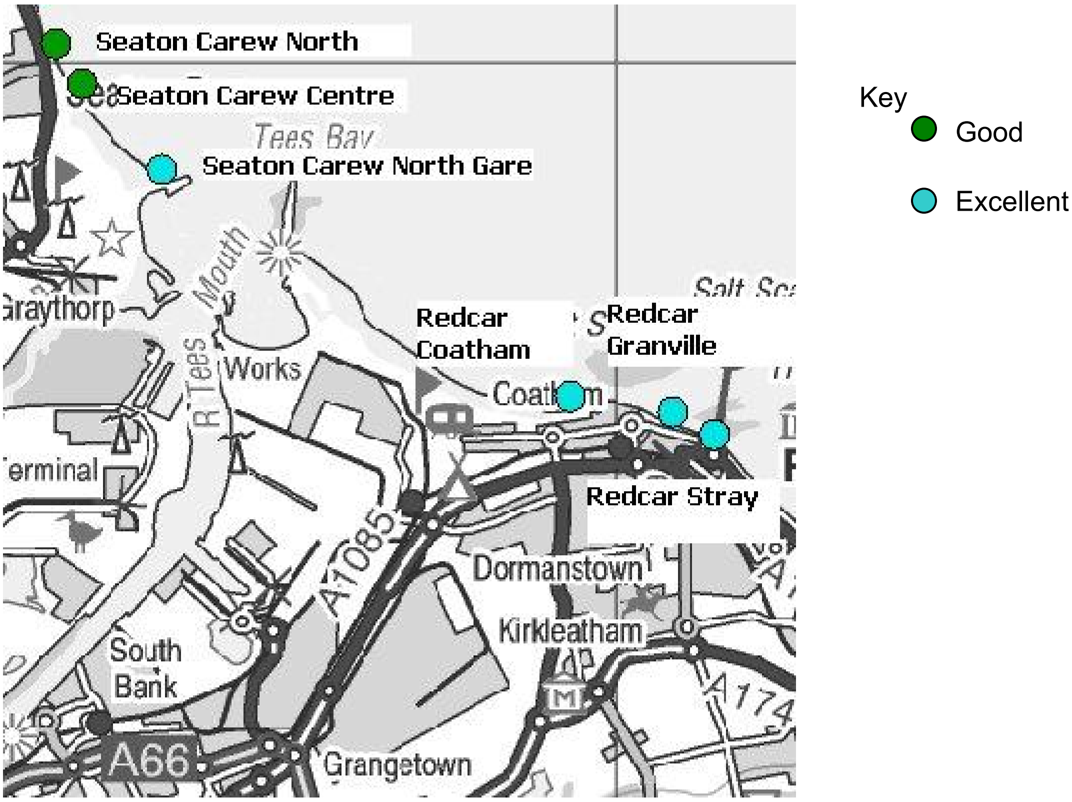


Figure 9.2 Locations of bathing waters around the Tees estuary

8. There are two types of microbiological standards; mandatory standards and the more stringent guideline standards.

9. The mandatory standards are:

- 10,000 total coliforms per 100ml of water;
- 2,000 faecal coliforms per 100ml of water.

10. For a bathing water to comply with the Directive, 95% of samples collected within a bathing season (15th May to 30th September) must meet these and the other physical criteria.

The guideline standards should be achieved where possible and are:

- 500 total coliforms per 100ml of water (in 80% samples);
- 100 faecal coliforms per 100ml of water (in 80% samples); and,
- 100 faecal streptococci per 100ml of water (in 90% samples).

11. Bathing Water quality at the 6 designated beaches is illustrated in Table 9.7. Water quality is classified as 'excellent', 'good' or 'poor'. 'Excellent' relates to the achievement of the more stringent guideline standards and 'good' relates to the achievement of the mandatory standards. Bathing waters classified as 'poor' fail to meet the Directive's minimum mandatory standard.

12. All bathing waters have exhibited either 'good' or 'excellent' quality for at least the last five years. Historically there have been failures of the mandatory standards; however significant improvements in the levels of sewage treatment over the past 10 years probably accounts for this.

Table 9.7 Bathing water quality at bathing waters in Tees Bay

Bathing Water	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Seaton Carew Centre	E	G	G	G	G	E	E	G	G	E	G
Seaton Carew North	G	G	G	G	G	G	E	E	G	G	G
Seaton Carew North Gare	E	G	E	G	G	E	E	E	E	E	E
Redcar Coatham	G	G	G	G	G	G	E	E	E	G	E
Redcar Glanville	G	P	G	G	G	G	G	G	G	G	E
Redcar Lifeboat Station	E	G	G	G	G	G	E	G	G	G	E

Bathing Waters Classifications: E = Excellent, G = Good, P = Poor

13. In December 2000, the European Commission put forward a proposal to revise the EC Bathing Waters Directive. Following several years of discussions and revisions, the Directive is now due to be enacted in April 2006. Member states will then have two years in which to transpose the legislation into UK law. The main differences to the current Directive include:

- A change in the standards and parameters to be applied;
- A new bathing water classification system;
- Proactive beach management;
- A significant increase in the information available to the public;
- The classification of the bathing water based on three seasons of data rather than the current one season; and
- The opportunity for member states to make changes to the list of designated bathing waters, the length of the bathing season and the location of the monitoring point.

9.2 Potential impacts during the construction phase

9.2.1 Increase in suspended sediment concentrations and increased turbidity during capital dredging

1. Changes to water quality will occur when sediment is released into the water column by dredging; sediment will be dispersed by tidal currents and potentially deposited elsewhere in the estuary. Such changes have the potential to impact on water quality by increasing turbidity. Turbidity is the interference with the passage of light rays through the water caused by the presence of suspended matter scattering and absorbing light. Fine particles (e.g. silts) in particular

interfere with light and, therefore, have a greater influence on water transparency compared with coarser particles, such as sand.

2. In general, suspended solids concentrations are low within the Tees estuary and Tees Bay. Background suspended solid levels in the vicinity to the proposed development are, for the most part, less than 20mg/l with short term peaks from 40mg/l to 80mg/l (HR Wallingford, 2005). The highest observed values are predicted to occur during spring tides with potentially greater suspended solid concentrations occurring during high rainfall or storm events (HR Wallingford, 2005).

3. The effect of capital dredging on suspended sediment concentration has been predicted for dredging using a CSD in the channel in the vicinity of the reclamation and in the Tees Dock turning circle and using a TSHD in the lower channel (the latter scenario incorporated the simulation of run-off from the reclamation site).

Cutter Suction Dredger

4. When the CSD is located in the Tees Dock turning circle, peak suspended sediment concentrations of up to 500mg/l are predicted in the immediate vicinity of the dredger; however, effects on suspended sediment concentrations are very localised to the area of the turning circle (see Figure 6.4). When the dredger is located in the area of the proposed quay wall, peak concentrations of suspended solids are predicted to occur within the immediate vicinity of the dredger, but the sediment plume spreads further afield (along the tidal axis) compared to dredging in the Tees Dock turning circle. Suspended sediment concentrations 500m from the dredger are not, however, predicted to exceed levels experienced naturally in the estuary. Peak concentrations are also predicted to remain on the same side of the channel as the barge receiving the dredged material.

Trailing Suction Hopper Dredger

5. Results for the use of a TSHD dredging sand in the lower channel and during reclamation show that peak increases in suspended sediment concentrations of between 500mg/l and 1000mg/l are predicted along the dredger track. Increases of a similar magnitude are predicted due to run-off from the reclamation. Concentrations of up to 50mg/l are predicted over parts of Seal Sands and up to 25mg/l in the Seaton Channel.

6. Figure 9.4 illustrates the predicted peak increases and time histories of suspended sediment concentration arising during the dredging in the lower channel and the effect of run-off from the reclamation of suspended sediment concentrations.

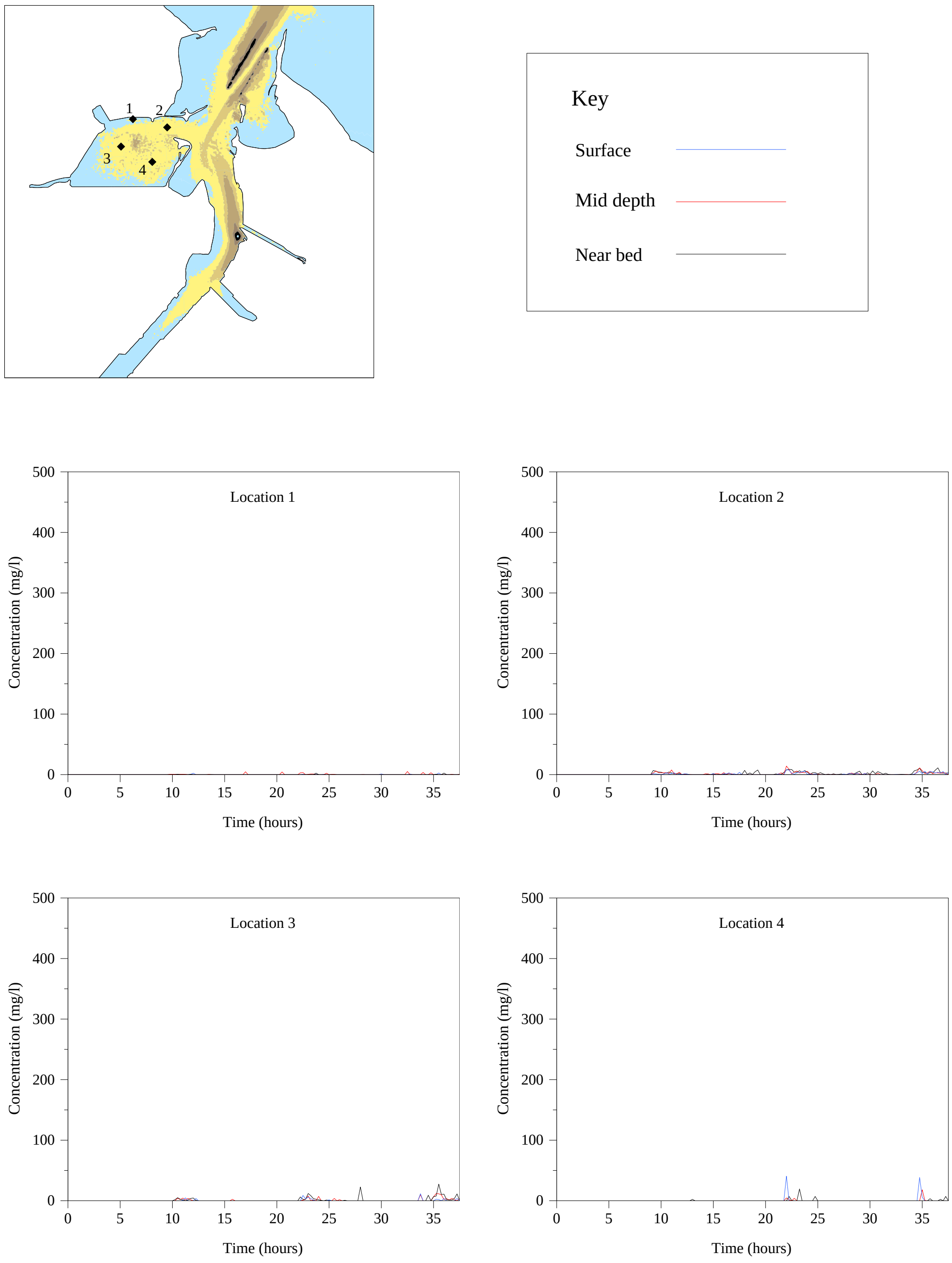


Figure 9.3 Time histories of suspended solids concentrations in Seaton Channel and Seal Sands for a TSHD dredging sand in the approach channel and run-off from the reclamation site

7. Figure 9.3 demonstrates that peak concentrations of up to 50mg/l above background can occur over Seal Sands and in Seaton Channel. Such effects

will occur over localised areas of Seal Sands and would occur under spring tide conditions. All other locations demonstrate lower peak increases in suspended sediment concentrations (i.e. less than 20mg/l above background).

8. For both types of dredger (CSD and TSHD), peak suspended solids concentrations (i.e. up to 500mg/l above background) are predicted in the immediate vicinity of the dredger. This material is quickly dispersed either in the water column or by settlement on the seabed. For example, for the CSD suspended sediment concentrations reduce to less than 50mg/l above background within approximately 100m either side of the dredger when the dredger is located in the vicinity of the proposed reclamation.

9. Since there are no environment quality standards relating to suspended solids for the Tees estuary, the impact of the increase in suspended solids concentrations is assessed against the range of background conditions experienced by the areas likely to be impacted.

10. HR Wallingford identifies depth averaged mean concentrations of less than 20mg/l during calm periods at low tide and between 40mg/l and 80mg/l during short term peaks. Information provided in Tansley (2003) also indicates occasional peaks of up to 90mg/l at the Gares and over 100mg/l at Redcar Jetty.

11. It can, therefore, be concluded that the predicted suspended solids concentrations generated by dredging will lead to peak increases in concentration above those normally experienced in the estuary. However, the variation is considered to be acceptable given the temporary nature of the works and the intermittent nature of the peaks related to both tidal influence and location of the dredger.

12. Given the above, the potential impact associated with the increase in suspended solids in the water column is considered to be of **minor adverse significance**.

Mitigation and residual impact

13. There are no mitigation measures that can be taken therefore the residual impact would be of **minor adverse significance**.

9.2.2 <u>Resuspension of contaminants during capital dredging</u>

1. The resuspension of sediments as described in Section 9.2.1 also has the potential to release contaminants into the water column and affect compliance with EQSs as set out in the Dangerous Substances Directive. Since the seabed sediments within the proposed reclamation area will be covered by the reclamation (and, therefore, will not be disturbed by dredging) the assessment of potential resuspension of contaminants focuses on the effect of capital dredging of the channel.

2. To assess the potential impact on compliance with the Dangerous Substances EQSs, the sediment-water partitioning approach has been used. This assumes

that the critical factor in sediment toxicity is the concentration of the contaminant in the interstitial water. The sediment standard is taken as the concentration in the sediment, in equilibrium with the interstitial water that does not give rise to a concentration that would breach the water quality standard (i.e. EQS), in this case the standards set by the Dangerous Substances Directive. The sediment standard is calculated using published partition coefficients. These express the relationship between contaminant concentration in the sediment and the surrounding water and are referred to as K_{oc} The sediment level is then calculated using the following equation $C_{sed} = K_{oc}.EQS.TOC$ where TOC is total organic carbon of the sediment sample. C_{sed} values are then compared to measured sediment concentrations and if C_{sed} are exceeded, there is the potential for an EQS breach.

3. K_{oc} are derived for a selected number of contaminants. The mean TOC for the dredging areas is 4.8%. Table 9.8 summarises these values and calculates the sediment concentration likely to cause a breach in the EQS. Values are then compared to actual mean sediment concentrations in Table 9.8.

Table 9.8 Sediment levels (C_{sed}) derived from equilibrium partitioning

Substance	EQS (µg/l)	K_{oc} (taken from Webster & Ridgway 1994)	TOC	C_{sed} (mg/kg)
Arsenic (dissolved)	25	13,000	0.048	15.6
Cadmium (dissolved)	2.5	64,000	0.048	7.68
Copper (dissolved)	5	1,700,000	0.048	408
Lead (dissolved)	25	380,000	0.048	456
Mercury (dissolved)	0.3	8,000	0.048	0.12
Zinc (total)	40	330,000	0.048	633
PCB	0.014*	209,000	0.048	0.14
Total DDT	0.025	160,000	0.048	0.192
g-HCH	0.02	1,950	0.048	0.002

*EPA environmental quality standard.

Table 9.9 Comparison of sediment standard to mean sediment concentrations in the proposed dredge area

Substance	C_{sed} Criteria (mg/kg)	C_{sed} (mg/kg) Main Channel
Arsenic (dissolved)	15.6	19.3
Cadmium (dissolved)	7.68	0.34
Copper (dissolved)	408	51
Lead (dissolved)	456	98
Mercury (dissolved)	0.12	0.5
Zinc (total)	633	150
Total PCB	0.14	0.02
ppDDT	0.192	ND
g-HCH	0.002	ND

4. The comparison shows that the mean concentrations of the majority of contaminants in the sediments within the dredging areas are below the significance criteria. This means that the interstitial water of the sediment mostly contains metals, PCBs and organochlorine pesticides at concentrations below EQSs for dangerous substances.

5. However, mean arsenic and mercury concentrations in the main channel exceed the significance criteria. This means that the interstitial water of the sediment contains these substances at concentrations above EQSs for dangerous substances. The magnitude of the exceeding concentrations over the EQSs significance criteria however, is less than one (i.e. a factor of 10).

6. Dredging would release sediment into the overlying water column. The sediment and the contaminants in the interstitial water would undergo significant dilution in the water column as they are dispersed throughout the Tees estuary. In the case of arsenic and mercury, a dilution of 10 would be sufficient to reduce interstitial concentrations to below EQSs. Hence, one litre of interstitial water needs only 10 litres of water in the overlying water column to dilute concentrations to below EQSs.

7. For organotins, there is the potential for the dredging to increase concentrations where baseline conditions already exceed EQS due to other inputs. Results for the sediment survey however, did not record TBT or DBT levels above the limit of detection. Re-suspension of contaminated sediment with high concentrations of organotins is therefore not considered to be of concern.

8. The concentration of brominated flame retardants is relatively low in the sediments. Deca BDE has not been reported in water samples which is consistent with its low water solubility (OSPAR Commission, 2001). It is therefore likely that contaminants will remain adsorbed to the surfaces of the suspended solids during resuspension and will occur. This is also likely to be the case for PAH contaminants as PAHs have a high affinity for sediments and therefore poor aqueous solubility (CIRIA, 2000).

9. Overall, it is concluded that dredging would result in a short term, localised impact of **minor adverse significance**. These temporary increases will however be quickly diluted to below EQS.

Mitigation and residual impact

10. It is not possible to mitigate against the release of contaminants into the water column as a result of the proposed dredging. The residual impact would therefore be of **minor adverse significance**.

9.2.3 Potential impact on dissolved oxygen levels as a consequence of re-mobilisation of suspended solids

1. The resuspension of sediment as a consequence of the proposed capital dredging could potentially affect dissolved oxygen levels in the water. This is due to the introduction of organic matter and nutrients into the water column which are broken down by microbial activity (i.e. respiration) resulting in a short term demand on dissolved oxygen concentrations.

2. In general, sediment plumes induced by dredging are considered to pose only a limited risk to water quality since the affected water usually has the capacity to accommodate an increased oxygen demand; particularly where dredging occurs in the open sea or in large estuaries (CIRIA, 2000). The tidal exchange within the Tees estuary will remain unrestricted throughout the construction (and operational) phases. In addition, peaks in suspended solids concentrations are only predicted to occur on a short term basis (See Section 9.2.1). Results also presented in Section 9.2.1, illustrate that these peaks significantly decrease over a tidal cycle to near background conditions.

3. Given the above, the resuspension of suspended solids as a result of the dredging is predicted to result in an impact of **minor adverse significance** on dissolved oxygen levels in the short term.

Mitigation and residual impact

4. It is not possible to mitigate the effect of the proposed dredging on dissolved oxygen concentrations. The residual impact would therefore be of **minor adverse significance**.

9.2.4 Impact of dredging on designated bathing waters

1. The proposed capital dredging has the potential to disturb sediment and release sediment-bound bacteria into the water column. Bacteria could therefore be transported to the designated bathing waters located in Tees Bay and potentially impact on compliance with the Bathing Waters Directive.

2. The majority of samples collected during the sediment quality survey registered results less than the limit of detection for bacteria. Only three sites recorded a positive value and these were 10, 10 and 20 faecal enterococci per gramme at

sites TS08, TS11 and TS05 respectively. The large distance to the bathing waters and therefore the significant dilution available means that it is considered that there is no risk to the bathing waters from bacterial contamination caused by disturbance of the sediments during dredging.

3. Given the above, it is predicted that there will be **no impact**.

Mitigation and residual risk

4. No mitigation measures are required and **no residual impact** is predicted.

9.2.5 Accidental spillage of polluting substances

1. During the construction period there is the potential for pollution from spills or leaks of fuel and oil. The risk of this arising can be minimised by following standard good practice with regard to pollution prevention guidance. It is therefore recommended that the appointed contractor undertakes the construction works in accordance with the Environment Agency's Pollution Prevention Guidelines PPG No. 5 on works in, near and liable to affect watercourses and PPG No. 6 on working at construction and demolition sites. It is also recommended that concrete pouring and filling works are monitored by the appointed contractor and in the case of spills in the estuary that appropriate remedial action is taken to clear up spills and avoid pollution.

2. Additionally, PD Teesport has an oil spill contingency plan in place. This plan has been developed for use in the event of an operational incident but is equally relevant for the construction phase. No changes to the existing plan are required to take account of the proposed construction works.

3. It is not possible to assess the significance of a particular pollution incident as this is dependant on the nature of the incident (e.g. location, scale, type of pollutant). The adoption of good practice however means that the potential for accidental pollution occurring is minimal. In any event, in view of the limited volume of potential contaminants that would be needed during the construction process and, therefore, present within at construction site at any one time, the likelihood of a significant pollution event occurring is **very low**.

Mitigation and residual impact

4. The risk of a significant pollution event occurring is **very low** particularly given the implementation of the measures recommended above with respect to following good site practice.

9.2.6 Impact on water quality of the Tees estuary as a consequence of draining water from dewatering of material deposited in the Bran Sands lagoon for reclamation

1. The Bran Sands lagoon is not owned by PD Teesport but, if the site was to become available to PD Teesport during the timescales of this project, the lagoon could be drained and used as a disposal option for dredged material.

Draining of this lagoon would require discharge of the lagoon water to the estuary.

2. Water quality data for the Bran Sands lagoon is limited and restricted to spot samples taken during pollution incidents (Environment Agency, pers. comm. EA). This information is therefore not considered to be a good representation of general water quality within the lagoon. It is, however, likely that the water quality will be similar to that of the estuary since water exchange takes place between the lagoon and the estuary via a tidal flap. Therefore **no impact** on the estuarine environment water quality in the Tees estuary is predicted.

Mitigation and residual impact

3. If Bran Sands lagoon were considered as a disposal site, it is recommended that a short programme of water quality sampling be undertaken to ensure that the above assumptions are accurate and to determine whether any incident has affected water quality in the lagoon immediately prior to undertaking any work.

4. Subject to the above recommended programme of water quality monitoring concluding that there is no risk to the water quality within the Tees estuary as a consequence of draining the lagoon, no mitigation is required and there would be **no residual impact**.

9.3 Potential impacts during the operational phase

9.3.1 Periodic increases in suspended sediment concentrations and increased turbidity during maintenance dredging

1. The implications of the proposed scheme on the maintenance dredging strategy have been established as part of the numerical modelling studies. It is concluded that the effect of the scheme on the maintenance dredging will be insignificant, with no requirement to change the current strategy. As such, it is concluded that there would be **no impact** on water quality as a consequence of maintenance dredging that is required as a consequence of the proposed scheme given that the overall volume of material requiring dredging would not be significantly increased, its composition will be very similar to that dredged at present and no increase in the frequency of dredging will be required.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact**.

9.3.2 Potential changes in water quality due to erosion and remobilisation of potentially contaminated sediment caused by changes in tidal flows or wave action

1. As discussed in Section 6, the proposed development has the potential to result in effects on the hydraulic and sedimentary regime of the estuary system. For example, changes to tidal current speeds and directions and wave climate are predicted. Such changes could have associated water quality implications,

should they affect sedimentary areas that have elevated levels of contamination, and result in mobilisation of such contaminants into the water column.

2. The results of the tidal current and wave studies are presented in Section 6, with full details provided in Accompanying Document 1. In summary, changes to tidal current are of a low order of magnitude. Areas where small increases in current speed are predicted are not expected to experience erosion of sediments and, therefore, the potential for the scheme to result in mobilisation of potentially contaminated areas is considered to be very low.

3. The predicted effect of the development on waves generated within the estuary is predicted to be small, with changes to significant wave height being smaller than 10cm. The reflection of waves from the proposed terminal would increase the significant wave height over the lower parts of the intertidal area of North Gare Sands but this additional effect would not be detectable in terms of effect on the substratum, particularly given that the effect of the proposed dredging on swell waves from offshore is a reduction in significant wave height. As a consequence, such changes are considered to be insignificant in terms of their potential to result in a trend of increased mobilisation of sediment.

4. The significant wave height for swell waves with an estimated return period of 1 year is predicted to increase by up to 30cm in ConocoPhillips Dock adjacent to the ConocoPhillips Oil Terminal. The potential for additional effects on the sediments of the seabed at this location in terms of mobilisation of sediment, is considered to be low as this area is subtidal. In addition, the areas currently experiences significant wave heights of up to 2m.

5. The implications of the results of the test of the sensitivity of the significant wave height to channel depth are worth noting at this point. Given that the baseline bathymetry in the model was shallower than 14.1m below CD (i.e. the existing declared channel depth), the modelled effects of the waves is enhanced compared to that situation that would arise if the baseline used in the model was the declared depth rather than the (shallower) actual depth. The implication is that PD Teesport could, in theory dredge, to 14.1m below CD by maintenance dredging and hence the effect of a further capital dredge to 14.5m below CD on wave climate would be less than predicted in these studies.

6. Overall, the potential for the proposed scheme to result in changes to the mobilisation of sediment from intertidal areas is considered to be low and as such **no impact** is predicted on the likelihood of mobilisation of potentially contaminated sediments.

Mitigation and residual impact

7. No mitigation is required and it is predicted that there would be **no residual impact**.

9.3.3 Potential effects on water quality due to changes to the dispersion characteristics of outfalls

1. Changes to flow characteristics around outfalls and other discharges to the Tees estuary could affect water quality due to effects on the dispersion of such outfalls. In view of the footprint of predicted changes to tidal current speeds and directions (see Section 6) the most notable discharge to be considered in the assessment is Dabholm Gut.

2. Given the above, the dispersion of discharges from Dabholm Gut was specifically modelled. The aim of the modelling was to examine whether the proposed development would result in a change to the dispersion characteristics of the discharge and therefore whether there was a potential for the development to result in the deterioration of water quality within the Tees estuary.

3. The studies conclude that under existing conditions the dispersion of material from Dabholm Gut is greater during spring tides compared with neap tides. In summary, under existing conditions, the increase in deposits occurs in the eastern part of the river between Tees Dock and some 1500m north of Dabholm Gut (see Figure 9.4). The maximum footprint of deposits over the tidal cycle (occurring at slack water) affects a wider area than this but some of this material is resuspended by higher current speeds either side of slack water.

4. Generally speaking, the distribution of deposited particles from Dabholm Gut as a consequence of the proposed development is similar to the existing situation and, therefore, the maximum footprint of deposition is largely unchanged as a consequence of the proposed development (See Figure 9.5). The main difference is an enhancement in deposition near the eastern shore to the north of Dabholm Gut. Deposition is also enhanced in the Tees Dock turning circle. Comparison of Figures 9.4 and 9.5 demonstrates the predicted effect of the proposed development on the existing pattern of deposition of material from Dabholm Gut during spring tide summer conditions. The pattern for spring tides in the winter is similar, although there is a tendency for less accumulation to the north of Dabholm Gut and more accumulation in the Tees Dock turning circle compared with the summer conditions.

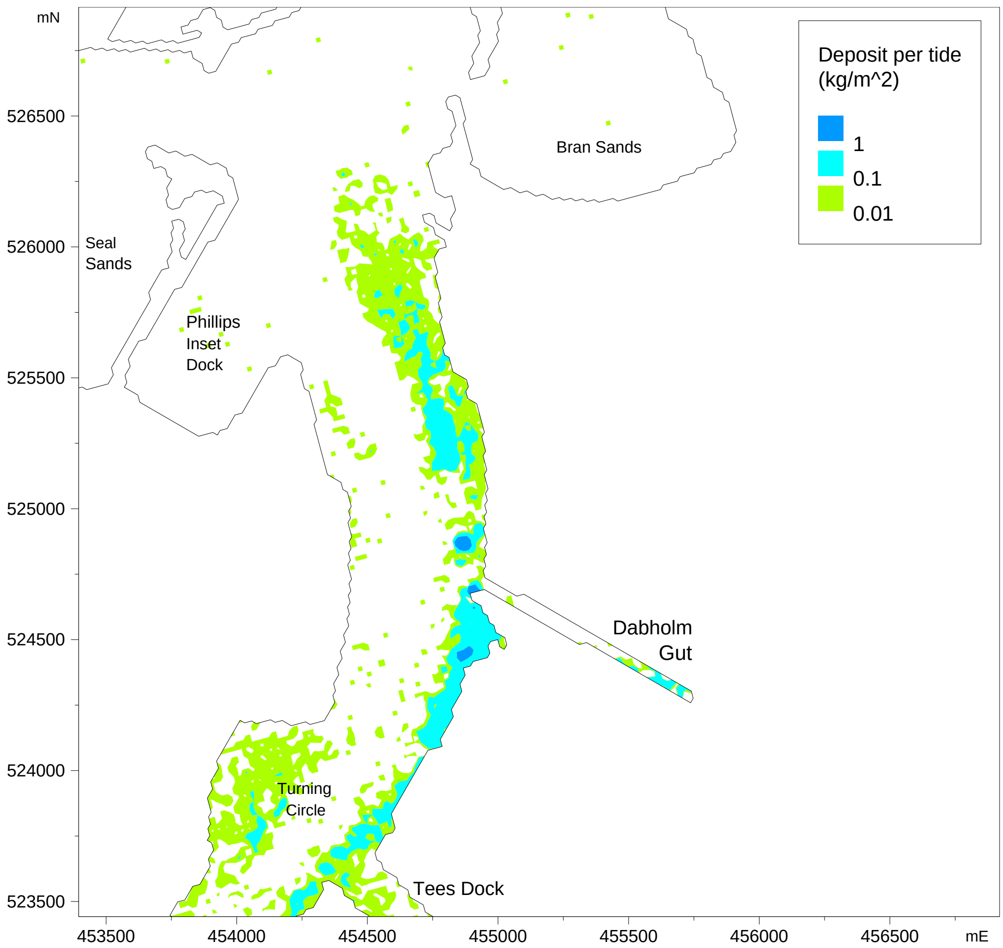


Figure 9.4 Increase in deposits over a tidal cycle (existing layout, spring tide, summer conditions)

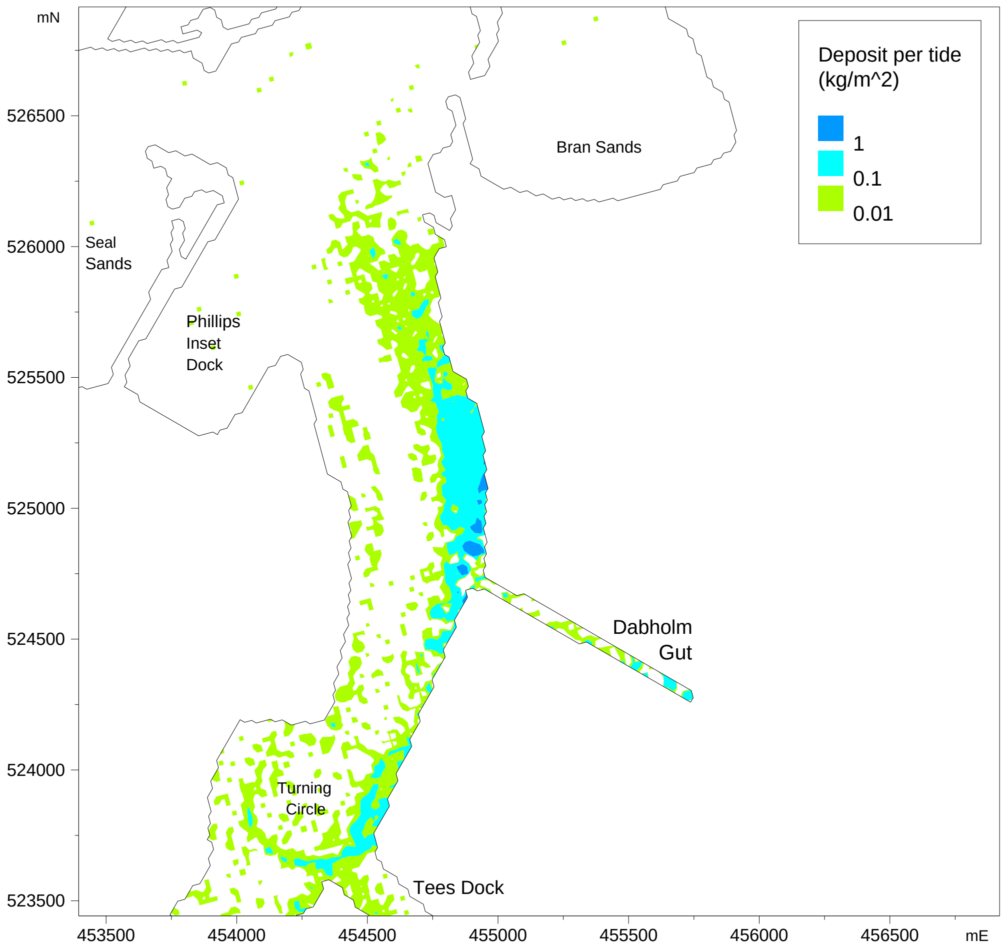


Figure 9.5 Increase in deposits over a tidal cycle (proposed layout, spring tide, summer conditions)

5. Overall, it is concluded that the proposed development has a minor influence on the pattern of deposition of material exiting Dabholm Gut. Similar areas of seabed are affected, with a predicted redistribution of deposited material within these areas. Consequently, although the dispersion of the discharge from Dabholm Gut is affected, the impact in terms of effect on water quality is predicted to be of **negligible significance**.

Mitigation and residual impact

6. No mitigation measures are required and the residual impact would be of **negligible significance**.

9.3.4 <u>Potential effect of surface water run off and domestic wastewater from the proposed development</u>

1. Surface run-off from the development has the potential to be exposed to oils in the paved terminal area and, therefore, could cause pollution when discharged

to the estuary. To minimise this risk, the design incorporates a series of drainage arrangements. The surface water system (i.e. the system collecting rainfall run off) will consist of a number of channel drains running parallel to the quay. Outfalls will collect this water and discharge it to the estuary via oil interceptors located behind the quay wall. Foul water (i.e. sanitary waste) will be collected via a separate system and gravitated to a new pumping station which will lift flows to the mains sewer. Additionally, any areas with a high risk of producing washings containing silt and contaminating substances will be connected to the foul system for transfer to the mains sewerage. These areas include the RTG service areas and workshops, mechanical fuelling facilities and chassis washing areas. .

2. Given the above, it is considered that there would be **no impact** on water quality.

Mitigation and residual impact

3. No further mitigation measures are required and there would be **no residual impact**.

9.3.5 Accidental spillage of polluting substances

1. The drainage system to be incorporated into the design of the proposed development will provide the opportunity to isolate the system, should spillage of polluting chemicals occur. Additionally, oil interceptors are to be placed at the quay wall to ensure all oils are removed from the surface water before it is discharged into the estuary.

2. All chemicals and oils will be stored according to the appropriate requirements and will be informed by the relevant Pollution Prevention Guidance such as PPG 2 ('Above ground oil storage tanks'). For example, the chassis areas and fuelling facilities will be located in a fully bunded complete retention separator. PD Teesport also has an oil spill contingency plan in place and no changes to this plan are required as a consequence of the proposed development.

3. It is not appropriate to assess the significance of a pollution incident as this is dependant on the nature of the incident (e.g. location, scale, type of pollutant). However, the adoption of good practice, and an appropriate design of the drainage system, means that all possible measures to limit the significance of a pollution incident have been taken into account.

10 MARINE ECOLOGY

10.1 Existing environment

10.1.1 Overview of main habitat types

1. The Tees estuary comprises intertidal sand and mudflats, rocky shore, saltmarsh, freshwater marsh and sand dunes. The estuary has been significantly modified over the last 150 years by activities such as land-claim and the construction of breakwaters and training walls. Over 80% of the intertidal sedimentary habitats of the Tees Estuary have been reclaimed (Environment Agency, 2005).

2. The remaining intertidal areas within the estuary are composed of mud and sand, with some *Enteromorpha* mats in sheltered areas (e.g. on Seal Sands). Outside the estuary mouth, sandflats predominate, but with significant rocky foreshores and reefs at both Redcar and Hartlepool. Remnants of some of the original habitats including mudflats, saltmarsh, grazing marsh, sand dunes and associated wetlands still exist and contribute to much of the areas in the estuary designated for their conservation value.

3. The strand-line and foreshores of North and South Gare, either side of the river mouth, and the mudflats of Seal Sands and Bran Sands are backed by their respective dune systems and series of open wet grasslands at Seaton Common and on Cowpen Marsh. Greatham Creek has well developed saltmarsh and is the only extensive example of this habitat between the Humber and Lindisfarne. All these locations have been recognised for their conservation value through national and international designations in the form of Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR), Special Protection Area (SPA) and Ramsar sites.

10.1.2 Overview of invertebrate fauna

1. The invertebrate (infaunal and epifaunal) communities of the areas that will be directly impacted by the proposed development have been described on the basis of the marine biological survey that has been undertaken as part of the EIA (see Section 10.1.4). The following paragraphs provide some context to the findings of the survey works and highlight some of the features of the benthic invertebrate communities of the estuary from a review of recent available literature.

2. A comprehensive overview of the invertebrate fauna of the Tees estuary is provided in Tansley (2003) and this section summarises some of the findings from the study.

3. Prior to the construction of the Tees Barrage, four main subtidal biotopes were identified within the estuary. Oligochaete species (in particular *Tubificoides benedii*) and *Capitella capitata* dominated the species assemblage at Stockton-on-Tees and downstream to just below Billingham Beck. Below this point, as far

as Seaton-on-Tees channel, the sediments comprised a high mud fraction and the species assemblage was characterised by polychaete and oligochaete species with *Neanthes virens*, *Nepthtys hombergii, C. capitata* and *T. benedii* being the most frequently recorded species. A number of species of mollusc were found at some sites, with the mud snail *Hydrobia ulvae* reaching a high abundance in the middle reaches of the estuary.

4. Near Dabholm Gut and opposite Billingham Beck no infauna were recorded which probably reflects historic chronic pollution at these sites.

5. At the mouth of the Tees estuary, the sediments are less muddy and were characterised by a sparse infauna of polychaete species; the polychaetes *Nephtys* spp. were most frequently recorded here, with a greater proportion of amphipod and bivalve species present than further upstream.

Overview of intertidal communities

6. The most diverse intertidal habitats are the seawall, boulders and cobbles of the South Gare breakwater due to its proximity to the open coast. The boulders and cobbles are characterised by a fucoid/barnacle mosaic. Red algae are present at lower levels on the shore. The richness of this habitat is increased by the under boulder communities. Other hard substrata comprise the silted cobbles of the training wall on Seal Sands and cobbles in Greatham Creek which are colonised by bladderwrack *Fucus vesiculosus* and green algae *Enteromorpha* spp. with a particularly low species richness. On the training wall mussels *Mytilus edulis* and abundant periwinkles *Littorina littorea* are also recorded.

7. Bran Sands and Seal Sands are characterised by polychaetes including *Spio martinensis, Capitella capitata,* oligochaetes *Tubificoides pseudogaster* and bivalves *Cerastoderma edule* and *Fabulina fibula*. The muddier areas of Bran Sands and Seal Sands are characterised by species that are tolerant of fine sediment and variable salinity and are indicators of a nutrient rich environment, such as *Hediste diversicolor, Spio martinensis* and oligochaetes.

8. Very sheltered sites at Greatham Creek and adjacent to Newport Bridge comprise fluid anoxic mud typical of mid and upper estuaries which have a low species diversity dominated by *Streblospio shrubsolii, H. diversicolor* and the oligochaete *T. pseudogaster.*

Additional information on the invertebrate communities of the study area

9. An analysis of macrobenthic data from the Tees estuary suggests that since 1979 there has been a general trend of increasing macrofaunal diversity and abundance. The number of taxa (>1mm) inhabiting the estuary rose from 33 taxa in 1979 to 106 taxa in 1998. In terms of providing a feeding resource for waterfowl, only a few large invertebrate species occur at densities high enough to provide profitable food for waterbirds. For example, on Seal Sands and Bran Sands the three key species of waterbird prey are the ragworm *H.diversicolor*, the laver spire shell *H. ulvae* and the amphipod crustacean *Corophium volutator* (Evans *et al.,* 2001 in Tansley, 2003).

10. In spite of the overall general improvement in macrofaunal diversity and abundance, some important prey species for waterbirds have declined at intertidal monitoring sites in the lower estuary. In particular, there has been an obvious decline in ragworm *H. diversicolor* on Seal Sands and this is perceived to be linked to the invasion of *Enteromorpha* mats in this area; ultimately this may be impacting on some species of feeding waterbirds.

10.1.3 Common and harbour seals

1. There are two species of seal present at Seal Sands; the common (harbour) seal *Phoca vitulina* and the grey seal *Halichoerus grypus*. Common seals breed at Seal Sands between mid/late June and early July but grey seals do not breed at this location and instead leave the area during the winter to breed elsewhere. However, a few non-breeding grey seals, particularly juveniles, remain at Seal Sands over the winter. Both the common seal and grey seal are listed as vulnerable under the EC Habitats Directive.

2. INCA has been monitoring the seal population at Seal Sands since 1989, with the most intensive monitoring being undertaken during the common seal pupping season (between early June and late August). The monitoring records a number of features of the population including total population numbers, areas used as haul-out sites, the number and health of pups, disturbance and behaviour.

3. The majority of the seals haul-out and stay at Seal Sands. However, a very small number swim upriver as far as the Tees Barrage to feed and a small group (up to 10 individuals) have been hauling out at Billingham Beck, near to where it flows into the Tees estuary at Newport Bridge (Jonathan Gibson, INCA, *pers. comm.*). Therefore, for the first time in 2005, monitoring was carried out at Billingham Beck in addition to monitoring from the Huntsman Tioxide hide. Surveys are carried out at each daylight low tide period. A summary of results from both sites is provided below:

- The maximum number of common seals observed on any one day in 2005 was 69 on the 15th August. This compares to 23 in 1989, 71 in 2002, 58 in 2003 and 56 in 2004.
- Mean number of common seals in each of the three months was; 31.4 in June, 40.6 in July and 50 in August.
- The maximum number of grey seals observed on any one day in 2005 was 31 on the 23rd August. This included 30 grey seals at seal sands and one at Billingham Gut. This compares to 18 grey seals in 1989, 26 in 2003 and 31 in 2004.

10.1.4 Overview of survey work and data analysis

1. In order to fully assess the implications of the proposed development on marine biological communities, a survey of infaunal and epifaunal communities present within and immediately adjacent to the areas that are predicted to be directly impacted by the proposed development was undertaken. The survey was

undertaken by IECS (University of Hull) and the methodology is summarised below. Prior to undertaking the survey, the methodology was agreed with English Nature and the Environment Agency. Raw biological data are included in Appendix 5.

Subtidal infauna and particle size distribution

2. The infaunal survey consisted of a grid of 25 pre-determined sampling stations. Samples were taken using a 0.1m^2 Day grab operated from a survey vessel. At least one sample for biological analysis was taken from each station, with triplicate samples taken at six stations. Sub-samples from each station were taken for analysis of particle size distribution (raw particle size data are included in Appendix 5). Sampling locations are shown on Figure 10.1. Points coloured blue indicate those sites where replicate samples were collected.

3. Biological samples were processed in the laboratory. Sample processing used a nested sieving technique; samples were sieved through a 1mm sieve and then 0.5mm sieve. All individuals were then identified to species level where possible and enumerated. Estimates of wet weight biomass were made to major group level (e.g. Polychaeta, Mollusca, Crustacea, etc).

Data analysis

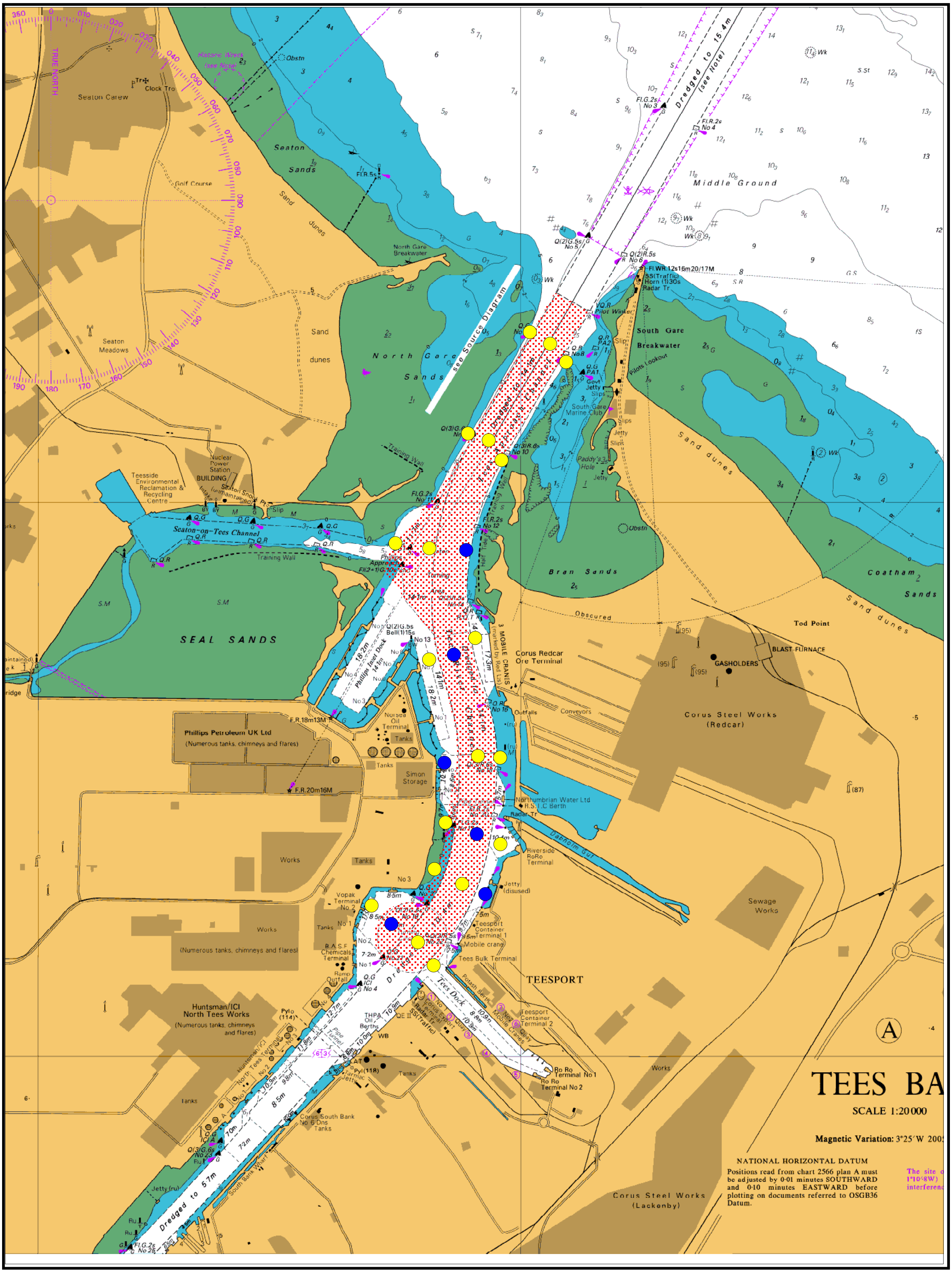
Biological community structure (infauna)

4. A number of univariate and multivariate statistical methods were used to describe the structure and variability of the biological communities of the survey area. A number of indices were used:

- Total number of species per sample (S);
- Total abundance of individuals per sample (A); and,
- Species diversity (Shannon-Weiner index, H') (a measure of the diversity of the samples which takes into account species richness and how equally abundant the species are).

5. The community structure has also been analysed using multivariate statistical methods. These are used to identify the species assemblage of each sample, the degree of similarity between samples based on species composition and, therefore, the distribution of different species assemblages throughout the survey area. The package used is called PRIMER (Plymouth Routines in Multivariate Ecological Research) (as described in Clark and Warwick, 1994). The analysis comprised of the following stages:

- *Data transformation*. Typically, communities are numerically dominated by a low number of species. The raw data can therefore be transformed to reduce the statistical weighting of such species and to allow species of lower abundance to have a greater contribution to the analysis. In this study a fourth root transformation has been used.
- *Similarity matrix*. This stage compares the composition of each of the samples with every other sample by producing a similarity matrix.



Key:

Proposed Dredge Footprint

No replicates (19)

Replicates (6)

Source: ARCS Charts under licence from UKHO

Marine Ecology
Benthic Sampling Locations

Northern Gateway Container Terminal
Environmental Statement

PD Teesport

April 2006

Approx scale
1 cm = 0.25 km

Figure 10.1

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- *Classification*. This stage constructs a dendrogram from the similarity matrix and groups samples into clusters based on the average level of similarity between groups of samples. By carrying out this analysis, different species assemblages can be identified. The species that are primarily responsible for the separation into groups can be identified using SIMPER (similarity percentages) within PRIMER.
- *Multidimensional scaling (MDS)*. This stage compliments the classification stage and arranges samples in clusters based on the level of similarity between clusters. Samples which plot close together are more similar in terms of composition that those which plot further apart.

6. The outcome of the process described above is a classification of samples based on community composition. The spatial distribution of different species assemblages can then be visually summarised by linking the data to the coordinates of the sampling stations and plotting the results within a Geographical Information System (GIS) package. For this study *MapInfo* was used, employing digital Admiralty Charts as the background.

Particle size distribution

1. The multivariate analysis as described above has also been applied to the particle size data in order to describe the spatial distribution of sediment types throughout the survey area. This distribution has also been illustrated using *MapInfo* (a GIS package).

10.1.5 Description of sediment types

1. In order to describe the distribution in sediment type in the survey area, cluster analysis was undertaken. The resulting group average sorting dendrogram showing the percentage similarity in particle size composition of the sediment at each of the sampling stations is shown in Figure 10.2.

2. Figure 10.2 demonstrates that the bed sediments within the survey area can be broadly divided into two groups which separate out at a relatively low level of average similarity (approximately 35%). Analysis of the raw data shows that sediments in group B contain relatively high percentages of sand with varying degrees of silt and clay. Sediments in group A however, contain greater than 50% of clay/silt and relatively low levels of sand. Fine particles therefore dominate the sediments in group A.

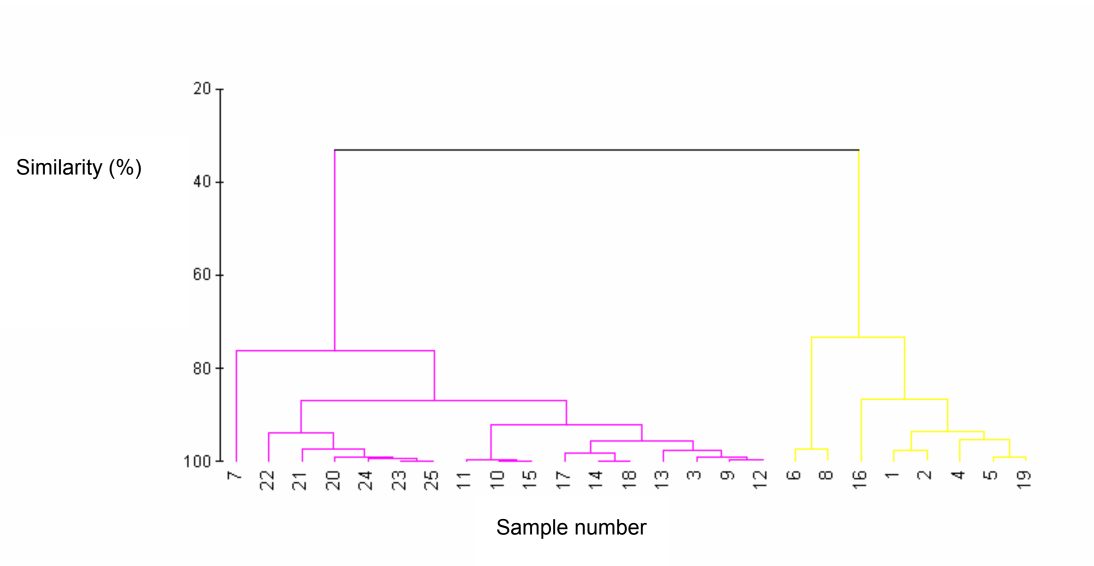


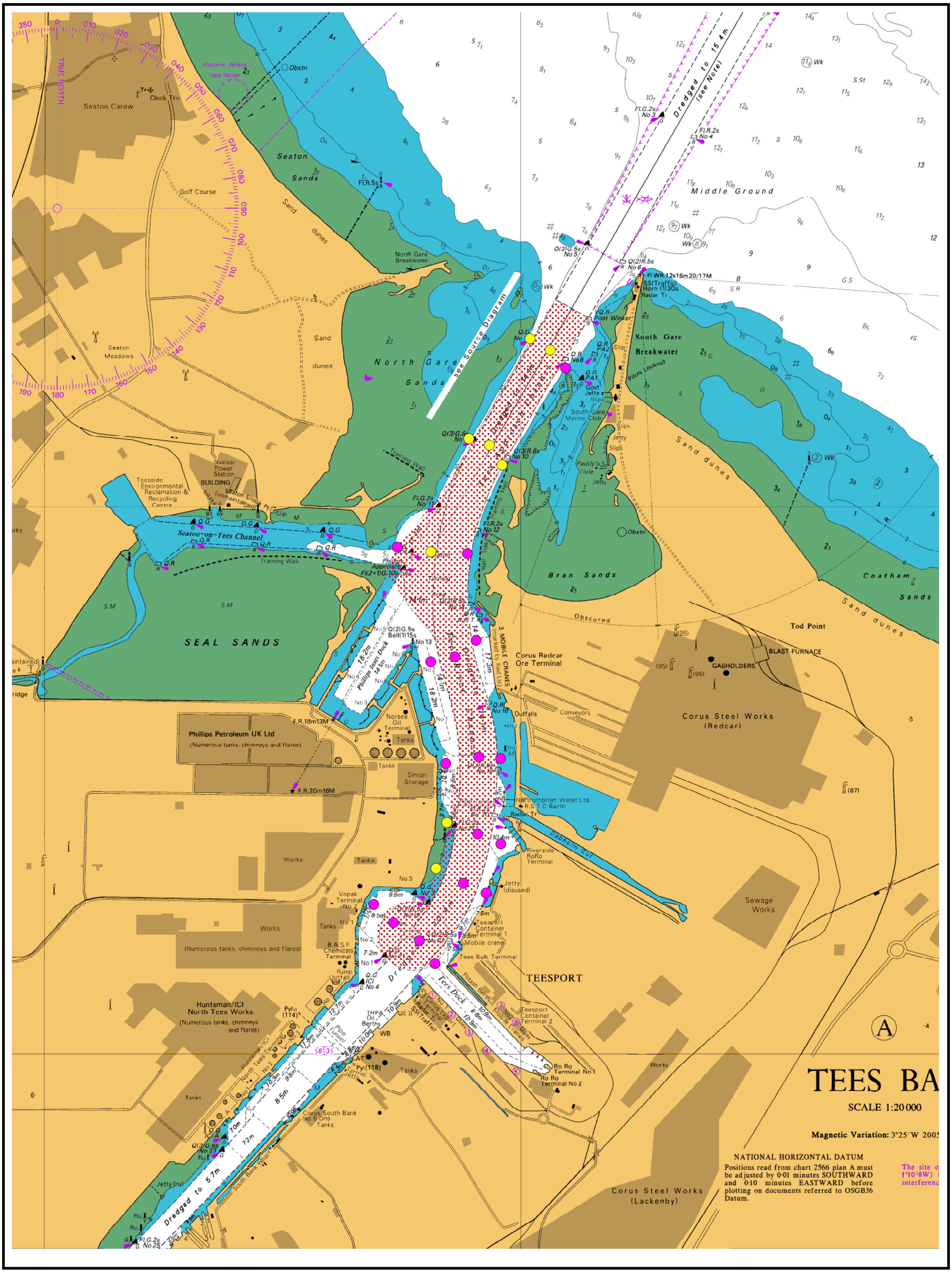
Figure 10.2 Group average sorting dendrogram showing two main clusters of samples of different sediment composition (purple = sediment group A, yellow = sediment group B).

3. The geographical distribution of the two sediment groups is shown on Figure 10.3. It can be seen that generally, the more sandy sediments dominate the mouth of the estuary. Areas also containing sandy sediments are located in the region directly opposite the proposed quay wall area. Finer sediments are predominantly found in the main channel, east of Seaton channel. This is consistent with the requirement for maintenance dredging of fine sediments in these areas.

10.1.6 <u>Description of biological communities (infauna)</u>

1. The results of the univariate analysis are presented in Figures 10.4. This figure shows the variability in the total numbers of species, total invertebrate abundance and species diversity. None of the species found were recorded from within the survey area are rare and therefore, in this respect the species present are typical of the estuarine environment.

2. It is expected that due to the requirement for maintenance dredging, there would be a distinct difference in the number, abundance and diversity of species between samples taken from the main channel and samples taken outside. There does not, however, appear to be an obvious difference except for species abundance where a slight increase can be noted in samples collected in areas outside of the main channel. Figure 10.4 indicates low numbers of species and low abundance in the Tees Dock turning circle area and in the proposed reclamation area.



Key:

Particle size analysis

- Sediment Group A
- Sediment Group B

Proposed Dredge Footprint

Source: ARCS Charts under license from UKHO

Results of particle size analysis

Northern Gateway Container Terminal Environmental Statement

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April 2006

Approx scale: 1cm - 0.5km

Figure 10.3

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Figure 10.4a

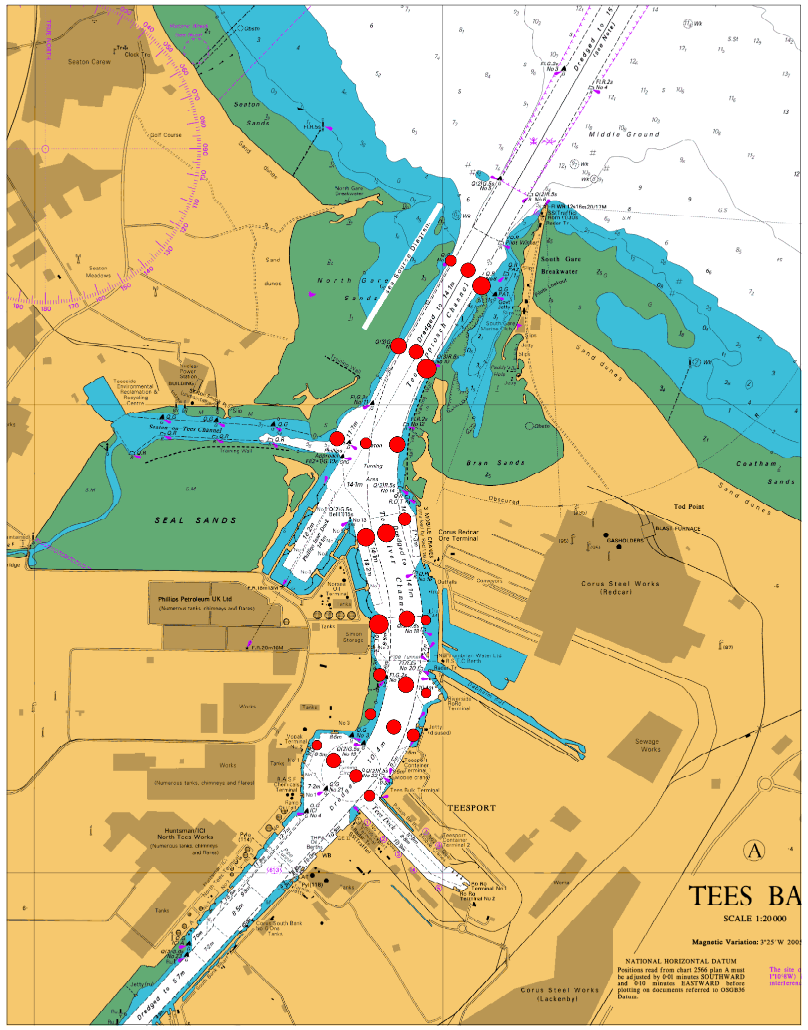


Figure 10.4b

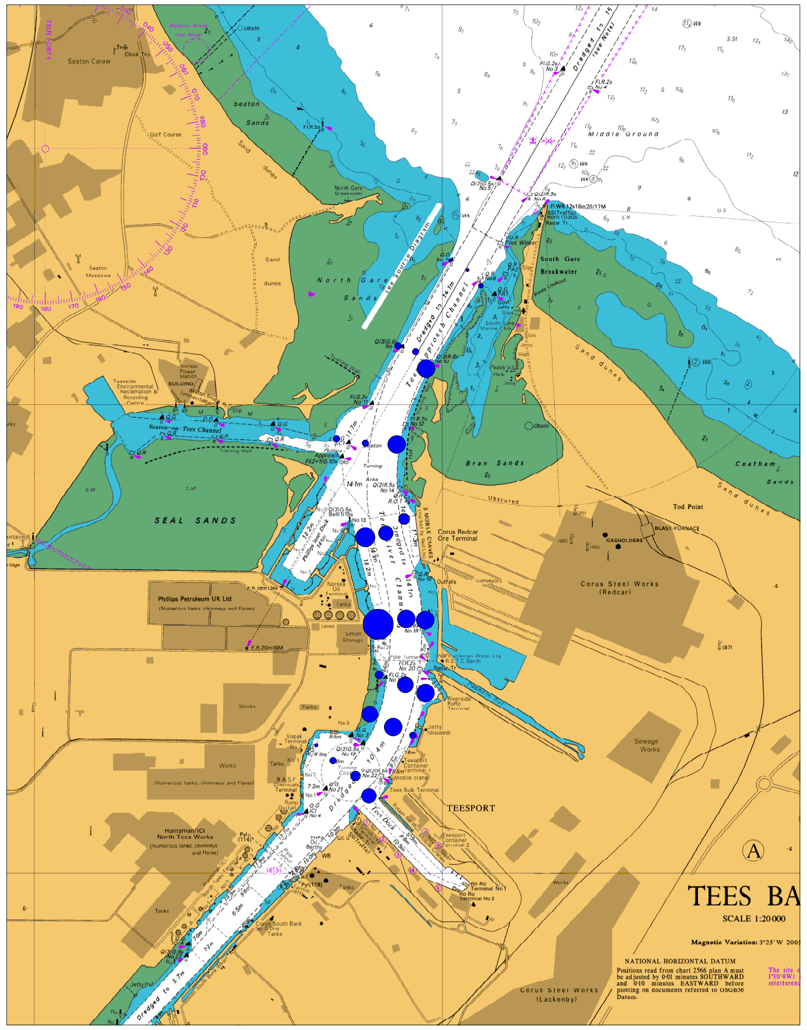


Figure 10.4c

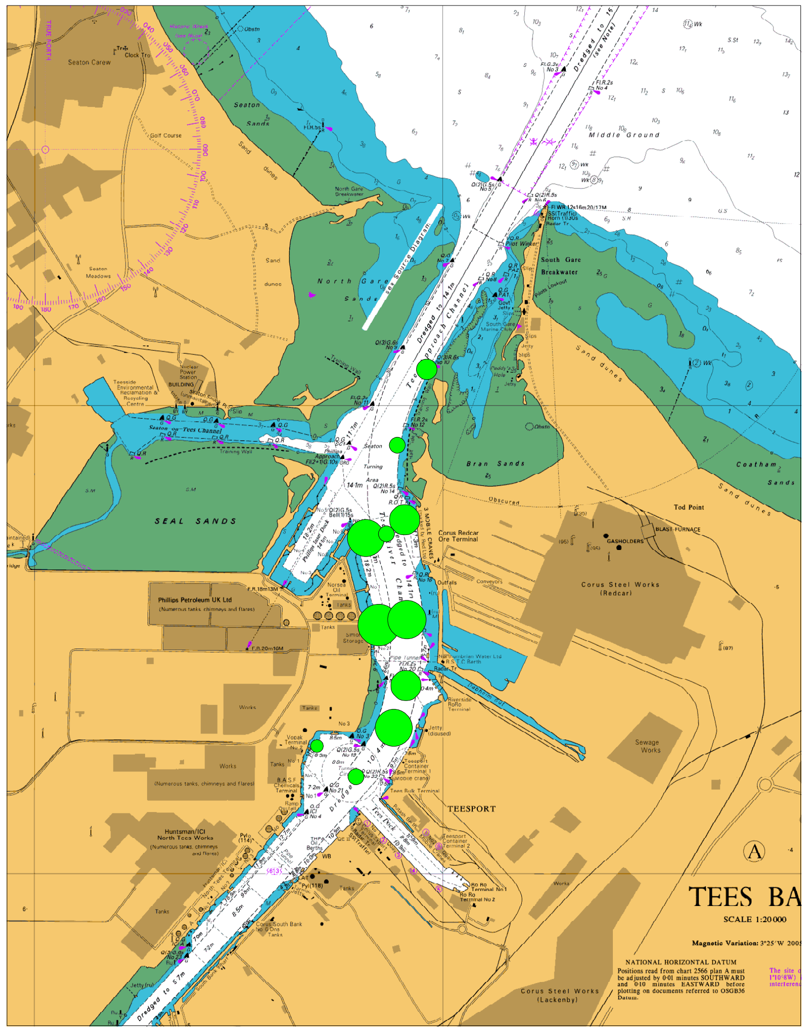
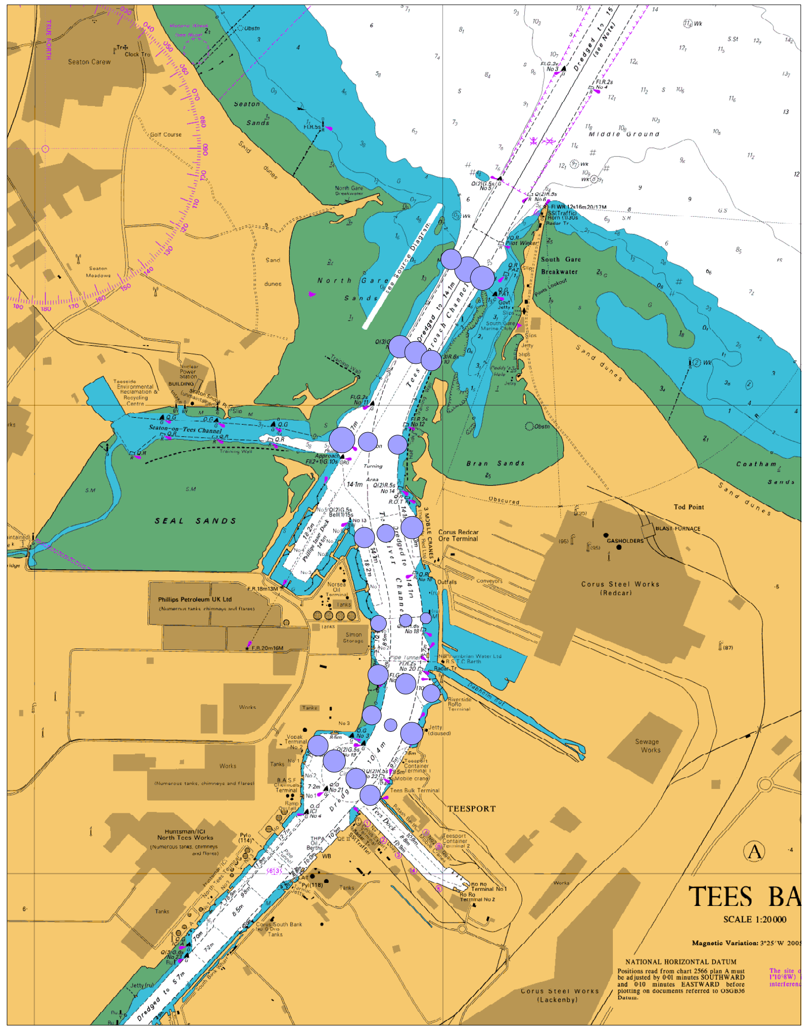


Figure 10.4d



Key:

Fig 10.4a: No. of Species
- 125
- 62.5
- 12.5

Fig 10.4b: Species Abundance
- 15,000
- 7,500
- 1,500

Fig 10.4c: Species Biomass
- 150
- 75
- 15

Fig 10.4d: Species Diversity
- 3.5
- 1.75
- 0.35

Graphical representation of marine ecology statistical analysis results

Northern Gateway Container Terminal Environmental Statement

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April 2006	1 cm = 0.15 km

Figures 10.4a-d

ROYAL HASKONING

Multivariate analysis

3. The multivariate analyses described in Section 10.1.4 were performed on the infaunal data. All species were included in the analyses; colonial species which are recorded in the raw data as 'P' (denoting present) were replaced with a '1'. SIMPER analysis was performed based on infaunal clusters to identify those species which are characteristic of the various clusters.

4. The group average sorting dendrogram for the infaunal data is shown in Figure 10.5.

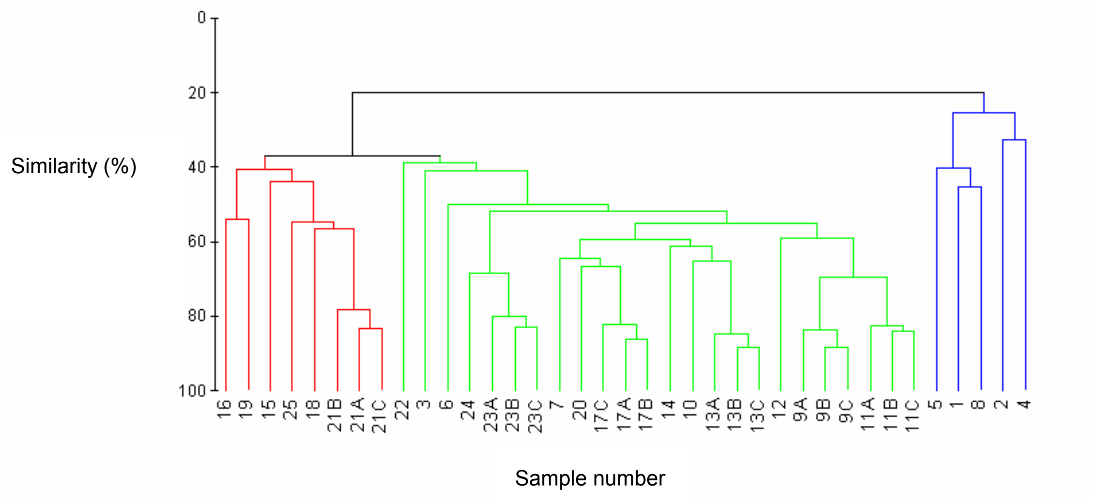


Figure 10.5 Group average sorting dendrogram for infaunal data showing three main groups of samples (faunal clusters) (red = Group A, Green = B and Blue = C).

5. Three main groups of samples can be distinguished. The first split (i.e. between Groups A and B and Group C) occurs at a relatively low level of similarity (approximately 20%). The second split which divides Groups A and B occurs at approximately 35 to 40% similarity.

6. The clusters identified in Figure 10.5 can be presented in a different way in a non-metric multidimensional scaling (MDS) ordination (Figure 10.6).

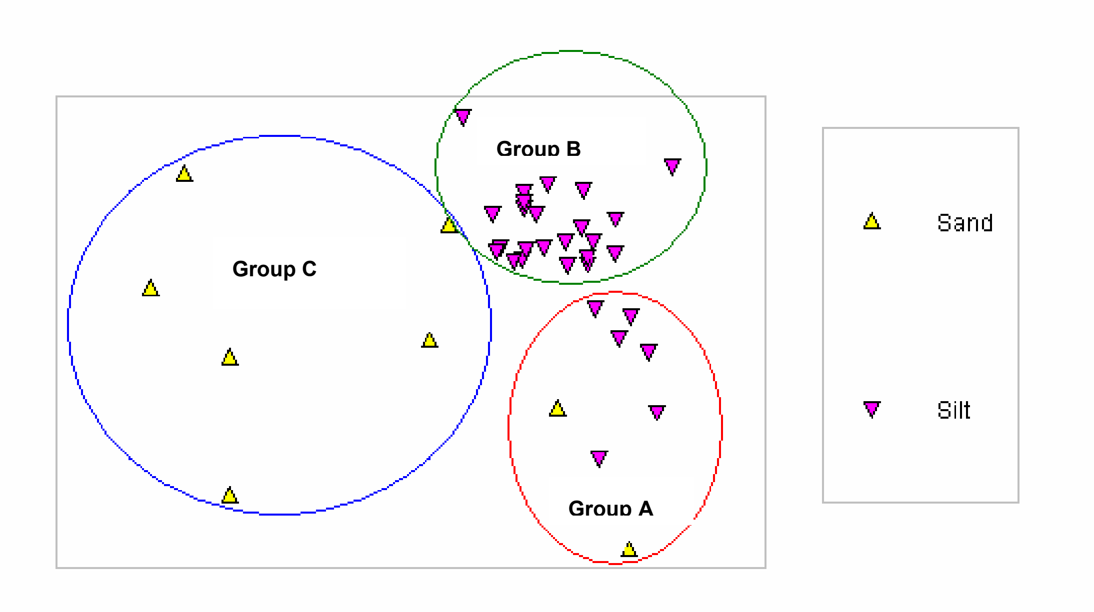
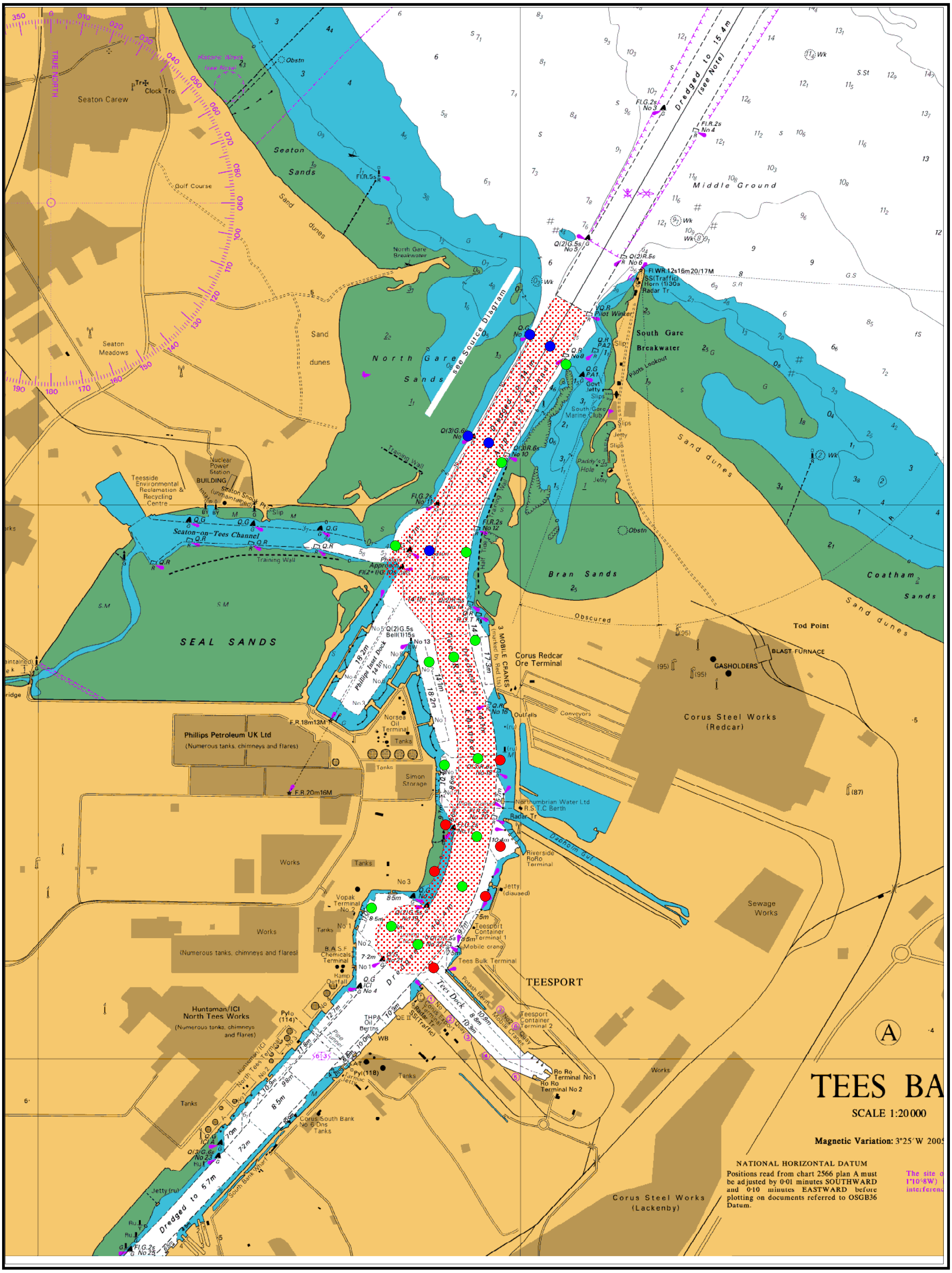


Figure 10.6 Multi-dimensional scaling (MDS) ordination for the macrofaunal data with a descriptor of the general sediment type superimposed on each sample location

7. As demonstrated in Figure 10.5, clusters of samples can also be identified in Figure 10.6, with the relative distance between the position of samples in the MDS plot indicating the degree of similarity between samples. The circles surrounding clusters of samples use the same colour coding as Figure 10.5. Using MDS plots, it is possible to correlate biological data to various environmental parameters. In Figure 10.6, descriptive terms for the general sediment composition at each station have been superimposed on the sample. The full results of the sediment analysis of the samples are presented in Appendix 5. The geographical distribution of the different faunal clusters is shown in Figure 10.6.

8. From Figure 10.7 it can be seen that group C samples are generally located in the sandy sediments towards the mouth of the Tees estuary, suggesting that sediment composition has a strong influence on the nature of the biological community present. Samples in Group C are characterised by polychaetes *Chaetozone christiei* and *Spio decorata* species. Crustaceans (*Diastylis bradyi* for example) and Molluscs (*Abra alba* for example) are also present.

9. Groups A and B generally tend to be present in sediments where a high percentage of fine material is present (i.e. to the east of Seaton Channel and in the main channel areas). Again both groups contain predominantly polychaetes with *Chone sp.* and *Ophyryotrocha sp.* present in Group B for example. Group B also contains bivalve molluscs *Abra alba*. *C. capitata* and *Ophyryotrocha sp.* dominate Group A. These species are characteristic of fine sediments, usually with some level of organic pollution and associated depleted oxygen levels.



Key:

Faunal clusters

- Group C
- Group B
- Group A

Proposed Dredge Footprint

Source: ARCS Charts under licence from UKHO

Geographical faunal clusters

Northern Gateway Container Terminal
Environmental Statement

PD Teesport

April 2006

Approx scale
1 cm = 0.25 km

Figure 10.7

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Disturbance due to dredging

10. When subject to disturbance, which can be either physical (e.g. removal due to dredging or storm activity) or chemical (e.g. organic enrichment), a proportion of the benthic community is often removed. This can allow particular species (termed opportunistic species) to colonise the disturbed sediment and the benthic community can often become dominated by a low number of species.

11. The effect can be described by performing k-dominance analysis on abundance and plotting the information. Figure 10.8 shows the k-dominance plot for the three faunal clusters shown in Figure 10.6. The colour coding which was used in the dendrogram and in the presentation of the geographical locations has been applied. Species are ranked based on their abundance with ‘species rank 1’ being the most abundant.

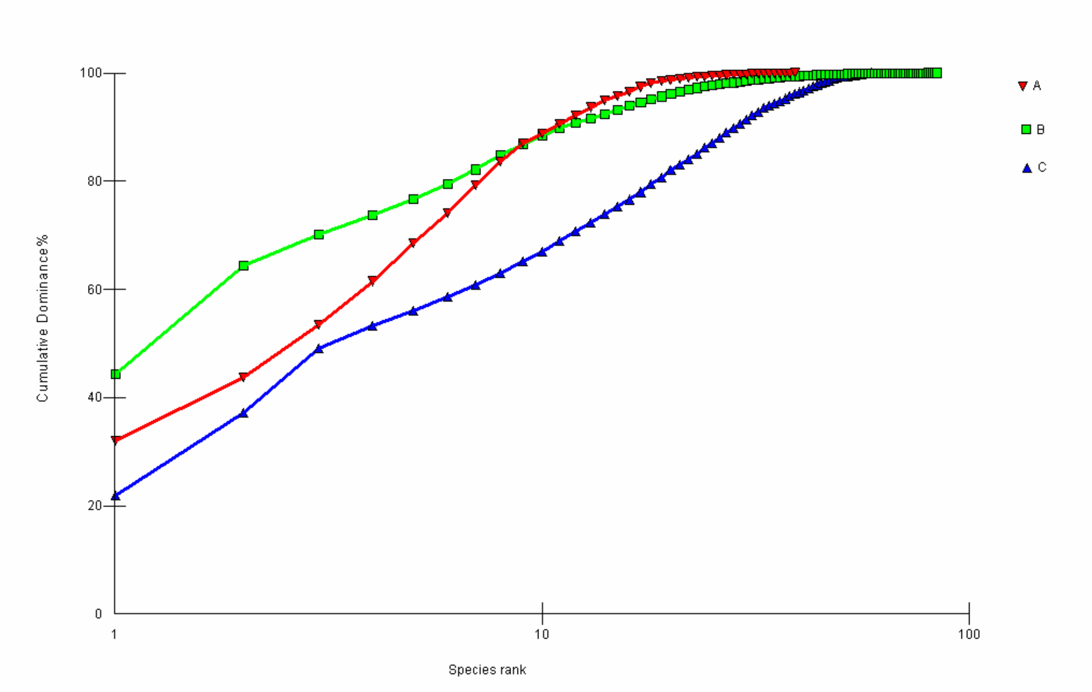


Figure 10.8 K-dominance plot based on infaunal abundance data.

12. Figure 10.8 shows that faunal cluster B is numerically dominated by a low number of species (i.e. a single species accounts for approximately 45% of the total faunal abundance). This coincides with the geographical location of the majority of the samples in group B being within or very close to the main channel in which maintenance dredging occurs. It can therefore be concluded that species in the main channel are largely made up of opportunistic species which colonise the area in between dredging programmes.

10.1.7 Description of biological communities (epifauna)

1. The raw epifaunal data are presented in Appendix 5. The trawls taken from the survey area appear to fall into three geographical groups, with a general increase in species abundance and diversity towards the central part of the

surveyed area. Trawls 1 to 4 (see Figure 10.9) yielded very little epifauna, as did trawls 11 to 14. Trawls 5 to 10 contained a wide variety of species at relatively high abundances. Trawl 15, however, yielded both the highest number of species and the highest abundance. No organisms were found in trawls 4, 12 and 14.

2. The most abundant species were the shrimp *Crangon* spp. and the shore crab *Carcinus maenus* (male), with their highest numbers in trawls 2, 8 and 15. However, whilst *Crangon* spp. was widespread throughout all 15 trawls, *C. maenus* was concentrated within the centre of the surveyed area in trawls 5 to 10 (although also present in 15). The brittle star *Ophiura albida* was also relatively abundant in trawl 8, although it was only present in two of the fifteen trawls.

3. A total of 10 fish species were caught in the trawls, although catches were typically low (1 or 2 individuals). However, sprat (*Sprattus sprattus*) and plaice (*Pleuronectes platessa*) were both numerous in trawl 15 (15 and 12 individuals respectively).

4. Some infaunal species were also caught in these trawls, the most notable being *Abra alba* which was present in abundances exceeding 6000 in trawl 8. This species was noted to be associated with a large volume of soft mud which may have been disturbed by maintenance dredging. Other numerous species included *Chone* sp. in trawls 6 and 8, and *Opryotrocha* sp. and *C. capitata* in trawl 10.

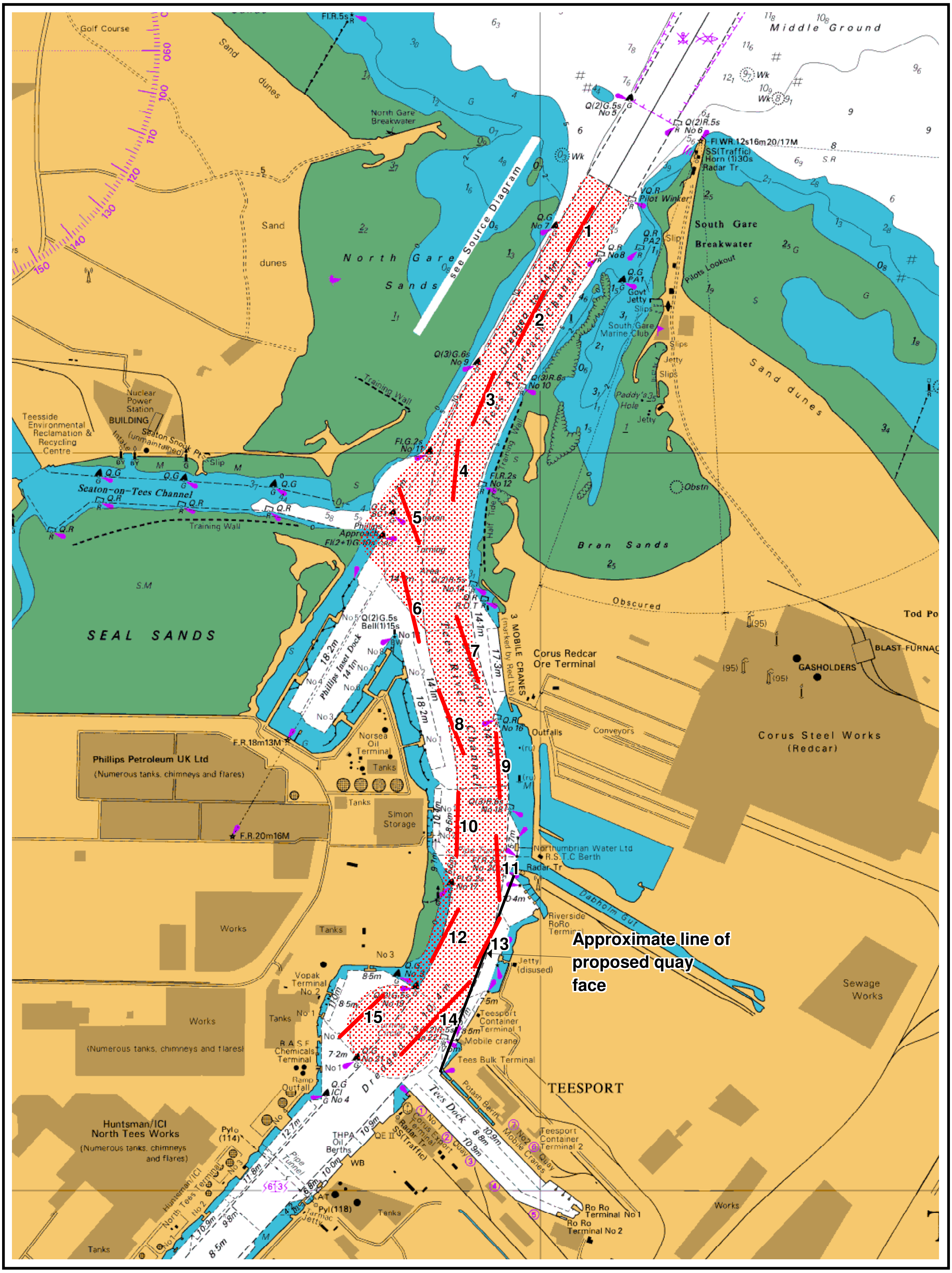
10.2 Potential impacts during the construction phase

10.2.1 Direct loss of subtidal benthic invertebrate resource due to reclamation and dredging

1. The reclamation would result in the permanent loss of invertebrate communities within the footprint of the reclamation. This area comprises approximately 8.5ha of subtidal area. In addition there would be an immediate loss of invertebrate resource due to the capital dredging over an area of approximately 120ha, although it should be noted that the vast majority of this area (approximately 116.5ha) comprises the existing navigation channel and is therefore, already dredged. The area of seabed that will be dredged that is currently outside of the existing channel comprises 3.5ha.

2. The reclamation and capital dredging will impact on the benthic invertebrate resource but much of this area is already impacted. The biological survey showed that the benthic communities within the footprint of the reclamation are well represented in the estuary and, therefore, the proposed scheme would not result in the net loss of a particular community type from the system.

3. The biological survey established the nature of the invertebrate communities within the lower Tees estuary. The survey established that the proposed reclamation would not result in the removal of a particular species assemblage from the lower estuary as similar assemblages exist outside of the footprint of



Trawl Line

Proposed Dredge Footprint

Source: ARCS Charts under license from the UKHO

Locations of Trawls

Northern Gateway Container Terminal Environmental Statement

PD Teesport

April 2006

Approx scale: 1cm = 0.17km

Figure 10.9

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the dredging. Additionally, numbers of species, abundance and biomass are lower in this area than the majority of samples elsewhere in the estuary (this applies for both epifauna and infauna). Therefore, although the reclamation would result in the permanent removal of a component of the benthic community, this loss is not deemed to be particularly significant in terms of the wider context of the benthic community in the lower Tees estuary.

4. The infaunal species assemblage in the main channel is numerically dominated by a small number of species and appears to show signs of disturbance. Assemblages located towards the mouth of the estuary, although not exhibiting species dominance, have relatively low species numbers and very low abundance and biomass. The removal of the benthic resource in both of these areas is therefore not considered to be particularly significant. Additionally, it should also be noted that recolonisation with similar species assemblages, will occur during the operational phase (see Section 10.3.4). A variety of epifaunal species were recorded from within the proposed dredging area, with highest species abundance being recorded around the middle of the surveyed area. It should be noted that most of the epifaunal species are mobile and their presence is likely to be transitory.

5. Based on the above, the impact of the capital dredging and reclamation on the benthic invertebrate resource is considered to be of **minor adverse significance**.

Mitigation and residual impact

6. The impact of capital dredging and reclamation on the subtidal benthic resource is not possible to mitigate and the residual impact would be of **minor adverse significance**.

10.2.2 <u>Potential smothering effect caused by sedimentation of material resuspended by capital dredging within intertidal areas</u>

1. During the capital dredging a proportion of the material that is dredged would be disturbed and re-suspended into the water column, dispersed and deposited onto the seabed. The dispersion and deposition of fine material during dredging is described in detail in Sections 6 and 7. With respect to potential for impact on intertidal communities, the most important effect is the predicted effect on Seal Sands given its designated status and the fact that this location is predicted to be affected by the deposition of fine material as a consequence of the capital dredging of sand in the lower Tees estuary.

2. It is predicted that peak deposition during the capital dredging would be up to 0.05mm per tide and is likely to occur on Seal Sands. The predicted total maximum depth of sediment deposition over the course of dredging sand will be up to 1mm. As described in Section 7, this sediment will be subject to a number of processes following deposition such as remobilisation and redistribution. However, it is predicted that a proportion of the dredged material would be reworked into the substratum. As a worse case scenario, it is predicted that the

net effect of the dredging and dispersive processes acting on the sediment following deposition, could be the deposition of up to 1mm of fine sediment overall.

3. Sediment deposition has the potential to affect benthic organisms of the intertidal areas of Seal Sands through physiological effects. Ultimately, significant overall deposition, or high rates of deposition, could exceed the tolerance of the organisms resulting in the loss of components of the benthic community and therefore a change in community structure.

4. The communities present on Seal Sands have been well described by a number of historic studies. In summary, the species present are typical species that characterise fine sediment habitats within estuarine areas. As such, they are tolerant of fluctuating environmental conditions, such as periodic sediment disturbance due to storms and are not considered sensitive in this respect. It is concluded therefore, that the rates of sediment deposition, and the overall degree of sedimentation, that is predicted in this instance would be tolerated by those species present within the intertidal area at Seal Sands. It is predicted that the proposed dredging would not give rise to the loss of a component of the benthic community.

5. Given the above, an impact of **negligible significance** on benthic community structure is predicted to arise as a result of the deposition of fine sediments at Seal Sands. The dredging is not predicted to result in the deposition of sediments at Bran Sands or North Gare Sands.

Mitigation and residual impact

6. No mitigation is possible and the residual impact would be of **negligible significance**.

10.2.3 <u>Deposition of fine sediment within areas of saltmarsh</u>

1. Within the European marine site, saltmarsh is mapped as being present at an isolated location at the eastern end of Seal Sands, in the sheltered location in the lee of the peninsula that extends along the eastern margin of Seal Sands. The numerical modelling studies predict minimal dispersion of fine material within this area, resulting in localised peak deposition of up to 1mm of sediment.

2. Peak deposition of this order of magnitude is not predicted to adversely affect the benthic communities or saltmarsh vegetation given that this is considered to be of low magnitude and is for a limited time period. Consequently, an impact of **negligible significance** is predicted.

Mitigation and residual impact

3. No mitigation is possible and the residual impact would be of **negligible significance**.

10.2.4 Potential smothering effect caused by sedimentation of material resuspended by capital dredging within subtidal areas

1. Capital dredging is predicted to result in the deposition of fine sediment within the subtidal zone. Much of the area affected by this deposition is within the footprint of the dredging and, therefore, this area will be directly impacted by the dredging activity itself. The deposition of fine material within this area is therefore not considered to represent an additional impact on the benthic community.

2. Elsewhere in the subtidal area (i.e. outside of the footprint of the capital dredging) peak deposition of up to 50mm is predicted (depending on location) and is generally predicted to be of low magnitude (less than 5mm). This deposition occurs over the slack water period and would be subsequently resuspended and dispersed as tidal current increase. It is expected, however, that the dredging would result in a layer of fluid mud over the seabed which, over time, would gradually disperse.

3. The biological survey undertaken in support of this EIA and other information that has been reviewed indicates that the biological communities of the mid to lower part of the estuary are dominated by polychaete and oligochaete species. These species are typically found in fine estuarine sediment. As such, they are tolerant to some degree, to elevations in near-bed suspended sediment concentrations and periodic sediment deposition. In view of the temporary nature of this potential impact, it is concluded that an overall impact of **negligible significance** would arise, with **no impact** on these communities in the longer term.

Mitigation and residual impact

4. The predicted impact is not possible to mitigate and the residual impact would be of **negligible significance**.

10.2.5 Implications for benthic intertidal and subtidal communities arising from an increase in suspended sediment concentrations and turbidity

1. The amount of suspended sediment in the water column can influence the depth of water that light can penetrate and, therefore, the amount of light available for primary production by phytoplankton and marine algae. In addition, at high levels and/or for prolonged periods of time, an increase in suspended sediment concentration can inhibit or prevent benthic organisms from feeding by clogging feeding apparatus (e.g. filter feeding molluscs).

2. This potential impact is linked to that described in Section 10.2.2 above. In summary, it is concluded that for intertidal and subtidal infauna, the elevations in suspended sediment concentrations that are predicted beyond the immediate vicinity of the dredging activity could be tolerated by these species. Similarly, marine algae are not likely to be significantly affected given their presence in the estuarine environment (and therefore tolerance to elevations in suspended sediment concentrations) and the fact that the dredging is a temporary activity

which would not have a prolonged effect on suspended sediment concentrations. In addition, it is important to note that the lower Tees estuary is not of particular conservation interest for diverse algal communities, with such communities being confined to areas of hard substrata which are largely man-made structures.

3. Particularly large increases in suspended sediment concentrations are predicted in the zone immediately around the dredging activity. It is concluded that the benthic communities present in areas where such increases will arise will be already removed due to the dredging itself and as such the increase in suspended sediment concentrations in these areas does not represent an additional impact.

4. Overall the potential impact on benthic communities as a result of increases in suspended sediment concentrations is considered to be of **negligible significance**.

Mitigation and residual impact

5. No mitigation is required and the residual impact would be of **negligible significance**.

10.2.6 Remobilisation of potentially contaminated sediments and subsequent effects on subtidal communities

1. Section 7 describes the potential impacts associated with the resuspension and deposition of the sediments to be dredged. In summary, a comparison of the survey data collected as part of this EIA with the Canadian Sediment Quality Guidelines indicates that the sediments in the main channel and in the area which will be reclaimed contain levels of metals ranging from below the ISQG to above the probable effect level (PEL). Sediment contamination therefore varies significantly depending on the parameter and location of the sample.

2. Samples within the area to be reclaimed by the proposed quay wall generally exhibit much higher levels of contamination than those levels measured in the main channel and at the receptor sites. Since this material is to be covered by the reclamation, sediments within this area will not be resuspended in the water column.

3. Contaminant concentrations in the main channel are generally at or below the Canadian sediment quality guideline. Several exceedances of the PEL are, however, recorded for individual PAHs, lindane and one sample for mercury. Sediment remobilised and deposited as a consequence of dredging in these areas could therefore potentially have an adverse biological effect.

4. The concentrations of chemical contaminants within the potentially impacted sites (i.e. the receptor sites) were characterised and results are presented in Section 7. In summary, a comparison of the survey data with the sediment guidelines indicates that the concentrations generally tend to be lower than those measured in the channel area, although differences are relatively minor.

The impact of the proposed development in relation to deposition of disturbed sediments is also addressed and discussed in Sections 7.

5. In summary the modelling predicts that the areas predominantly affected by deposition are Seal Sands and Seaton Channel. Other potential receptor areas at North Gare Sands, Bran Sands and the Vopak foreshore are not predicted to be influenced by sediment deposition arising during dredging.

6. Due to the relatively minor differences in the majority of the contaminant levels for parameters surveyed it is unlikely that significant changes in the sediment quality will occur. Additionally, Seal Sands is only predicted to be impacted when the dredger is located in the predominantly sandy areas of the main channel, adjacent to North Gare Sands where contamination is less likely. Dilution and dispersion associated with tidal flows will further reduce the risk.

7. There is also the potential for a decrease in dissolved oxygen levels caused by bacterial breakdown of remobilised organic matter during dredging. This could potentially impact on respiration of benthic organisms. The dilution and dispersion afforded by a dynamic estuarine environment (i.e. there is no significant restriction on water movements), in addition to the short term nature of the peaks of suspended solids, mean that it is unlikely that dissolved oxygen levels in the water column will be impacted.

8. Given the above, the impact is predicted to be of **minor adverse significance**.

Mitigation and residual impact

9. Since it is not possible to mitigate against this impact, the residual impact would be of **minor adverse significance**.

10.2.7 <u>Potential impact on seal colonies due to increased noise levels (both airborne and underwater)</u>

1. This impact is discussed in Section 19.2. It is considered that this potential impact is the only route whereby the proposed scheme could potentially impact on seal populations.

10.3 Potential impacts during the operational phase

10.3.1 <u>Potential impact on marine communities due to changes in the flow regime</u>

1. The predicted effects of the proposed development on the hydraulic regime are presented in Section 6. The scheme is predicted to have very minor effects on the flow regime, with very small decreases in flows being predicted for the navigation channel (generally decreases of up to 0.1m/s). Minor increases in flow speeds of up to 0.1m/s are predicted for some locations (e.g. opposite and immediately downstream of the proposed development), with localised increases of up to 0.2 m/s. The results of the numerical modelling of changes to flows under different conditions are described in Section 6.

2. It is predicted that the scheme would result in an increase in the tidal range of less than 4mm near the Tees Barrage and less than this amount adjacent to the proposed reclamation. No changes to tidal range are predicted for the area downstream of the proposed development location.

3. The studies on the effects of the proposed development on waves indicate that the intertidal area of North Gare Sands would experience some changes in wave height, but such changes are of very low magnitude and unlikely to affect benthic community structure. Overall, the impact of the scheme on marine communities due to changes in the hydraulic regime is predicted to be of **negligible significance**.

Mitigation and residual impact

4. No mitigation measures are required and the residual impact would be of **negligible significance**.

10.3.2 Effect of decreased exposure of intertidal area at North Tees mudflat on benthic community structure

1. As described in Section 6.4.2, it is predicted that the proposed scheme will result in the raising of the level of low water on spring tides (by 2mm) in the vicinity of the proposed reclamation. In terms of potential impact on intertidal areas, this predicted effect has implications for the area of intertidal known as North Tees mudflat. No effects on tidal range are predicted in the vicinity of other intertidal areas in the Tees estuary.

2. The effect of the predicted change in tidal range will be to reduce the area of North Tees mudflat that is exposed at low water on spring tides. This change will affect the extreme lower part of the intertidal area (i.e. a narrow strip of habitat) and, when the slope of the mudflat is taken into account, equates to an area of approximately 160m^2. In essence, the predicted change represents the conversion of intertidal area to very shallow subtidal area under spring tide conditions.

3. Benthic community structure is influenced by the tidal regime to which it is subjected and, therefore, a change from intertidal habitat to very shallow subtidal has the potential to impact on community structure. In this instance the change is considered to be of very low magnitude and, in terms of an effect on the physical environment to which the benthic community is exposed, the predicted effect would not result in a change in benthic community structure. As a consequence, **no impact** is predicted.

Mitigation and residual impact

4. The predicted effect on tidal range is not possible to mitigate and there would be **no residual impact**.

10.3.3 Potential effect of increased supply of fine sediment to Seal Sands on benthic community structure

1. It is predicted that, as a consequence of the proposed scheme, there would be a small (order 10%) increase in the supply of fine material to Seaton Channel and, therefore, potentially to Seal Sands. Given that the existing rate of accumulation of material on Seal Sands is quoted as being of the order of 3mm/year, the proposed scheme is predicted to increase this rate by 0.3mm/year (assuming that the increase in supply to Seaton Channel accumulates on Seal Sands in the same proportion as at present).

2. In terms of effect on benthic communities (and consequently on waterfowl populations), the trend for an increased supply of fine material is not predicted to directly adversely affect the structure of the benthic community of Seal Sands. In some areas of Seal Sands, there has been a trend for an increase in the coarse component of the substratum which is likely to lead to a reduction in the diversity of the benthic community in these areas. The increase in supply of fine sediment to areas which are currently muddy is not considered to be an issue which would result in an adverse effect on community structure.

3. It is important here to consider the effects of the extensive *Enteromorpha* mats on Seal Sands on particle size distribution of the sediments and consequently on benthic community structure. A number of studies have been undertaken on the causes of *Enteromorpha* development and its effects on the benthic community. In summary, it can be concluded that the relationship between these factors is complex. However, studies by the University of Durham into the relationship between particle size and *Enteromorpha* coverage conclude that areas with *Enteromorpha* are generally siltier and areas without *Enteromorpha* are generally sandier although between 1992 and 1999 there was no easily discernable correlation between particle size distribution and *Enteromorpha* cover (Tansley, 2003).

4. Tansley (2003) concludes that sediment type and sediment changes that have taken place on Seal Sands are influencing factors in determining the location of *Enteromorpha* mats. It may be that the sediment type on Seal Sands may have become more silty over time thus making the substratum more cohesive, favouring the colonisation of *Enteromorpha*. The presence of *Enteromorpha* itself subsequently reduces the erodability of the bed and the removal of *Enteromorpha* and has the effect of favouring retention of silt (i.e. trapping) within the mat itself.

5. The presence of *Enteromorpha* and its effects on the benthic community are of vital importance to feeding waterfowl (see Section 11). Again, studies show that the relationship is complex although it is generally recognised that the presence of thick and extensive algal mats are detrimental to benthic community diversity.

6. The above comments are of relevance when considering the implications of the proposed scheme for the ecology of Seal Sands. It is predicted that the proposed scheme would make a minor contribution to the supply of fine material to Seal Sands and, therefore, it is likely that more fine material would be trapped

within the *Enteromorpha* mats on Seal Sands. It is, however, considered unlikely that the scheme would encourage accumulation of fine material in areas which are currently comprised of sandy sediments as the hydraulic regime of such areas would not favour deposition of fine material. It is important to note in this respect that the proposed scheme is not predicted to result in changes to tidal current speeds over Seal Sands.

7. In terms of the effect of the potential increase in supply of material to Seal Sands on intertidal elevation, the magnitude of effect is predicted to be very small and effectively undetectable from background change. Potential changes due to the scheme are quantified as being a fraction of a millimetre change per year and are likely to be confined to those areas colonised by *Enteromorpha* which is likely to act as a sediment trap.

8. Overall, the increase in supply of fine material to Seal Sands as a consequence of the scheme is not expected to result in a significant change in the structure of the benthic community itself or to encourage indirect effects by resulting in an increase in the fine component of sandy areas, which may encourage *Enteromorpha* colonisation. The overall impact of the scheme is predicted to be of **negligible significance**.

Mitigation and residual impact

9. No mitigation measures are required and the residual impact would be of **negligible significance**.

10.3.4 <u>Potential impact on marine communities due to changes in the regime for maintenance regime</u>

1. The predicted changes to the rate of infill of the navigation channel as a consequence of the scheme are minimal. It is concluded that the changes are insignificant with respect to effect on the existing maintenance dredging strategy and no changes to maintenance dredging are necessary. As such, there would be **no impact** on marine communities as a result of the maintenance dredging requirement arising from the proposed development.

Mitigation and residual impact

2. No mitigation is required and there would be **no residual impact**.

10.3.5 <u>Recovery of marine communities within the footprint of the capital dredging</u>

1. The impact of capital dredging on the existing marine communities is described in Section 10.2. Following the completion of the dredging, the marine community of the dredge area would be expected to recolonise the impacted area. The nature of the communities that would recolonise the seabed compared with those which are currently present is largely dependant on the change in nature of the sediments that are exposed at the surface of the seabed.

2. Given that the navigation channel is dredged to underlying geological material, the proposed capital dredging would be expected to result in the exposure of a similar sediment type to that which is currently present. As such, over time the marine communities that colonise within the proposed dredge area would be expected to be of a similar structure to those which are currently present.

3. Overall, the impact during the operational phase would be of **minor beneficial significance**, but it should be noted that the effect of the dredging overall (i.e. taking into account the potential impact during the construction phase) would be neutral.

Mitigation and residual impact

4. No mitigation is required. There would be an impact of **minor beneficial significance** during the operational phase, but the net potential impact of the scheme would be neutral.

10.3.6 <u>Potential impact on seal colonies due to increased noise levels (both airborne and underwater)</u>

1. This impact is discussed in Section 19.2.

11 MARINE AND COASTAL ORNITHOLOGY

11.1 Existing environment

1. This section describes the marine and coastal waterbird interest of the Tees estuary system and adjacent coastal areas in general, and specifically the waterbird interest of areas within the immediate vicinity of the site of the proposed development and dredging. For the purposes of this section, waterbirds are defined as waders, wildfowl, gull and tern populations. Section 12 describes the existing status of other birds in the study area.

11.1.1 Sites designated for waterbird interest

1. There are a number of sites within the Tees estuary that are designated (either in whole or in part) for marine and coastal waterbird interests under national and international legislation, namely the following:

- Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site;
- Seaton Dunes and Common Site of Special Scientific Interest (SSSI);
- Tees and Hartlepool Foreshore and Wetlands SSSI;
- Seal Sands SSSI;
- Cowpen Marsh SSSI;
- Redcar Rocks SSSI;
- South Gare and Coatham Sands SSSI; and,
- Teesmouth National Nature Reserve (NNR).

2. Further detail on the designated interest of the above sites is provided in the following sub-sections.

Teesmouth and Cleveland Coast SPA

3. The Teesmouth and Cleveland Coast SPA contains a range of habitats including sand and mudflats, rocky shore, saltmarsh and freshwater marsh. The site qualifies as SPA by supporting populations of European importance of little tern (breeding) and sandwich tern (on passage). The site also qualifies by supporting populations of European importance of ringed plover (on passage) and knot and redshank (over winter). The site further qualifies by regularly supporting at least 20,000 waterfowl over the winter period.

4. Further details on the designated interest features of this SPA are provided in Section 26 which describes the implications of the proposed scheme in light of the conservation objectives for the Teesmouth and Cleveland Coast European marine site. Although drawing on the description of potential impacts of the development as set out in Sections 11.2 and 11.3, Section 28 is intended to draw together the potential impacts that have consequences for the designated status of the European marine site in order to inform the appropriate assessment of the implications of the scheme on this site, if such an assessment is deemed necessary in accordance with Regulation 48 of the Conservation (Natural Habitats &c.) Regulations 1994.

Tees and Hartlepool Foreshore and Wetlands SSSI

5. This site comprises several coastal areas which are an integral part of the complex of wetlands, estuarine and maritime sites supporting the internationally important wildfowl and waders on the Tees estuary. Reclamation of the Tees estuary has resulted in the loss of most of the upper shore as feeding and roosting areas for waterbirds and at high tide the birds have to disperse to inland wetlands or more distant coastal locations.

6. In winter this SSSI supports nationally important numbers of purple sandpiper, sanderling and shoveler. Proportions of the total Tees population of other birds regularly feed and roost on parts of the site, in particular sanderling, knot, purple sandpiper and turnstone along the north Hartlepool shore and Hartlepool Headland; redshank, curlew, teal and shelduck on Greenabella Marsh; shoveler, teal, wigeon, gadwall, lapwing and golden plover on Saltholme Pool and Dorman's Pools; redshank and shelduck on the North Tees mudflats.

Seaton Dunes and Common SSSI

7. This site is of importance for its flora, invertebrate fauna and bird life. The site contains a diverse range of habitats comprising sandy, muddy and rocky foreshore, dunes, dune slacks and dune grassland, relict saltmarsh, grazed freshwater marsh with dykes, pools and seawalls. The site covers approximately 312ha.

Seal Sands SSSI

8. Seal Sands is particularly important for waterbirds due to the fact that it is the only extensive area of intertidal mudflats with tidal channels on the east coast of England between the Lindisfarne National Nature Reserve to the north and the Humber estuary to the south. Seal Sands attracts large numbers of migratory wildfowl and wading birds, especially over the winter period. The site is particularly important for shelduck, knot and redshank.

Cowpen Marsh SSSI

9. Greatham Creek, which is within the Cowpen Marsh SSSI, includes the largest saltmarsh between Lindisfarne and the Humber estuary. Together with adjacent coastal grazing marshes and mudflats, it provides an important wintering site for migratory wildfowl and wading birds. The site forms an integral part of the Tees estuary.

Redcar Rocks SSSI

10. Redcar Rocks SSSI is a geological SSSI but is also noted for its wader populations. For this reason it is included within the Teesmouth and Cleveland Coast SPA. The citation for this site states that when exposed at low tide, the rocks and sands provide an important feeding ground for several species of

wading birds, for example knot, turnstone, sanderling and purple sandpiper (especially during the winter months).

South Gare and Coatham Sands SSSI

11. This site is of importance for its flora, invertebrate fauna and birdlife. The range of habitats present includes extensive intertidal mud and sand, sand dunes, saltmarsh and freshwater marsh which have all developed since the construction of the South Gare breakwater. At low tide, areas of rocky foreshore along the breakwater are exposed.

Teesmouth NNR

12. This site is a coastal site with a range of habitats including intertidal sand flats, sand dune systems, saltmarsh and grazing marsh. The NNR has two main areas, namely North Gare (dunes and marsh on the north bank of the Seaton-on-Tees Channel) and Seal Sands (mudflats and sands on the south bank of the Channel). The NNR has a large bird population which is further recognised through the inclusion of parts of the NNR in SSSIs and the Teesmouth and Cleveland Coast SPA.

11.1.2 Description of the waterbird interest in the vicinity of the proposed development

Introduction

1. In order to allow a robust assessment of the potential impacts of the proposed development on waterbird populations and their habitats to be assessed it is necessary to describe the usage of the study area by waterbirds. In particular, the use of the various habitats that would be directly impacted by the development is important as well as habitats that have the potential to be indirectly affected by, for example, significant disturbance and changes to the hydraulic regime.

2. A number of sources of data have been used to describe waterbird usage, namely:

- Data from the Wetland Birds Survey (WeBS); and
- Data collected from specific counts undertaken for various purposes around the estuary (e.g. counts undertaken on the Vopak foreshore by INCA on behalf of BP and low water counts undertaken by the University of Durham).

3. Where possible, the above data has been supplemented with information gathered through the consultation process to increase the level of understanding of the importance of different habitats.

4. It should be noted that the site of the proposed terminal itself has not specifically been covered by any waterbird counts in the past. This is largely due to the fact that the area does not have any intertidal mudflats, with the foreshore in this area being largely engineered, steeply sloping frontage. However, the site of the

proposed terminal, including the estuary frontage, is included within a WeBS count sector, as discussed below.

5. The following sub-sections describe the usage of areas that will be directly and indirectly impacted by the proposed development by waterbird populations. For each area, all available data has been used to help build up as complete a picture as possible of the importance of different area to waterbirds. It is recognised that there is a significant amount of local counts which are likely to better represent the potential use of an area by waterbirds than those undertaken less frequently (e.g. WeBS).

Waterbird usage of the proposed terminal site and Bran Sands lagoon area

6. The basis of the description of the waterbird usage of the proposed terminal site and immediately adjacent land for the purposes of the EIA is WeBS data. The WeBS count sectors for the Tees estuary WeBS site are shown in Figure 11.1. Count sector 52427 (termed Bran Sands South) encompasses the foreshore that would be affected by the proposed terminal and Bran Sands lagoon (and surrounding land) immediately to the north-east of the proposed terminal site. It is, however, important to comment on the current usage of the proposed terminal site and Brand Sands lagoon area as there have been recent changes in this area that have significantly affected the waterbird interest of the site, particularly its use by terns. This current usage has been established through discussions with INCA. A discussion of WeBS data and the current usage of the site is provided below.

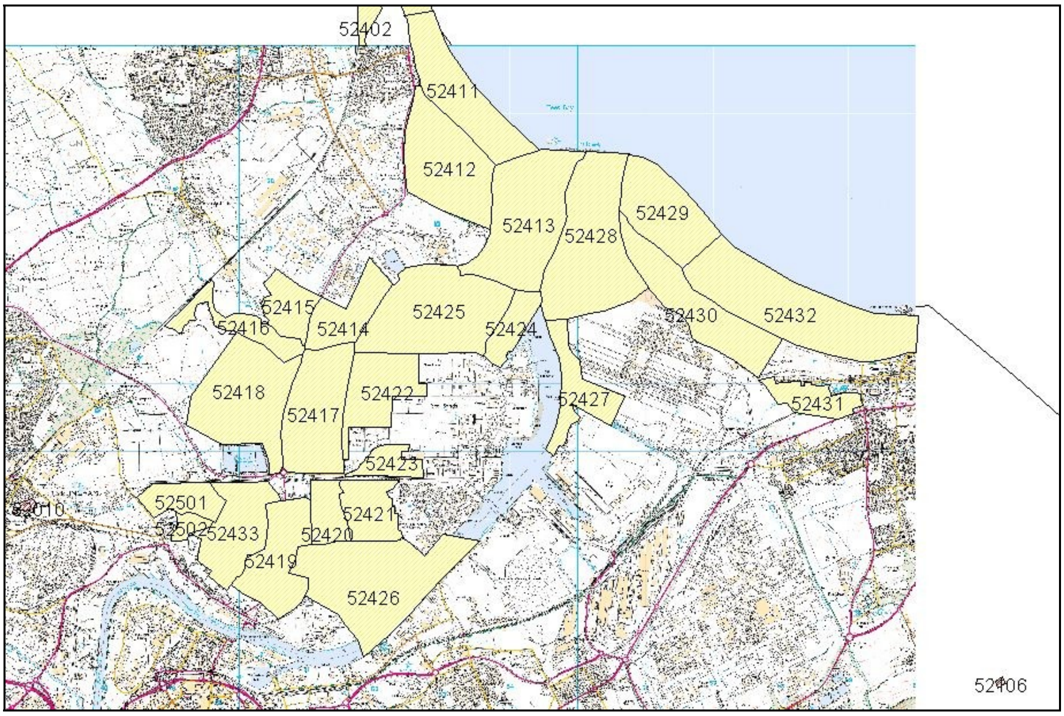

Figure 11.1 WeBS count sectors for the Tees estuary (source: BTO)

Analysis of WeBS data

7. WeBS core counts were obtained from the BTO for the most recent five available winters (i.e. 1999/2000 to 2003/2004 (at the time of writing, data for 2004/2005 have not been published)) for the Bran Sands South count sector. To put the counts from this sector in context of the estuary system, equivalent counts were also obtained for the whole of the Tees estuary site (as shown in Figure 11.1). This approach puts the usage of the proposed terminal site and the immediately surrounding area in a proper ecological context. This is considered to be a more appropriate approach than, for example, only including counts from those sectors that are within the boundary of the SPA and Ramsar site. This approach is further supported by the fact that, as stated in the citation for the Tees and Hartlepool Foreshore and Wetlands SSSI, birds disperse to inland wetlands and other coastal locations at high tide and move around the estuary utilising different sites at different stages of the tide.

Table 11.1 Summary of peak monthly totals and seasonal peaks in waterbird populations at Bran Sands South and in the Tees estuary over the period 1999/00 to 2003/04

	Bran Sands South				Tees estuary			
Year	Peak monthly total[1]	Seasonal peak[2]			Peak monthly total	Seasonal peak		
		Spring	Autumn	Winter		Spring	Autumn	Winter
1999/00	1330 (Jan)	613	1534	1898	17543 (Jan)	7276	18413	25257
2000/01	1085 (Jul)	746	2353	703	19989 (Oct)	8460	25304	22393
2001/02	1106 (Jan)	N/C	437	1453	21753 (Feb)	N/C	10919	31786
2002/03	795 (Feb)	183	937	1338	21894 (Nov)	6833	21168	29915
2003/04	2577 (Aug)	351	2731	1501	25790 (Dec)	8226	30546	33890
MEAN		473	1598	1379		7699	21270	28648

1 Peak monthly total = maximum of the sum of the counts of all species within each month

2 Seasonal peak = sum of the maximum counts of all species within each season

Table 11.2 The relative usage of Bran Sands South and the Tees estuary by waterbirds over the period 1999/00 to 2003/04 (based on the data presented in Table 11.1 above)

Year	Percentage of Tees estuary waterbirds within Bran Sands South			
	Peak monthly	Spring	Autumn	Winter
1999/00	7.6	8.4	8.3	7.5
2000/01	5.4	8.8	9.3	3.1
2001/02	5.1	N/C	4.0	4.6
2002/03	3.6	2.7	4.4	4.5
2003/04	10.0	4.3	8.9	4.4
MEAN	**6.3**	**6.1**	**7.0**	**4.8**

Table 11.3 The relative usage of Bran Sands South and the Tees estuary by individual waterbird species over the period 1999/00 to 2003/04

Species1	5 year mean peak (1999/00 – 2003/04)								
	Spring			Autumn			Winter		
	BSS	Tees	%	BSS	Tees	%	BSS	Tees	%
Red-throated diver	-	3	0	-	2	0	-	6	0
Great northern diver	-	1	0	-	-	0	-	1	0
Little grebe	-	29	0	-	78	0	-	18	0
Great crested grebe	-	18	0	-	23	0	-	33	0
Cormorant	11	131	8.4	73	548	13.3	19	195	9.7
Grey heron	-	26	0	5	65	7.7	3	29	10.3
Mute swan	1	48	2.1	1	77	1.3	2	35	5.7
Canada goose	19	90	21.1	24	106	22.6	6	111	5.4
Dark-bellied Brent goose	1	1	100	-	-	0	-	4	0
Shelduck	42	332	12.6	64	330	19.4	108	679	15.9
Wigeon	-	76	0	9	1143	0.8	10	1760	0.6
Gadwall	-	86	0	1	138	0.7	9	146	6.2
Teal	3	296	1.0	27	988	2.7	122	929	13.1
Mallard	6	231	2.6	26	478	5.4	28	371	7.5
Shoveler	1	67	1.5	1	200	0.5	1	131	0.8
Pochard	-	58	0	5	100	5	23	103	22.3
Tufted duck	-	128	0	1	190	0.5	2	118	1.7
Scaup	-	1	0	-	-	0	3	5	60
Long-tailed duck	1	1	100	-	-	0	1	1	100
Goldeneye	5	17	29.4	1	7	14.3	64	85	75.3
Red-breasted merganser	-	22	0	3	9	33.3	2	49	4.1
Ruddy duck	-	33	0	-	68	0	-	29	0
Moorhen	-	45	0	1	83	1.2	-	70	0
Coot	-	391	0	-	1029	0	1	1032	0.1
Oystercatcher	-	598	0	2	1748	0.1	1	1574	0.1
Ringed plover	1	353	0.3	1	192	0.5	-	57	0
Golden plover	-	83	0	-	807	0	-	825	0
Grey plover	-	23	0	-	60	0	-	179	0
Lapwing	8	241	3.3	119	1477	8.1	445	5409	8.2
Dunlin	-	240	0	11	1321	0.8	11	374	2.9
Ruff	-	7	0	-	25	0	2	7	28.6
Snipe	-	20	0	-	49	0	-	33	0
Whimbrel	-	10	0	1	15	6.7	-	-	0
Curlew	-	257	0	3	702	0.4	1	1135	0.1
Redshank	18	1166	1.5	62	1808	3.4	189	1476	12.8
Turnstone	5	213	2.3	14	323	4.3	28	269	10.4
Black-headed gull	32	132	24.2	202	1959	10.3	144	2270	6.3

Species1	5 year mean peak (1999/00 – 2003/04)								
	Spring			Autumn			Winter		
	BSS	Tees	%	BSS	Tees	%	BSS	Tees	%
Common gull	1	81	1.2	27	1365	2.0	93	3935	2.4
Lesser Black-backed gull	4	19	21	2	79	2.5	1	7	14.3
Herring gull	41	611	6.7	67	863	7.8	28	1066	2.6
Great Black-backed gull	6	74	8.1	139	702	19.8	29	931	3.1
Kittiwake	-	28	0	142	419	33.9	-	3	0
Sandwich tern	5	172	2.9	76	1149	6.6	-	-	0
Roseate tern	-	-	0	-	1	0	-	-	0
Common tern	266	536	49.6	486	859	56.6	-	-	0

1 Note that only those species recorded within the Bran Sands South sector over the period 1999/00 to 2003/04 are included within the table

8. The WeBS data presented in Tables 11.1 to 11.3 demonstrate that the Bran Sands South sector has some importance for waterbirds in the wider context of the Tees estuary. The data presented in Tables 11.1 and 11.2 show that, on the basis of the five year mean peak (1999/00 to 2003/04) the Bran Sands South sector is of most importance in the autumn period in terms of the percentage of the Tees estuary waterbird population that it supports. However, there is some inter-annual variation in the total number of waterbirds within the Bran Sands South sector in different seasons, as shown in Tables 11.1 and 11.2.

9. The numbers of different waterbird species using the Bran Sands South sector as shown as five year peak mean figures in Table 11.3. This table shows that, on the basis of the WeBS data, the sector is of most importance for the common tern, both in terms of numbers of individuals supported and the percentage of the Tees estuary population supported in this sector (but see comments below on the current usage of the area by this species). For example, in the autumn period, Bran Sands South supported 486 individuals, representing almost 57% of the Tees estuary population of this species (five year peak mean (1999/00 to 2003/04)). This sector also supported 6.6% of the Tees estuary population of Sandwich tern.

10. A review of Table 11.3 shows that the usage of the Bran Sands South sector by species of wader, waterfowl and divers is generally limited although lapwing, goldeneye, teal, shelduck and redshank are present in notable numbers, particularly during the winter period. The Bran Sands South sector does not contain any areas of mudflat, with intertidal areas being comprised of engineered shorelines. Therefore, most of the waterbirds within the sector are likely to be associated with the lagoon (and areas of open land surrounding the lagoon) and would tend to use the area as a roosting site when intertidal areas in other areas of the estuary are not available for feeding over the high water period.

11. In addition to the common tern (discussed above) the Bran Sands South sector is of most importance for gulls particularly herring gull and Great Black-backed

gull. This sector supported 7.8% and 19.8% of the Tees estuary population respectively over the period 1999/00 to 2003/04. The sector is also of importance for kittiwake with 33.9% of the Tees estuary population being supported in this sector over the same period.

12. An important feature of the waterbird usage of the Bran Sands South sector is the presence of particular species that are listed in the citation for the Teesmouth and Cleveland Coast SPA (see Section 28 for details of the designated status of the SPA). The Sandwich tern is an Annex 1 species which is present within this sector and redshank (a non-Annex 1 migratory species) is also present. Other cited species (knot and little tern) are not recorded in the WeBS data for the Bran Sands South over the period 1999/00 to 2003/04.

Current usage of the area by waterbirds

13. As described above, on the basis of WeBS data, the Bran Sands lagoon is most important for breeding common tern. However, discussions with INCA reveal that this situation is no longer the case for the reasons set out below.

14. In the past, an agreement was reached with ICI (the owners of the site) that floating tern rafts could be constructed within the Bran Sands lagoon to provide breeding platforms for common terns. This was done on the understanding that the rafts could be removed should the area be needed by ICI for other purposes. This would involve the phased withdrawal of the rafts over time (outside of the breeding season for the common tern) along with the associated creation of new breeding areas elsewhere.

15. Over the last two to three years, the raft islands have been removed from the lagoon and it is understood that only two rafts currently remain. At the same time, new islands have been constructed on the north side of the estuary in saline lagoons that have been created as a consequence of the historic extraction of brine. This phased relocation of breeding sites has been successful in that the original colony in the Bran Sands lagoon (which has been comprised of up to 1000 individuals) now breeds successfully on the north side of the estuary.

16. As a consequence of the above, the key waterbird interest of the Bran Sands lagoon is now effectively relocated with the result that the lagoon is now of minimal interest. It is likely that the lagoon and its immediate surroundings will still represent a site which is used by roosting waterbirds over the high tide period but the overall importance of this area in supporting waterbirds is now considered to be low.

Overview of designated waterbird populations

17. For feeding waders and wildfowl, the major intertidal areas of the estuary system comprise North Tees mudflat, Seal Sands, Bran Sands and North Gare Sands and all of these areas are of importance for various species of waterbirds that contribute to the overall waterbird assemblage of the SPA and Ramsar site. In addition, other areas around the estuary (primarily those areas designated as

SSSI such as Seaton Dunes and Common and Cowpen Marsh) represent important habitats which support waterbirds that are part of the overall population of the SPA.

18. Little tern (an Annex I species listed on the SPA and Ramsar citation) now breeds to the north of the mouth of the estuary at Castle Eden Dene; breeding begins in May. A small number breed at North Gare but these individuals are subject to a relatively high level of disturbance from the public. This species feeds around the mouth of the Tees estuary on small fish and sandeels.

19. Sandwich tern (an Annex I listed on the SPA and Ramsar citation) has not bred in the Tees estuary since the 1930s but it is present on passage. It favours the Seaton Snook area on the northern side of the Seaton Channel but individuals do feed and loaf elsewhere in the lower estuary.

11.1.3 Usage of other intertidal areas by waterbirds

1. In addition to the usage of the area in the vicinity of the proposed development by waterbirds, an analysis of the waterbird usage of intertidal areas in the lower estuary has been undertaken. This analysis encompasses Seal Sands, North Gare Sands and Bran Sands as these areas comprise the significant remaining intertidal areas in the estuary system, they are designated for their waterbird importance and they have the potential (to a greater or lesser degree) to be impacted by the capital dredging.

2. An overview of the usage of these areas by waterbirds is based on WeBS data for the period 1999/2000 to 2003/2004.

Seal Sands

3. Seal Sands is divided into two sectors for the purposes of WeBS counts (Peninsula East and Peninsula West). The WeBS sector codes for these sectors are 52424 and 52425 (see Figure 11.1). The five year summary data (1999/2000 to 2003/2004) for these sectors is presented in Tables 11.4 and 11.5.

Table 11.4 Summary of peak monthly totals and seasonal peaks in waterbird populations at Peninsula East and in the Tees estuary over the period 1999/00 to 2003/04

Year	Peninsula East				Tees estuary			
	Peak monthly total[1]	Seasonal peak[2]			Peak monthly total	Seasonal peak		
		Spring	Autumn	Winter		Spring	Autumn	Winter
1999/00	391 (Sept)	142	638	211	17543 (Jan)	7276	18413	25257
2000/01	423 (Sept)	131	704	256	19989 (Oct)	8460	25304	22393
2001/02	398 (Oct)	N/C	438	48	21753 (Feb)	N/C	10919	31786
2002/03	398 (Sept)	162	400	277	21894 (Nov)	6833	21168	29915
2003/04	665 (July)	116	874	238	25790 (Dec)	8226	30546	33890
MEAN	**-**	**138**	**611**	**206**	**-**	**7699**	**21270**	**28648**

1 Peak monthly total = maximum of the sum of the counts of all species within each month

2 Seasonal peak = sum of the maximum counts of all species within each season

Table 11.5 Summary of peak monthly totals and seasonal peaks in waterbird populations at Peninsula West and in the Tees estuary over the period 1999/00 to 2003/04

Year	Peninsula West				Tees estuary			
	Peak monthly total[1]	Seasonal peak[2]			Peak monthly total	Seasonal peak		
		Spring	Autumn	Winter		Spring	Autumn	Winter
1999/00	2861 (Sept)	937	4591	3420	17543 (Jan)	7276	18413	25257
2000/01	4781 (Feb)	1380	6702	5566	19989 (Oct)	8460	25304	22393
2001/02	3739 (Jan)	N/C	2633	4755	21753 (Feb)	N/C	10919	31786
2002/03	4401 (Jan)	1147	4435	6519	21894 (Nov)	6833	21168	29915
2003/04	2814 (Sept)	1125	5205	4547	25790 (Dec)	8226	30546	33890
MEAN	**-**	**1147**	**4713**	**4961**	**-**	**7699**	**21270**	**28648**

1 Peak monthly total = maximum of the sum of the counts of all species within each month

2 Seasonal peak = sum of the maximum counts of all species within each season

Table 11.6 The relative usage of Peninsula East and the Tees estuary by waterbirds over the period 1999/00 to 2003/04 (based on the data presented in Table 11.4 above)

Year	Percentage of Tees estuary waterbirds within Peninsula East			
	Peak monthly	Spring	Autumn	Winter
1999/00	2.2	2.0	3.5	0.8
2000/01	2.1	1.5	2.8	1.1
2001/02	1.8	N/C	4.0	0.2
2002/03	1.8	2.4	1.9	0.9
2003/04	2.6	1.4	2.9	0.7
MEAN	**2.1**	**1.8**	**3.0**	**0.7**

Table 11.7 The relative usage of Peninsula West and the Tees estuary by waterbirds over the period 1999/00 to 2003/04 (based on the data presented in Table 11.5 above)

Year	Percentage of Tees estuary waterbirds within Peninsula West			
	Peak monthly	Spring	Autumn	Winter
1999/00	16.3	12.9	24.9	13.5
2000/01	23.9	16.3	26.5	24.8
2001/02	17.2	N/C	24.1	15.0
2002/03	20.1	16.8	21.0	21.8
2003/04	10.9	13.7	17.0	13.4
MEAN	**17.7**	**14.9**	**22.7**	**17.7**

4. Peninsula West encompasses the intertidal mudflat of Seal Sands and this sector supports a very significant proportion of the waterbird populations of the whole site (Table 11.7). This data emphasises the importance of Seal Sands as a waterbird habitat in the context of the wider estuary.

5. The WeBs data shows that the Peninsula West sector is of particular importance (in the context of the estuary) for shelduck, wigeon, oystercatcher, knot, dunlin, curlew and redshank.

6. Peninsula East is of most importance for wildfowl, gulls and terns. These species are likely to be roosting on the peninsula itself or feeding in nearby shallow water areas. Cormorant in particular is consistently recorded in this sector throughout the year.

7. A study was undertaken in 2003 by the Wildfowl and Wetlands Trust and the University of Durham on behalf of English Nature to investigate long term changes in bird usage of the Tees Estuary (Ward *et al*, 2003). The study focussed on Seal Sands as this is the principal intertidal feeding area in the estuary. Ward *et al* (2003) presents summary data for seasonal peak waterbird usage of Seal Sands at low water over the period 1990 to 2001 (Table 11.8). This data, therefore, provides as good indication of the usage of Seal Sands as a feeding area for waterbirds.

Table 11.8 Seasonal mean peak low water counts at Seal Sands (1990-2001) for those waterbirds identified as being partly or wholly dependant upon Seal Sands (from Ward *et al*, 2003)

Species	Winter	Spring	Autumn
Shelduck	699	191	299
Wigeon	134	1	229
Teal	69	3	37
Mallard	17	3	103
Oystercatcher	238	118	310
Ringed plover	68	668	342
Golden plover	82	19	144
Grey plover	160	13	72
Knot	1201	74	97
Sanderling	0	163	21
Dunlin	1126	505	1443
Black-tailed godwit	2	1	15
Bar-tailed godwit	110	27	32
Curlew	338	153	597
Redshank	511	611	1079
Turnstone	4	3	29
Common tern	0	2	67
Sandwich tern	0	8	928

North Gare Sands

8. The WeBS sector code for North Gare Sands is 52413 (see Figure 11.1). The five year summary data (1999/2000 to 2003/2004) for this sector is presented in Table 11.9.

Table 11.9 Summary of peak monthly totals and seasonal peaks in waterbird populations at North Gare Sands and in the Tees estuary over the period 1999/00 to 2003/04

Year	North Gare Sands				Tees estuary			
	Peak monthly total[1]	Seasonal peak[2]			Peak monthly total	Seasonal peak		
		Spring	Autumn	Winter		Spring	Autumn	Winter
1999/00	1135 (Sept)	535	1313	1018	17543 (Jan)	7276	18413	25257
2000/01	1994 (Dec)	811	1851	2080	19989 (Oct)	8460	25304	22393
2001/02	8454 (Feb)	N/C	424	9781	21753 (Feb)	N/C	10919	31786
2002/03	1073 (Aug)	770	1221	980	21894 (Nov)	6833	21168	29915
2003/04	3106 (Aug)	814	4441	563	25790 (Dec)	8226	30546	33890
MEAN	**-**	**733**	**1850**	**2884**	**-**	**7699**	**21270**	**28648**

1 Peak monthly total = maximum of the sum of the counts of all species within each month

2 Seasonal peak = sum of the maximum counts of all species within each season

Table 11.10 The relative usage of North Gare Sands and the Tees estuary by waterbirds over the period 1999/00 to 2003/04 (based on the data presented in Table 11.9 above)

Year	Percentage of Tees estuary waterbirds within North Gare Sands			
	Peak monthly	Spring	Autumn	Winter
1999/00	6.5	7.4	7.1	4.0
2000/01	10.0	9.6	7.3	9.3
2001/02	38.9	N/C	3.9	30.8
2002/03	4.9	11.3	5.8	3.3
2003/04	12.0	9.9	14.5	1.7
MEAN	**14.5**	**9.6**	**7.7**	**9.8**

9. Examination of the WeBS data indicates that, in the context of the Tees estuary, North Gare Sands is of importance for oystercatcher, ringed plover, grey plover, knot, dunlin, curlew, redshank and a number of species of gull. Notably, this sector is used by notable numbers of Sandwich tern and common tern, both of which are Annex I species.

Bran Sands

10. The WeBS sector code for Bran Sands North is 52428 (see Figure 11.1). The five year summary data (1999/2000 to 2003/2004) for this sector is presented in Table 11.11.

Table 11.11 Summary of peak monthly totals and seasonal peaks in waterbird populations at Bran Sands North and in the Tees estuary over the period 1999/00 to 2003/04

Year	Bran Sands North				Tees estuary			
	Peak monthly total[1]	Seasonal peak[2]			Peak monthly total	Seasonal peak		
		Spring	Autumn	Winter		Spring	Autumn	Winter
1999/00	2373	461	547	2525	17543 (Jan)	7276	18413	25257
2000/01	1373	257	1813	1761	19989 (Oct)	8460	25304	22393
2001/02	1088	N/C	1016	1708	21753 (Feb)	N/C	10919	31786
2002/03	3404	327	702	4773	21894 (Nov)	6833	21168	29915
2003/04	3236	848	2034	5029	25790 (Dec)	8226	30546	33890
MEAN	**-**	**473**	**1222**	**3159**	**-**	**7699**	**21270**	**28648**

1 Peak monthly total = maximum of the sum of the counts of all species within each month

2 Seasonal peak = sum of the maximum counts of all species within each season

Table 11.12 The relative usage of Bran Sands North and the Tees estuary by waterbirds over the period 1999/00 to 2003/04 (based on the data presented in Table 11.11 above)

Year	Percentage of Tees estuary waterbirds within Bran Sands North			
	Peak monthly	Spring	Autumn	Winter
1999/00	13.5	6.3	3.0	10.0
2000/01	6.9	3.0	7.2	7.9
2001/02	5.0	N/C	9.3	5.4
2002/03	15.5	4.8	3.3	16.0
2003/04	12.5	10.3	6.7	14.8
MEAN	**10.7**	**6.1**	**5.9**	**10.8**

11. Examination of the WeBS data indicates that, in the context of the Tees estuary, Bran Sands North is of importance for oystercatcher, grey plover, knot, dunlin, bar-tailed godwit, curlew, redshank and a number of species of gull. Notably, this sector is used by notable numbers of Sandwich tern and common tern, both of which are Annex I species.

11.1.4 Waterbird usage of the Vopak foreshore

1. Data on waterbird usage of the Vopak foreshore is available from counts undertaken by INCA on behalf of BP between March and October 2005. Counts were undertaken at different states of the tide and waterbirds using the mudflats, seawall, Vopak land and adjacent water area were recorded. The data are summarised in Table 11.13.

Table 11.13 Waterbird usage of the VOPAK foreshore (2005)

Species	Date (and tidal state)																		
	30/3/05 (low)	30/3/05 (high)			18/4/05 (rising)	18/4/05 (rising)	2/5/05 (rising)		10/5/05 (falling)		17/5/05 (rising)	26/5/05 (high)		26/5/05 (rising)	6/6/05 (falling)		13/6/05 (rising)	17/6/05 (low)	23/6/05 (falling)
	Mud	VL	SW	Water	Mud	VL	Mud	VL	VL	SW	Mud	SW	Water	Mud	Mud	VL	Mud	Mud	Mud
Curlew	3	1			2	5					1			1				1	1
Shelduck	1	4			4			12	14				3		9			17	
Oystercatcher	2				1	2					2				1				1
Redshank	1		45		3		1												
Lapwing		1												1					2
Herring gull		12							30		44						11		40
Red-breated merganser				4															
Kittiwake							10												
Cormorant										1					1				
Common gull											1								
Common tern												1							
Greater Black Backed gull														1					
Little ringed plover																1			
Black headed gull															2				
Lesser Black Backed gull																	1		
TOTAL	**7**	**18**	**45**	**4**	**10**	**7**	**11**	**12**	**44**	**1**	**48**	**1**	**3**	**3**	**13**	**1**	**12**	**18**	**44**

Species	Date (and tidal state)																		
	1/7/05 (rising)	7/7/05 (falling)	28/7/05 (rising)		9/8/05 (falling)			19/8/05 (low)		19/8/05 (high)	25/8/05 (rising)			6/9/05 (falling)		18/9/05 (rising)	18/9/05 (rising)		19/9/05 (rising)
	Mud	VL	Mud	VL	VL	SW	Water	Mud	VL	VL	VL	SW	Water	VL	SW	Mud	VL	SW	VL
Curlew	1	6	2	1	11			3	4	8	19			8		3	4		7
Shelduck								1											
Oystercatcher	2		4			1		4				1				10	4		
Redshank			7			5		2				4				2		2	
Turnstone						7									3				
Lapwing		9			42			235			194			15		320	150		170
Herring gull			20					60									1		
Red-breated merganser																			
Kittiwake	2																		
Cormorant			1				6	20					1			64		4	
Common gull																			
Common tern			2					5											
Greater Black Backed gull	1							5										1	
Little ringed plover																			
Ringed plover			1																
Black headed gull			16					60											
Lesser Black Backed gull																			
Grey Heron			2									3			1				
TOTAL	**6**	**15**	**55**	**1**	**53**	**13**	**6**	**395**	**4**	**8**	**213**	**8**	**1**	**23**	**4**	**399**	**159**	**7**	**177**

Species	Date (and tidal state)								
	19/9/05 (rising)	3/10/05 (rising)		16/10/05 (low)	16/10/05 (high)		17/10/05 (rising)		
	SW	VL	SW	Mud	VL	Water	VL	SW	Water
Curlew		23		2	33		35		
Shelduck									
Oystercatcher				3				6	
Redshank	3		17	3				7	
Turnstone	1		4						
Lapwing				27			60	8	
Snipe							3		
Herring gull				26					
Red-breated merganser				1		6			5
Kittiwake									
Cormorant	3		8	23		2			4
Common gull				3					
Common tern									
Greater Black Backed gull			1	1					
Little ringed plover									
Ringed plover									
Black headed gull				20					
Lesser Black Backed gull									
Grey Heron				2					
Whimbrel		1							
TOTAL	**7**	**24**	**30**	**111**	**33**	**8**	**98**	**21**	**9**

11.2 Potential impacts during the construction phase

11.2.1 Disturbance to feeding and roosting waterbirds

1. Feeding and roosting birds have the potential to be disturbed during the construction phase as a result of noise and vibration caused by dredging and piling. An assessment of the potential for impact on waterbirds, and other species, is contained in Section 19.

11.2.2 Direct loss of intertidal habitat due to reclamation and capital dredging

1. The reclamation would not result in the direct loss of any area of intertidal mudflat. The site of the proposed terminal does have some intertidal area but this is composed of rock armouring and does not represent a feeding area for waterbirds. The capital dredging, which involves dredging adjacent to the Vopak foreshore opposite the proposed reclamation area, does not result in a direct impact on the foreshore. Consequently, no loss of intertidal area would arise as a result of the capital dredging. As a result, **no impact** on intertidal area is predicted as a consequence of the direct effects of the reclamation works or capital dredging.

2. The implications of the loss of habitat above mean high water associated with the development of the terminal is addressed in Section 12 (coastal and terrestrial ecology).

Mitigation and residual impact

3. No mitigation measures are required and it is predicted that there would be **no residual impact**.

11.2.3 Potential effect on intertidal habitats available to feeding waterbirds due to predicted effects on tidal prism

1. Changes to the cross sectional area of the Tees estuary as a consequence of capital dredging and reclamation can influence the tidal propagation (tidal prism) within the estuary. This potential effect has been fully examined as part of the hydraulic modelling studies, reported in Section 6. Changes in tidal propagation can affect the level of low and high water and, therefore, result in changes to the area of intertidal habitat that is exposed at low water. The consequence of such changes is that the area of habitat available for feeding birds can be affected.

2. In summary, the studies conclude that the effect on tidal propagation would be minor, with no change in elevation of either high or low water downstream of the site of the proposed development. This zone of the estuary has the most significant areas of intertidal feeding habitat within the system (e.g. Seal Sands) and **no impact** is predicted on these areas. At the site of the proposed development and upstream of the proposed development, it is predicted that changes to water level would be small.

3. At the site of the proposed development, it is predicted that there would be a minor increase in the level of low water of the order of 0.002m (2mm) at low

water on spring tides. It is estimated that the effect of this change would be to convert approximately 160m^2 (0.016ha) of intertidal habitat at North Tees mudflat to very shallow subtidal habitat under these tidal conditions. In terms of knock-on effect on the ability of birds to feed in this area, the impact is considered to be of **negligible significance.** It is considered that predicted changes to water levels upstream of the North Tees mudflat are not relevant in terms of effect on feeding waterbirds given the lack of intertidal areas.

Mitigation measures and residual impact

4. This predicted effect of the scheme is not possible to mitigate, and there would be **no residual impact** for intertidal areas downstream of the proposed development, with an impact of **negligible significance** at North Tees mudflat. The effect of the proposed scheme on tidal range at North Tees mudflat is considered in-combination with the recharge of this mudflat in Section 28.

11.2.4 Effect of sediment deposition on intertidal food resources due to capital dredging

1. The deposition of fine sediment within intertidal areas due to capital dredging has the potential to affect benthic communities that represent a feeding resource for waders and wildfowl. For example, high levels of overall deposition or a high rate of deposition could adversely affect components of the benthic community to the detriment of feeding waterfowl.

2. The nature of the predicted deposition of fine material, in terms of total deposition, rate of deposition and areas affected by the dredging, is presented in Sections 6 and 7. The implications of this for benthic communities are presented in Section 10.2 where it is concluded that the structure and functioning of the benthic communities of intertidal areas would not be affected by deposition associated with capital dredging.

3. Given the above, it is concluded that there will be no adverse effect on intertidal food resources as a result of the effects of capital dredging and **no impact** is predicted.

Mitigation and residual impact

4. No mitigation is required and **no residual impact** is predicted.

11.2.5 Effect of increased suspended sediments on the food resource for terns

1. Terns species feed on small fish and sandeels in the area around the mouth of the Tees (in Tees Bay and near the mouth of the estuary); of particular note in this respect are little tern and Sandwich tern as these species are cited in the SPA and Ramsar citations. The capital dredging in the lower estuary is predicted to cause an increase in the peak suspended sediment concentrations in the estuary mouth and in the near-shore waters in Tees Bay. The main effect is along the streamline of the tidal currents (which aligns with the channel within the estuary) although there is some lateral dispersion of sediments either side of the dredger. In Tees Bay, increases in suspended sediment concentrations along the coast are predicted due to tidal currents, but these increases are

relatively minor (less than 25 mg/l). Deposition of sediment is largely limited to the confines of the navigation channel, with some minor (less than 1mm) peak deposition predicted adjacent to the channel.

2. This predicted effect has the potential to result in adverse effects on small fish that represent a food resource for terns. Fish tend to avoid areas of inhospitable conditions and therefore the key effect is likely to be a localised redistribution of fish away from the areas of increased suspended sediment concentrations.

3. It is considered that this localised effect on the food resource for terns will not result in a significant effect on their feeding ability. This conclusion is made on the basis of the localised area affected by increased suspended concentrations in relation to the area available for feeding and short-term nature of the impact, which would only occur during dredging in the outer reaches of the channel. Terns are likely to be able to continue feeding effectively at the estuary mouth and in the near-shore waters of Tees Bay. Overall, the potential impact is judged to be of **negligible significance** at worst.

Mitigation measures

4. No mitigation measures are required and the residual impact would be of **negligible significance**.

11.2.6 <u>Potential for effect on areas used by designated Annex I species</u>

1. As described in Section 11.1, a small number of little terns breed at North Gare. The scheme is predicted to have some influence on North Gare Sands but the area used by little tern for breeding is above mean high water and is some distance from the zone of potential effect. In any case, no morphological effects are predicted at North Gare Sands as a result of the scheme.

2. Sandwich tern favours the area around Seaton Snook for roosting (above mean high water). The scheme does not have the potential to affect populations of this species.

3. Overall, **no impact** is predicted on areas of the estuary used by these Annex I species.

Mitigation measures

4. No mitigation measures are required and there would be **no residual impact**.

11.2.7 <u>Loss of waterbird interest within the Bran Sands lagoon during reclamation</u>

1. The disposal of dredged material in the Bran Sands lagoon would result in the loss of the lagoon and waterbird interest associated with the lagoon.

2. In summary, the current interest of the lagoon is limited due to the phased removal of floating rafts from the lagoon. There are, however, two rafts remaining and these could potentially be used by common terns for breeding. Other than the common tern, the area has some value as a roosting and loafing

area for waterbirds. Any birds using the area due to the presence of the lagoon would be displaced to other areas of the estuary; this would not result in undue pressure for resources (e.g. space) elsewhere in view of the current relatively low usage of the lagoon area by waterbirds.

3. This impact is considered to be of **moderate adverse significance** overall if the option for disposal of material within Bran Sands were exercised.

Mitigation and residual impact

4. Where disposal at Bran Sands is proposed, some of the capital dredged material will be used beneficially to reinstate bird islands in the Bran Sands area. Such islands have previously been created using dredged material and these have, over time, eroded; they are not, therefore, expected to be permanent structures.

5. The reinstatement of bird islands would be expected to encourage terns to breed on the islands, as was the case when islands were created in saline lagoons on the northern shore of the Tees estuary. This would, therefore, mitigate the loss of the remaining rafts within the Bran Sands lagoon. Should a number of islands be created, there is the potential for a net benefit to arise in that a greater opportunity for breeding may be provided compared to that lost due reclamation.

6. Depending on the nature of the dredged material used to construct the islands, and the prevailing hydraulic conditions, the islands would be expected to erode over time. The possibility of utilising material from other dredging projects that may be undertaken in the future for periodic reinforcement of the islands should be considered.

7. Overall, the creation of bird islands would result in a worse case residual impact of **negligible significance** given that there is a reasonably high degree of confidence, based on previous experience, that such islands would be used by breeding terns. There is the potential for a net beneficial impact should greater breeding opportunity be created compared to that which is lost. In the event that the islands did erode over time and there was no opportunity for their replenishment through periodic recharge with dredged material, the residual longer term impact would revert to **minor adverse significance**.

11.3 Potential impacts during the operational phase

11.3.1 Potential effect on the morphology of intertidal habitats and implications for waterbird populations

1. The predicted effects of the proposed scheme on the morphology of intertidal areas throughout the estuary system is summarised in Section 6. This summary integrates the effects of the proposed scheme on tidal currents speeds and directions and wave climate and, therefore, represents an overview of the effects of the proposed development on intertidal habitats during the operational phase.

2. In summary, the predicted effects of the scheme on physical processes (which have the potential to combine to result in an effect on estuarine morphology, are summarised as follows:

a) Reduced large-scale flows in the main deepened channel;
b) Increased near bed landward residual flow;
c) Slightly increased tidal range towards the Tees Barrage;
d) Increased import of fine sediments resuspended in Tees Bay;
e) Increased reflection of wind waves within the estuary from the reclamation;
f) Increased swell wave heights in the deepened channel; and
g) Reduced swell wave heights over the intertidals at the mouth of the estuary.

3. With respect to point c), the implications for waterbird feeding areas are addressed in Section 11.2.7 above.

4. When considering potential impact on feeding areas for waterfowl, the areas of interest are considered to be Seal Sands and North Gare and Bran Sands. These areas are the main areas of intertidal habitat in the estuary that are of importance for feeding waterfowl and are also within sites that are designated for their importance for waterbirds (amongst other features).

5. For Seal Sands, it is concluded overall that the morphological effects associated with the proposed scheme are likely to be small. It is predicted that there will be a small (order 10%) increase in the supply of fine material to Seal Sands (via Seaton Channel). It is predicted that fine material would accumulate in the areas of Seal Sands that are currently comprised of muddy sediments, with coarser areas unlikely to experience accumulation of fine material. No changes to tidal flows in this area are predicted and therefore the route for a potential effect on intertidal morphology is the increase in supply of fine sediment described above.

6. In addition to the increased supply of fine material, it is predicted that the scheme may provide a short term source of sand to Seal Sands by some slumping of sand into the Seaton Channel turning circle. However, the reduction in storm wave action over North Gare would be expected to counterbalance the significance of this potential source of sand. On balance, the increase in supply of fine material to Seal Sands (described above) is likely to be the dominant process affecting intertidal morphology of this area.

7. It is concluded that the net effect of the scheme will be to contribute to a raising of the elevation of the intertidal area. This is predicted to be of very low magnitude (predicted to be 0.3mm/year) and indistinguishable from background (considered to be in the order of 3mm/year) (i.e. a change of 10%). Overall, the effect of the scheme on intertidal morphology of Seal Sands with respect to habitats for feeding waterbirds is predicted to be of **negligible significance**.

8. The proposed scheme is not predicted to have a significant effect on the intertidal areas at North Gare and Bran Sands. No changes to tidal flows are predicted, although decreases in the swell wave heights are predicted over these areas which may result in some localised redistribution of bed material. Overall, **no impact** on waterbird populations is predicted.

Mitigation and residual impact

9. No mitigation measures are possible and it is predicted that there would be a residual impact of **negligible significance** (Seal Sands) and **no residual impact** at North Gare and Bran Sands.

11.3.2 Potential effect of increased supply of fine sediment to Seal Sands on feeding resource for waterbirds

1. The potential impact of the increased supply of fine sediments to Seal Sands on the benthic community structure is described in Section 10.3. In summary, it is concluded that the physical effects arising from the proposed scheme are unlikely to have an impact on benthic community structure of Seal Sands and consequently the potential impact on waterbird populations is considered to be of **negligible significance**.

Mitigation and residual impact

2. No mitigation measures are possible and the residual impact would be of **negligible significance**.

11.3.3 Disturbance to feeding and roosting waterbirds due to increased shipping activity

1. Shipping activity can disturb waterbirds in two main ways; first, through noise generated by the vessels and second due to shipwash. The issue of ship-generated noise is addressed in Section 19.

2. Shipwash can be a source of disturbance to feeding waterbirds in that it propagates across intertidal areas and causes feeding birds to take flight. This repeated disturbance minimises the time that birds can feed within the tidal cycle and hence can reduce overall feeding efficiency. This can be critical during the winter months and during periods of particularly severe weather when maximising available feeding time of paramount importance. With respect to the proposed scheme, the areas potentially affected which are used by waterbirds are North Gare Sands, Bran Sands, Seal Sands and the Vopak foreshore.

3. North Gare Sands and Bran Sands are relatively exposed areas of intertidal, although some protection is afforded by the breakwaters. Nevertheless, passing vessels could generate wash which will affect these areas. It is important to note that these areas will already experience shipwash but the frequency is likely to increase as a consequence of the container terminal.

4. Seal Sands is likely to be less vulnerable to shipwash given its relatively sheltered location and the presence of the training wall fronting Seaton Channel.

5. The Vopak foreshore is opposite the proposed terminal and could be affected by shipwash through manoeuvring vessels at the terminal. However, the fact that speeds will be low results in a low potential for ship-generated wash to impact

significantly on the foreshore. Nevertheless, it is concluded that this foreshore is likely to experience an increase in shipwash.

6. Shipwash does not have the potential to impact on areas that are used by Annex I species (little tern and Sandwich tern).

7. Overall, the potential additional impact associated with the proposed scheme is assessed to be of **negligible significance** for North Gare Sands, Bran Sands and the Vopak foreshore given that waterbirds only have the potential to be affected whilst the mudflats are exposed. Population effects are not predicted to arise as a consequence of this potential impact. **No impact** is predicted for Seal Sands.

Mitigation measures and residual impact

8. Other than the normal controls on navigation already exercised by PD Teesport, no other mitigation is possible. The residual impact would be of **negligible significance** for waterbirds at North Gare Sands, Bran Sands and the Vopak foreshore and **no impact** is predicted at Seal Sands.

11.3.4 <u>Potential effect of maintenance dredging on food resources for Annex I species</u>

1. Terns (including the Annex I species little tern and Sandwich tern) feed on small fish and sandeels in the waters at the mouth of the Tees estuary and in the near-shore area of Tees Bay. There is the potential for the maintenance dredging requirement as a consequence of the scheme to affect this food resource through increasing the suspended sediment concentration of the water column during dredging. This could cause the redistribution of small fish in the area.

2. The hydraulic and sediment transport studies conclude that there would be an increased maintenance requirement but this would not warrant an increased frequency of dredging above that which already occurs. The duration of each campaign would however increase marginally. However, no increase in maintenance requirement is predicted in the lower estuary (where terns feed). As a result, **no impact** on the food resource for Annex I species is predicted.

Mitigation and residual impact

3. No mitigation is required and there would be **no residual impact**.

11.3.5 <u>Disturbance to feeding and roosting waterbirds due to noise generated by the container terminal</u>

1. This potential impact is addressed in Section 19.

12 TERRESTRIAL AND COASTAL ECOLOGY

12.1 Existing environment

12.1.1 Introduction

1. ESL (Ecological Services) Ltd was commissioned to undertake a terrestrial ecological baseline survey of land that has the potential to be impacted by the proposed development. It should be noted that this section does not consider waterbirds. Impacts on waterbirds are discussed in Section 11.

2. The survey included land that had the potential to be impacted by the disposal of dredged material, including the options for disposal that have been considered. Therefore, the surveys covered the former Leathers chemical works site at North Gare (now discounted as an option for disposal) and the Bran Sands lagoon.

3. The four areas surveyed are described as:

- Teesport Estate;
- ICI Bran Sands (i.e. the lagoon area);
- Seaton Channel/North Gare (i.e. the Leathers site); and,
- Vopak foreshore.

4. The full survey report (including all figures and data) is included in Appendix 6, and the following sub-sections are extracted from the survey report to summarise the terrestrial ecological interest. It should be noted that information on the Leathers site is excluded from the following description as this site has been excluded as an option for the disposal of dredged material.

12.1.2 Scope of surveys and methodology

1. The ecological surveys included the following aspects:

- Habitats and plant communities;
- Great crested newts;
- Amphibians and reptiles;
- Bats;
- Brown hares;
- Water voles;
- Otters;
- Badgers;
- Birds; and,
- Invertebrates.

2. The methodology for each of the above is provided in the survey report in Appendix 6.

12.1.3 Findings of the ecological surveys

1. The detailed findings of the surveys, with full species lists, are provided in the survey report included in Appendix 6. On the basis of these findings, an

overview of the nature conservation importance of the surveyed areas for each of the habitats and species surveyed is provided below. As mentioned above, the findings of the survey of the former Leathers chemical works site at North Gare are excluded from the following description as this site has been discounted as a possible disposal location for dredged material.

Habitats and plant communities

2. All habitats and plant communities present on the Teesport Estate, ICI Bran Sands site and Vopak foreshore sites are common and widespread both nationally and locally (Rodwell, 1992 and 2000) and thus of low conservation value.

Plant species

3. The majority of the plant species recorded within the surveyed sites are typical of the habitats present and the coastal location. None are listed above the Least Concern category in the new Red Data Vascular Plant List (Cheffings and Farrell 2005). Nationally they are therefore all of low conservation importance.

4. The invasive alien species Japanese knotweed and giant hogweed, present on the Teesport Estate site, are a potential threat to native vegetation.

Amphibians and reptiles

5. No great crested newts were found in any water body in or adjacent to the Teesport Estate. Medium numbers of smooth newts and low numbers of common toad and common frog tadpoles were recorded during the evening visits. No reptiles were recorded on any of the four sites although apparently suitable habitat is present, particularly on the Teesport Estate.

Bats

6. In England, Scotland and Wales, all species of bats are fully protected under the Wildlife & Countryside Act 1981 and as amended, including amendments in the Countryside and Rights of Way Act 2000. They are also included on Schedule 2 of the Conservation (Natural Habitats, &c.) Regulations 1994. Taken together, this legislation makes it illegal to:

- Intentionally or recklessly kill, injure or capture a bat;
- Deliberately disturb bats when they are occupying a roost;
- Damage, destroy or obstruct access to bat roosts.

7. A bat roost is defined as being any structure or place that is used for shelter or protection, and since it may be in use only intermittently, a roost retains such designation even after the bats have left.

8. Common pipistrelles are listed as a Priority Species in the UK Biodiversity Action Plan (Anon 1998) with evidence of a declining national population. None of the surveyed sites currently hold a roost for common pipistrelle and only one bat

was noted feeding over the Teesport Estate on one occasion. These sites are therefore of very limited local importance for the species.

9. Noctule bats were noted foraging over both the Teesport Estate and ICI Bran Sands on one occasion. They may have been making an opportunistic visit to the site whilst moving between a roost site and a regular feeding area but without more local information it is difficult to assess whether the two sites are regularly used by this species. The two sites may therefore be of some local importance for foraging noctules.

Brown hares

10. Brown hares are listed as a Priority Species in the UK Biodiversity Action Plan (Anon, 1999) with evidence of declining national population. Brown hares were recorded in several parts of the Teesport Estate, particularly the wasteland and rough grassland habitats.

Water voles and otters

11. No evidence of water voles or otters was found at any of the surveyed sites. These areas are therefore of low conservation value for these species.

Badgers

12. No evidence of badgers was found on any of the surveyed sites and none was thought to have the potential to conceal a sett. They are therefore of low conservation value for this species.

Birds

13. The Wildlife and Countryside Act (1981 and as amended) protects all wild birds and their nests and eggs. Under this Act it is an offence to:

- Kill, injure or take any wild bird;
- Take, damage or destroy the nest of any wild bird while it is in use or being built; and,
- Take or destroy the egg of any wild bird.

14. In addition, certain rare breeding birds, listed on Schedule 1 to the Act, are also protected against disturbance whilst building a nest or on or near a nest containing eggs or dependent young.

15. The species recorded within the Teesport Estate are typical of the habitats available and the coastal location. Little ringed plover (listed on Schedule 1 of the Wildlife and Countryside Act) was recorded but is not considered to have bred on the site in 2005. The rough grassland areas (in the eastern third of the site) held relatively high numbers of territories of skylark, linnet and reed bunting (all Red List species) and therefore that area of the site is probably of local importance for its assemblage of breeding birds. Good numbers of wheatears

(over 40 during the passage period and double figure counts on other visits) fed on the site, which is therefore probably of local importance for them.

16. The species recorded in the Vopak foreshore area are typical of the habitats available and the coastal location. Little ringed plover was recorded in this area but is not thought to have bred on the site in 2005. The presence of breeding ringed plover, lapwing, shelduck and skylark probably make the site of local importance for its breeding birds. This site is probably also of local importance for feeding passage wheatears.

17. The species recorded within the Bran Sands lagoon site are typical of the habitats available and the coastal location. No Schedule 1 species were recorded from this site. The presence of up to 6 shelduck feeding territories and at least 20 pairs of common terns on rafts in the lagoon area indicates that the site has some local importance for its breeding birds. The lagoon area would also seem to be used as a high tide roost, although only lapwings used it during the survey period.

Invertebrates

18. No site is completely without invertebrate species, but it is the composition of the overall species inventory that reveals the true level of ecological interest. As a site becomes available ruderal plants will invade and insects will follow. These first invertebrate colonisers are typically generalists and are unlikely to include the rarer species that are regarded as being of conservation concern, although less common species may appear at this time if their specific food plant or other essential micro-habitat feature is present. As the vegetation develops, a new suite of invertebrates replaces that which has been forced out by the same changes. These transient "metapopulations" of invertebrates depend for their survival on a continuity of sites both entering and leaving the ruderal succession.

19. None of the recorded species at any of the four sites visited is of particular noteworthiness. The cool spring weather may have reduced the availability of invertebrates for sampling, but on the basis of these surveys, the level of invertebrate interest likely to be encountered in any area other than the ruderal habitat at the Teesport Estate is low. However, elsewhere in the country, neglected post-industrial sites which have developed a ruderal flora have been found to support outstanding assemblages of invertebrates (e.g. Harvey, 2000). There does not appear to be any significant published information on the invertebrate communities of such sites in the north-east, but it seems logical to consider that such sites may have a similarly high interest, although thermophilic species such as solitary bees will certainly be less well represented at this latitude.

12.2 Potential impacts during the construction phase

12.2.1 <u>Direct loss of ecological interest within the footprint of the proposed terminal and works to improve internal roads and rail</u>

1. The construction phase has the potential to directly impact on those communities within the Teesport Estate. The capital dredging would not directly

impact on any areas of terrestrial and coastal ecological interest. The ecological interest of the Bran Sands lagoon site would only be directly impacted should this site be used for the disposal of dredged material (this is addressed in Section 12.2.3 below).

2. The construction of the terminal, works to roads within the Teesport Estate and works to re-instate the rail link to the new intermodal rail terminal would directly impact on a number of habitats within the Teesport Estate comprising small ponds, areas of tall herb dominated vegetation, scattered scrub, wasteland vegetation and rough grassland. It should be noted that much of the proposed terminal area and areas that would be affected by works to the roads and rail already comprises hard surfacing.

3. On the basis of the findings of the ecological surveys, the proposed development site does not host bat roosts, water voles, otters, badgers, great crested newts or reptiles. Smooth newts, common toad and brown hares were recorded. The plant and invertebrate communities are described as being of low conservation interest with no noteworthy species being recorded. The assemblage of birds is typical for this type of location and is considered to be of local importance due to the presence of a number of Red List species and other species on the areas of rough grassland.

4. The proposed terminal would impact on an area of approximately 54ha, although of this area approximately 40% to 50% comprises existing surfaced areas with the remainder being made up of the mixture of habitats listed above (mostly rough grassland). Land adjacent to the roads that would be affected works to the roads and land that would be affected by the rail link to the new intermodal rail terminal, also comprises rough and waste grassland.

5. The loss of the terrestrial ecological interest of part of the Teesport Estate is considered to be of **minor to moderate adverse significance** overall, with the most notable species being the presence of a number of Red List bird species. The loss of habitats due to the development would not result in the loss of a habitat type in the local area, with similar habitats being present in other areas of the Teesport Estate. This is demonstrated through the surveys which covered a wider area than that which would be directly affected by the development (see Figure 2, Appendix 6) and this shows that the habitats which would be directly impacted are characteristic of the habitats of the wider area.

Mitigation and residual impact

6. It is recommended that a number of mitigation measures are adopted. Of most importance is the need to avoid disturbance to breeding birds which is an offence under the Wildlife and Countryside Act. This can be achieved by either scheduling the reclamation works outside of the bird breeding season or managing the land in such a way that birds are discouraged from breeding on the site in advance of construction (i.e. through clearing vegetation). It should be noted that the proposed development would not result in the loss of habitats used by breeding birds, with similar habitat types present within other parts of the Teesport Estate.

7. Given the findings of the ecological surveys, no specific mitigation measures are proposed with respect to mammals given their apparent absence within the proposed development area. However, it is recommended that a further pre-construction survey is undertaken to verify the findings of previous surveys . The pre-construction surveys should also cover amphibians, including a repeat survey for great crested newts (which were absent from all waterbodies during the current surveys). Mitigation measures may then be required depending on the findings of these repeat surveys and may include relocation of species; any such measures will need to be agreed with English Nature.

8. As a consequence of the above programme of mitigation measures, in particular the measures to discourage breeding birds within the site prior to construction, it is predicted that the residual impact would be of **minor adverse significance.** Some degree of impact on the terrestrial ecological interest of the site is unavoidable. However, the implementation of the above measures would ensure that all possible steps have been taken to minimise adverse impact.

12.2.2 Potential for indirect effects on ecological interest

1. The capital dredging has the potential to affect the Vopak foreshore area through disturbance due to the proximity of the dredger to the shoreline, particularly during the dredging required to realign the navigation channel in this area. On the basis of the results of the ecological surveys of this area, this is only a potential issue for birds, as breeding units were identified for seven species, with a number of other species using the site for feeding.

2. It is predicted that the magnitude of impact on birds present on the land adjacent to the Vopak foreshore would be low due to the nature and location of the dredging operation. The dredging is not a particularly noisy operation (i.e. similar to other shipping traffic in the estuary) and the dredging would be approximately 150m away from the high water mark (the centre of the existing shipping channel is some 250m away from the high water mark). In addition, the presence of commercial vessels and dredgers operating in the channel is an intrinsic feature of the estuary. The potential impact of the presence of the dredger is therefore predicted to be of **negligible significance** on breeding birds on the Vopak land.

Mitigation and residual impact

3. No mitigation measures are possible and the residual impact would be of **negligible significance**.

12.2.3 Direct loss of ecological interest within the footprint of the disposal in Bran Sands lagoon if secured for the disposal of dredged material

1. The disposal of dredged material to Bran Sands lagoon would largely affect the lagoon itself, although inevitably there would be disturbance to certain areas of land around the lagoon, particularly the area between the lagoon and the estuary during the pumping ashore of dredged material. The ecological surveys

show that the terrestrial and coastal ecological interest of the Bran Sands lagoon and surrounding land is extremely limited and of low conservation value.

2. It is concluded that the potential impact on terrestrial and coastal ecological interest associated with the disposal of dredged material in the lagoon would be of **negligible significance**.

Mitigation and residual impact

3. No mitigation measures are required and the residual impact would be of **negligible significance**.

12.3 Potential impacts during the operational phase

1. During the operational phase, there are no activities that have the potential to impact on the terrestrial ecological interest of the surrounding area as all activities would be within the boundaries of the terminal. The material disposed of in the Bran Sands lagoon would effectively be sterile and it would not be expected to have any ecological interest (should this become a feasible option).

13 FISHERIES RESOURCES

13.1 Existing environment

13.1.1 Overview of fisheries regulation and data sources

1. The North Eastern Sea Fisheries Committee (NESFC) is responsible for controlling fisheries in coastal waters within the 6 nautical mile limit; an area from South Shields to Donna Nook south of Grimsby. Fisheries for salmon (*Salmo salar*), sea trout (*S. trutta*) and eels (*Anguilla anguilla*) are managed by the Environment Agency that has authority in coastal waters for the management of fisheries of catadromous (salmon and sea trout) and anadromous species (eels) that migrate to spawn between the sea and freshwater.

2. The majority of the boats fishing the study area operate seasonally and are less than 10m in length. Since there is no statutory obligation for vessels less than 10m length to report their landings to DEFRA, the most robust data available are those provided to the NESFC as part of their permitting and registration requirements. As the NESFC holds the vast majority of information on fishing activity for the study area, the description of the existing environment (i.e. current fishing activity) has been largely undertaken by analysis of the data provided by the NESFC. Consultation with the Environment Agency has supplemented this information. For example, information has been obtained from the Environment Agency on rod catches to assist in the description of the importance of the estuary for migratory fish.

3. The Tees estuary itself is not considered an important area for commercial fishing activity and, therefore, information relating to fishing activity concentrates on activity within the inshore areas of Tees Bay. Given the low potential of the proposed scheme to affect fishing activity in Tees Bay, a detailed analysis of offshore fishing activity has not been undertaken.

13.1.2 Overview of fishing activity

1. The majority of fishing effort in the area is directed towards potting for crabs and lobsters. In addition, there is some trawling for cod, sole and other demersal fish such as haddock and plaice.

2. Commercial fishing activity in the study area is generally limited to activity outside of the estuary in Tees Bay and can be split into three categories. The first category comprises those fishing vessels which are based in Hartlepool in the north of Tees Bay. Of these, 8 boats were licensed with the NESFC in 2004 compared to 5 in 2003 and 4 in 2002. These vessels are larger in size when compared with others that fish in the study area and are generally trawlers crewed by full time personnel.

3. The second category generally comprises smaller vessels (i.e. less than 10m in length) although the fleet is significantly larger in number than those vessels based in Hartlepool. Fishing activity is generally seasonal and crewed by part time personnel.

4. The third category is based on vessels moored at a small man-made breakwater at South Gare, close to the mouth of the Tees estuary. It is envisaged that this category is potentially most at risk than the others from the development. The mooring, locally known as Paddy's Hole, harbours up to 17 small fishing vessels.

13.1.3 Shellfish, demersal and pelagic fish

1. Eight of the vessels registered at Paddy's Hole actively worked up to 1000 pots for lobster (*Homarus gammarus*), edible crab (*Cancer pagurus*) and velvet crab (*Necora puber*) during 2004. Pots are laid inshore during April to May for edible crabs and velvet crab, with good catches of lobster being from the middle of July through to September. Four vessels regularly work gill and trammel nets for Dover sole (*Solea solea*) and codling (*Gadus morhua*) throughout the year. Five vessels regularly work otter trawl gear for sole, codling and nephrops (*Nephrops norvegicus*) between September and May. The majority of this fishing activity for crab and lobster takes place outside the estuary. To the south, close to the rocks and 'scars' surrounding Redcar, and to the north, Seaton Carew, with nephrops being caught further offshore in areas of soft mud. A small number of pots are set in the lower estuary in the summer months for lobster and velvet crab.

2. Table 13.1 summarises the monthly fishing effort reported by vessels operating from South Gare breakwater. Such catch return information is a mandatory requirement of the NESFC shellfish permit provisions. Table 13.2 summarises the monthly shellfish landings reported by vessels operating from South Gare breakwater.

Table 13.1 Summary of fishing effort by vessels operating from South Gare breakwater (data supplied by NESFC)

Month	Days at sea	Netting effort (m days)
January	24	57400
February	18	48000
March	14	43200
April	10	12000
May	20	200000
June	16	26000
July	34	306000
August	19	34000
September	32	83500
October	20	56500
November	20	58500
December	31	80600
Total	**258**	**1005700**

Table 13.2 Summary of monthly shellfish landings reported by vessels operating from South Gare breakwater (data supplied by NESFC)

Month	Number of pots	Potting effort (pot days)	Crab (kg)	Lobster (kg)	Whelk (tonnes)	Velvet crab (kg)
January	200	4600	78.2	88.8	0	13.4
February	100	1800	18.1	35.7	0	1.8
March	100	1800	46.1	56	0	1.9
April	425	7250	544.9	150.87	0	242
May	675	20325	994.5	297.05	1	499.9
June	825	24330	1081.2	444.1	0.25	658
July	1045	31305	760.7	953.4	0	574
August	960	29400	761.8	1406.1	0	64
September	910	20400	393	704.47	0	100
October	460	13850	282	275.05	0	0
November	300	8630	150	240.85	0	40
December	220	6380	45.7	181.2	0	187
Total	6220	170070	5156.2	4833.59	1.25	2382

3. Other types of fishing activity are pursued from the foreshore during periods of low tide. These include bait digging for both ragworm and lug worm and the collection of shore crabs from traps made out of disused car tyres. This activity peaks in May and September. Intertidal shellfish collection is difficult to quantify as only limited information is available; the predominant species collected is the cockle (*Cerastoderma edule*) (David McCandless, NESFC, *pers. comm.*).

4. The lower Tees Estuary supports many fish some of which are estuary dependant such as flounder *(Platichthys flesus*) and some of which are temporary residents such as plaice (*Pleuronectes platessa*) which use the estuary as a nursery ground (Tansley 2003). Data collated from the Hartlepool Power Station intake screens have also identified the presence of herring (*Clupea harengus*) and sprat (*Sprattus sprattus*). Habitats in the middle of the estuary i.e. those in the vicinity of Teesport are not considered to be of sufficient quality to encourage significant numbers of resident or migratory fish species (Tansley 2003). Herring and plaice are identified as Biodiversity Action Plan (BAP) species and priority species by the grouped plan for commercial marine fish

5. Sandeels are also abundant in the local area although there is no commercial fishery. They are however an important food source to the marine ecology and bird populations of the area (Geoff Barber, INCA *pers comm*).

13.1.4 Migratory fish

1. Licences are required to take salmon and sea trout from the sea as well as to take eels (except by rod and line). Commercial fishing around the mouths of many of the north-east regions' rivers is prohibited in order to protect returning

migratory fish. The Environment Agency has the role of maintaining, improving and developing fisheries within the north-east and therefore has implemented a set of byelaws in different areas of the region to ensure this role is fulfilled. These bylaws describe Conservation Areas in which salmon fishing is prohibited. The Conservation Area for the Tees stretches from Hartlepool Bay via Longscar Buoy, out to Tees Fairway Buoy and down past the South Gare Breakwater. Fishing does occur however within Tees Bay out to the 6 mile limit.

Salmon and sea trout

2. Improvements in water quality since the early 1980's have enabled the numbers of salmonids and sea trout to steadily increase. Data on the numbers of returning migratory salmonids and sea trout have been obtained, predominantly from the Tees barrage fish pass managed by the Environment Agency. The numbers and lengths of salmon and sea trout using the pass have been recorded since 1995. Whilst these data are not estimates of total run size, they do illustrate a general upward trend in numbers since the early 1990's. Most of the upper tributaries are spawning and nursery areas for brown trout, salmon and sea trout and are vital to the state of fish stocks in the middle and upper catchments.

3. There are upstream movements of salmon from May onwards through summer to peak movement in September/October. The downstream smolt run peaks in May. The numbers of salmon and sea trout caught on rod and line are collated by the Environment Agency. Although the salmon and trout rod catches have increased over recent years (see Figures 13.1 and 13.2), in the context of other estuaries the catch is limited. For example in 2004, 208 salmon were recorded in the Tees, compared to 6788 for all north-east rivers in total; this represents only 4% of the catch. For sea trout, catches in the Tees only represent 3% of total catch. The fishing season for sea trout starts in March followed by June for Salmon. For both species, the season ends on the last day of August.

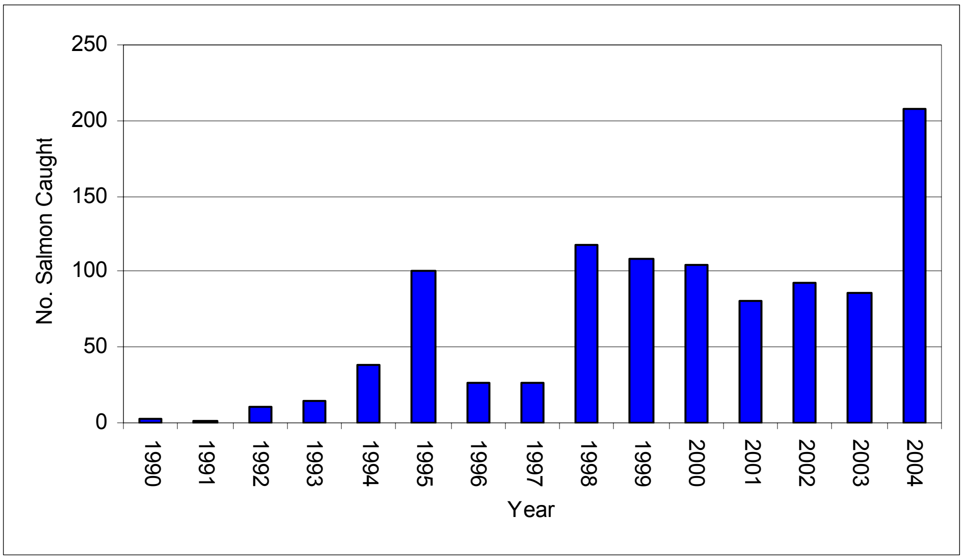

Figure 13.1 Number of rod-caught salmon in the Tees since 1990

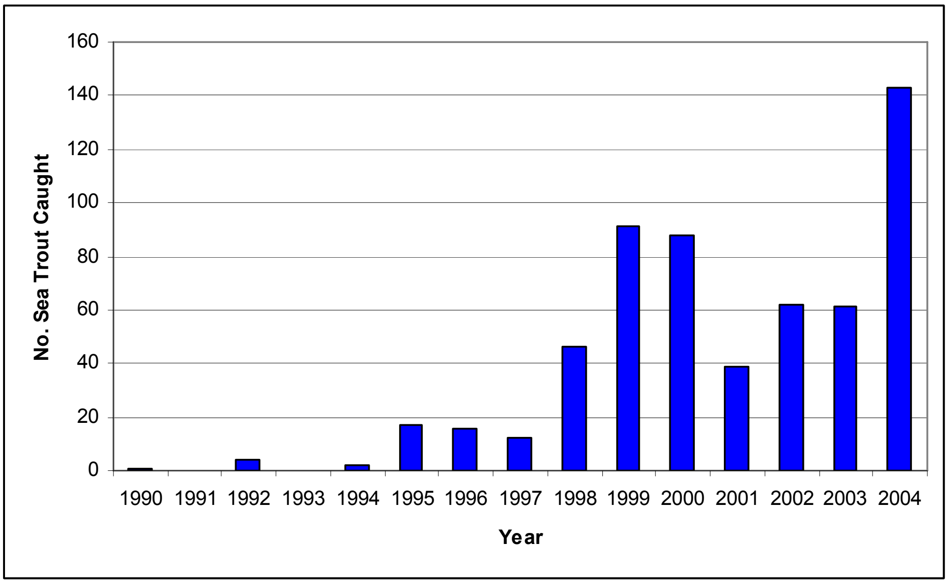

Figure13.2 Number of sea trout caught over the period 1990 to 2004.

Eel

4. There is one fisherman licensed to use fyke nets to catch eels *(Anguilla anguila)* in the tidal reach of the Tees.

Rare species

5. In this context, rare species refers to species that are protected under national or international legislation (other than fisheries legislation). River lampreys

Lampetra fluviatilis enter the Tees estuary to spawn and have been observed at the Tees barrage at Stockton.

13.2 Potential impacts during the construction phase

13.2.1 Direct uptake and disturbance of fish during capital dredging

1. During the capital dredging there is the potential for fish eggs, fish , shellfish and the food resources on which they rely to be taken up directly by the dredger. Potential effects are injury, mortality and displacement. The potential for direct uptake is greatest for demersal species (i.e. those which live on the seabed) such as flatfish. It should be noted that the area that would be affected directly by the dredging is not a spawning ground for fish species due to the fact that the directly affected area is already an intensively dredged navigation channel.

2. The disturbance caused by the dredge head is likely to cause the majority of fish to move away from the dredger, thereby avoiding direct uptake. Consequently, it is not expected that there would be significant uptake of fish during dredging and any effect would be localised. The impact is therefore predicted to be of **negligible significance**.

Mitigation and residual impact

3. There are no mitigation measures that can be taken to reduce the potential direct uptake or disturbance to fish and therefore the residual impact would be of **negligible significance**.

13.2.2 Potential impacts on shellfish and fish species caused by increases in suspended sediment concentrations (SSC) due to dredging and dewatering of the reclamation area

1. The construction phase will result in increases in the suspended sediment concentration of the water column during capital dredging and during the return of water to the estuary from the reclamation process. The predicted characteristics of the change in suspended solids concentrations (SSC) are fully described in Section 9.

2. Such changes have the potential to impact on fish within and traversing the estuary. The effects are most likely to be predominantly physiological, particularly the blocking of gill structures for example, but fish are also less efficient at hunting prey and avoiding predators.

3. In general, estuarine fish have a degree of tolerance to conditions of high SSC as concentrations can vary significantly in response to tidal conditions and other events such as storms (increased wave action) and high rainfall. Larvae and juvenile fish are more susceptible to adverse physiological effects than mature fish as their sensory systems are less well developed. Consequently, they are less able to detect and avoid adverse conditions. The presence of migratory salmonids (salmon and sea trout) within the estuary from May onwards through the summer period is of particular note in that there is the potential to disrupt migration routes and to affect fish physiology. The capital dredging could

coincide with the timing of salmon migration in the estuary and, therefore, the assessment of potential impact on migrating fish has been undertaken on the assumption that this is the case.

4. It is predicted that the increase in SSC arising during capital dredging would be outside the range of natural variation, particularly in the immediate vicinity of the dredger (see Section 9.2). Peak suspended solid concentrations in the main channel are however significantly affected by the location of the dredger. When located in the Tees Dock turning circle or in the area of the proposed quay wall, concentrations of suspended solids decrease significantly outside of the immediate vicinity of the dredger (see Section 9.2). This occurs both laterally and within the streamlining of the vessel. This significant decrease in suspended solids also occurs when the dredger is located in the main channel adjacent to North Gare Sands, however suspended solid concentrations are predicted to remain above natural variation both laterally and in the streamline of the vessel.

5. The cross section of the estuary affected by the plume arising from the proposed dredging is particularly relevant if areas remain relatively unaffected, thereby allowing migration to continue. With respect to the proposed dredging, significant elevations in suspended sediment concentrations are predicted to occur in the immediate vicinity of the dredger and along the streamline; however, the relatively narrow nature of the Tees means that there is the potential for a significant cross-sectional area of the estuary to be influenced by elevated suspended sediment concentrations throughout the course of the capital dredging. It is concluded, therefore, that there could be temporary impacts on migration and populations living within the estuary, particular on juvenile stages of fish species.

6. Overall, it is predicted that there is the potential for an impact of **moderate adverse significance** on fish populations within the estuary, largely due to the presence of migratory salmonids at certain times of the year and the potential for their migration to be disrupted.

Mitigation and residual impact

7. It is recommended that PD Teesport programme the dredging to occur during the winter months to avoid potential impacts on migratory fish, although resident fish within the estuary would be affected. Should this mitigation measures be adopted, the overall impact on fish species due to elevations in suspended sediment concentrations is predicted to be of **minor adverse significance**.

13.2.3 Potential impacts on fish species caused by effects on water quality (contaminants and dissolved oxygen)

1. In addition to the physical effects of fish populations associated with elevated SSC (described in Section 13.2.2) there is the potential for chemical effects to arise as a result of the resuspension of contaminated sediments during capital dredging or due to decreases in dissolved oxygen in the water column should significant amounts of organic matter be released during dredging. The potential

for such chemical effects to arise is informed by the findings of the sediment quality survey that has been undertaken as part of the EIA process (see Section 7.1).

2. In summary, it has been concluded in Section 7.1 that there are elevated levels of some contaminants within the proposed dredged footprint. However, as discussed in Section 9.2, the resuspension of sediments in the water column is unlikely to give rise to breaches in the majority of environmental quality standards (EQSs). Where EQSs are potentially at risk of being breached, dilution is likely to quickly reduce concentrations to below the level of the EQS.

3. The potential impact of the dredging on dissolved oxygen concentration is discussed in Section 9.2. In summary, it is considered that the dilution and dispersion afforded by a dynamic estuarine environment (i.e. the dredging will not occur in an area that is enclosed or where there are restrictions in water exchange), combined with the short term nature of the increases in suspended sediment concentrations, that dissolved oxygen levels are unlikely to be impacted.

4. Given the above, **no impact** is expected to arise on fish populations as a result of the quality of the sediments to be dredged.

Mitigation and residual impact

5. No mitigation measures are required and there would be **no residual** impact.

13.2.4 <u>Effect of noise and vibration during construction on fish populations</u>

1. Certain aspects of the construction phase have the potential to impact on fish due to the generation of noise and vibration, particularly the piling for the construction of the quay wall but also noise and vibration generated during dredging. Generally, fish detect and respond to sound to hunt for prey, avoid predators and for social interaction. High levels of mortality can occur when fish are exposed to excessive levels of underwater sound, noise and vibration. There is also the potential to affect fish migration through the estuary and effects on fish distribution.

2. When assessing the potential impact of noise on fish populations, it is important to consider the nature of the existing noise in the environment and therefore to assess the potential impacts associated with construction activities, such as piling, in this context. The low frequency noise produced by ships propagates well through the water column and many fish are known to acclimatise rapidly to background noise. The Tees estuary is heavily used by commercial shipping and, therefore, the area is subject to noise associated with shipping on a day to day basis. Noise generated by dredging is, therefore, unlikely to be of significance given this context.

3. Of greater potential concern is noise and vibration generated during the piling for the construction of the quay wall. A discussion of the potential effects of

underwater noise generated during the construction phase is provided in Section 19.2.

13.2.5 Effect of construction light on fish populations

1. The construction works (with the exception of piling) would take place 24 hours a day and therefore lighting would be required at night during the construction. Light spill can be a further source of disturbance to fish in the estuary. Under the existing situation, there will be a degree of light spill into the water column from the existing operations on the quay side; however, the reclamation and piling works will require lighting further out into the estuary than at present. Consequently, there is the potential for additional disturbance to fish.

2. The reaction of many fish to this type of disturbance is that they are attracted to light sources. Therefore, there is the potential for some attraction of fish to the construction area, although the noise generated during construction will counteract this effect to an extent. Overall, it is concluded that the noise and light during the construction phase will result in some localised redistribution of fish within the area around the proposed development. However, this will not affect the fish populations of the estuary as a whole and, therefore, the impact is predicted to be of **negligible significance**.

Mitigation and residual impact

3. Construction lighting should be directed away from the estuary where possible in order to minimise light spill into the water column. A residual impact of **negligible significance** is predicted.

13.2.6 Restriction of access to potential fishing grounds

1. Since there is very limited, if any, fishing activity within the Tees estuary and no fishing in the navigation channel, the construction phase will not have an impact on access to fishing grounds. Therefore, **no impact** is predicted in this respect.

Mitigation and residual impact

2. No mitigation is required and there would be **no residual** impact.

13.3 Potential impacts during the operational phase

13.3.1 Potential impact on feeding resource for fish populations

1. Fish feed on a wide range of benthic invertebrates which live within and on the surface of the seabed, such as polychaete worms and the siphons of molluscs which protrude above the sediment surface. Therefore, impacts on this invertebrate resource as a result of the scheme can lead to the loss of a potential feeding resource or a reduction in the value of the impacted area as a feeding resource. The potential impacts of the proposed scheme on the subtidal ecological resource is assessed in Section 10.

2. There are two components of the scheme that have the potential to directly impact on the feeding resource for fish populations; the capital dredging and the reclamation for the construction of the terminal. In addition, there is the potential for an indirect impact on the feeding resource for fish populations to arise due to the deposition of fine sediment that is suspended and dispersed during capital dredging onto intertidal and subtidal areas.

3. Overall, the majority of the capital dredging is within the existing dredged channel and the biological communities present are of relatively low diversity when compared with areas outside the channel. Nevertheless, these areas are likely to represent a feeding area for fish to some extent and so the removal of this resource during dredging and reclamation would remove a proportion of the subtidal food resource for fish.

4. During the operational phase there will be recovery of the communities within the dredged area, although there will be an overall net loss of approximately 8.5ha of potential subtidal feeding area due to the reclamation. The overall impact is therefore predicted to be of **minor adverse significance**.

Mitigation and residual impact

5. The potential impact of dredging and reclamation of the food resource for fish populations is not possible to mitigate and the residual impact is considered to be of **minor adverse significance**.

13.3.2 Effect of lighting for the container terminal on fish populations

1. Lighting that is required for the container terminal has the potential to result in an impact on fish populations in a similar manner to that described in Section 13.2 for construction lighting. At present, the existing quayside within part of the proposed development site is lit given that there are existing operations at the site (e.g. TCT1). However, the lighting required for the proposed container terminal will be more significant due to the need to provide a minimum lighting standard to meet statutory requirements (Docks Regulations 1988) and so there is the potential for increased light spill into the water column.

2. Details of the lighting design for the proposed terminal are provided in Section 3.1. The luminaries that will be incorporated into the lighting scheme are designed minimise upward light output and obtrusive light into the environment (e.g. sky glow, light spill, glare and light intrusion). Nevertheless, it is likely that there will be some light spill into the estuary given the need to light the quayside during night time operations.

3. As described in Section 13.2, fish tend to react to light spill. Therefore, light spill into the water column can result in a redistribution of fish. However, the fish populations of the estuary as a whole would not be affected beyond the potential redistribution of individuals in the area affected by light spill and the impact is predicted to be of **negligible significance**.

Mitigation and residual impact

4. Beyond the measures incorporated into the lighting design to minimise light spill and other forms of light pollution, no mitigation measures are required. The residual impact would be of **negligible significance**.

14 COMMERCIAL NAVIGATION

14.1 Existing environment

1. Teesport is a busy commercial port which has regular movements of large vessels on a continuous basis. Many of the riverside industrial plants along the 17km stretch of the Tees have docking and cargo handling facilities. In 2004, Teesport handled 53.8 million tonnes; the main traffic handled was liquid bulk (36.2 million tonnes), dry bulk (12.5 million tonnes), and unitised cargo (3.6 million tonnes). At present, there are on average between 950 and 1100 vessel movements per month.

2. The Tees is approached from the north-east through a deepwater channel in Tees Bay. The approach channel has a dredged depth of 15.4m below CD from Tees Fairway light buoy to the entrance, where it reduces to 14.1m below CD. Thereafter the maintained depth is progressively reduced to 4.5m below CD east of Billingham Beck, seven nautical miles from the entrance. Above Billingham the channel is not dredged. Traffic in the Tees estuary is controlled by a sophisticated vessel traffic system (VTS).

3. The harbour authority has powers to make byelaws for the efficient and safe operation of the port. These include the regulation of navigation, pollution prevention and berthing and mooring. The authority has jurisdiction extending from near the Tees barrage to three miles offshore and from Blackhall Rocks four miles north-west of Hartlepool to Saltscar Rocks off Redcar.

4. The navigation of existing shipping on the river can be summarised as follows. Large deep drafted ships bound for the ConocoPhillips Oil Terminal and the Redcar Ore Terminal (ROT) pick up tug assistance after passing South Gare and are turned in the Seaton Channel turning circle. Ships arriving fully laden for the ROT require deep water which is only provided at high tide, but can leave at any time. Similarly, fully laden tankers leaving the ConocoPhillips Oil Terminal do so at high water.

5. Shipping to and from Tees Dock, TCT1 and the upstream chemical industry berths are turned at the Tees Dock turning circle. The present dredged depth of the Tees Dock turning circle means that deep drafted vessels to/from Tees Dock are restricted to sailing at high water.

14.2 Potential impacts during the construction phase

14.2.1 Potential conflict between construction activities and commercial navigation within the Tees Estuary

1. During the construction phase there is the potential for conflict between the construction activity and navigation within the Tees estuary. This potential arises due to the presence of the dredger within the navigation channel, the need for pipelines to pump dredged material ashore from the dredger and the presence of other construction plant required to construct the terminal itself. Construction activity will be focused on the area in the vicinity of the terminal but the capital dredging will, at certain stages in the construction programme, affect

the wider estuary between the proposed terminal location and (approximately) the breakwaters at the mouth of the Tees estuary.

2. The potential conflict between construction plant and shipping traffic could take a number of forms, including delays to shipping, increased risk collision, obscuring navigational aids and the prevention/interference of activities of other operators that are present in the vicinity of the proposed terminal. This potential conflict exists for the duration of the construction which is predicted to last for a period of 120 weeks overall, divided into two periods associated with Phase 1 (80 weeks) and Phase 2 (40 weeks).

3. For the purposes of impact assessment, it is necessary to assume a worst case scenario which could be seen as either a collision between construction plant and vessels operating in the estuary or a severe delay to commercial shipping traffic due to construction activity. These scenarios could result in significant economic consequences and an impact of **major adverse significance** must be assumed.

Mitigation and residual impact

4. There are a wide range of mitigation measures that will be specifically implemented in order to ameliorate this potential impact. In particular, given that the presence of the dredger will constrain the channel width, the potential conflict between the dredger and commercial shipping will be controlled through one-way control of vessels and re-timing of vessel movements. The Harbour Master has confirmed that this will ensure that potential conflicts would be avoided and that there are no concerns over the ability of this to be implemented via the existing VTS.

5. Other measures would specifically be implemented to avoid potential conflicts. These comprise the deployment of additional buoys (as required) to mark construction areas and to warn other shipping of the works that are taking place. Vessels will also be informed of the construction works as they arrive and leave the estuary via the VTS. Red lights would mark the location of the construction works (e.g. at either end of the construction site) as an aid to navigation. Trinity House would be informed of changes to buoyage and lighting that may be required during construction. A Notice to Mariners will be issued which would set out all of the above measures.

6. Overall, the Harbour Master has confirmed that there are no concerns over conflicts arising during the construction phase given that fact that the mechanism exists for the effective management of all shipping traffic within the Tees estuary and Tees Bay via the VTS. Similar measures to those described above have been implemented during other construction works in the estuary and past experience shows that operators within the estuary are very cooperative with each other in accommodating such works. As a result of the management measures that are in place and which will be implemented during the construction phase, **no residual impact** is predicted.

14.3 Potential impacts during the operational phase

14.3.1 Navigational safety for larger vessels

1. The potential change to risk of collision due to increased vessel traffic levels and due to the increased movements of larger vessels within the estuary is discussed in Section 14.3.2.

2. The proposed container terminal will result in more frequent movements of larger vessels within the Tees estuary compared with the existing situation. The size of vessel to be handled at the proposed terminal will be the current 6,600 TEU post-panamax and the current build of 8,000 TEU vessels. An 8,000 TEU container vessels is typically 325m long with a beam of 42.8m. Therefore, in addition to considering the implications of an overall increase in vessel numbers, it is important to consider navigational safety for the larger vessels themselves.

3. In determining the design for the proposed navigation channel, a series of navigation simulation exercises have been undertaken by PD Teesport at South Tyneside College. These exercises were intended to simulate vessel manoeuvring (including turning) within the approach channel and berthing of container vessels at the proposed terminal. The ultimate aim was to inform the design of the channel and turning circles in order to satisfy the Harbour Master that vessels of the type that would use the proposed terminal could navigate to and from the terminal in a safe manner.

4. The proposed channel design, as described in Section 3.1, is a consequence of the navigation simulations described above and the Harbour Master has no concerns over the ability of the larger vessels to safely manoeuvre within the estuary. Therefore, **no impact** is predicted.

Mitigation and residual impact

5. No mitigation measures are required and there would be **no residual impact**. Measures that will be implemented in light of the overall increase in vessel traffic within the estuary, and the consequences of a change in vessel type within the estuary for other commercial shipping, are addressed in Section 14.3.2.

14.3.2 Increased risk of collision due to increase in vessel traffic numbers

1. It is difficult to predict the overall increase in vessel traffic that would occur during the operational phase as this is dependant on the nature of the customers that will ultimately use the terminal. However, PD Teesport estimate that an increase in traffic of the order 100 movements per month would arise as a consequence of the construction of the terminal, or an increase of approximately 10% on the average number of existing vessels movements per month.

2. All vessel traffic in the estuary and Tees Bay is controlled by the VTS and this would, therefore, be applicable to all traffic generated as a consequence of the presence of the container terminal. The Harbour Master has been consulted with respect to this predicted increase in traffic levels and has stated that there are no concerns to an increase in vessel traffic of this order of magnitude and

that no changes to the existing VTS are required to accommodate the predicted increase in traffic levels. Consequently, it is predicted that there will be no change in the existing risk of collision as a result of the construction of the terminal and **no impact** is predicted.

Mitigation and residual impact

3. No mitigation measures are required and there would be **no residual impact**.

14.3.3 Potential for delays due to increased shipping activity

1. PD Teesport commissioned a shipping traffic study to investigate the impact of the proposed development and its related shipping on the existing ship movements on the river (Royal Haskoning, 2005b). The assessment was carried out using the Royal Haskoning in-house VTS module of POSPORT, Marine Traffic Model.

2. The shipping study concludes that the maximum impact to shipping on the river as a consequence of the proposed development is to introduce a shipping delay of the order of one hour over the course of one week. The amount of waiting time estimated by the simulation varies between 24 minutes and 62 minutes depending upon the actual sailing schedule for the new container ships. It is further concluded that the estimated weekly waiting time is split between existing shipping and the new container vessels; the maximum waiting time to any category of vessels is 30 minutes.

3. Overall, it is considered that there would be an impact of **negligible significance** on existing and new shipping activity as a consequence of delay.

Mitigation and residual impact

4. It is not proposed that any changes to the existing procedures controlled by the Harbour Master are required and the residual impact would be of **negligible significance**.

15 ARCHAEOLOGY AND HERITAGE

15.1 Existing environment

1. The existing environment and impact assessment of the archaeology and cultural heritage resource is based on the archaeological desk-based assessment undertaken by AOC Archaeology Group. The full copy of the report is presented in Appendix 7.

2. The following sources of data were consulted to ascertain the existing environment:

- Museum of Hartlepool, Museum Service (Clarence Road, Hartlepool): For old Ordnance Survey maps (1st & 2nd Edition, small- and large-scale) and pre-Ordnance Survey historical maps;
- Sites and Monuments Records (curated by Tees Archaeology, Hartlepool): For data pertaining to archaeological sites, Listed Buildings and Scheduled Ancient Monuments and World Heritage Sites within the study area;
- Teesside Archives (Middlesbrough): For tithe and enclosure maps pertaining to the proposed development area;
- National Monuments record (Swindon): For vertical aerial photographs; and,
- A site walkover.

General history of the site and surrounding area

3. There is scant evidence of the prehistoric period for the area, and evidence for the Palaeolithic period is scarce. A significant factor in this are the geomorphological processes experienced by the area (sea level rise, glacio-isostatic uplift, coastal erosion, and fluvial erosion, in addition to sedimentation in some areas), whilst later human development and activity has significantly disturbed and destroyed many *in situ* sites. One example of this is the movement of lithic material and its deposition within the study area from ships ballast over the last few centuries.

4. Mesolithic activity is usually found in the form of *in situ* lithic scatters across the region; however, due to the processes of preservation, the great age of this material and difficulty in dating such material, our knowledge and understanding is limited. Within the immediate area of Teesport, the Hartlepool submerged forest provides the most extensive information for this period, containing the preserved prehistoric landscape and (subject to its location) one facet of information that provides information about the geomorphological development of the area. Linked to this site are other associated features of the period, including a palaeo-channel and finds indicating a possible Mesolithic fish trap. These finds present an indication (albeit scarce) of the potential archaeological resource that could be present within the proposed development area.

5. Due to the close relationship between Neolithic and early Bronze Age sea levels to current levels, one significant factor affecting the visibility and preservation of sites and finds from these periods is the extensive urban development of the towns within the Tees estuary. Furthermore, with respect to the immediate study area, it is possible that siltation resulting from sea level rise (and the other

associated geo-morphological processes) may have covered and preserved sites and finds from these periods. Again, the submerged forest near Hartlepool also provides finds from the Bronze Age period, indicating that human activity was present within the estuary.

6. The extensive urban developments within the estuary and its surrounding area would also have disturbed and/or covered Late Bronze Age and Iron Age sites and finds. At present there are no known permanent settlements from these periods. However, occasional finds across the Tees estuary and surrounding area do indicate activity both near and adjacent to the watercourse, particularly later period sites that could indicate that earlier activity may have occurred during these periods (e.g. salt working).

7. Although there are no significant Romano-British settlements in the immediate study area, finds from this period have been identified in Hartlepool. Furthermore, ship borne trade is likely to have increased, particularly with the Continent, and vessels may well have traversed the channels of the Tees estuary. However, the study area is most likely to have been situated within the intertidal environment, and as such little permanent activity would have occurred within this or the previous (Iron Age) period.

8. As with the earlier historic and prehistoric periods, the Anglo-Saxon era is scarcely represented within the Tees estuary. Settlements, or the development thereof, are identified at Stockton, Norton, Billingham and Hartlepool. However, as with earlier activity and the Medieval period, later urban expansion has effectively covered or destroyed the finds and features of most of this era. It is likely that the study area would have comprised of either river channel or intertidal environment and consequently, activity would have been limited to transient and temporary exploitation.

9. Of the later periods, the industrial and urban developments of the Post Medieval and modern period significantly blur the information of activity and features of the Medieval period. Stockton developed into an important port within the Tees estuary overtaking Yarm in the 17th and 18th Century. However, the opening of the railway line to the port of Middlesbrough began to overshadow Stockton in the 19th Century. Industrial developments within the Tees estuary and Teesside areas commenced in the 19th Century, initially at Urlay Nook near Eaglescliffe, then expanding rapidly after the discovery of salt deposits in the area. Following the start of the 20th Century further industrial developments rapidly expanded in Teesside and its surroundings, with nylon, plastics, oil and petrol, and then, later, petrochemicals forming the key industries covering large areas of land. Hartlepool also underwent a rapid change in the 19th Century, with its fishing port expanding into a busy trade port.

Prehistoric (10,000 BC - AD 43)

10. There are no known sites of prehistoric nature within the proposed development area. A Neolithic stone axe head is reported to have been found within the assessment area during dredging of the river (Site 21, Appendix 7). In the wider vicinity a submerged forest is known to exist in close proximity to Hartlepool on

the north bank of the Tees. Finds from this forest include Mesolithic flints comprising a saw, a pick and several oval scrapers. Neolithic and Bronze Age finds are also known from the area. It is important to note that during the Mesolithic period and into the Neolithic the landscape of this region would have existed in a period of flux. The terrestrial area now occupied by the North Sea was gradually inundated and the proposed development area transformed from terrestrial land into an intertidal zone. Furthermore estuaries were often favoured by prehistoric peoples for settlement due to their accessibility to natural resources of the sea and proximity to usable fertile land. For example, the submerged forest and intertidal landscape of the Severn Estuary in Wales has yielded a rich and well preserved record of prehistoric activity in this zone (Bell *et al*, 2000).

Roman (AD 43-410)

11. According to Heaviesides the earliest mention of the Tees in documentary records is in the year AD 343 when an '*iruption of the Picts and Scots was repulsed by the Emperor Constants*'. No finds or sites of Roman activity are known within the study area.

Early Medieval (AD 410-AD 1000)

12. There are no documentary records that mention the Teesport area during this period, however early medieval activity in close proximity to the proposed development area is demonstrated by the find of an early medieval spearhead (Site 5, Appendix 7). The spearhead consisted of a leaf shaped blade and closed socket and was found at a slag tip in the 1930s on the site of an old blast furnace.

Medieval (AD 1000-1600)

13. Teesside first appears in historical archive sources in the early 13th century. The Tees has been commercially important since the 13th century when a crossing point was needed on the trade route between Durham and York. The importance of the medieval salt panning industry to the wider Teesside area is demonstrated by the former concentration of salt mounds located north-east of the proposed development area at west Coatham marsh (Sites 6-16, Appendix 7). Documentary references to the salt industry can be found in 15th and 16th centuries but by 1650 the salt pans are described as having long since been washed away by the tide in places (RCHME, 1993). The existence of these salt mounds was noted on the First Edition Ordnance Survey maps but none of these now remain. In close proximity to these salt mounds are two possible moated sites (Site 22, Appendix 7) now reported to have been destroyed.

14. The earliest cartographic evidence available for the proposed development area is too schematic and small scale in nature to provide any detail about the Tees and proposed development area. For example, Janszoon Waghenaer's map of 1584 (see Appendix 7) shows the side u-shaped estuary of the Tees, the inscriptions are in Dutch but Hartlepool, Stockton and Redcar are clearly

marked. Numerous windmills and church towers are marked on the south bank of the Tees probably as useful navigational tools.

Post-Medieval (AD 1600-1900)

15. From 1666 the Turners of Kirkleatham held the rights to all anchorage and groundage dues from shipping from Redcar to Cargo Fleet. Until the late 17th century the area around the Tees remained largely agricultural in nature and the proposed development was located within the Tees channel. The intertidal nature of the proposed development area is demonstrated by Dobson's map (1762, see Appendix 7), which shows the area to be largely in-filled with sand and mud.

16. Moves to reclaim mud and sand of the intertidal zone on the south bank of the Tees are demonstrated on Mowbray's plan of 1779. The plan shows the embankments made by Lowthers of Wilton in 1723 to prevent high tides from overflowing onto west Coatham Marsh so that it could be used as pasture. The plan shows the windpump and sluices in place that were used to drain east Coatham Marsh. A flagon (Site 18, Appendix 7) thought to be post-medieval in nature was found in close proximity to the proposed development during dredging.

17. The construction of the low level Victoria Bridge at Stockton in 1770 cut Yarm off and the trade moved down river. In 1810 following a campaign by the newly established Tees Navigation Company, an act was passed allowing the creation of a cut through the Mandale loop of the river (a distance of three miles) making the River more easily navigable. Following the opening of the Mandale cut the number of vessels navigating the Tees increased and the Tees navigation Committee erected a number of lighted buoys through the channel so that it could be navigated by night as demonstrated on Johnson's map of 1854 (see Appendix 7). Further alterations to the course of the channel occurred in 1855 with the construction of the 'Jack in-the Box' which shut off the north and middle channel so that all water was diverted through the south channel (Pattenden, 2001). The straightening and channelling of the Tees during the 19th century will have directly affected the proposed development area transforming the Tees from a wide braided into a single deep channel, thus the extent to which the sand and mud banks were inundated by water would have decreased even prior to the construction of reclamation banks.

18. The first edition Ordnance Survey map (Figure 4 in Appendix 7) depicts the Middlesbrough to Redcar railway roughly following the line of the present day railway. Land north of the railway line is located within the River Tees and several beacons and buoys marking the navigation passage through the channel are marked. The majority of the surrounding area is shown to be agricultural on this map although the beginnings of extraction and refining industries are notable for example at Eston Iron Works and Furnace Row. As the industries of the Tees expanded a number of additional railway lines sidings and stations were added in close proximity to the proposed development area and further improved the industrial infrastructure (Crow, 2000). Examples of such stations are located within the study area at Sites 3, 4 and 5 (see Appendix 7).

19. Fowler's map of 1881 (Figure 5 in Appendix 7) provides an insight into the process of reclamation in the 19th century in and around the proposed development area. The embankment walls used to keep the tide from flooding the reclaimed area are shown almost complete in several places along the south bank and a new high tide water embankment has been set out. Much of the land behind these banks is shown as reclaimed although they clearly do not extend as far into the channel as the present day bank. The South Gare breakwater at the river mouth is shown to be almost complete.

20. The training wall that were used to channel the Tees on its required course are also visible on Fowler's (1881) map (see Appendix 7). These walls were typically constructed of slag which was provided free of charge by local iron masters who saw it as a cheap method of dumping their waste. The river channel was dredged and the silts that were removed were used to reclaim the foreshore. By the end of the nineteenth century approximately 2500 acres of foreshore had been reclaimed (Rowe, 1999). In 1852 the Tees Conservancy Commissioners were founded to help look after the interests of all river and port users.

21. As the number of vessels in the Tees increased so did the number of those lost to tragedy and inclement weather. The vicinity of the proposed development site is though to be close to where The Heckler (Site 30, see Appendix 7) was lost. A number of other ships are also thought to have been lost in the wider Tees vicinity, thus the possibility that the remains of these wreckages are buried beneath the proposed development site cannot be ruled out. Details of these wrecks can be found in the site Gazetteer located at the end of this report. The wreck located at Seaton Sands located north of Tees Mouth has been afforded official protection. In addition to the site of wrecked vessels, the assessment area also includes the site of the former Tees floating hospital (Site 23, see Appendix 7). The hospital was established in 1895 to treat members of sea crews arriving on the river who had infectious diseases.

Modern (post-1900)

22. Clarke's map of 1906 (Figure 7 in Appendix 7) shows a considerable amount of dry land to have been built up on the south bank some of which includes parts of the proposed development area. The extent to which land had been reclaimed by this time is significant when one considers that the original high water mark was located at the line of the Middlesbrough to Redcar railway. This map also shows the expansion of the towns lining the banks of the Tees presumably in response to the growth of industry. Later Ordnance Survey maps consulted for the (see Figures 8 and 9 in Appendix 7) area show the progressive reclamation of land in and around the proposed development area.

23. As a major port and industrial centre, Teesport was a bombing target during World War II and a number of features formerly located on and around the proposed development area are a testament to British defence efforts during this time. Site 1 (see Appendix 7) formerly located partially within the proposed development site was a former World War II bombing decoy site. This consisted

of a fire based decoy which involved lighting fires to represent sites already under attack and thus divert the enemy fire away from the real target. Remains of other types of bomb decoy, for example those intended to represent a furnace glow and railway marshalling yards were also located on the reclaimed land in close proximity to the proposed development area. The last known reference to these sites was in 1943 and it is unlikely that they will have survived within the proposed development site as most are now reported to have been built over (Dobson, 1996). A number of other World War two defences survive within the study area and consist of pill boxes located within West Coatham Sands (Sites 19 and 20, see Appendix 7).

24. Aerial photographs consulted from 1946 - 1971 provide a valuable insight into the progress of land reclamation on the vicinity of the proposed development site. These photographs show the proposed development area to be underwater although some of land further north appears to have been recently reclaimed as demonstrated by a grid like pattern of banks and drains. Within the outline of these recently reclaimed fields, a darker area showing a dendritic outline can be identified confirming the alluvial origins of the deposit. These photographs also show the Tees dock to have been constructed although the land further east and north on which the proposed development is located is still in the process of reclamation and remains largely underwater. Photographs from 1971 show land either side of the Dabholm Gut to have been recently reclaimed as it continues to display alluvial dendritic patterns. The Dabholm Gut is shown to be longer than in its present form and it extends further south to meet to railway line. In 1965/66 the Tees Dock was constructed and opened. An act of parliament in 1966 established Tees and Hartlepool Port Authority as the controlling body for the river.

25. The Tees Barrage was built in 1995 to control water levels on the River Tees and has increased prospects for its navigability. In recent years the proposed development has remained largely unoccupied although maps consulted from 1990 show it to have been partially occupied by the Nissan UK factory until its removal later in the 1990s. A site visit confirmed that a certain amount of dumping has occurred on site. The process of reclamation is still in its final stages of completion as demonstrated by the partially water filled area in the north-east of the site. The Barrage and 14 miles of Tees Navigation are now operated by British Waterways.

15.2 Potential impacts during the construction phase

15.2.1 Potential impact associated with the removal of existing structures on site

1. The proposed development will impact upon the remains of 20th century structures, industrial buildings and the remains of other demolished structures that survive within the development area. The proposed development will entail the demolition of all of the present standing buildings, and the earthen and rubble banks used for land reclamation that occupy the development area. However, the structural remains that presently occupy the site are 20th century in date, and none have any statutory designations, consequently they are of negligible archaeological or heritage value. The site visit confirmed that these structures are modern and unremarkable and relate solely to the later 20th

century port operations. Consequently, **no impact** is anticipated due to the removal of existing structures on site.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact.**

15.2.2 Potential impact of development works on existing reclaimed land

1. The majority of the proposed development area has been reclaimed during the past 150 years and has been subject to disturbance from industrial use and dumping. With the exception of the area proposed for the deep sea berth (see below) it is unlikely that further development will disturb any hitherto unknown archaeological remains. Consequently, **no impact** is anticipated.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact.**

15.2.3 Potential impact of berth construction, quay wall construction and capital dredging on the potential archaeological resource

1. Whilst the development will have a limited impact on the majority of the proposed site it is possible that the berth and quay wall construction and dredging required to construct the new quay could disturb buried peat deposits associated with the early intertidal occupation of the site.

2. It is possible that the proposed dredging works and channel straightening will impact upon buried sediments within the Tees Channel, which have the potential to preserve important information relating to early use of the channel as well as sea level change and the environment. The loss of such information would be of regional importance in terms of the potential knowledge such a resource could provide. Furthermore, the use of the Tees as a port from at least the medieval period has been demonstrated and several ships are known to have been lost in the area. Therefore, the possibility of uncovering maritime archaeology associated with this use cannot be ruled out. However, the potential for impact associated with capital dredging is considered to be low given that the majority is within an existing dredged channel.

3. As the type and rarity of potential finds cannot be determined, and because of the potentially high degree of preservation of submerged and buried features, it is possible for maritime wrecks/finds of regional or national importance to be present. The disturbance, damage and loss of these could therefore result in a potential impact of **moderate to major adverse significance** on the archaeological heritage of the area if they were found to be present.

Mitigation and residual impact

4. To mitigate against the destruction of such sediments it is recommended that borehole data from the channel and berth area is examined to determine whether hitherto unknown buried archaeological or palaeoecological remains

exist within the Tees channel. If borehole data indicates the existence of suitable sediments, further sampling and environmental assessment of these sediments would be required. The specific sampling strategy would be determined and agreed in detail with the relevant statutory archaeologist (e.g. Tees Archaeology and English Heritage) during the preparation of the Written Scheme of Investigation by the archaeological contractor.

5. The nature of the residual impact would depend on the outcome of the above investigation.

15.3 Potential impacts during the operational phase

15.3.1 <u>Affect on the setting of designated structures</u>

1. The proposed development could result in visual effects on the settings of protected buildings and monuments. However, there are no Listed Buildings or Scheduled Ancient Monuments located within 2 km of the site, and the nearest listed buildings are located in Redcar and are shielded from the development area by matures trees, industrial factories of the Tees, as well as by the topography. There are, therefore, unlikely to be any adverse visual impacts of the development on cultural heritage sites. Furthermore, the proposed development is consistent with current land-use in the surrounding area. Overall, **no impact** is anticipated.

Mitigation measures

2. No mitigation measures are required and there would be **no residual impact**.

16 RECREATION AND ACCESS

16.1 Existing environment

16.1.1 Recreation

1. The Tees estuary supports a range of land and water based recreational activities, many of which are highly seasonal. The main activities within the estuary are walking (including dog walking), beach recreation, golf and bird watching. The majority of activities are informal and as such difficult to control and manage. Management of the recreational usage of the estuary is mainly limited to byelaws and planning control over the provision of facilities and access (e.g. the management of sailing and inshore recreation is controlled by byelaws regulating or restricting movements in harbours for the safety of bathers or pollution control).

2. The heavily industrialised nature of the estuary, history of poor water quality and the busy commercial nature of the port have placed constraints on the estuary for potential use for water sports. Despite this, summer water-based recreation includes power-boating, jet-skiing, sand-racing, dinghy-sailing and windsurfing, albeit at a low intensity. These activities are predominantly confined to the open coast or at the estuary mouth in the sheltered waters within the breakwaters. In the upper estuary, recreational activities such as paddle sports take place upstream of the Tees Barrage.

3. At the mouth of the estuary, the South Gare area has a variety of leisure facilities which are predominantly used by day or short stay visitors. These include beach huts, car parks and a caravan site. The use of the golf clubs at Seaton Carew and Cleveland is mainly from April to September, but golf is played year-round. There is a life boat station at South Gare.

4. Within the estuary, wildfowling is confined to small areas of Cowpen Marsh and Saltholme Pools from the 1 September to 31 January while angling is largely confined to breakwaters. Bait gathering in intertidal areas can be locally intensive, especially on Bran Sands adjacent to the South Gare Breakwater. Recreational angling largely takes place in Tees Bay with the majority of boat owners based in South Gare where there are a few established clubs for dinghy sailing, pleasure boating, sub-aqua and training activities.

5. Some of the important sites for nature conservation within the estuary are often used for education, research and recreational purposes. At the Teesmouth Field Centre approximately 5000 schoolchildren annually take part in a variety of study programmes and English Nature, Hartlepool Countryside Warden and Tees Valley Wildlife Trust undertake regular guided walks and events. The only area that is used regularly for recreation is South Gare, adjacent to the estuary mouth and the beaches south to Redcar.

16.1.2 Access

1. Much of the land bordering the estuary is owned privately therefore there are few public rights of way. Existing paths include the 'Black Path', which runs

parallel to the final section of the Teesdale Way, the Cleveland Way long distance footpath, two public footpaths at Greatham Creek and Portrack Marsh and a footpath, bridleway and byway at Seaton Dunes and Common. There are cycle ways adjacent to the river at Portrack, Old River Tees and Billingham Beck. In addition, a new cycle route is proposed to run along the A178 at Port Clarence. There are no public rights of way within the proposed development site.

2. On the north side of Seal Sands, public access is available along the Zinc Works Road through the sand works. North of this, access is across the golf course to the North Gare where there is informal use of the beach northwards to Seaton Carew.

3. Formal non-statutory access agreements also exist between organisations or individuals and landowners. These agreements relate to clearly defined privately owned industrial land for recreational, educational and research purposes. Access permits are also issued by some landowners for specific activities (e.g. bird watching). These permits stipulate strict conditions, and permission can be withdrawn at any time. Bran Sands to the west of South Gare is the area most used by recreational bird watchers and bait diggers.

16.2 Potential impacts during the construction phase

16.2.1 Potential impact on water-based recreation due to construction activities in the estuary

1. Given that the land-side works would take place on privately owned land within PD Teesport's estate, the main potential impact on recreation during the construction phase will be due to the works within the estuary (i.e. capital dredging and reclamation). A variety of plant will be sited in and around the development area therefore there is the potential for restriction of access by water to the area around the proposed development site, particularly associated with the presence of the dredger in various parts of the channel throughout the course of the construction work.

2. As described in Section 16.1, use of the area of the estuary around the development site is by recreational vessels is low due to the industrialised nature of this section of the estuary. The main potential for conflict with recreational activity is during the dredging that will take place close to the mouth of the estuary where some sailing is undertaken. However, given the limited duration of dredging in this area and particularly the fact that the dredging would take place within an existing navigation channel that is heavily used by commercial shipping, conflict between recreational vessels and the construction activities are predicted to be of **negligible significance**.

3. Given that construction activities of land will not result in the restriction on any public rights of way, it is predicted that there would be **no impact** on access on land.

Mitigation and residual impact

4. The movements of the dredger and other water-based aspects of the construction phase will be within the control of the existing VTS that controls commercial shipping activity and other vessel movements in the estuary and Tees Bay. In addition, Notices to Mariners would be issued for the construction phase of the works. The residual impact of the construction phase on water-based recreation is expected to be of **negligible significance**, with **no residual impact** on land-based recreation and access.

16.3 Potential impacts during the operational phase

16.3.1 Potential conflict between water-based recreation due to changes in commercial shipping traffic

1. As a consequence of the proposed development, there will be a change to the pattern commercial shipping, with an increase in the frequency of movements of larger vessels navigating in the lower estuary and an overall increase in shipping traffic. This change in commercial shipping has the potential to give rise to conflicts with recreational users of the area.

2. Commercial vessels will be confined to navigating within the dredged channel (as at present) and recreational craft, therefore, avoid this area. Additionally, much of the water-based recreation is undertaken outside of the estuary within Tees Bay and along the coast. Consequently, during the operational phase, the potential for conflict between commercial shipping and recreational activity is the same as at present and as a result **no impact** is predicted as a consequence of the proposed development.

Mitigation and residual impact

3. Commercial shipping and other vessel traffic within the estuary and Tees Bay is properly controlled by the VTS and no specific mitigation measures are deemed necessary as a consequence of the proposed development. It is predicted that there would be **no residual impact**.

17 ROAD TRAFFIC

1. The construction and operational phases of the proposed development and its associated infrastructure may lead to impacts on existing road users, pedestrians and cyclists. This section summarises the main findings from the Transport Assessment undertaken by Steer Davies Gleave. The full Transport Assessment accompanies this ES as Accompanying Document 2.

17.1 Existing environment

1. A number of sources of data have been used to describe the existing conditions with respect to patterns of employee travel to work, predicted traffic generation from other significant committed development in the vicinity of the proposed container terminal, occurrence of accidents and existing traffic flows of key links and junctions. These sources comprise PD Teesport (employee information), local councils (traffic counts and accident data), Highways Agency (traffic counts), other Transport Assessments prepared for other developments and site visits.

17.1.1 Link flows

1. Combining data from the sources described above, existing flows on main links in the study area are shown in Table 17.1.

Table 17.1 Existing (2005) 24 hour annual average daily flows

Location	2-way 24-hr ADT	%HGV
A66, east of Teesport Link Road	22,400	10.2
Teesport Link Road	5,400	34.3
A1053, A660 to A1085	22,800	8.8
A1053, A1085 to A174	17,300	7.8
A174, west of A1053	34,500	4.6
A174, A172 to A171	26,800	6.9
A174, east of A19	48,600	7.2
B1380 Easton Road	11,200	4.5
A66, east of Cargo Fleet Lane	30,700	9.0
A19, north of A66	83,400	9.9
A19, south of A174	33,300	16.7
A66, west of A19	68,300	7.2

17.1.2 Public transport

1. Bus services close to the site are limited and no services travel along Teesport Road into Teesport. The nearest bus stop is some 2km from the main port entrance, and further still to the ultimate point of work. There are no passenger rail services to Teesport; the nearest station is at South Bank offering limited morning and evening peak hour services between Darlington and Saltburn (also stopping at Redcar, Middlesbrough, Thornaby and Bishop Auckland).

2. Apart from a very small section of cycleway at the junction of Teesport Road with the A66, there are no specific cycling facilities along Teesport Road between the Port and the main highway network. North of the junction, cyclists would be expected to use the main carriageway in both directions of travel with no segregation from the high numbers of heavy goods vehicles along the route; this is likely to have safety concerns for cyclists.

3. Conditions for pedestrians along Teesport Road are also poor. Whilst there is a footway provided along the western edge of Teesport Road, this has become overgrown in many locations. In addition, Teesport Road, and hence the footway, is only lit to a point approximately 100m from the junction with the A66.

17.1.3 Employee travel patterns

1. The bulk of employees (48%) live in Middlesbrough. Other major centres for Teesport employees are Redcar (9.8%), Guisborough (7.4%), Stockton (7.1%) and Hartlepool (6.4%). A works bus is operated from Hartlepool daily.

2. Traffic count data collected in weeks beginning 18th and 25th October 2004 provides daily flow profiles on Teesport Road, into and out of the Port. Traffic flow profiles follow an expected employment-related pattern with peak flows into the port in the morning and out in the evening (albeit with a smaller peak just after lunch related to shift working). Light and heavy goods vehicles profiles are relatively flat during the day with some early morning and later evening trips observed.

17.1.4 Accident data

1. Accident data have been obtained from both Redcar and Cleveland Borough Council and Middlesbrough Council, covering the main highway network in the study area. In total, there were 213 accidents recorded local to Teesport, in Redcar and Cleveland with a further 132 on the A66 through Middlesbrough, giving a total of 345 in the past 5 years (Table 17.2).

Table 17.2 Existing accidents analysis by severity

District	Fatal	Serious	Slight	Total
Redcar & Cleveland	2	17	194	**213**
Middlesbrough	1	18	113	**132**
Total	**3**	**35**	**307**	**345**
%	**0.9%**	**10.1%**	**89.0%**	**100%**

2. Accident numbers can be defined as 'Link' or 'Junction' accidents. Table 17.3 shows a summary of existing accidents by location.

Table 17.3 Existing accident analysis by location

Location	Accident Type	No. of Accidents
Redcar & Cleveland		
Teesport Road	Link	1
A1053	Link	5
A1085, west of A1053 junction	Link	23
A1085, east of A1053 junction	Link	8
A174, west of A1053 junction	Link	8
A174, east of A1053 junction	Link	44
B1380 Eston Road/High Street	Link	57
A66, west of Teesport junction	Link	18
Greystones Roundabout (A1053/A174)	Junction	35
A1053/A66 Teesport roundabout	Junction	5
A1053/A1085 roundabout	Junction	9
Middlesbrough		
A66 between A19 and Hartington	Link	23
A66, Hartington and Riverside	Link	20
A66, Riverside to Cargo Fleet Lane	Link	3
A66/A19 Interchange	Junction	11
A66/Riverside junction	Junction	23
A66/Cargo Fleet Lane Interchange	Junction	52

17.2 Potential impacts during the construction phase

17.2.1 Impact of construction traffic on road network

1. It has been estimated that there will be approximately 40 HGV/ready-mix truck movements and approximately 225 car movements into and out of the proposed development site each day. Timings of HGV movements will be spread over the course of the working day. The site will operate from 07:30 to 18:00 and the car movements will generally reflect these start and finish times.

2. The forecast numbers of construction-related HGV trips to and from the site are low and will be spread over the working day. The impact on off-site junction operations is likely to be minimal. Construction workers will arrive prior to starting at 07:30 and leave after 18:00; as such, the impact of construction-related car trips will be outside of the local highway peak.

3. Overall, the traffic generated during the construction phase will represent a potential impact of **negligible significance.**

Mitigation and residual impact

4. No mitigation measures are possible and the residual impact would be of **negligible significance**.

17.3 Potential impacts during the operational phase

17.3.1 Generation of additional road traffic

Trip generation

1. The numbers of cars into and out of the port along Teesport Road (Section 17.1.3) has been taken as a proxy for journeys to work by car. It has further been assumed that the distribution of employee trips throughout the day will translate to future traffic patterns. Increases in car trips are, therefore, assumed to be proportional to existing flows. The ratio of increased job numbers to existing employees is 1.412 on completion of Phase 2. The predicted number of car trips by employees associated with the proposed development (and phases) is shown in Table 17.4.

Table 17.4 The predicted number of car trips by employees associated with the proposed development

	Existing (2004)	Phase 1 (2010)	Phases 1+2 (2014)
Employee Numbers	3,642	4,742	5,142
AM peak INBOUND	131	171	185
AM peak OUTBOUND	26	34	37
PM peak INBOUND	26	34	37
PM peak OUTBOUND	119	155	168

2. Additional container traffic will be transported by heavy goods vehicles. Container destinations will predominantly be further afield and HGVs are assumed, therefore, to use either the A174 or A66 to access the A19. PD Teesport provided forecasts of the proportion of containers destined for different parts of the region and beyond. Additionally, it is assumed that freight traffic will follow fixed routes (Table 17.5).

Table 17.5 Assumed container traffic distributions and routes

Destination		Route	Proportion
Scotland		A66 to A19 (north)	10%
West Yorkshire		A174 to A19 (south)	19%
North West	(50%)	A66 to A19 (north)	14.5%
North West	(50%)	A174 to A19 (south)	14.5%
Midlands		A174 to A19 (south)	23%
Other (South West)		A174 to A19 (south)	10%
Local -	Billingham	A66 to A19 (north)	5.4%
	Stockton	A66 to A66 (west)	1.8%
	Redcar	A1085	0.9%
	Middlesbrough	A66 to Marton Road	0.9%

3. To assess the impact of this increased activity on the surrounding road network, TEUs need to be factored to an equivalent container unit. This has been defined as 1.7 TEU/unit. It is then assumed that each container unit represents one heavy goods vehicle trip. This gives:

- Phase 1 = 582,353 units per annum or 3328 units per day 2-way
- Phases 1+2 = 882,353 units per annum or 5042 units per day 2-way

4. Existing heavy vehicle traffic levels into and out of the site are 688 and 693 respectively. This illustrates that heavy vehicle flows into and out of the site are approximately equal and gives a two-way existing heavy goods flow of 1381 vehicles/day.

5. The impact of the increased container activity on existing flows can be summarised as follows:

- Phase1, 2-way increase = 2213/1381 = +60%
- Phases 1+2, 2-way increase = 3353/1381 = +143%

6. The above figures are based on 100% of containers being transported by road (i.e. they are worst case figures, assuming that the aspirations for modal split are not met). However, if the non-road targets are met (i.e. transport of only 70% of throughput by road), the resulting increases of HGV trips when compared to existing levels reduce to:

- Phase1, 2-way increase = 1549/1381 = +12%
- Phases 1+2, 2-way increase = 2347/1381 = +70%

Future year forecasts

7. Traffic growth forecasts have been derived from TEMPRO based on the methodology outlined in the TEMPRO Guidance Note. The application of local adjustments to national forecasts allows different growth rates to be derived for different authorities. In the growth forecasts provided below, it can be seen that higher growth is forecast for Redcar and Cleveland than for Middlesbrough.

8. Growth forecasts have been derived to convert between base year 2005 flows to each of 2010 (Phase 1), 2014 (Phases 1 and 2) and 2029 (15 years following the completion of the development).

9. In addition to background traffic growth detailed above, growth associated with the ASDA Import Centre and proposed paper recycling facility at Wilton are included. Trip generation levels associated with these developments are contained in the relevant Transport Assessment reports, and have been previously agreed with the local planning authority and the Highways Agency.

10. Trips associated with the ASDA Import Centre and the proposed paper recycling facility are considered ‘committed’; that is they are added to background traffic growth forecasts prior to assessing the additional impact associated with the proposed container terminal.

Summary of junction analysis

11. The majority of the junctions under the scope for assessment fall under the jurisdiction of the Highways Agency. The initial assessment evaluates the percentage increase in junction flows resulting from the addition of development traffic, and when the increase is greater than 5%, full assessments are undertaken (in line with Circular 04/2001).

12. The A1053/A1085 junction is the first point of contact with the Highways Agency network and as such the junction must operate within capacity 15 years after the completion of the proposed development (2029). Operating 'within capacity' has been defined as all moves achieving a ration of flow to capacity (RFC) value of no more than 85%.

13. For each of the other Highways Agency junctions, traffic generated by the proposed development will already be on the trunk road network before arriving at the junction and the applicable assessment criteria are stated in the Highway's Agency's document 'Control of Development Affecting Trunk Roads', namely:

    "Where further highway improvements are required up or down-stream of [the first point of access to the trunk road network for development related traffic], the works will be to a standard capable of ensuring that conditions on the trunk road are no worse at any time during the fifteen year assessment period than if the development had not taken place."

14. This can be summarised as the need to demonstrate nil detriment – that is the junction operates no worse with trips associated with the development than without.

15. The A66/A1053 junction is under control of the local highways authority and so the nil detriment criterion again applies, 15 years after development opening (the Design Year).

16. All junctions were assessed during both the morning and evening peak hour periods. An overview of those junctions where a significant impact is predicted is provided below. Other than those junctions discussed below, no material impact is predicted at any other junctions (see Accompanying Document 2 for details).

<u>A66/A1053</u>

17. The results of the junction assessment show that the AM peak performance is worsened on the A1053 approach arm following the addition of traffic associated with the proposed development. However, the results show that all other arms remain operating within capacity and that there would be no operational issues to be resolved in the PM peak. The conclusion of the assessment is that there would be an **adverse effect** on the performance of this junction.

A1053/A1085

18. The results show that the AM peak performance is worsened on the A1053(s) approach arm following the addition of development traffic. However, the results also show that all other arms remain operating within capacity and that there would be no operational issues to be resolved in the PM peak. The conclusion of the assessment is that there would be an **adverse effect** on the performance of this junction.

A1053/A174

19. The results show that the addition of development traffic at this junction is predicted to result in a worsening of queues on the approach from A174(w) in the morning peak with some increased queuing also predicted on the B1380 Eston Road approach. In the evening peak, the main impact is increased queuing from the A1053 approach. The conclusion of the assessment is that there would be an **adverse effect** on the performance of this junction.

Mitigation and residual impact

A66/A1053

20. In light of the above assessment, it is concluded that at this junction, mitigation is required only for the A1053 approach, as follows:

- Widen A1053 entry width from 9.0m to 10.0m
- Extend A1053 flare length from 26.0m to 30.0m

21. With the implementation of the above mitigation measures, it is predicted that this junction would operate no worse with trips associated with the development than without (i.e. 'nil detriment' as a consequence of the proposed development). Therefore, **no residual impact** is predicted.

A1053/A1085

22. In light of the above assessment, it is concluded that at this junction, mitigation is required only for the A1053(s) approach, as follows:

- Widen A1053(s) entry width from 12.0m to 14.0m
- Extend A1053(s) flare length from 28.5m to 35.0m
- Introduce a dedicated left-turn slip for traffic between A1053(s) and A1085(w).

23. With the implementation of the above mitigation measures, it is predicted that this junction would operate within capacity (RFC<0.85) for each arm with trips associated with the development, which is an improvement on the forecast situation without the proposed development. Therefore, a **beneficial impact** is predicted.

A1053/A174

24. In light of the above assessment, improvements to this junction are required to achieve nil detriment, as follows:

- Widen A174(w) approach from 3 to 4 lanes, with the nearside lane for left turning traffic only
- Extend flare length on B1380 Eston Road approach
- Widen A1053 approach from 7.3m to 8.3m
- Revise signal timings at each of the A174 approach arms

25. With the implementation of the above mitigation measures, it is predicted that this junction would operate no worse with trips associated with the development than without (i.e. 'nil detriment' as a consequence of the proposed development). Therefore, **no residual impact** is predicted.

17.3.2 Impacts of increased traffic generation on accident statistics

1. As a general observation, increased traffic can be assumed to result in increased accidents numbers, both on links and at junctions, assuming no specific accident reduction measures are put in place.

2. Based on the above assumption it concluded that the impact on accident numbers of additional traffic relating to the proposed development is forecast to be an increase of only 1.6% over the network as a whole. An increase of 4.5 accidents over a five year period represents a little under 1 additional accident per year. It is concluded that this predicted impact is of **negligible significance**.

Mitigation and residual impact

3. No mitigation is required and the residual impact is predicted to be of **negligible significance**.

18 RAIL TRAFFIC

1. The target modal split for the transportation of containers from the proposed NGCT is 70% by road, 20% by rail and 10% transhipment. Therefore, the operational phase of the proposed development has the potential to impact on capacity of the rail network.

2. A Transportation Assessment (TA) for the proposed NGCT has been undertaken by Steer Davies Gleave. The TA accompanies this ES as Accompanying Document 2 and forms the basis for this section of the ES.

18.1 Existing environment

1. Currently, all freight services must travel via Tees Yard and Middlesbrough in order to access Teesport. To reach the port complex, services leave the main line at the Grangetown Junction. From this junction there is direct access to the Exchange sidings. Trains requiring access to and from the Western sidings are required to reverse in the Exchange sidings in order to gain access. The existing rail system within the Teesport Estate is shown in Figure 2.

2. There are currently up to 14 trains per day to Teesport. These are split as follows:

    - Between five and six to Cleveland Potash;
    - Three intermodal services (to Manchester, Workington and Glasgow); and
    - Five steel trains (expected to reduce to two or three trains per annum when a new direct link between Tees Dock and Corus is completed).

3. The recent modal split for container migration is shown in Table 18.1.

Table 18.1 Recent modal split for container migration (number of units)

Mode	2004/05	2005/06
Rail	13,000 (7.5%)	15,000 (7.2%)
Road	160,000 (92.5%)	192,000 (92.8%)

4. It is anticipated that rail take-up will increase with budgeted volumes rising to 25,000 units in 2006/07 when a further two trains per day are expected to serve the North West and the Midlands.

5. Rolling stock in operation for freight trains is mostly Class 66 while passenger trains vary from Class 142 for Northern trains to Transpennine Express using Class 158. The latter will change to Desiros from summer 2006.

6. It is understood that there are no points on the local network where trains are routinely held at signals.

18.2 Potential impacts during the construction phase

18.2.1 Potential for effect on existing rail operations at Teesport

1. There are existing rail operations at Teesport that utilise the existing Exchange rail sidings. As part of Phase 1 of the proposed development, these sidings will be upgraded to provide some additional capacity through the addition of new sidings until such time as the new intermodal rail terminal is required in Phase 2. The operations at existing sidings will not be affected during the construction phase. The construction phase will not result in an increase in the number of trains using the local network.

2. Overall, it is predicted that there will be **no impact** on rail activity during the construction phase.

Mitigation and residual impact

3. No mitigation is required and there will be **no residual impact**.

18.3 Potential impacts during the operational phase

18.3.1 Potential for additional rail traffic and impact on the rail network capacity

1. Assuming that the target modal share of containers by rail is met (i.e. 20%) it is estimated that 671 units per day would be transported by rail. The number of trains per day that this would generate is presented in Table 18.2.

Table 18.2 Forecast number of freight trains per day

Year	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Local/NE	0	0	0	0	0	0	0
Scotland	1	1	2	2	2	2	2
West Yorks	0	0	0	0	0	0	0
North West	2	2	2	3	4	4	4
Midlands	2	3	3	3	4	4	4

2. The number of trains per day is calculated taking the geographic distribution of units and assuming that of those destinations which could be served by rail (Scotland, North West and Midlands), 20% will travel by that mode.

3. In summary, by 2014 (i.e. on completion of the full development) it is predicted that there will be up to 10 freight trains per day generated by the NGCT development.

4. When the proposed NGCT is fully developed, trains entering and exiting the main rail network will utilise the existing disused connection into the Teesport complex at Shell Junction. This junction to the spur exists at present, and the connection from this spur to the proposed new intermodal rail terminal will form

part of Phase 2 of the proposed development. Network Rail have confirmed that the interlocking and signalling to allow the junction to be reinstated remains in place, although the crossing has been plain-lined (i.e. the pointwork has been removed and the section of line functions as a through route only). Whilst there will be some cost involved in restoring this junction to an operational condition this involves no insuperable engineering problems. The location of the existing Shell Junction is shown at Figure 1.3, with a schematic layout of the Shell Junction shown at Figure 18.1.

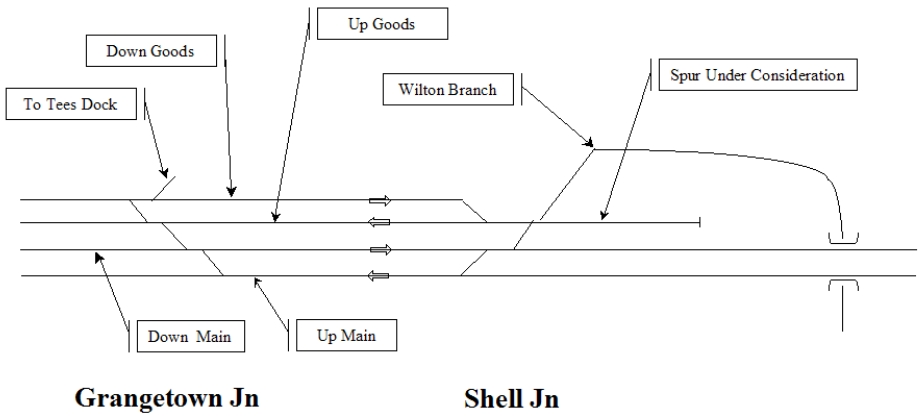

Figure 18.1 Schematic track layout showing the Grangetown Junction and Shell Junction

5. Figure 18.2 depicts the current point work at Shell Junction looking in the down (eastbound) direction.

Figure 18.2 Shell Junction looking in down direction

6. Access to the national rail network is controlled by Network Rail. There are a number of key factors that need to be considered when assessing the capacity of any section of a rail route. These are:

    - The number of tracks on the route.
    - The design of signalling on the route, which determines the minimum possible headway between services.
    - The formation and use of junctions on the route, the extent to which services make conflicting moves will impact on capacity.
    - The number and mix of services types on the route; capacity is harder to manage where there is a mix of slow and fast services.

7. In practice the ability to identify additional train paths over a route will be influenced by a mix of the above factors.

Network capacity

8. Rail capacity is never a straightforward issue. For example, access may be possible in one place at one time of day, and at a different time of day elsewhere.

9. An analysis of the likely routes that freight services will take from Teesport in order to reach rail freight facilities in key geographical locations around the UK is presented in Accompanying Document 2. The analysis highlights key locations

or routes where there may be constraints on identifying additional paths. The analysis has been made based on:

- Figure 3.4 of Network Rail's 2005 Route Plans – showing Capacity Utilisation.
- Assessment of the number of freight paths using Freightmaster No. 37.
- Consideration of services in the current passenger timetable.
- The operational characteristics of the route, e.g. number of lines.

10. Whilst the analysis highlights issues that exist in identifying additional freight paths, it is likely to be possible to identify additional paths through a trade off between end to end journey times and the time of day services run. For example, as a general rule daytime access is more difficult than evening or overnight. This is particularly evident on main passenger routes that combine high speed and local passenger services, with freight, on a 2-track railway line, or in large conurbations. This would certainly be the case with destinations of Scotland, North West or Midlands.

11. One forum for planning the future capacity and use of the network is a Route Utilisation Strategy (RUS) produced by Network Rail. A RUS for the East Coast Main Line is currently being developed. In advance of the RUS consultation process and subsequent publication, indication from Network Rail is that there will be sufficient capacity on the East Coast Main Line (ECML) and its offshoots for the projected services for the Northern Gateway.

12. Overall, the analysis has shown that rail is an option for intermodal transport from the proposed NGCT. However, any decision to operate rail freight services would need to be made as a commercial agreement between rail freight operators and their customers. Network Rail has been advised of the rail distribution projections within this report and has commented positively on the potential to identify additional freight paths to and from Teesport.

13. The proposed NGCT will have an effect on the rail network in that it will add more trains to the network. However, on the assumption that Network Rail are satisfied that there is sufficient capacity on the existing rail network to accommodate this increased traffic, the impact is considered to be of **negligible significance** in terms of effect n network capacity.

Mitigation and residual impact

14. No mitigation is required and the residual impact will be of **negligible significance.**

18.3.2 <u>Consideration of gauge issues</u>

1. There are reported gauge restrictions in the Middlesbrough area which would prevent high cube 9'6" boxes being carried on standard wagons. Work undertaken on behalf of Network Rail has identified 15 structures (e.g. tunnels) in the Middlesbrough area that limit the loading gauge and, therefore, the ability of the network to handle 9'6'' boxes. At present, the scale of works required to address the issues with these structures is not known.

2. In spite of the above, there are measures that can be taken to overcome issues of gauge limitation. In the absence of any gauge enhancements, one option to allow the carriage of 9'6" boxes is to use low profile wagons. These wagons allow the box to be carried in the well, between bogies, reducing the height of the top of the container from the rail. This would allow 9'6'' boxes to be moved to and from Teesport using the existing rail infrastructure. Using low floor wagons may bring further advantages in allowing freight services to access other terminals via routes with reduced loading gauges.

3. Given the above, it is concluded that gauge restriction will not represent an impediment to the transportation of containers from the proposed NGCT by rail and, therefore, **no impact** is predicted.

Mitigation and residual impact

4. No mitigation is required and there will be **no impact** in this respect.

19 NOISE AND VIBRATION

19.1 Existing environment

1. The area surrounding the site of the proposed development is a very busy industrial area with associated heavy 24-hour traffic flows on the A66, A1053, A1085 (east past Corus) and A174. Current traffic flows on these roads at Grangetown and Dormanstown are in the range of approximately 10,000 to 20,000 vehicles per 18-hour day.

2. The area on the north bank of the Tees estuary, directly opposite the site of the proposed development, also comprises heavy industry and refineries and does not include any potentially noise sensitive receivers other than the Vopak foreshore, an intertidal area used by feeding waterbirds. Further downstream, Seal Sands, Bran Sands and North Gare Sands are considered sites of ecological interest requiring specific consideration with respect to potential noise generation, given that they are included within the Teesmouth and Cleveland Coast SPA. These areas are currently subject to the noise from frequent ship and tug boat movements in the mouth of the Tees estuary.

3. The proposed development site is approximately 2500m from the nearest residential properties on Wilton Avenue, Dormanstown to the east and approximately 3000m from Bolckow Road, Grangetown to the south. Between the port and the residential areas are mixed brownfield sites and open grassland, the large Corus Steel works and the A66/A1053.

19.1.1 <u>Survey work to assess ambient noise levels</u>

1. Noise measurements were made during a survey between Thursday 6th October 2005 and Monday 10th October 2005 and again on Wednesday 7th December 2005. The intention of these surveys was to provide an indication of the existing noise climate at various locations within the study area. The following lists the areas and measurements made:

Noise at the end of Wilton Avenue, Dormanstown

2. The ambient noise in this area is dominated 24 hours a day by road traffic noise from the adjacent trunk roads and mixed industrial noise from the Wilton works to the south, Corus steelworks to the west/south west and impulsive noise from the railway sidings running along the western side of the A66. Even at night, traffic flows are relatively significant and traffic noise is clearly audible. On occasions, however, local domestic noise such as loud music or high-speed vehicle or motorbike noise on the roads of the local housing estate intrude on the noise climate; any such intrusive noise events were excluded from the measurement survey.

3. As the general trunk road traffic flows tend not to fluctuate significantly, 10-minute measurements taken close to the houses were considered sufficient to characterise the ambient noise climate. These included day-time and night-time measurements on a Sunday, judged to represent the lowest possible ambient

noise levels. The measurements were made on the road outside 77 Wilton Avenue.

Noise in the vicinity of 141 Bolckow Road, Grangetown

4. The ambient noise here is dominated by road traffic noise from the adjacent A66/A1053 and plant noise from the large Corus steel works immediately to the north. In particular, a distinct tonal noise in the 200Hz third-octave frequency band was noted from the direction of Corus. This is probably related to the banks of cooling towers located along the A1053. 10-minute sample measurements were deemed sufficient due to the lack of variation in the character of the noise. The measurements were made on the grassed area adjacent to the public footpath at the rear of Corncroft Court, facing the A66.

Noise levels at Elgin Avenue, west of Grangetown

5. Noise at this location is dominated by road traffic noise from the A66 and traffic flows at night are relatively high. Day-time and night-time measurements were made close to the houses on Elgin Avenue, approximately 15m from the A66 roundabout.

Noise at properties closest to the railway line to the west of Middlesbrough station (Bridge Street West)

6. This area comprises predominantly commercial properties with some derelict, unoccupied housing and a few occupied dwellings including a hostel on Bridge Street West itself. At the time of the survey, the area appeared to be in the process of commercial redevelopment. Road traffic noise from the A66 dominates the noise climate and 10-minute measurements were taken during the night-time on a Sunday to represent the quietest possible background situation.

Noise measurements at North Gare Sands

7. The ambient noise climate at this location is subject to a significant amount of noise from the surrounding industrial and commercial operations on the banks of the Tees estuary. Depending on wind direction and strength, the noise climate is dominated either by wind and wave noise or industrial noise. 5-minute measurements of the background noise were made when conditions were cold and calm with a very light (<2m/s) westerly breeze. The industrial noise was noted to be dominant.

Noise measurements at Bran Sands

8. The ambient noise here is generally dominated by Corus steelworks and the Redcar Ore terminal. In particular, strong tonal noise from the cooling towers on the north side of the Corus steelworks, in the 630Hz to 1000Hz range and at 1600Hz, was audible. 5-minute background noise measurements were again considered appropriate. Night-time noise levels here and at North Gare Sands

do not differ significantly from those during the day-time. This is thought to be due to dominance of the 24-hour port and industrial operations.

Background noise measurements at South Gare Point

9. In an attempt to establish an approximate typical source noise level for vessels under power, brief (less than 5-minute) measurements of a variety of ships and boats passing South Gare Point were made.

Survey results

10. Table 19.1 below presents a summary of the existing average ambient noise levels at the relevant measurement locations outside the port, measured as the dB L_{Aeq}, the dB L_{A10} and the dB L_{A90} noise levels. An explanation of the various noise indices and technical terms is given in the Glossary.

Table 19.1 Measured existing ambient noise levels

	Existing day-time noise levels (dB)			Existing night-time noise levels (dB)		
Location	L_{A10}	L_{Aeq}	L_{A90}	L_{A10}	L_{Aeq}	L_{A90}
Wilton Avenue	52	50	48	55 (42)	53 (40)	51 (38)
Corncroft Court	59	57	54	57 (49)	54 (47)	50 (44)
Elgin Avenue	72	69	61	65 (62)	61 (59)	52 (51)
Bridge St. West	-	-	-	63	63	55
Bran sands	54	52	51	-	-	-
N. Gare Sands	56	55	53	-	-	-

11. Table 19.1 shows, unusually, that the night-time noise levels at Wilton Avenue are higher than those during the day-time. This may be due to the fact that the night-time measurements were made during relatively high-wind conditions (gusts of up to 8 m/s). General convention is that night-time noise levels are usually 10dB lower than day-time. These calculated values are shown in the parentheses in Table 19.1 and, as a conservative approach, are used as the ambient night-time noise levels in the assessment. The data for Elgin Avenue were measured much closer to the road and show less effect due to wind. The measurements for Bridge Street West were relatively unaffected by wind due to the sheltered position of the location. Measurements are, therefore, not corrected.

19.1.2 Vibration

1. The separation distance between the nearest houses and the closest part of the proposed construction works is approximately 1500m. The distance from these properties to the proposed main terminal area is approximately 2500m, and to the proposed upgraded rail spur is approximately 1000m at its nearest point. These distances, and the fact that the main A66/A1053 trunk road lies between these activities and the nearest receptor locations, clearly suggests that neither operational nor construction activities will give rise to perceptible airborne or

ground borne vibration at the houses. It is, therefore, considered unnecessary to carry out background vibration surveys for this scheme.

19.2 Potential impacts during the construction phase

1. Noise impacts from the construction phase of the proposed development can arise from a number of sources including the physical preparation and levelling of the ground, impact operations such as breaking out hard ground and concrete, piling, dredging, the noise from fixed and mobile plant on site, general construction activities and the movement of materials to and from site by road, rail or ship. Noise generated by the movement of site personnel at the beginning and end of the day could also have an impact.

2. Noise generated by piling activities is often perceived as being the most significant source of noise from construction works of this nature. As described in Section 3.3.3, there are two possible forms of construction of the quay wall that are under consideration. The actual form of construction will be determined during detailed design.

3. One possible form of construction is a piled suspended concrete deck. The most practicable method of piling that is adopted for the quay construction is partly dependant on the nature of the ground conditions at the site, in particular the strength of the bedrock. Past experience of undertaking construction works in the vicinity of the site of the proposed quay wall (e.g. during the construction of the TCT1 quay and the Riverside Ro-Ro) demonstrates that ground conditions at the site may dictate that percussive pile driving is not practical and that piles may need to be bored into the bedrock. Site investigation to be undertaken as part of the detailed design process prior to construction will determine which form of piling can be undertaken at the site. Should percussive pile driving prove possible, it is likely that this method would be undertaken.

4. In light of the above uncertainty, a precautionary approach has been adopted in the noise assessment and it has been assumed that percussive piling would be undertaken for the quay construction. The noise generated by this method of piling would be expected to be significantly greater than noise generated by installing bored piles and, therefore, the noise assessment undertaken represents a worst case scenario.

Assessment methodology and data sources

5. As described in Section 3.1.2, the proposed terminal will be constructed in two phases. The construction of Phase 1 is predicted to commence in 2009, with the construction of Phase 2 predicted to commence in 2013.

6. For the purposes of the noise assessment, it is necessary to define, in broad terms, a programme for the construction period. It is estimated that the construction period for Phase 1 of the proposed development (i.e. construction of the initial 700m of quay) would last for an overall duration of 80 weeks. Piling, which is expected to be the most significant source of noise during the

construction period, is estimated to take place from week 15 to week 59 of this period (i.e. a duration of 44 weeks).

7. Phase 2 of the proposed development (i.e. construction of the remaining 300m of quay) would last for an overall duration of 40 weeks. Piling is estimated to take place from week 12 to week 36 of this period (i.e. a duration of 24 weeks). Overall, therefore, the construction period for the full development is expected to be 120 weeks in total, with this total period being split into two phases of 80 and 40 weeks.

8. The majority of the construction operations for each of the two phases of construction will occur for 10 hours each day from Monday to Saturday; the working period has nominally been assumed to be 08:00 to 18:00. The time period chosen is not critical in respect of the potential noise impact unless it were to start very early (before 07:00) or continue late into the evening (beyond 20:00).

9. The noise assessment takes account of the fact that the operation of the container terminal following the completion of Phase 1 of the development would overlap with the construction works for Phase 2.

10. The potential noise levels arising from the two construction periods for the proposed development have been calculated using the SoundPlan noise modelling software. This uses the methodology described in British Standard (BS) 5228: Part 1: 1997 and enables calculations of noise emissions arising from the movements of vehicles on haul roads and the operation of various items of fixed and mobile plant on a site. It also allows the duration of operation (on-time) per hour or area of operation on site, the nature of the ground type and cover between source and receiver, difference in height between source and receiver and any screening by barriers or other physical structures to be taken into account.

11. The results of the various calculations and corrections are external free field noise levels at selected receivers. For the purposes of this assessment, receiver sites are those sites considered likely to be sensitive to any changes in noise levels. Where sensitive receivers are residential areas, predicted noise levels are at the first floor level. The following lists the sources of data for each component required to assess the impact of the construction phase on noise levels:

- Noise data for construction machinery

12. Table D.1 of Part 1 of BS 5228 provides source noise levels for items of plant commonly found on construction sites. These figures are based on various EC Directives which are currently being revised and consolidated into one Directive (2000/14/EC). For the purposes of this assessment, it has been assumed that predominantly older machinery will be used on site. Since older machinery tends to be noisier, the use of this source data will provide a conservative estimate.

- Noise data for piling activities

13. Source noise data for noise from piling activities has been derived from BS 5228: Part 4: 1992, with an additional +5dB penalty added to account for the potential increase in nuisance caused by the impulsive noise this activity produces (as described in BS 5228: Part 1: 1997 and based upon guidance contained in BS 4142:1997).

- Noise data for dredging activities

14. Data for the dredging activities were derived from the Environmental Statement prepared by Bureau Veritas for the Bathside Bay Container Port development (Royal Haskoning, 2003), which used a similar type of equipment.

- Numbers and types of plant

15. Indicative numbers and types of plant to be used during the construction periods for the proposed development were summarised in Section 3.1. The assessment is based on an assumed worst-case situation with several items of plant operating simultaneously across the site. It is assumed that the number of plant required is similar for the construction of Phase 1 and Phase 2.

16. The construction operations have been split into several distinct work activities. These are listed in Table 19.2. The table shows each work activity along with its associated plant types and numbers, their source sound power levels and the percentage duration of the working period that each item operates.

Table 19.2 Construction work areas and source noise data

Work activity	Plant Items	Number operating	% on-time	Source noise level (dB L_W)
Dredging	Dredger	1	50	109*
Piling	Pile hammer	2	50	140**
	Diesel generator	2	100 (24 hours)	102***
Main site	Bulldozer	2	50	113***
	Excavator	2	50	110***
	Compactor rammer	2	50	91***
	HGV off-loading aggregate	1	10	112+
	Diesel generator	2	100 (24 hours)	102
New access road	Bulldozer	1	50	113
	Excavator	1	50	110
	HGV offloading aggregate	1	10	112
	Diesel generator	1	100 (24 hours)	102
Rail head	Bulldozer	2	50	113
	HGV offloading aggregate	1	10	112
	Diesel generator	1	100 (24 hours)	102

Work activity	Plant Items	Number operating	% on-time	Source noise level (dB L_W)
Railway	Bulldozer	3	50	113
	Excavator	2	50	110
	Dump truck	2	30	112***
	HGV offloading aggregate	1	10	112
	HGV bringing aggregate	1	30	107+
	Diesel generator	2	100 (24 hours)	102

* Data from ES for Bathside Bay Container Port, technical report AT 5277/2 Rev 1, Bureau Veritas Acoustic Technology

** Data from BS 5228: Part 4: 1992, Table 1, plus 5dB tonal penalty

*** Data from BS 5228: Part 1: 1997, Table D.1

+ Data derived from EC Directive 70/157/EEC (6/2/70)

17. The potential impacts associated with the construction phases are assessed based on guidance from several sources: guidance contained in BS 4142: 1997 "Method for rating industrial noise affecting mixed residential and industrial areas" which provides a method for comparing a source noise against existing background noise, World Health Organisation guidance (1999) and accepted convention of the audible significance of changes in environmental noise which provides that a 3dB change in noise levels is the lowest change in environmental noise levels discernible by the human ear whilst a 10dB change would be perceived as a doubling (or halving) of the noise.

18. A 5dB change would be clearly audible and BS4142 states that a difference of +5db for site noise above background will be of marginal significance. A difference of +10dB is likely to lead to complaints whilst a difference of -10dB indicates that complaints are unlikely.

19. The guidance provided by the World Health Organisation (WHO) provides health-based guideline community noise levels for specific areas. For outdoor living areas the guidance states that "To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55dB L_{Aeq} for a steady continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50dB L_{Aeq}".

19.2.1 <u>Impacts on ambient noise levels in sensitive residential areas as a result of construction</u>

1. To assess this potential impact, the nearest noise sensitive properties (i.e. receiver sites) to the construction site were considered. These are identified as follows and are shown in Figure 19.1:

- Wilton Avenue, Dormanstown;
- Corncroft Court and Bolckow Road, Grangetown

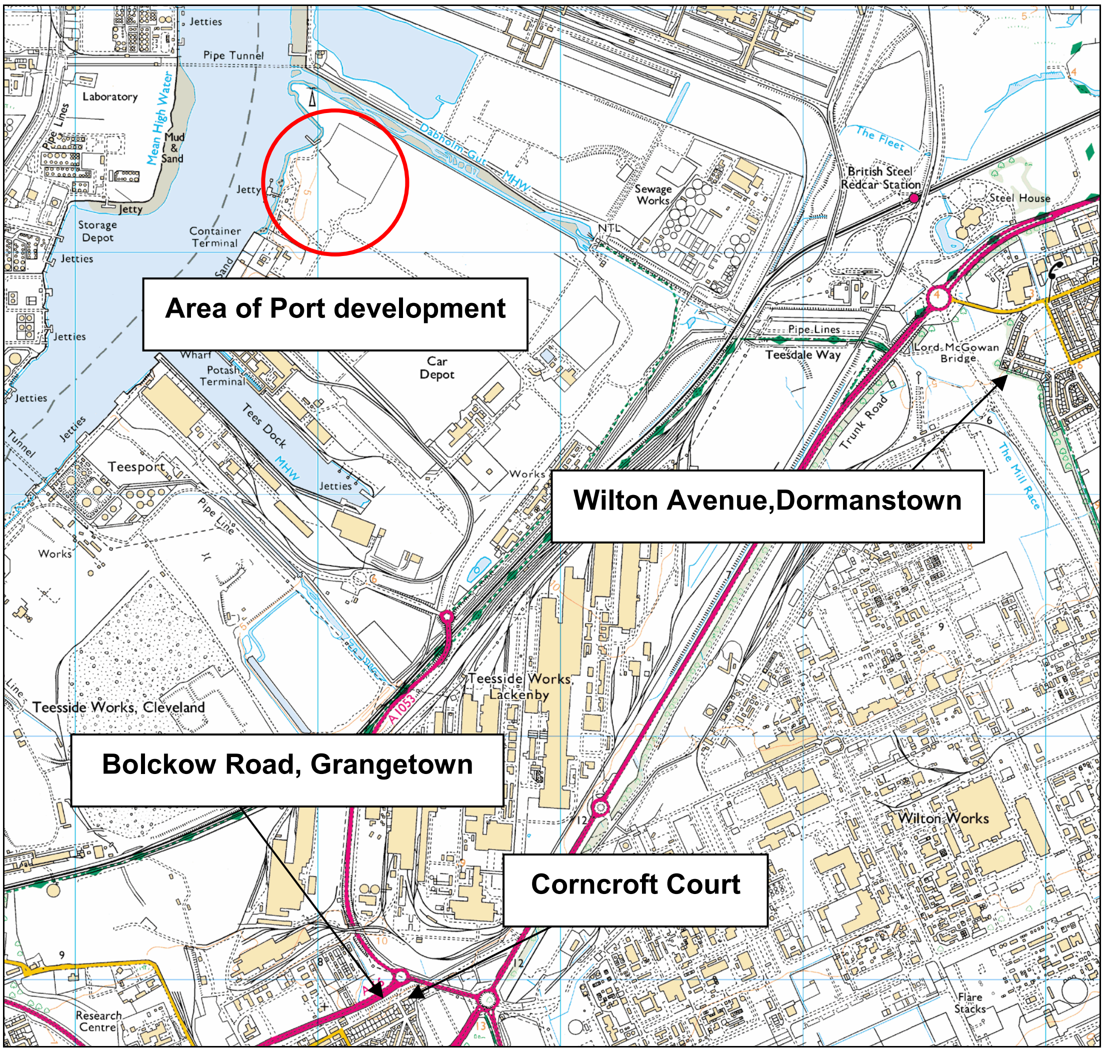

Figure 19.1 Noise sensitive properties in the vicinity of the proposed development

2. The properties at Dormanstown are the closest to the construction site. They are also less well screened than the properties at Grangetown and are set in a quieter environment further away from the main roads.

3. The properties at Grangetown have the large Corus buildings between them and the site, with dominant noise from traffic on the A66/A1053 and a significant existing noise contribution from the Corus steelworks.

4. The measured and predicted noise levels at these properties are taken to be representative of their immediate neighbours.

Results

5. The noisiest construction activity will be the piling which may be required for the construction of the quay. There would be two periods of piling required for the construction of the development lasting for 44 weeks in 2009 (associated with the construction of Phase 1) and 24 weeks in 2013 (associated with the construction of Phase 2). An assessment has, therefore, been carried out to predict noise levels at the nearby houses associated with piling, but also including other activities that will be taking place during the construction works such as dredging and general preparatory construction activities for the main site, rail head and new access road.

6. Whilst the main working period has nominally been assumed to be 08:00 to 18:00 from Monday to Saturday; the dredging operations will occur 24 hours a day, 7 days a week. The noise source position for the dredger was taken to be a point source 3m above water level and the dredging operation has been modelled as occurring at two positions closest to the two main residential receiver positions, with an on-time of 50%. This is a somewhat unrealistic representation of the dredging activities and with a higher on-time than might be expected but will provide a conservative prediction erring on the side of protection of the amenity of the nearest residents.

7. In addition, generators for site security and safety lighting will be required to operate throughout the non-construction night-time periods across the whole site. These sources are also included in the assessment.

8. The piling operations for the end retaining walls of the quay are judged to be potentially the greatest noise source arising from the construction activities. This is in terms of both overall noise level and the increased potential for annoyance caused by the repetitive impacts. The source height for noise from this plant is nominally taken as a point 5m above ground level and additionally includes a 5dB penalty to take account of the potentially increased nuisance caused by the impulsive nature of the impact noise. All plant other than the piling and dredging equipment are assumed to have a noise source position 1m above ground level, corresponding approximately to the position of a vehicle engine.

9. The duration of construction activities associated with Phase 1 and Phase 2 of the proposed development *that do not involve piling* are estimated to be 36 weeks for Phase 1 (i.e. 80 week total period minus 44 weeks for piling) and 16 weeks for Phase 2 (i.e. 40 week total period minus 24 weeks for piling).

10. Given the above, additional assessment has been carried out for the periods of the construction works that do not involve piling, but with all other plant items and the addition of mobile and fixed plant along the line of the new railway line closest to Wilton Avenue. Initial assessments of the contributions from each construction activity found that the dredging made no significant contribution to the noise levels at the residential receivers and so a separate assessment of this aspect of the construction work in isolation was not considered necessary.

11. The assessment results for noise generated during the two construction phases (i.e. for Phases 1 and 2) are presented in Table 19.3 (results for those periods with piling and dredging) and Table 19.4 (results for those periods without piling and dredging). Existing ambient noise levels (L_{Aeq}) together with the predicted construction noise levels are also shown. Levels for Bolckow Road are assumed to be the same as those measured a few yards away at Corncroft Court.

Table 19.3 Predicted free-field receiver noise levels *with* piling and dredging and existing ambient noise levels

Receiver	Construction noise levels (dB L_{Aeq})		Existing ambient noise levels (dB L_{Aeq})	
	Day-time	Night-time	Day-time	Night-time
Wilton Avenue	46	23	50	40
Corncroft Court	48	20	57	47
Bolckow Road	49	20	57	47

12. Table 19.3 shows that for the construction works which include piling and dredging, the predicted day-time construction noise levels are 9dB below existing ambient levels at Corncroft Court, 8dB lower than existing ambient noise levels at Bolckow Road and 4dB lower than existing ambient noise levels at Wilton Avenue, with the dominant noise being from piling activities. The resulting noise levels derived by combining the existing ambient noise levels with the construction noise levels gives a resultant ambient noise level of 58dB L_{Aeq} at Corncroft Court and Bolckow Road and 52dB L_{Aeq} at Wilton Avenue.

13. The predicted night-time construction noise levels, because piling would not take place at night, are 29dB lower than the existing ambient noise levels at Corncroft Court and Bolckow Road and 18dB lower than existing ambient noise levels at Wilton Avenue. Where two noise levels are different by more than 10dB, the lower noise makes no effective contribution and the resultant noise level will be the same as the higher of the two. There is therefore no change in the ambient night time noise levels at any of the receivers.

Table 19.4 Predicted free-field construction receiver noise levels *without* piling and dredging and existing ambient noise levels

Receiver	Construction noise levels (dB L_{Aeq})		Existing ambient noise levels (dB L_{Aeq})	
	Day-time	Night-time	Day-time	Night-time
Wilton Avenue	34	22	50	40
Corncroft Court	29	18	57	47
Bolckow Road	28	18	57	47

14. Table 19.4 shows that for the construction works that do not include piling and dredging, at Corncroft Court, Bolckow Road and Wilton Avenue, the predicted day-time and night-time construction noise levels are significantly lower (>18dB)

than existing ambient noise levels and so make no contribution to the noise at these receivers.

15. It can be seen from the above that for the period of the construction works that involve piling, daytime noise levels will potentially increase by 1dB at Corncroft Court and Bolckow Avenue and by 2dB at Wilton Avenue. In view of the existing high noise levels from the adjacent roads, these changes are unlikely to be audible at the receivers. Night time noise levels do not increase.

16. During the period of the construction works that does not involve piling, ambient noise levels at the receivers do not change at any time of the day or night.

17. Relative to the WHO guidance, existing daytime ambient noise levels are already at the limit for “moderate annoyance” at Wilton Avenue and during the periods of the construction phase when piling is taking place, noise levels will increase this by 2dB. Daytime noise levels are already above the threshold for “serious annoyance” at Corncroft Court and Bolckow Road and the period of construction that involves piling will increase this by 1dB.

18. Night time ambient noise levels are below the WHO guidance thresholds at all times and at all receivers and the construction works do not create any additional noise.

19. However, in view of the dominance of road traffic noise at all locations and the additional audible noise from the Wilton Chemical Complex that can be heard at Wilton Avenue, it is judged that during the day these changes will be generally be inaudible and of no great significance even though, in theory, the threshold for moderate annoyance is exceeded during the daytime at Wilton Avenue during the period of the construction works that involves piling.

20. It is therefore judged that during piling activities, the noise levels due to construction will have a **negligible, short term** and **reversible impact** during the daytime at Wilton Avenue, **no impact** during the daytime at Corncroft Court and Bolckow Road and **no impact** at night at any of the receivers.

21. The results show that for the remaining construction works (i.e. those works that do not involve piling), the construction noise levels make no contribution to the noise levels at any of the receiver locations at any time of day. **No impact** is therefore predicted. Occasional impulsive noise, from large or heavy items of equipment being dropped or placed heavily on the ground may be audible but are unlikely to be a cause for complaint.

Mitigation and residual Impact

22. The assessment shows that no specific mitigation in respect of day-time construction noise will be required. However, all construction and site operations will be conducted in accordance with the principles of Best Practicable Means (BPM) as outlined in BS 5228: Part 1: 1997 and the Control of Pollution Act 1974. BPM describes methods of working and equipment usage to ensure that potential construction noise nuisance is prevented wherever

possible. The applicant will ensure that BPM is applied to all construction operations.

23. There would be **no residual impact.**

19.2.2 Impact of construction activity on vibration levels

1. Due to the very large separation distance between the construction areas and the nearest houses, it is judged that there will be **no impact** from either airborne or ground borne vibration from the site construction activities.

Mitigation and residual impact

2. No mitigation measures are required; there would be **no residual impact.**

19.2.3 Impacts on ambient noise levels as a consequence of construction traffic

1. The assessment of effect of construction traffic movements on ambient noise levels has been based on experience of similar previous schemes following examination of the existing traffic flows and assessment of the impacts of the operational traffic impacts (see Section 17).

2. Current total traffic flows are in the region of 20,000 vehicles per day with 9% (1800) of traffic consisting of heavy goods vehicles. If the total number of vehicles were to double, the noise increase would be 3dB; a just perceptible change in environmental noise levels.

3. Similarly, assuming an average vehicle speed of 80km/h for heavy goods vehicles on the road network, the number of goods vehicles would need to increase by an additional 25% of the existing total traffic flow, or approximately 5000 additional heavy goods vehicles per day, to produce a 3dB change in noise levels due to the movement of heavy goods vehicles alone. Considering the existing noise from the road network, it is unlikely that a +3dB change in noise levels would be noticed by the local residents. In view of the considerable existing traffic flows on the A66, A1053 and A174, it is not anticipated that the construction traffic will contribute anything like a doubling of the existing total road traffic volume or contribute an additional 25% increase in heavy goods vehicles. It is therefore judged that the additional construction traffic will have **no impact** on noise levels at the houses adjacent to the A66, A1053 or A174.

Mitigation and residual impact

4. No mitigation measures are required; there would be **no residual impact.**

19.2.4 Impacts of increased traffic on vibration levels

1. Due to the considerable existing traffic flows on the roads and the separation distance between the roads and houses, it is judged that the additional site construction traffic will have no impact on vibration levels at the houses adjacent to adjacent to the A66, A1053 or A174.

Mitigation and residual impact

2. No mitigation measures are required; there would be **no residual impact.**

19.2.5 Potential impacts of piling on sites and features of ecological interest

1. Assessment has been carried out to predict the likely airborne noise levels at several locations within the estuary, arising most particularly from the piling activities that may be required for the construction of the quay wall, ship movements and ship turning. Table 19.5 illustrates the representative areas selected.

2. General construction noise levels (i.e. noise generated from sources other than those listed above) were not considered as these locations (except for the Vopak foreshore) as they are sufficiently far away that noise levels from construction would be significantly attenuated. It is unlikely that wildlife will be affected by noise in the way that humans are, as the Vopak foreshore will have acclimatised to the existing significant ambient noise from the refineries on the north bank of the Tees. Bran Sands, North Gare Sands and Bran Sands lagoon are similarly already subject to significant noise from the many commercial and industrial uses on the adjacent banks to the Tees estuary.

3. The assessment of piling noise is based on source noise levels of 140dB as used in the construction noise assessment. The assessment of ship passage noise assumes a source noise level of 119dB derived from measurements made during the survey on 7th December 2005.

4. The effect of piling that may be required for the quay face on noise levels at various areas used by waterbirds has been predicted. In summary, the following areas have been considered, with approximate straight-line distances from the source of the piling to each potentially sensitive area defined (Table 19.5).

Table 19.5 Potentially sensitive locations at which the effects of piling noise have been predicted

Receptor	Approximate distance from proposed piling (m)
North Gare Sands	2,700
Bran Sands	1,630
Bran Sands lagoon	375
Vopak foreshore	280
Seal Sands	1,685
North Tees mudflat	1,930

5. Table 19.6 shows that airborne noise levels from piling are significantly greater than existing ambient noise levels at the Vopak foreshore and Bran Sands lagoon and marginally greater than ambient levels at North Gare Sands and Bran Sands.

Table 19.6 Predicted airborne noise levels at ecological receivers within Teesmouth

Location	Existing measured background noise	Piling noise (dB L_{Aeq})
Vopak foreshore	57*	78
Bran Sands Lagoon	57*	79
Bran Sands A	54*	55
Bran Sands B	51*	-
Bran Sands C	51	-
Seal Sands A	56*	55
Seal Sands B	53	-
North Gare Sands A	56*	62
North Gare Sands B	53	-

*Background noise levels derived from nearest background measurement position, namely northern end of Bran Sands or northern end of North Gare Sands, and determined by calculation.

6. The noise levels at the more important areas for waterbird populations at Seal Sands are below existing ambient noise levels. However, the startle reaction caused by the piling impacts may be sufficient to temporarily disrupt feeding birds initially, but birds are likely to re-settle and continue feeding given that this feeding area is some distance from the proposed construction works. As a result, the overall impact on feeding birds at these locations is predicted to be of **negligible significance**, particularly given the temporary nature of the effect.

7. For other locations, particularly locations that are closer to the construction works (e.g. the Vopak foreshore) an impact of **minor adverse significance** is predicted as disturbance effects are likely to be greater, potentially causing localised redistribution of feeding birds to other areas (e.g. Seal Sands). However, such an effect is only likely to occur during the initial periods of the piling works due to the fact that the works will introduce a new source of noise to which birds will gradually become accustomed to an extent.

8. Although seals occasionally pass through the zone of the estuary adjacent to the proposed construction works, the area of importance for seals is at the western side of Seal Sands. Although the noise generated by piling would be noticeable at this location, the change from ambient levels is not considered to be of great magnitude in the context of background noise levels and the impact is predicted to be of **negligible significance.**

Mitigation and residual impact

9. Given the relatively low significance of the potential impacts as described above, it is concluded that the implementation of mitigation measures is not required. Therefore, the residual impacts will be of **negligible significance** (Seal Sands) and of **minor adverse significance** (Vopak foreshore)

19.2.6 Impacts associated with underwater noise as a consequence of piling and capital dredging

1. Underwater noise generated by percussive piling that may be required to construct the quay and noise from capital dredging are the two aspects of the construction works that have the most potential to represent disturbance to fish.

2. There is little published evidence on the environmental implications of underwater noise, and evidence of an effect in one situation is unlikely to be directly applicable to other situations given the widely differing sensitivities of different species to noise and environmental differences.

3. However, evidence presented at the London Gateway public inquiry noted that pile driving could generate excessive levels of noise (i.e. noise that may damage or kill fish) in the immediate vicinity of the activity (e.g. within about 5m of the activity). Beyond this distance, noise levels would not be so significant as to result in damage or fish kills and fish will tend to exhibit avoidance reactions and move away from the source of the disturbance.

4. Noise generated by dredging can be expected to give rise to a similar effect as described above for pile driving. That is, in theory in the immediate vicinity of the dredger noise levels could be such that damage to fish species could occur. In reality, fish will avoid such adverse conditions and so the dredging would result in a re-distribution of fish away from the dredger.

5. When considering the potential impact of underwater noise it is important to have regard to the nature of the noise environment under the existing situation. The Tees estuary is an industrialised environment experiencing high levels of shipping and construction activity along its shores and is subject to the existing maintenance dredging regime therefore, it would be expected that there will at present be a significant amount of underwater noise generated for a variety of sources.

6. As described in Section 13, the Tees estuary has some fishery interest, including some migratory fish interest. However, there is no significant commercial fishing activity within the region of the estuary from the site of the proposed development downstream due to the high levels of shipping (i.e. the presence of a busy commercial shipping channel). The main fisheries interest in the region is in the offshore areas of Tees Bay. It is, however, recognised that the lower estuary may have some importance for estuary-dependant fish and the mouth of the estuary has some importance for sandeels.

7. It is concluded that the generation of underwater noise during the construction works is inevitable; should percussive piling be required for the quay face, this would be the most significant source of noise. However, the overriding consequence of the generation of such noise would be for fish to move away from the source of the noise should adverse conditions be experienced and, therefore, the construction works would be expected to result in the localised redistribution of fish.

8. In light of the low importance of the area in the vicinity of the proposed development for fish populations, this potential impact is expected to be of **negligible significance**, with no overall effect on the estuarine populations of fish expected as a result of construction. In the event that the construction of the proposed quay does not require percussive piling methods, the significance of the potential impact would be reduced.

Mitigation and residual impact

9. It is concluded that no mitigation measures are required and the residual impact would be of **negligible significance**.

19.3 Potential impacts during the operational phase

1. During the operational phase, noise impacts can arise from increased movements on the road and rail network outside the port, increased port activities including increased ship and tug boat movements on the River Tees and noise within the estuary which could affect areas of ecological interest.

19.3.1 Potential impacts on features of ecological interest

Impact of airborne noise from ship movements

1. Airborne noise effects may impact on bird populations that overwinter in the estuary and on mammals such as seals for example. Table 19.7 predicts the likely airborne noise levels caused by the passing and turning of ships at several representative locations within the estuary.

Table 19.7 Predicted airborne noise levels at ecological receivers within Teesmouth

Location	Existing measured background noise	Ship passing noise (dB L_{Aeq})	Ship turning circle noise (dB L_{Aeq})
Vopak foreshore	57*	54	50
Bran Sands Lagoon	57*	47	46
Bran Sands A	54*	-	-
Bran Sands B	51*	47	-
Bran Sands C	51	52	-
Seal Sands A	56*	-	33
Seal Sands B	53	46	-
North Gare Sands A	56*	50	-
North Gare Sands B	53	51	-

*Background noise levels derived from nearest background measurement position, namely northern end of Bran Sands or northern end of North Gare Sands, and determined by calculation.

2. Both birds and seals are already exposed to significant numbers of ship movements in the Tees estuary, including the frequent movement of the Pilot boat and tugs, and it is probable that they will have become habituated to the low energy, gradual increases in airborne noise associated with the passage of relatively slow-moving ships. Table 19.7 also shows that noise levels from ship movements and turning are generally below existing ambient noise levels therefore impacts associated with airborne ship noise are judged to have **no impact** on either bird or seal populations.

Mitigation and residual impact

3. No mitigation measures are required and there would be **no residual impact**.

Impact of underwater noise from ship movements

4. The Tees estuary currently experiences significant levels of heavy shipping traffic (see Section 14.1) and this traffic is expected to increase as a consequence of the proposed development.

5. The response of fish species to underwater noise generated by shipping will be the same as described above for dredging and fish will tend to exhibit avoidance reactions to adverse environmental conditions such as excessive noise.

6. In view of the existing ambient conditions (i.e. noise generated by existing shipping), the additional impact of noise generated by shipping associated with the proposed development is predicted to be of **negligible significance.**

Mitigation and residual impact

7. No mitigation measures are required and the residual impact would be of **negligible significance.**

19.3.2 <u>Impact of increased operational road traffic on noise levels in residential areas</u>

Assessment methodology

1. Traffic noise is assessed based on an 18-hour (06:00 and 24:00) annual average weekday traffic flow (AAWT) and is described in terms of the dB $L_{A10,\ 18\text{-}hour}$ noise level. The L_{A10} noise level is the parameter used in the UK to describe noise from road traffic and is the 10th percentile level, or the level exceeded for 10% of the assessment or measurement period. Relative changes in noise level are simply described in terms of the difference of the dB noise level.

2. Volume 11, Section 3, Part 7 of the "Design Manual for Roads and Bridges" (DMRB 11.3.7) is the specified method for carrying out environmental assessment of road traffic impacts associated with schemes requiring an EIA. It is this methodology that is used to undertake the assessment.

3. Two potential options for the proposed scheme are considered:

- Option 1 (principle option) involves 70% of freight at Teesport to be moved by road, 20% by rail and the remaining 10% for trans-shipment.
- Option 2 (alternative and worst-case scenario) involves 100% movement of freight to and from the port by road.

4. Where increases in traffic occur, the impacts immediately upon opening of the scheme are usually found to present the greatest nuisance. The scheme opening year is, therefore, taken to be the completion of phase 2 (i.e. 2014) to present the most conservative prediction of noise impacts.

5. DMRB 11.3.7 sets out a three-stage process of assessing the potential impacts from road traffic and, where calculation of noise levels is required, DMRB refers to the document Calculation of Road Traffic Noise (CRTN).

6. Step 1 of Stage 1 requires the identification of "existing roads and possible new route corridors where traffic changes of plus or minus 25% are expected in the year the scheme is opened". This change equates approximately to a 1dB change in noise levels and the baseline against which this change is assessed is the traffic flow in the same year without the scheme.

7. Projected traffic data for the scheme opening year (2014) were derived from the traffic assessment (Section 17) for both operational scenarios (see above).

8. As Option 2 for freight movement involves a greater number of vehicles on the road relative to baseline conditions, assessment of impacts has been carried out using this data set, with the corresponding presumption that impacts will be similar or less for Option 1.

Impact assessment

9. It can be seen that, in 2014 for Option 2, the only road predicted to experience a change of more than 25% is the A1053 Teesport Link Road which runs from the A66 into the port area. This road currently carries approximately 4000 vehicles per day and will be subject to a total traffic flow change of 50%, with a 15% relative change in HGV traffic, upon completion of Phase 2 in 2014. CRTN provides a method for calculating the basic noise level (BNL) at 10m from the nearside edge of the carriageway and from which it is predicted that, in 2014, the noise level from traffic on the A1053 Link Road will increase from 74dB $L_{A10, 18\text{-hour}}$ to 76dB $L_{A10, 18\text{-hour}}$, a change of 3dB including a correction for the relative increase in HGV numbers.

10. Step 3 of Stage 1 of DMRB 11.3.7 requires the identification of "*areas which are especially sensitive to noise*" such as schools, hospitals etc and Step 4 requires an estimation of the number of houses within 300m either side of the centre line of any roads subject to changes of 25% or more.

11. The A1053 Teesport Link Road passes industrial premises including the Corus steel works with no particularly noise sensitive areas or premises and no residential housing on either side of the road. The nearest noise sensitive properties are the houses on Bolckow Road on the south east side of the A66. Here the ambient noise is dominated by road traffic on the A66 and A1053/A1085 link and changes in traffic flows (and subsequent noise levels) on these roads in the scheme opening year and with Phase 2 of the port operations complete, are less than 25%. Based on this information and in accordance with DMRB 11.3.7, further assessment and modelling would not be required. However, in view of the large increase in traffic flows and numbers of HGVs on the A1053 Teesport Link Road, it is judged that some noise impact might be experienced by the residents on Bolckow Road and that a basic assessment of potential noise level changes should be carried out.

12. Bolckow Road is approximately 30m from the closest part of the A1053 Link Road and an additional calculation is required to account for attenuation of noise with distance to the properties. From this it is predicted that the noise at Bolckow Road, due to increased traffic on the A1053, will be **69dB** $L_{A10,\ 18\text{-hour}}$.

13. However, the noise at Bolckow Road is dominated by existing road traffic noise from the A66/Bolckow to A66/Teesport Link and the A66 Teesport Link to A66/A1085 Link. Using the same calculation methods, the predicted contribution to noise levels at Bolckow Road from traffic movement on these two road links, in 2014 with phase 2 of the port expansion complete, is predicted to be **78dB** $L_{A10,\ 18\text{-hour}}$.

14. The difference in noise levels from the two different sets of roads is 9dB, and so it can be concluded that the impact on noise levels at Bolckow Road resulting from the significant increase in traffic on the A1053 is far outweighed by noise generated by existing traffic on other trunk roads in the locality (on which the relative increases in traffic are less significant). In addition, the predicted baseline (2014 without scheme in operation) noise levels are well in excess of the WHO guideline threshold values and the port operational traffic noise will make no significant difference to this situation.

15. It is therefore judged that, in 2014 with Phase 2 of the port operation complete, the increased road traffic noise from the A1053 Teesport Link Road will have a **negligible** impact on the nearest properties on Bolckow Road, when compared to the existing noise arising from the A66 and A1053 adjacent to the properties. This assessment is based on Option 2, a scenario in which 100% of the generated freight will be transported by road. In reality it is highly likely that a proportion of containers will be transhipped and/or carried by rail, and this conclusion is one which is based on worst-case assumptions.

Mitigation and residual impact

16. No mitigation measures are required therefore the impact remains at **negligible**.

19.3.3 Impact of increased road traffic on vibration levels in residential areas

1. Due to the considerable existing traffic flows on the roads and the separation distance between the roads and houses, it is judged that the additional operational traffic will have **no impact** on vibration levels at the houses adjacent to adjacent to the A66, A1053 or A174.

Mitigation and residual impact

2. Since no mitigation measures are required, the impact remains at **no impact**.

19.3.4 Impact of increased rail traffic on noise levels in residential areas

1. Rail noise is assessed in the UK according to guidance contained in the document Calculation of Railway Noise (CRN). This document provides a method for predicting noise levels arising from the movement of various types and combinations of rail vehicles. The method takes account of factors such as ground effects (absorption or reflection), gradient, barriers, the type of rail and ballast, the type of engine, the number of carriages, the relative height of source and receiver and the distance between source and receiver. The document provides sound exposure levels (SEL) for the different types of engine and carriage commonly used on the UK railway network and the calculations are valid within 300m of the rail head.

2. For the assessment of noise impact in respect of train movements, the relative change in noise levels in 2014 with the completion of Phase 2 of the port expansion has been determined.

3. There are very few residential properties affected by rail noise at this time; the single most potentially affected property would be the Navigation Public House at the junction of Marsh Road and Cargo Fleet Road, North Ormesby. This property appears to be inhabited as a residential property and is approximately 25m from the level crossing leading onto Dockside Road.

4. The only other residential properties that can be identified are possible flats and a hostel on Bridge Street West, immediately to the west of Middlesbrough Station. The properties are approximately 40m from the railway tracks and are separated from the railway by Bridge Street West itself and a brick wall approximately 1m to 1.5m high that bounds the edge of Railtrack land on Bridge Street West.

5. The only predicted rail traffic changes with the scheme are an increase in freight trains, and the relative impacts of this change will be the same at both locations. The assessment of potential impacts was therefore carried out for the closer property, the Navigation Public House, in the first instance as a worst-case measure of the significance of any changes.

6. For the purposes of the assessment, the following inputs have been used:

- The principal rail traffic on the railway passing the property comprises Class 66 diesel freight locomotives and either Class 142 or 156 Pacer type diesel-electric passenger trains.

- There are currently approximately 19 freight trains per day on this stretch of line, less than one an hour. This will increase to 27 freight trains of the same type with Phase 2 of the port expansion complete, an increase of 42%, equivalent to 1.1 trains per hour in total (Based on information provided by SDG).
- CRN does not provide SELs for Class 66 locomotives but does provide it for Class 60s. These are understood to be noisier than the Class 66 locomotives, so the use of these source noise levels will provide a worst-case situation.
- It has been assumed that the average number of wagons per freight train is 15 and that these are the noisier double-axle tread-braked wagons.
- In accordance with the guidance in CRN, the diesel locomotives are calculated as one train and their wagons as a separate train; no barriers were modelled between the railway line and the property and the intervening ground was taken to be hard and reflective with no absorption.
- The speed of the trains was taken to be 60kmh for the passenger trains and 40kmh for the freight trains.

7. From this information it is possible to calculate the noise levels at the Navigation Public House where the only change between the before and after scenario is the number of freight trains per hour. It was calculated that with the current number of freight trains, the noise levels at the house are 71dB LAeq, 18h during the day and 71dB LAeq, 6h during the night. With Phase 2 of the proposed port operation completed, the noise levels are predicted to be 72dB LAeq, 18h during the day and 72dB LAeq, 6h during the night.

8. The assessment therefore shows that the noise effects of increased rail-freight movements on the line past the Navigation Public House are negligible.

9. In terms of the properties on Bridge Street West, there are already a relatively high number of train movements on the railway lines here. This is due to a greater number of passenger trains entering Middlesbrough station from the west and then returning the same way, than the numbers that pass through towards Redcar and past the Navigation Public House. Additionally, the background noise includes a greater contribution from passenger engines accelerating away from the station or braking as they approach the station. It is therefore judged that the relative noise impact of the increased freight movements here will be less than at the Navigation Public House and is judged to be negligible.

Mitigation and residual impact

10. No mitigation measures are required therefore the impact remains at **negligible**.

19.3.5 <u>Impact of increased rail traffic on vibration levels in residential areas</u>

1. Due to the separation distance between the railway line and the Public House and the large numbers of existing heavy goods vehicles that pass close to the premises along Cargo Fleet Road, it is judged that there will be no impact on vibration levels at the Public House.

2. Again due to the reasons described above in Section 19.3.3 concerning the already relatively high number of passenger trains passing Bridge Street West and noise due to acceleration and braking, it is judged that the impact here will be less than at the Navigation Public House. The impact on vibration levels is therefore judged to be **no impact.**

Mitigation and residual impact

3. No mitigation measures are required therefore the impact remains at **no impact**.

19.3.6 Impact of increased port traffic on noise levels in residential areas

1. Noise from the port operations may arise as a result of the movements of increased numbers of ships on the Tees, from ships at berth, from the increased quayside activities associated with the loading and off-loading of cargo and from the movements of mobile plant within the port area.

2. The potential noise impacts of the port operations were modelled using SoundPlan software, utilising the calculation methodology of BS 5228. Using the same base-map as for the construction phase, details of potential port operational plant were input to the model, along with source noise terms derived from the Bathside Bay ES as described previously. The plant items used in the model are listed below in Table 19.8. For the operational plant, source noise data provided included octave-band frequency spectrum information which allows a more detailed assessment of noise propagation as the degree of attenuation of noise through the air is strongly frequency dependant.

Table 19.8 Port operational plant

Item	Number operating	% on-time
Ship to shore crane	8	50
Port Tractor unit	3*	70
Rubber-tyred gantry crane	3	20
Reach stacker	3	20
Rail mounted gantry crane	1	20
Ship at berth	3	100

* Noise generated by port tractor units is significantly greater when moving and transporting containers than when standing at idle or moving when not under load. Thus the actual number of tractor units in use is not critical to the calculation, and the defining parameter is the 'activity sound power level'. More tractors in use for a similar container throughput only implies greater idle time per tractor (with reduced noise levels). Noise predictions assuming three port tractor units operating under full load is, therefore, a conservative scenario and one which would give rise to a higher noise impact than one in which a greater number of vehicles would be idling

3. For the purposes of the assessment, the following assumptions have been made:

- Ten ship-to-shore gantry cranes are employed at the port; it is assumed that eight of these are operating continuously on three ships at berth;

- Three port tractor units are modelled of which two follow a route from the end cranes nearest to the houses, along the side of the container stacks away from the quayside to the container stack nearest to the houses, and one carries containers from the outer edge of the container storage area, around the access road outside the main port area to the lorry parking area, and then back into the port area. Figure 19.2 shows the modelled routes;

- Three Rubber-tyred gantry cranes will operate simultaneously on the container stacks nearest the houses along with two reach stackers;

- At the railhead, one reach stacker and one rail mounted gantry will be loading to a train;

- The container stacks will be aligned parallel with the quay side and will therefore provide a degree of screening of noise from plant behind it. For the purposes of the assessment the two rows of stacks nearest the quayside were taken to be one container-high, approximately 3m. At the other side of the port area away from the quayside, container stacks at the outer edges of the container storage area were also taken to be 1 container-high, 3m high, thereby providing a conservative estimate of the amount of screening provided;

- The train at the railhead is a potential barrier, 4m high; and

- Three ships are continuously at berth, all with motors and ship-board plant operating.

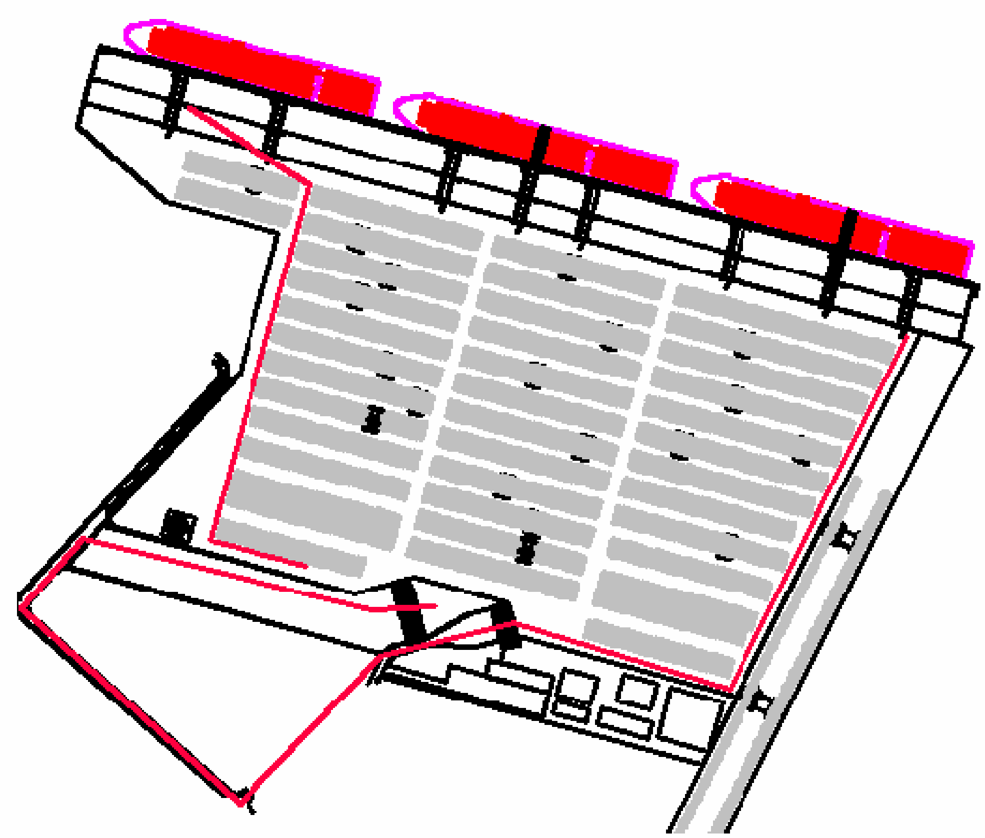

Figure 19.2 Route of port tractors shown by thick red lines [to be replaced]

4. Results are presented in Table 19.9 for the three residential areas described above.

Table 19.9 Predicted free-field operational noise levels and existing background noise levels

Receiver	Operational noise levels (dB L_{Aeq})		Existing background noise levels (dB L_{A90})	
	Day-time	Night-time	Day-time	Night-time
Wilton Avenue	28	28	50	40
Corncroft Court	28	28	57	47
Bolckow Road	28	28	57	47

5. The results of the modelling show that the predicted operational noise levels at all three residential receivers are significantly below existing ambient noise levels and would make no additional contribution to the ambient noise. The port operations are therefore judged to have **no impact** at the nearest houses.

Mitigation and residual impact

6. No mitigation measures are required therefore the impact remains at **no impact**.

19.3.7 Impact of increased port traffic on vibration levels in residential areas

1. As previously described, the separation distance between the port and nearest housing is such that vibration from port operations will not be perceived at the houses. There is therefore considered to be **no impact** as a consequence of the port traffic.

Mitigation and residual impact

2. No mitigation measures are required therefore the impact remains at **no impact**.

20 AIR QUALITY

20.1 Existing environment

20.1.1 Project description

1. This section describes those aspects of the proposed development that have the potential to affect local air quality. The following paragraphs describe those features of the proposed development that are of particular relevance to the assessment of potential air quality effects; full details of the construction and operational phases of the proposed development are provided in Section 3.

2. The proposed development will include a new quay face of 1000m in length with a dredged deep water berth alongside. Capital dredging will be required to deepen the existing approach channel and the Tees Dock and Seaton Channel turning circles.

3. Goods will be transported to and from the terminal by road, rail and sea. It is expected that 70% of goods will be transported by road. A new intermodal rail terminal will be constructed to provide a link to rail.

4. The container terminal will operate using ship to shore cranes, rubber-tyred gantry cranes, tractor-trailer units, rail-mounted gantry cranes, reach stackers and railhead reach stackers.

5. The development is expected to proceed in two phases. Phase 1 will be operational in 2010 and will have a capacity of approximately 1 million TEUs; Phase 2 will be operational in 2014 and will result in a total capacity of 1.5 million TEU.

6. This section contains the details of an assessment of the air quality impacts of the proposed development on human health and sensitive ecological sites.

20.1.2 Key pollutants

1. The following pollutants have been considered in this assessment because they are likely to be released during the construction or operational phases of the scheme and have the potential to affect human health or the environment.

Particulate matter

2. Airborne particles typically consist of minerals, combustion (carbon) products, or natural materials (e.g. pollen) which are small enough to be inhaled and many of which will reach the lower (gas exchange) region of the lungs. PM_{10} particles are those with a mean aerodynamic diameter of less than 10 micrometres (one-hundredth of a millimetre). Exposure to elevated levels has been linked to different health indicators, including hospital admission rates for both respiratory and coronary conditions.

Nitrogen oxides (NO_x)

3. NO_x is a term used to describe the mixture of nitrogen oxides which is present in the atmosphere as a result of combustion reactions in both industry and vehicle engines. Emissions are primarily in the form of NO, which is oxidised by ozone (O_3) to NO_2. Nitrogen *dioxide* (NO_2) is the primary concern for effects on health, and is the species for which the health-based standard is expressed. The various oxides of nitrogen can also react with hydrocarbons in the atmosphere to contribute to photochemical smog. NO_x can also affect ecologically sensitive sites through deposition, causing acidification and eutrophication.

Carbon monoxide (CO)

4. CO is primarily emitted from the combustion process, particularly from petrol vehicle exhausts due to incomplete combustion; the highest concentrations are generally found at roadside locations. Inhalation of high levels of environmental CO can cause headaches, fatigue and respiratory problems.

Sulphur dioxide (SO_2)

5. Sulphur dioxide (SO_2) is a colourless, non-flammable gas that causes irritation to the eyes and throat. It is particularly harmful to asthmatics and even moderate concentrations have been shown to affect lung function in susceptible individuals. SO_2 also contributes to acidification of sensitive ecological sites.

20.1.3 <u>Legislative background and technical guidance</u>

1. The Environment Act 1995 introduced a framework of Local Air Quality Management and placed a duty on local authorities to formally assess air quality in their areas. The Government published statutory guidance detailing how local authorities were to undertake the ‘review and assessment’ (R&A) process, in consideration of objectives in the Air Quality Regulations first laid down in 1997, revised in 2000 and amended in 2002.

2. The objectives are shown in Table 20.1.

Table 20.1 The Air Quality (England) Regulations 2000 as amended by the Air Quality (England) (Amendment) Regulations 2002

Pollutant	Objective		Date to be achieved by
	Concentration	measured as	
Objectives for the protection of human health			
Benzene	16.25μg/m^3	running annual mean	31 December 2003
	5μg/m^3	annual mean	31 December 2010
1,3-Butadiene	2.25μg/m^3	running annual mean	31 December 2003
Carbon Monoxide	10mg/m^3	maximum daily running 8-hour mean	31 December 2003
Lead	0.5μg/m^3	annual mean	31 December 2004
	0.25μg/m^3	annual mean	31 December 2008
Nitrogen dioxide	200μg/m^3 not to be exceeded more than 18 times a year	hourly mean	31 December 2005
	40μg/m^3	Annual mean	31 December 2005
Particles, PM_{10} (gravimetric)[b]	50μg/m^3 not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	40μg/m^3	annual mean	31 December 2004
Sulphur Dioxide	350μg/m^3 not to be exceeded more than 24 times a year	hourly mean	31 December 2004
	125μg/m^3 not to be exceeded more than 3 times a year	24 hour mean	31 December 2004
	266μg/m^3 not to be exceeded more than 35 times a year	15 minute mean	31 December 2005

a) The Objectives for nitrogen dioxide are provisional.

b) A provisional Objective for PM_{10} in England & Wales (outside London) has been set at 50μg/m^3 as a 24 hour mean with the exceedances allowed reduced to 7 days, and an annual mean in the same areas of 20μg/m^3 to be achieved by the end of 2010. Within London, the number of daily exceedances of the 24 hour mean has provisionally been reduced to 10, and the annual mean to 23μg/m^3 by the end of 2010.

(Table continued overleaf)

Pollutant	Objective		Date to be achieved by
	Concentration	measured as	
Other Objectives NOT in Regulations:			
PAH (Polycyclic aromatic hydrocarbons)	0.25ng/m^3	annual mean	31 December 2010
Ozone	100µg/m^3, not to be exceeded more than 10 times a year	8 hour mean	31 December 2005
Objectives for the protection of vegetation and ecosystems (prescribed in Air Quality Limit Values (England) Regulations 2001):			
Nitrogen dioxide (as NOx)	30µg/m^3	annual mean	July 2001. Apply only at a distance >20km from an agglomeration, and >5km from Part A regulated processes, motorways and built-up areas of more than 5000 people.

3. Planning Policy Statement 23 (PPS23) has useful guidance on air pollution and planning. It describes situations where air quality might be a material consideration in development control decisions. It states that:

"*any air quality consideration that relates to land use and its development is capable of being a material planning consideration. The impact on ambient air quality is likely to be particularly important, however:*

- *where the development is proposed inside, or adjacent to, an air quality management area (AQMA) as designated under part IV of the Environment Act 1995;*
- *where the development could in itself result in the designation of an AQMA;*
- *where to grant planning permission would conflict with, or render unworkable, elements of a local authority's air quality action plan."*

4. NSCA (formally the National Society for Clean Air) in their 2004 guidance on air quality assessments that inform decisions on development control states that:

"Air quality is a material consideration in all planning applications. However the weight given to air quality in deciding the application will depend on such factors as:

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations."*

20.1.4 Local Air Quality Management Review and Assessment

1. The five Tees Valley councils have formed the Tees Valley Environmental Protection Group (TVEPG) to coordinate the review and assessment of air quality in the area. TVEGP published a Progress Report in 2005, which contained details of air quality monitoring in the Tees Valley and compared the available data with national objectives to determine whether the objectives were likely to be met at relevant locations.

2. There are a number of locations in the Tees Valley that carry out continuous monitoring of NO_2; some of these are part of DEFRA's Automatic Urban and Rural Network of continuous air quality monitoring stations (AURN). There are also passive diffusion tube monitoring sites. The progress report concluded that road traffic was the main source of NO_2 in the area and that some kerbside locations experienced annual mean concentrations greater than the objective of 40µg.m-3. However, the objective was predicted "to be met across the Tees Valley area in all areas where target group members of the public may be present." In addition, the hourly mean objective of no more than 18 exceedances of 200µg.m^{-3} "will continue to be met in all parts of the Tees Valley area."

3. Local sources of PM10 were considered to be road traffic, industry, construction and natural coastal processes. It was also noted that peak PM10 concentrations are "weather dependent, and can be influenced by sources outside the Tees Valley." The annual and daily mean objectives were predicted to be met at all relevant locations. TVEPG considered that the more stringent provisional objectives set for 2010 are less likely to be met "without significant reductions in particulate emissions from all sources."

4. TVEGP stated that the significant sources of SO_2 were "almost entirely industrial" and that "traffic does not significantly contribute." The report notes a downward trend as a result of lower emissions from the main industrial complexes. Consequently, the daily, hourly and 15-minute mean objectives will be met across the whole of the area as long as industrial emissions do not significantly increase.

5. Other pollutants considered in the progress report included CO, benzene, 1,3-butadiene and polycyclic aromatic hydrocarbons (PAHs). All current objectives in respect of these pollutants were predicted to be met.

20.1.5 Local air quality monitoring

1. DEFRA and the devolved administrations operate the AURN of continuous air quality monitoring stations. There are 5 stations in or close to Middlesbrough and monitoring for the period 1999-2004 have been considered. Full details of recent monitoring results are given in Accompanying Document 3, and are summarised here.

2. The recorded annual mean concentrations of NO_2 are well below the national objective of 40µg.m^{-3}, at all stations with the exception of Yarm, which is a kerbside location. There is no clear trend in concentrations over the period considered.

3. A 99.8th percentile of hourly means less than 200µg.m^{-3} indicates that there were fewer than 18 exceedances of the hourly mean threshold of 200µg.m^{-3}, which is the short-term objective for NO_2. The recorded concentrations of NO_2 are well below the national objective of 200µg.m^{-3} at all five monitoring stations. The highest values are consistently recorded at Billingham, with moderate values also recorded at Yarm. There is no clear trend in concentrations over the period considered.

4. The recorded annual mean concentrations of PM_{10} are well below the national objective of 40µg.m^{-3} at all stations. The provisional objective of 20µg.m^{-3} as an annual mean, however, is exceeded at all stations in at least one year. There is no clear trend in concentrations over the period considered.

5. A 90.4th percentile of daily means less than 50µg.m^{-3} indicates that there were fewer than 35 exceedances of the daily mean threshold of 50µg.m^{-3}. The national daily PM_{10} objective of 50µg.m^{-3} is achieved at all locations and years, with the exceptions of Middlesbrough and Yarm in 2003. There is no clear trend in concentrations over the period considered.

6. A 98.1th percentile of daily means less than 50µg.m^{-3} indicates that there were fewer than 7 exceedances of the daily mean threshold of 50µg.m^{-3}. The provisional daily PM_{10} objective of 50µg.m^{-3} set for 2010 is exceeded at all locations in at least one year during the period considered. There is no clear trend in concentrations over the period considered.

7. The recorded maximum 8-hour rolling average CO concentrations are well below the national objective of 10µg.m^{-3} at all stations. There is no clear trend in concentrations over the period considered.

8. A 99.2th percentile of daily means less than 125µg.m^{-3} indicates that there were fewer than 3 exceedances of the daily mean threshold of 125µg.m^{-3}. The national SO_2 objective of 125µg.m^{-3} is achieved at all locations and years. There is a statistically significant (95% confidence level) downward trend in concentrations over the period considered at Middlesbrough, Newcastle and Redcar.

9. A 99.7th percentile of hourly means less than 350µg.m^{-3} indicates that there were fewer than 24 exceedances of the daily mean threshold of 350µg.m^{-3}. The national SO_2 objective of 350µg.m^{-3} is achieved at all locations and years. There is a statistically significant downward trend in concentrations over the period considered at Middlesbrough, Newcastle and Redcar.

10. A 99.9th percentile of 15-minute means less than 266µg.m^{-3} indicates that there were fewer than 35 exceedances of the 15-minute mean threshold of 266µg.m^{-3}. The national SO_2 objective of 350µg.m^{-3} is achieved at all locations and years.

There is a statistically significant downward trend in concentrations over the period considered at Middlesbrough, Newcastle and Redcar.

20.1.6 National Pollutant Maps

1. Site-specific pollutant estimates have been obtained from national pollutant maps, available from the National Air Quality Information Archive (NAQIA). The maps give the concentrations of pollutants for Air Quality Strategy (AQS) Objective years at a 1km x 1km resolution. The concentrations given include significant local sources of pollution, including road traffic and industrial emissions. Concentrations for other years can be calculated using adjustment factors, which are also available from the NAQIA.

2. Concentrations of NO_2 in the study area are generally well below the national objective of 40μg.m^{-3}, typically being in the range 24-28μg.m^{-3} in 2005. Local industrial sources of NO_2 give rise to elevated concentrations, particularly near the industrial areas at Seal Sands and to the east of Middlesbrough. Concentrations at these locations are predicted to exceed the objective in 2005, but achieve it in 2010 and 2014 when Phase 1 and Phase 2 of the scheme, respectively, are assumed to be operational.

3. Concentrations of PM_{10} are generally well below the national objective of 40μg.m^{-3}, typically being in the range 18-20μg.m^{-3} in 2005. Annual mean concentrations near industrial areas at Seal Sands, east of Middlesbrough and Billingham are increased by approximately 10μg.m^{-3}.

4. Table 20.2 shows the estimated annual mean concentrations for the grid square closest to the site, with centre 454500, 523500, for the years 2005, 2007, 2010 and 2014. Comparison with the measured values of NO_2 and PM_{10} for Middlesbrough reported above indicates that these values are realistic for the study area. The predicted concentration of SO_2 is typical of the area around Seal Sands and is higher than predicted for the centre of Middlesbrough. The predicted annual average concentration of SO_2 for Seal Sands is similar to the peak daily average concentrations recorded at the Middlesbrough station. It should also be noted that the NAQIA does not provide year adjustment factors for SO_2, but TG(03) (DEFRA, 2003) suggests that, for "*the purpose of review and assessment, authorities may assume that background annual mean sulphur dioxide concentrations at the end of 2004 and 2005 will be 75% of the 2001 values*". Local monitoring data also suggest that concentrations have reduced significantly in Middlesbrough in recent years.

Table 20.2 NAQIA estimated concentrations

Year	NO_x (µg.m^{-3})	NO_2 (µg.m^{-3})	PM_{10} (µg.m^{-3})	SO_2 (µg.m^{-3})	CO (mg.m^{-3})
2005	32.2	22.0	19.3	25.7*	0.18
2007	29.6	20.8	19.0	25.7*	0.19
2009	29.0	20.8	18.3	25.7*	0.13
2013	25.8	19.2	18.2	25.7*	0.12

* 2001 value multiplied by 0.75 following guidance in TG(03)

20.2 Potential impacts during the construction phase

1. Poor air quality, in the form of gaseous pollutants, fine particles or dust, can have adverse effects on human health and the environment. The impacts of the construction period have been assessed at selected receptors, which are expected to experience the most significant effects.

20.2.1 Generation of dust during the construction activities

1. Fugitive dust emissions have the potential to cause significant nuisance at nearby residential properties by causing soiling of surfaces. In addition a small fraction of dust emitted will be in the form of fine particles, which can have an adverse effect on human health. Dust deposition by sedimentation under the influence of gravity, impaction under the influence of eddy currents or by deposition under the influence of precipitation, can affect vegetation through smothering and changes in photosynthesis and respiration. Alkaline dusts, such as cement, can have an additional toxic effect.

2. Operations that often result in dust emission include:

- Demolition and debris removal;
- Cutting or grinding;
- Resuspension of road dust, particularly on unmade roads;
- Site preparation and earth moving; and,
- Stockpiling and handling of loose materials.

3. TG(03) (DEFRA, 2003) provides an approach for the screening of potential fugitive dust releases. For the purpose of review and assessment, the guidance indicates that “if there are no relevant locations for public exposure within 1000 metres of the dust emissions source then there should be no need to proceed further.”

4. No sensitive receptors have been identified within this radius and therefore the release of dust during the construction phase is not considered to be a significant issue in this instance. As such, no further assessment is required and an impact of **negligible significance** is predicted.

Mitigation and residual impact

5. Although the predicted impacts are negligible, dust emissions during demolition and construction should be controlled by good site practice. This should include measures such as:

- Dampening of dusty materials using water sprays;
- Control of cutting or grinding of materials on site;
- Minimizing the height of stockpiles;
- Enclosing material stockpiles;
- Sheeting the sides and tops of vehicles carrying spoil and other dusty material;
- Applying a speed limit to vehicles on the site and access roads;
- Using metalled roads wherever practicable;
- Cleaning the hard surfaces of the site;
- Use of wheel washing facilities; and
- Public consultation and information.

6. The residual impacts are predicted to be of **negligible significance**.

20.2.2 Emission of pollutants from construction plant

1. Construction plant with diesel engines will emit a number of pollutants and have the potential to affect both human and environmental receptors. The pollutants NO_x, PM_{10}, SO_2 and CO have been considered. This assessment is described below.

2. The impact of emissions from existing sources and the construction phase of the proposed development was calculated for residential and ecological receptors, using the United States Environmental Protection Agency (US EPA) model Aermod. The study took into account terrain and atmospheric NO_x chemistry. The sensitivity of the results to alternative meteorological data and background ozone concentrations was investigated. Full details of the study are given in Accompanying Document 3.

3. Details of the port cargo handling equipment (CHE) currently used, and that required to operate the proposed development are set out in Table 20.3. Electrically powered equipment, such as ship to shore cranes and rail mounted gantry cranes, were assumed to have no significant local emissions.

Table 20.3 Cargo handling equipment for the proposed terminal

Item	Existing	Phase 1	Phase 2	Power Rating (kW)
Rubber Tyred Gantry Cranes (RTGs)	0	16	24	400
Port Tractor Trailer Units	0	48	72	130
Empty Reach Stackers	1	4	6	172
Railhead Reach Stackers	0	4	4	246

4. Information regarding shipping on the Tees was obtained from PD Teesport Harbour Master's Office. Data for each of the 59 existing berths included the number of visits per year, the number of hours a ship was berthed, and the details of a typical vessel using that berth. For the proposed development, two vessel sizes were considered. The larger had a capacity of 6410 TEU, the second had a capacity of 1092 TEU. The details of the larger vessels were obtained for the largest currently in operation. A report published by Man B&W (2005) indicates that larger post-Panamax or Suezmax vessels might have propulsion power demands some 20% greater than these existing vessels. However, full details of these proposed vessels are not yet available. The full table of data used is given in Accompanying Document 3.

5. The emissions from shipping were calculated following the methodology presented in a report by ICF Consulting (2003) "Best Practices in Preparing Port Emission Inventories", which was developed for the US EPA. Details are given in Accompanying Document 3. Future emissions of SO_2 were assumed to reduce in line with European Directive 2005/33/EC, which requires that marine fuels with a sulphur content of greater than 1.5% will not be used by shipping in the North Sea after 11 August 2007. In addition, ships at berth will not use marine fuels with a sulphur content exceeding 0.1% by mass after 2010. Information regarding tugs operating on the Tees was obtained from Svitzer Marine (*pers comm*. 2005) and their emissions were included in the study.

6. Construction emissions were assessed in 2007 and 2009. The 2007 scenario (B07C) included both construction plant and capital dredging emissions in addition to the current operation of the port. The 2009 scenario (P1C) included Phase 1 of the development and construction plant. Capital dredging was assumed to have been completed before Phase 1 became operational.

7. There will be additional road vehicles associated with the construction phase, and these movements have been included in emissions from the site itself. The construction vehicles have not been considered off-site because the number involved is considered to be negligible in comparison to the existing traffic and that generated by the operational development. The effect of operational traffic on air quality is considered below (Section 20.3).

Table 20.4 Modelling scenarios

Scenario	Year	Description
B07C	2007	Existing activities plus construction
P1C	2010	Phase 1 plus construction

Sensitivity study

8. Meteorological conditions affect the dispersion of pollution, resulting in differences in the annual mean concentration of pollutants up around 30% (TG(03)). To investigate this sensitivity, model calculations were performed for 2005 baseline (B07) conditions with meteorological data for the period 2000-2004. It was found that 2001 data resulted in the greatest concentrations. This data was used in subsequent scenario modelling to ensure that worst-case impacts were calculated.

9. The sensitivity of the model to alternative ozone data was also considered. Data from Middlesbrough and Redcar monitoring sites were obtained from NAQIA and the B07 scenario was again used to investigate the effect of alternative ozone data. The concentration of NO_2 was found to be relatively insensitive to the concentration of ozone. The exceptions to this are peak concentrations close to a source of NO_x. Data from Redcar were found to represent a worst-case, as ozone concentrations were generally higher, and were used for all further scenario modelling.

Results

10. The maximum impact, in terms of annual mean NO_2, is 0.2μg.m^{-3} for the construction of Phase 1 and 0.3μg.m^{-3} for the construction of Phase 2. In comparison to the national air quality objective of 40μg.m^{-3}, these impacts are all considered to be of **minor adverse significance**.

11. The maximum impact, in terms of the 99.8th percentile of hourly mean concentrations of nitrogen dioxide, is 5.8μg.m^{-3} for construction in 2007 and 7.7μg.m^{-3} for Phase 1 plus construction. In comparison to the national air quality objective of 200μg.m^{-3}, these impacts are considered to be of **minor adverse significance**.

12. The maximum impact, in terms of annual mean PM_{10}, is 0.2μg.m^{-3} for construction in 2007 and 0.2μg.m^{-3} for Phase 1 plus construction. In comparison to the national air quality objective of 40μg.m^{-3} and the provisional national air quality objective of 20μg.m^{-3}, these impacts are considered to be of **negligible significance**.

13. The maximum impact, in terms of the 90.4th percentile of hourly mean concentrations of PM_{10}, is 0.4μg.m^{-3} for construction in 2007 and 0.4μg.m^{-3} for Phase 1 plus construction. In comparison to the national air quality objective of 50μg.m^{-3}, these impacts are considered to be of **negligible significance**.

14. The maximum impact, in terms of the 98.1th percentile of daily mean concentrations of PM_{10}, is $0.8\mu g.m^{-3}$ for construction in 2007 and $0.8\mu g.m^{-3}$ for Phase 1 plus construction. In comparison to the provisional national air quality objective of $50\mu g.m^{-3}$, these impacts are considered to be of **negligible significance**.

15. The maximum baseline concentration in terms of the 99.2th percentile of daily mean concentrations of sulphur dioxide is predicted to decrease from 9 to $3\mu g.m^{-3}$ over the period 2007-2014 as a result of more stringent controls on sulphur in marine fuels. The greatest concentrations are seen during the Phase 1 plus construction scenario at receptors close to the site. The greatest concentration is calculated to be $10\mu g.m^{-3}$, which is an increase of $3\mu g.m^{-3}$ on the 2010 baseline. However, this represents only a $1\mu g.m^{-3}$ increase on calculated existing peak daily average concentrations. In comparison to the national air quality objective of $350\mu g.m^{-3}$, these impacts are all considered to be of **negligible significance**.

16. During the construction of Phase 1 the maximum impact in terms of 99.7th percentile of hourly mean concentrations of sulphur dioxide is predicted to be $3\mu g.m^{-3}$, and during the construction of Phase 2 the maximum impact is predicted to be $12\mu g.m^{-3}$. In the context of the national air quality objective of $125\mu g.m^{-3}$, the impact of the construction of Phase 2 is considered to be of **moderate adverse significance**, although it should be recognised that the impact is short term.

17. The maximum 8-hour running mean CO concentration is $0.022mg.m^{-3}$ for construction in 2005 and $0.020mg.m^{-3}$ for Phase 1 plus construction. In comparison to the national air quality objective of $8mg.m^{-3}$, these impacts are considered to be of **negligible significance**.

18. The Critical Load for the annual deposition of nitrogen at each ecological receptor is in the range $10\text{-}15kg.Ha^{-1}$. The locations of all ecological receptors are shown in Accompanying Document 3. Although this is exceeded at most receptors for the baseline case, the maximum impact during construction is only $0.02kg.Ha^{-1}$; this is considered to be of **negligible significance**.

19. The Critical Loads for annual acid deposition are in the range $1.5\text{-}4.0keq.Ha^{-1}$ and current deposition rates are in the range $1.45\text{-}2.0keq.Ha^{-1}$. The Critical Load is estimated, using Air Pollution Information System (APIS) data, to be exceeded currently at some areas of Cowpen Marsh. However, the maximum impact of the development, calculated for the Phase 1 plus construction scenario, is only $0.005keq.Ha^{-1}$; this is considered to be of **negligible significance.**

20. The introduction of vessels larger than those considered in this assessment would slightly increase the emissions. This would not lead to a significant change in the overall calculated impact and therefore would not affect the conclusions drawn.

Mitigation and residual impact

21. The assessment has considered the benefits associated with the introduction of low-sulphur marine fuels required under the EC Directive. In the long term, the provision of electrical power to berthed vessels, known as cold-ironing, would reduce emissions from the port.

22. In the short term, there are no practical measures that would significantly reduce emissions of air pollutants from the port and associated shipping.

20.3 Potential impacts during the operational phase

20.3.1 Emission of pollutants due to increased road, rail and shipping traffic

1. The new development will generate additional road traffic, including HGVs and vehicles belonging to workers accessing the site. Dwellings close to roads used by vehicles accessing the port will be affected by pollutants associated with exhaust emissions, particularly NO_2 and PM_{10}. Other pollutants, such as CO, benzene and volatile organic compounds are also emitted by road traffic, but in quantities that are considered unlikely to have a significant adverse impact on human health.

2. Emissions of NO_x, PM_{10}, SO_2 and CO will all result from shipping movements, berthed vessels, and diesel-powered cargo handling equipment, such as reach stackers. Diesel locomotives are sources of NO_2, PM_{10} and SO_2. It is estimated that the fully operational terminal will generate 10 freight trains per day. This is in addition to a current estimate of 19 freight trains per day, which is likely to increase by 2 per day by 2006/7. In addition, passenger services from Middlesbrough station total approximately 43 trains each way per day.

3. DEFRA technical guidance TG(03) states that locomotives "*emit nitrogen oxides, but there is no evidence to suggest that there is any risk of the 1-hour or annual mean objectives for nitrogen dioxide in 2005 being exceeded*" and that "*there is no evidence to suggest that there is any risk of the 24-hour or annual mean objectives* [for PM_{10}] *being exceeded in 2004 or 2010.*"

4. Furthermore, the guidance states that "*moving locomotives do not make a significant contribution to short-term concentrations*" of SO_2" TG(03) does state that "*exposure to stationary locomotives may be more significant, but only in terms of the 15-minute objective*" if members of the public are regularly exposed within 15m of the stationary locomotives. As no residential receptors were identified within 15m of the line, it is considered that rail emissions will not be significant in terms of the national air quality objectives.

Sensitive receptors

5. Receptors over a wide area might be affected by emissions associated with port activities and shipping. Only receptors close to busy roads are likely to be affected by road traffic emissions. Receptors that might experience the most

significant effects as a result of the additional road traffic were identified and assessed. All receptors considered for road traffic impacts have also been assessed with regard to shipping and port emissions in order to quantify the cumulative effect of all relevant pollution sources.

6. Sites that are considered sensitive because of their ecological importance can be affected by gaseous pollutants and by the deposition of those pollutants onto surfaces. Designated SSSIs, SPAs, Ramsar and NNR sites in the Tees Valley area have been identified and are shown in Accompanying Document 3.

7. The two main issues associated with pollutant deposition are eutrophication, which results from the deposition of reactive nitrogen, and acidification, which is caused by deposition of reactive nitrogen and sulphur species. Information and data on these issues can be obtained from the UK Air Pollution Information System (APIS), and some further information is given in Accompanying Document 3.

8. The effects of acidification and nitrogen deposition on ecologically sensitive sites have been assessed using the concept of critical loads (CLs). These are defined as:

"a quantitative estimate of exposure to one or more pollutants below which significant harmful effect on specified sensitive elements of the environment do not occur according to present knowledge"

9. The most significant habitats in the area are freshwater and saltmarsh, sand dunes, sand slacks, mudflats, and rocky foreshore. Saltmarshes and mudflats which are inundated at high tide are thought to be relatively insensitive to nitrogen deposition as they receive large nutrient loadings from river and tidal inputs. Similarly, areas with large bird populations will receive increased nitrogen through guano inputs which are likely to exceed those from anthropogenic sources.

10. Sand dunes could experience increased plant growth in species which are nitrogen limited and therefore result in accelerated succession. There is however considerable uncertainty in critical load estimates. Information from APIS indicates that coastal, rocky and wetland habitats are all relatively insensitive to acidification. There is some evidence, however, that acidification can affect bird populations through such routes as declining fish populations, declining calcium-rich material affecting eggshell formation and skeletal growth, and increased exposure to toxic metals, such as aluminium.

Assessment of effects of road traffic

11. The impacts of road traffic emissions were calculated using ADMS-Roads, a detailed dispersion model. The full details of the assessment are given in Supporting Document 3, and are summarised here. The pollutants emitted by road traffic that are most likely to have a significant adverse impact on human health are NO_2 and PM_{10}. Other pollutants, such as CO and benzene, are not

emitted in quantities that are likely to affect human health, and have not been considered further.

12. Traffic data, including Annual Average Daily Traffic (AADT) flows, speeds and the proportion of HGVs, were supplied by the traffic consultants Steer Davis Gleave and a diurnal traffic profile was applied.

13. The scenarios modelled included a baseline assessment for comparison with current monitoring data, and future scenarios for 2010 and 2014 with and without the development. The 2010 scenario with the development assumed that only Phase 1 would be operational and road freight was reduced accordingly. The scenario for 2014 assumed that the full Phase 2 development was operational (Table 20.5).

14. These scenarios assumed that 70% of goods travelling to and from the port would be transported by road, with the remainder transported by rail or ship. In order to consider the worst-case scenario of 100% transported by road (i.e. assuming no rail share or transhipment), two additional scenarios were considered to calculate the effect of this for Phase 1 and Phase 2 of the development.

Table 20.5 Road traffic modelling scenarios

Scenario	Year	Description
B05	2005	Existing Road Traffic
B10	2010	Do Minimum
B14	2014	Do Minimum
PI	2010	Phase 1 of Development
PII	2014	Phase 2 of Development
PI -100	2010	Phase 1 of Development with 100% throughout by road
PII-100	2014	Phase 2 of Development with 100% throughout by road

Oxides of Nitrogen (NO_x)

15. Without the development, the impact of road traffic on NO_x concentrations is calculated to be lower in 2010 and 2014 than in 2005 by approximately 29% and 43%, respectively. This is a result of more stringent emissions standards for new vehicles, which outweighs the effect of increased traffic flows. The maximum impact is less than 2μg.m^{-3} for both Phase 1 and Phase 2 and is experienced at Receptor 4. For the scenarios which consider 100% of goods to be transported by road, the maximum impact was less than 3μg.m^{-3} for both Phase 1 and Phase 2.

16. The impact in terms of health, however, must be considered in terms of the concentration of NO_2, the pollutant for which the AQO is expressed. The national objective was not predicted to be exceeded at any modelled location. Without the development, reductions in both background concentration and local road traffic emissions were predicted to result in concentrations of NO_2 in 2010 and 2014 that are 2-5μg.m^{-3} lower than those in 2005. Both Phase 1 and Phase 2 of the development are predicted to lead to increases in the concentration of

NO_2 of up to 0.5µg.m^{-3} at sensitive receptors. If all freight is transported by road, the maximum impacts increase to 0.6µg.m^{-3}. This impact is significantly less than the reduction predicted to occur over this period and is not likely to affect the achievement of the Air Quality Objective (AQO); it is considered to be of **minor adverse significance**.

Particulate Matter (PM_{10})

17. As for NO_x, the contribution of road traffic to PM_{10} was predicted to fall over the period 2005-2014 due to reductions in exhaust emissions, which outweigh the increase in traffic flows. The national objective was not predicted to be exceeded at any modelled location. Without the development, reductions in both background concentration and local road traffic emissions were predicted to result in concentrations of PM_{10} in 2010 and 2014 up to 0.5µg.m^{-3} lower than those in 2005. Both Phase 1 and Phase 2 of the development were predicted to lead to increases in the concentration of PM_{10} of less than 0.1µg.m^{-3} at sensitive receptors for both the 70% and 100% freight by road scenarios.

18. This impact is significantly less than the reduction predicted to occur over this period and it is not likely to affect the achievement of the national objective. In addition, road traffic was not predicted to cause the more stringent provisional objective of 20µg.m^{-3}, set for 2010, to be exceeded at any modelled receptor in any scenario considered.

19. The number of days with mean concentrations in excess of 50µg.m^{-3} is also predicted to decrease over the period 2005 to 2014. The national objective of 35 days and the provisional national objective of 7 days are predicted to be achieved and the effect of the development on this is negligible for both the 70% and 100% freight by road scenarios.

Port activity and shipping emissions assessment

20. This assessment followed that same methodology as used to assess the impact of the construction phase site and shipping emissions.

Modelling scenarios

21. The scenarios modelled included a baseline assessment for comparison with current monitoring data, and future scenarios for 2010 and 2014 with and without the development (Table 20.6). The 2010 scenario with the development assumed that only Phase 1 would be operational. The scenario for 2014 assumed that the full (i.e. Phase 1 and Phase 2) development was operational.

Table 20.6 Modelling scenarios

Scenario	Year	Description
B05	2005	Existing Activities
B10	2009	Existing Activities
B14	2013	Existing Activities
P1	2009	Phase 1 of development
P2	2013	Phase 2 of development

Results

22. The maximum impact, in terms of annual mean NO_2, is 0.2µg.m^{-3} for Phase 1 and 0.3µg.m^{-3} for Phase 2. In comparison to the national air quality objective of 40µg.m^{-3}, these impacts are all considered to be of **minor adverse significance**.

23. The maximum impact, in terms of the 99.8th percentile of hourly mean concentrations of nitrogen dioxide, is 4.0µg.m^{-3} for Phase 1 and 5.8 µg.m^{-3} for Phase 2. In comparison to the national air quality objective of 200µg.m^{-3}, these impacts are considered to be of **minor adverse significance**.

24. The maximum impact, in terms of annual mean PM_{10}, is 0.1µg.m^{-3} for Phase 1 and 0.1µg.m^{-3} for Phase 2. In comparison to the national air quality objective of 40µg.m^{-3} and the provisional national air quality objective of 20µg.m^{-3}, these impacts are considered to be of **negligible significance**.

25. The maximum impact, in terms of the 90.4th percentile of hourly mean concentrations of PM_{10}, is 0.2µg.m^{-3} for Phase 1 and 0.2µg.m^{-3} for Phase 2. In comparison to the national air quality objective of 50µg.m^{-3}, these impacts are considered to be of **negligible significance**.

26. The maximum impact, in terms of the 98.1th percentile of daily mean concentrations of PM_{10}, is 0.3µg.m^{-3} for Phase 1 and 0.5µg.m^{-3} for Phase 2. In comparison to the provisional national air quality objective of 50µg.m^{-3}, these impacts are considered to be of **negligible significance**.

27. The maximum 99.2th percentile of daily mean concentrations of sulphur dioxide is predicted to decrease from 9 to 3µg.m^{-3} over the period 2005-2014 as a result of more stringent controls on sulphur in marine fuels. For the fully operational development, the highest predicted 99.2th percentile of daily means is 4µg.m^{-3}, which is an increase of 1µg.m^{-3} on the predicted 2014 baseline. In comparison to the national air quality objective of 350µg.m^{-3}, these impacts are all considered to be of **negligible significance**.

28. The current maximum 99.7th percentile of hourly mean concentrations of sulphur dioxide is calculated to be 38µg.m^{-3}, but this baseline is predicted to decrease to 13µg.m^{-3} by 2014. Phase 2 of the development is predicted to lead to a maximum concentration of 16µg.m^{-3}, and the maximum impact of the development is predicted to be 4µg.m^{-3}. In the context of the national air quality objective of 125µg.m^{-3}, the impact of the operational development is considered to be of **negligible significance**.

29. The maximum 8-hour running mean for Phase 2 of the development is calculated to be 0.014 $mg.m^{-3}$, and the maximum impact is $0.009mg.m^{-3}$. In comparison to the national air quality objective of $8mg.m^{-3}$, these impacts are considered to be of **negligible significance**.

30. The Critical Load for the annual deposition of nitrogen at each ecological receptor is in the range $10\text{-}15kg.Ha^{-1}$. Although this is exceeded at most receptors for the baseline case, the maximum impact of the development is only $0.02kg.Ha^{-1}$; this is considered to be of **negligible significance**.

31. The Critical Loads for annual acid deposition are in the range $1.5\text{-}4.0keq.Ha^{-1}$ and current deposition rates are in the range $1.45\text{-}2.0keq.Ha^{-1}$. The Critical Load is estimated, using APIS data, to be exceeded currently at some areas of Cowpen Marsh. The maximum impact of the development is only $0.005keq.Ha^{-1}$ for Phase 1 and $0.003keq.Ha^{-1}$ for Phase 2; this is considered to be of **negligible significance**. The impact for Phase 2 is lower than that of Phase 1 because of the reduction in sulphur in marine fuels required by 2014.

Mitigation and residual impact

32. Mitigation measures are not considered necessary; the residual impact would be of **minor adverse significance** at worst.

Cumulative impacts

33. As there are a number of potential sources of air pollution that have been assessed individually, the cumulative impact was also considered. This was only necessary for NO_2 and PM_{10} as other pollutants are not emitted in significant amounts by more than one source. The only receptors that needed to be considered were residential locations as they are likely to be affected by road, traffic, cargo handling equipment and shipping emissions. The ecological receptors under consideration are not located close to main roads so do not need to be considered here. As a worst-case, emissions from road traffic in 2007 were assumed to be equal to those in 2005. The road traffic emissions modelling assessment described above showed that pollution resulting from road traffic is likely to decrease significantly over the period 2005-2014. The background concentration of NO_2 was assumed to reduce in line with the predictions published by the NAQIA.

34. The national objective which is generally considered to be the most stringent is the annual mean objective of $40\mu g.m^{-3}$ for NO_2. The impacts in terms of this objective were, therefore, considered to investigate the cumulative impact of the development.

35. The cumulative annual mean concentration NO_2 at each residential receptor is given in Table 20.7 below; also shown is the cumulative impact of all emission sources associated with the development. The locations of sensitive receptors are given in Accompanying Document 3. The maximum concentrations were found at receptor R17, but these were still well below the national objective of

40µg.m^{-3} and impact of the development was predicted to be negligible here. The maximum impact was predicted to be experienced at receptor R4, but the impact was still less than 1µg.m^{-3} for both phases of the development. This is considered to be of **negligible significance**.

Table 20.7 Calculated cumulative total annual mean concentration of NO_2 (µg.m^{-3})

Receptor	Scenario					Impact	
	DM07	DM09	DM13	WD09	WD13	WD09	WD13
R1	23.5	23.5	21.5	23.6	21.5	0.0	0.1
R2	25.9	25.2	22.8	25.3	23.0	0.1	0.1
R3	21.2	21.9	20.2	22.0	20.3	0.1	0.2
R4	23.4	23.7	21.6	24.1	22.1	0.5	0.5
R5	22.3	22.7	20.9	22.8	20.9	0.1	0.1
R6	22.2	22.6	20.7	22.7	20.8	0.1	0.1
R7	22.6	22.8	21.0	23.1	21.2	0.2	0.3
R8	23.5	23.5	21.6	23.8	21.9	0.3	0.4
R9	22.7	22.9	21.0	23.1	21.3	0.3	0.3
R10	22.1	22.4	20.6	22.7	20.8	0.2	0.2
R11	22.8	23.0	21.0	23.2	21.4	0.3	0.3
R12	21.6	22.1	20.3	22.2	20.5	0.2	0.2
R13	21.6	22.0	20.2	22.2	20.4	0.1	0.1
R14	22.9	23.0	21.1	23.2	21.3	0.2	0.2
R15	243	24.0	21.9	24.3	22.2	0.3	0.3
R16	22.5	22.7	20.8	22.8	20.9	0.1	0.1
R17	28.3	27.7	25.0	27.7	25.0	0.0	0.0

Summary of predicted air quality impacts

Source	Pollutant	Duration	Adverse/Beneficial	Significance
Construction	NO_2	Short-term	Adverse	Negligible
	PM_{10}	Short-term	Adverse	Negligible
	SO_2	Short-term	Adverse	Moderate
	CO	Short-term	Adverse	Negligible
	Nitrogen Deposition	Short-term	Adverse	Negligible
	Acid Deposition	Short-term	Adverse	Negligible
Road Traffic	NO_2	Long-term	Adverse	Minor
	PM_{10}	Long-term	Adverse	Negligible
Cargo Handling Equipment & Shipping	NO_2	Long-term	Adverse	Minor
	PM_{10}	Long-term	Adverse	Negligible
	SO_2	Long-term	Adverse	Negligible
	CO	Long-term	Adverse	Negligible
	Nitrogen Deposition	Long-term	Adverse	Negligible
	Acid Deposition	Long-term	Adverse	Negligible

21 LANDSCAPE AND VISUAL SETTING

21.1 Existing environment

1. The landscape character of the Tees estuary and its immediate surroundings has been shaped by industrial development. The low lying areas surrounding the estuary, and large expanses of reclaimed land, support substantial industrial complexes; this is clearly illustrated in Figure 21.1. Movements within the estuary are generally limited to relatively slow moving cargo and pilot vessels. Flare stacks and chimneys are also a characteristic visual feature of the industrial elements of the estuary, particularly in the mid to lower Tees estuary.

Figure 21.1 Photograph showing the industrialised nature of the lower Tees estuary, looking seawards

2. In common with the surrounding area, the landscape in the immediate vicinity of the proposed development site is dominated by industrial and port-related activity. There are, however, areas of open land (including that area which comprises the development site itself), some of which has previously been reclaimed.

3. The site of proposed development is not covered by any specific landscape designations. South Gare is included within a Special Landscape Area (SLA) designated by the local planning authority mainly for its views of the sea and estuary. The proposed development site does not lie within an Area of Outstanding Natural Beauty (AONB).

4. The Tees Community Forest is located in the non-industrial areas of Billingham and Middlesbrough and aims to create a wooded landscape for work, wildlife and recreation.

5. The Tees Lowland Character Area (a non-statutory designation made by the Countryside Agency) acknowledges the contrast of the quiet rural areas with extensive urban and industrial development concentrated along the lower reaches of the Tees, the estuary and coastline.

21.2 Potential impacts during the construction phase

21.2.1 Potential impact on the visual character of the area due to the presence of construction plant

1. The construction phase of the proposed development will impact on the visual setting of the area with the temporary presence of construction plant on land, dredgers and pipelines and associated lighting during night-time working. However, the location of the proposed development in the estuary is such that there are very few visual receptors that would be affected (for example, there are no residential areas that overlook the site of the proposed development) and the construction works are temporary. The construction site is currently characterised by port-related and other industrial activity and the nature of the works would not be out of keeping with the existing activities in the areas.

2. As a result of the above, the visual impact during the construction phase is considered to be of **negligible significance**.

Mitigation and residual impact

3. Given the nature of the existing environment, no specific mitigation measures are required and the residual impact is predicted to be of **negligible significance**.

21.3 Potential impacts during the operational phase

21.3.1 Effect of the proposed development on landscape character

1. The nature of the proposed development (i.e. port-related activity) is in keeping with the current industrial landscape character of the area in the vicinity of the development site and as such the development will not introduce a new element to the landscape character. The photomontage included in Figure 21.2 provides an illustration of the main components of the scheme from the air.

Figure 21.2 Photomontage of the proposed container terminal

2. The most significant aspect of the proposed development in terms of impact will be ship-to-shore cranes on the quayside and lighting that will be required for the proposed development. These features of the proposed development would be expected to be visible from surrounding areas but are not considered to be incompatible with the existing landscape character. In addition, the lighting for the proposed development has been designed to ensure that sky glow, light spill, glare and general light pollution will be minimised as far as possible (see Section 3.1).

3. Given that the proposed development site is not within an AONB or other site designated for landscape character, there is no potential for a direct effect on such designations. Similarly, given the developed, industrialised nature of the mid to lower Tees estuary, and specifically the proposed development site, the proposed development would not cause a change in character of the area and there are no significant residential areas in proximity to the proposed development.

4. Overall, it is concluded that the proposed development would result in **no impact** on the existing landscape character of the area. This conclusion is supported by comments received from the Countryside Agency on the Environmental Scoping Report (Royal Haskoning, 2005).

Mitigation and residual impact

5. No mitigation measures are required and there would be **no residual impact**.

22 COASTAL PROTECTION AND FLOOD DEFENCE

1. This section considers the direct and indirect impacts on flood and coastal defences resulting from the construction and operational phases of the proposed development. This section is based on information presented in the Flood Risk Assessment (FRA) prepared for the proposed development in accordance with Planning Policy Guidance 25 (PPG25) (see Appendix 8) and the hydraulic and sediment transport studies undertaken as part of the EIA (Section 6 and Accompanying Document 1).

22.1 Existing environment

1. The majority of the proposed development site area is currently undeveloped land. Along the water front, however, there are some existing facilities that will be replaced: the Riverside Ro-Ro facility to the north, and the existing Teesport Container Terminal No.1 (TCT1) to the south. Between these two facilities is currently undeveloped brownfield land, with the redundant Shell Oil jetty located in the centre. Beyond the south-west boundary of the site is located Teesport Container Terminal No.2 (TCT2), along with other dock quays and facilities in the Tees Dock area.

2. Topographic survey data was provided by PD Teesport to supplement other existing plans of the site areas and surrounds. The topography of the proposed development site is shown in Appendix 8. Existing site levels are as follows:

- Current TCT1 quay and terminal at approximately +4.75mOD;
- Riverside Ro-Ro terminal at approx +6.50mOD (rising to +9.00mOD);
- Undeveloped land behind TCT1 and between TCT1 and the Riverside Ro-Ro, the proposed site area for the new terminal, typically at a level of between +5.0mOD and +6.5mOD;
- Undeveloped land behind the proposed container terminal, back to the proposed Asda warehouse, are typically +3.5mOD to +6.5mOD;
- Existing Tees Dock area and TCT2 quay to the south-west of the development site with quay levels at +4.55mOD and above along the full length.

3. Approximately 8.5ha of the total 55ha proposed development area will be reclaimed from the river Tees channel that is currently below mean high water. Existing sea bed levels along the proposed line of the new quay are:

- Ro-Ro berth area approximately 11.15m below CD (-14.00mOD);
- Shell Oil Jetty approximately 13.65m below CD (-16.50mOD);
- TCT1 approximately 7.50m below CD (-10.35mOD).

4. The present dredged approach channel in the Tees estuary is at a depth of 10.4m below CD (-13.25mOD) adjacent to the proposed development site, increasing to 14.1m below CD (-16.95mOD) to the North Gare and South Gare breakwaters and 15.4m below CD (-18.25mOD) beyond the breakwaters.

5. The proposed development area is identified as being partially located within the Environment Agency's current Flood Zone (Zone 3). In this respect the designation as tidal floodplain means that the area has been assessed as

having 0.5% (1 in 200 year), or greater annual probability of tidal flooding. The present flood zone outlines for Flood Zones 2 and 3 in the vicinity of the proposed development site are shown in Appendix 8.

6. Recent work by the EA has been completed for the Tees Tidal Flood Risk Management Strategy. The study is being undertaken to define the existing flood risk for areas along the Tees Estuary up to the Tees Barrage. The Scoping Report for the strategy study (Royal Haskoning 2005) does not identify the proposed development site area as a flood cell, which highlights that the site is potentially not affected by the 0.5% probability (1 in 200 year) water level, including allowance for sea level.

22.2 Potential impacts during the construction phase

22.2.1 Potential effect on the integrity of flood defences during the construction works

1. The construction works do not have the potential to directly impact on any flood defences as no defences will be removed or altered during the construction phase. As such, **no impact** is predicted.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact.**

22.3 Potential impacts during the operational phase

22.3.1 Potential for effect on risk of tidal flooding at, and immediately adjacent to, the proposed development site

1. The principal source of flood risk to the development is due to extreme tide levels. A range of the return period tidal levels at the location of the proposed new terminal are presented in Table 22.1 below. Values in the year 2056 allow for projected sea level rise over the next 50 years at 4mm/year, in accordance with DEFRA/Environment Agency guidelines for the North East Region. The tide levels indicated in Table 22.1 are based on predictions for the Tees Entrance from the following documents:

- 2005 Admiralty Tide Tables data for UK and Ireland;
- Correspondence from the EA, Planning Liaison in response to the Environmental Scoping Report, dated 1 August 2005 (see Appendix 8);
- EA Scoping Report for the Tees Tidal Flood Risk Management Strategy (EA, 2005).

Table 22.1 Predicted extreme tide levels at the proposed development site (without development)

Condition	Tide Level, mOD (*mCD*)	
	2006	**2056**
Mean Sea Level	+0.35 (+*3.20*)	0.55 (+*3.40*)
Mean High Water Springs	+2.65 (+*5.50*)	2.85 (+*5.70*)
Highest Astronomical Tide	+3.25 (+*6.10*)	3.45 (+*6.30*)
100	4.06 (+*6.91*)	4.26 (+*7.11*)
200	4.19 (+*7.04*)	**4.39** (+*7.24*)
1000	4.39 (+*7.24*)	4.59 (+*7.44*)

2. The EA, in line with Defra/PPG25 guidance, require that flood risk from tidal flooding is assessed for at least the 200-year return period event (0.5% probability). Assessment should also include for the effects of climate change on rising sea levels, at +200mm over the next 50 years (4mm/year). The overall 200-year return period water level, including for sea level rise, to be considered is +4.39mOD, shown highlighted in Table 22.1.

3. The new proposed quay level and container terminal site will be at or greater than +6.15mOD. This presents a freeboard allowance at the proposed new quay of +1.76m above the required extreme water levels.

4. Other development site levels behind the quay are currently in excess of +5.0mOD. This is + 0.61m above the 200-year water level, including for sea level rise. To the north the proposed site is provided with additional protection from flooding via the Dabholm Gut by the proposed new rail line terminal. This is to be raised to a level in excess of +6.50mOD, giving a freeboard of +2.11m above the required (200-year) extreme water level, including for sea level rise.

5. To the south, the existing TCT2 terminal and other quays around the north side of Tees Dock area are above +4.55mOD. This is above the extreme 200-year water level, including allowance for sea level rise, but only provides +0.16m of freeboard allowance. Existing site levels of the proposed development are currently above +5.00mOD however, and for the terminal itself will be further raised to +6.15mOD, so any potential outflanking of tidal flows from this direction will not affect the proposed development.

6. Given the above, it is concluded that the proposed development will result in an increased standard of flood defence at the proposed development site itself, representing a potential impact of **moderate beneficial significance**. The presence of the proposed development would not give rise to an adverse effect in terms of changes to existing risk of flooding to immediately adjacent areas to the north and south of the proposed development.

Mitigation and residual impact

7. No mitigation measures are required and the residual impact would be of **moderate beneficial significance.** No adverse residual impact would arise for areas immediately adjacent to the proposed development to the north and south.

22.3.2 Potential for effect on risk of tidal flooding elsewhere in the estuary system

1. The predicted effect of the proposed development on flows and water levels has been assessed as part of the hydraulic modelling studies (Section 6 and Appendix 8). The results indicate a very small effect on high water levels of up to +2mm near the Tees Barrage, and less than +4mm overall increase on the tidal range. For the mean spring tidal range of 4.6m this represents less than a 0.1% effect on the total tidal range. A lower magnitude of effect on tidal range is predicted in the region of the estuary adjacent to the proposed development, with no effect on water levels predicted in the lower estuary.

2. In summary, it can be concluded that the predicted impact of the development on tidal water levels throughout the estuary is of low magnitude. The important result with respect to potential for tidal flooding is the predicted change in the level of high water on spring tides; the maximum predicted change is up to 2mm increase in the level of high water at the Tees Barrage. Such predicted effects are considered to be of **negligible significance** and would not affect the integrity of any flood defences at this location or throughout the estuary system.

Mitigation and residual impact

3. No mitigation measures are required and the residual impact would be of **negligible significance**.

22.3.3 Consideration of the effect of fluvial flows on flood risk throughout the estuary

1. Given the location of the proposed development site close to the mouth of the Tees estuary, flows are tidally dominated and flood risk from extreme water levels at the site is principally dictated by the surge tides. The EA have stated that they do not consider the impact of fluvial flows at this location to be an issue, and results from HR Wallingford's modelling assessment corroborate this view. Water levels are only very marginally affected by the input of river flows and show a similar negligible effect on water levels with the proposed development arrangement as the tidal only case (see Section 22.3.2).

2. Fluvial flows are regulated by the Tees Barrage which is operated to maintain upstream water levels and prevent the upstream penetration of saline water. Flows downstream of the barrage are, therefore, not continuous and are unlike natural river flows.

3. HR Wallingford undertook the hydraulic studies by including a constant river flow input into their hydrodynamic tidal model in combination with mean spring and neap tidal variations. A river flow input of 60 cumecs was included at the upstream extent of the model, at the Tees Barrage.

4. Including the river flow input of 60 cumecs to the model has no effect on the maximum water levels adjacent to the proposed new quay. The inclusion of the river input with the proposed development produces a very small effect on resulting water levels at the proposed quay. Resulting water levels at the Barrage show a slight increase with the inclusion of the river flow input compared with the tidal water level case (3mm as opposed to 2mm).

5. Given the above, it is considered that the incorporation of fluvial flows into the assessment of flood risk does not change the conclusions drawn above in Section 22.3.2 and, therefore, the effect remains of **negligible significance** on flood risk throughout the estuary system.

Mitigation and residual impact

6. No mitigation measures are required and the residual impact would be of **negligible significance**.

22.3.4 Potential effect on frequency of overtopping

1. The potential for increased overtopping frequency has been informed by the studies into the effects of the proposed development on the wave climate throughout the estuary system (see Section 6). The modelling predicted the effects of the proposed development on both swell waves and wind-generated waves.

2. The changes in alignment and reflective properties of the new proposed quay structure do increase the wind-generated wave effects towards the mouth of the Tees estuary; however, increases are small (less than 10cm) and dissipate across the Tees estuary.

3. The maximum locally generated wind waves adjacent to the quay are estimated from the northerly winds. Results from a northerly 20m/s wind produce generated waves at the quay of up to 0.70m, with an estimated exceedance of 0.4%. Assessment of the potential for overtopping of both types of quay wall has shown that such an extreme event would produce a low degree of overtopping. In combination with the high 200-year surge water level, including sea level rise, the 0.70m wave produces a predicted overtopping rate of approximately 6 l/s/m (litres per second per metre) length for a 1 in 3 constructed rock armour slope. Even if a steeper 1 in 2 slope construction was employed, the potential overtopping rate increases to only approximately 14 l/s/m length. . Due to the proposed construction of a suspended deck over the rock armour slope, splash flooding from even this extreme event would mostly be prevented. The suspended deck would absorb and deflect the waves rather than allowing overtopping on to the terminal. A vertical quay wall construction presents an improved situation and results in only nominal overtopping (<0.1 l/s/m length) for extreme 0.7m wave in combination with the 200-year water level.

4. Swell entering the estuary is limited in direction by the North Gare and South Gare Breakwaters. Although not reaching through to the new terminal location, approaching swell waves are affected by the deepened approach channel. Results taken adjacent to the quay indicate no change in wave height for even the 50-year offshore conditions.

5. The wave modelling results show that deepening of the approach channel does increase significant wave height in the quay area of ConocoPhillips Dock adjacent to the ConocoPhillips Oil Terminal, during extreme events. For the 50-year return period, wave conditions are increased by a maximum of 0.5m, and for the 1-year return period event conditions a maximum increase of 0.3m is obtained. These results, however, are based on modelling of the actual (i.e. shallower) depth (as opposed to currently declared depth) and so the results overestimate the effect of the proposed deepening of the declared depth from 14.1m to 14.5m below CD by up to 50%.

6. The top of the embankment at the ConocoPhillips Oil Terminal is at +5.50mOD, with the loading arm deck at +6.00mOD and a suspended roadway between at +8.00mOD. The slag embankment has a slope of 1 in 4.

7. Assessment of the potential for waves overtopping the embankment at the oil terminal was undertaken. Generally the results show that the scheme produces approximately a two-fold increase on the existing rates of wave overtopping at the ConocoPhillips Oil Terminal. Again, it should be reiterated that the effects of dredging the channel to the present declared depth account for approximately half of this impact.

8. In addition, the 50-year swell wave results show that there is some small increase of wave heights along the Tees Estuary. At the Corus Steel quay, just to the north of the proposed development site, the figure indicates an increase of up to 0.1m, with the 50-year swell producing a wave height of 0.4m with the scheme in place.

9. The quay at the Corus Steel site is at 5.5mOD, and is a vertical quay face construction. Assessment showed that no overtopping will occur with the 50-year swell conditions in combination with the 200-year water level.

10. Other than the locations mentioned above, the proposed scheme is predicted to have no impact on the frequency of overtopping of any seawalls or flood defences structures in the Tees estuary.

11. It is concluded, therefore, that there is an increased risk of wave overtopping in the ConocoPhillips Oil Terminal/ConocoPhillips Dock area, particularly under extreme swell conditions. When compared with the conditions that would prevail at this location under extreme events at the present time, the effects of the capital dredging represent a minor change. Overall, a potential impact of **minor adverse significance** is predicted.

12. No adverse effect is predicted at any other flood defence structures throughout the estuary.

Mitigation and residual impact

13. This potential impact is not possible to mitigate and a residual impact of **minor adverse significance** would arise.

23 INFRASTRUCTURE AND LAND DRAINAGE

23.1 Existing environment

1. The Tees estuary is bordered by industrial developments which include chemical, petrochemical and steel works, sites of former industry and open areas of ground originally for industrial use. There is a concentration of oil-related industry near the river mouth including major petrochemical works. There is a large titanium pigment plant south of Seaton Carew, on the northern side of Teesmouth, and large petrochemical works and an oil refinery owned by Petroplus. A second oil and chemicals processing plant is located next to Teesport on the south side of the estuary, adjacent to the major Corus Steel Works at Bran Sands (which has its own jetty for importing iron ore and coal). Hartlepool nuclear power station, operated by British Energy, is located on the east side of Seaton Channel. Further up the Tees estuary, there is a former ICI agrochemical plant at Billingham which was a sister to the former ICI chemical plant at Wilton now owned by Sembcorp. On the south shore, there are several ship repair yards and the large modern port facilities at Tees Dock.

2. Infrastructure in the immediate vicinity of the proposed development includes Dabholm Gut; a partly culverted, partly canalised channel 30m wide and 1.35km long which runs approximately north-south immediately to the east of Teesport estate. Dabholm Gut fills during the flooding tide and has historically received untreated domestic sewage and industrial effluents. Either side of the proposed development site, overhead cables and pipe tunnels cross the estuary.

3. There are a number of abstractions located within the area potentially influenced by the development. There are two surface water abstractions located within the vicinity of the proposed development. The first is located in Tees Dock (NZ 546 235) and is held by Tees Bulk Handling Ltd. The second is located within the channel (NZ 547 259) and is held by Corus UK Ltd. A third abstraction license located outside of the immediate vicinity of the development is held by Hartlepool nuclear power station. The power station is licensed to abstract $35.5m^3/s$ of surface water from Seaton channel for cooling water.

4. The foreshore in the vicinity of the proposed development is backed by extensive quays, jetties and wharves. The other main feature of the infrastructure in the estuary is flood and coastal defences; these are described in Section 22.

5. Water level management plans (WLMP) are in place at a number of locations throughout the Tees estuary. These management plans facilitate the evaluation and integration of water level requirements for a variety of land uses including agriculture, conservation and flood defence. At Teesmouth sites with WLMPs include Seaton Common, Greatham Creek, Nuclear Electric and Cowpen Marsh.

6. Five major tributaries flow into the Tees estuary, namely Old River Tees, Lustram Beck, Ormesby, Billingham Beck and Greatham Creek.

23.2 Potential impacts during the construction phase

23.2.1 Potential impact on tunnels, pipelines and other infrastructure due to the construction works

1. The capital dredging, terminal construction and disposal of dredged material to land have the potential to directly impact on various infrastructure (as described in Section 23.1) within the vicinity of the works. Flood and coastal defences are excluded from this assessment as this is addressed in Section 22.

2. With respect to the capital dredging, the potential direct effect of the construction phase is limited to impacts on pipelines and cables that cross the Tees estuary. There are several groups of cables, pipelines and tunnels that cross the estuary. The first is located outside of the footprint of the capital dredging (upstream). Since these pipelines are not within the footprint of the capital dredging, no impact is predicted.

3. The second group (pipelines) crosses the estuary in the Dabholm Gut area. These are outside of the footprint of the proposed quay wall and reclamation (the terminal was designed to avoid this infrastructure). The capital dredging for the berthing pocket and approach channel would, however, pass over these pipelines. The pipelines are located at a minimum depth of 22.45m below CD beneath the dredged footprint and the maximum depth of dredging is 16m below CD for the berthing pocket. Additionally, piles for the quay construction at the downstream end of the quay will be socketed into bored holes in the rock to avoid vibration during installation.

4. In addition to the above pipelines there is a set of BOC pipes that cross the estuary just upstream of the radar tower adjacent to Dabholm Gut. These pipelines are at approximately 53m below CD in the centre of the estuary and are, therefore, too deep to be affected by capital dredging.

5. Given the above, **no impact** is expected to arise on pipelines, cables and tunnels crossing the estuary as a consequence of the terminal construction and capital dredging.

Mitigation and residual impact

6. Other than the avoidance of vibration during piling at the downstream end of the quay wall, there are no further mitigation measures that can be taken therefore the residual impact would remains at **no impact**.

23.2.2 Potential impact on abstractions due to the construction works

1. For the Hartlepool power station, the main concern relates to increases in concentrations of gross solids around the area of the intake. Fines are not considered to be an issue due to the high velocity of the intake flow through the plant and therefore minimal risk associated with settlement. There is however the potential for gross solids to block screens and, therefore, interrupt the process (British Energy, *pers. comm*). Since the dredging is to occur some distance from the intake location in Seaton Channel, gross solids will have

settled out of suspension in the immediate vicinity of the dredger. **No impact** on the abstraction is therefore predicted.

2. In the vicinity of the Corus abstraction, suspended solid concentrations are not predicted to increase above background concentrations by more than 25mg/l. Again, gross solids will have settled out of suspension within the vicinity of the dredger. **No impact** is predicted.

3. Given the above, **no impact** is predicted on abstractions as a result of the proposed scheme.

Mitigation and residual impact

4. No mitigation is required and there would be **no residual impact**.

23.2.3 <u>Potential impact on Dabholm Gut and other discharges due to the construction works</u>

1. In addition to Dabholm Gut, there are also a number of discharges consented by the Environment Agency in the location of the development. No aspect of the construction works will have an effect of the operation of Dabholm Gut and no run-off from the reclamation area will discharged to Dabholm Gut. There are currently two consented discharges which relate to the existing Ro-Ro facility. These will obviously become redundant as a consequence of the construction phase.

2. Other than the two discharges related to the Ro-Ro facility, **no impact** is predicted. The potential impact on the Ro-Ro facility discharges is not considered to represent an adverse effect given that the discharges will not be required due to the relocation of the Ro-Ro facility.

Mitigation and residual impact

3. No mitigation is required and **no residual impact** is predicted.

23.2.4 <u>Implications of construction in the vicinity of a hazardous installation</u>

1. The Health and Safety Executive (HSE) has advised that the proposed development is within the Consultation Distance (CD) of a major hazard installation (pipeline) which runs parallel to Dabholm Gut.

2. The presence of the CD has potential implications for the design of the layout of the proposed terminal in that there may be restrictions on the type of development that is allowable within the CD. Discussions with the HSE indicate that restrictions relate to the number of occupants within a building and the number of floors occupied; buildings with less than 100 occupants and less than three floors are unlikely to be problematic as they are likely to be able to be evacuated effectively in the event of an emergency.

3. With respect to the proposed terminal, a number of buildings are proposed, some of which would lie within the CD. However, none of these buildings would

have over two floors and all would have less than 100 occupants. As a consequence, it is concluded that there would be **no concern** with respect to the proposed layout of the terminal in the context of the CD.

Mitigation and residual impact

4. PD Teesport has evacuation plans for all buildings including marked evacuation routes. This would also apply to the proposed terminal. It is concluded that there is **no residual concern** with respect to this issue.

23.3 Potential impacts during the operational phase

23.3.1 Potential impact on infrastructure due to maintenance dredging

1. The hydraulic and sedimentary studies indicate that there is no requirement to change the current maintenance dredging strategy and, therefore, **no impact** is predicted on infrastructure as a result of the proposed development.

Mitigation and residual impact

2. No mitigation measures are required and there would be **no residual impact.**

23.3.2 Potential impact on outfalls and abstractions

1. Outfalls and abstractions have the potential to be impacted as a consequence of changes to the flow regime and sediment transport pathways. The potential effects of the proposed development on these aspects are described in Section 6.

2. The most significant abstraction that has the potential to be affected by the proposed development is the intake for the Hartlepool power station, which extracts water from the Seaton Channel. Assuming that the intake flow is the same following the proposed channel dredging as at present, the prediction of no changes in the hydraulic regime in the Seaton Channel as a consequence of the proposed development is unchanged.

3. Since there is no requirement to change the existing maintenance dredging strategy, **no impact** relating to increases in gross solids or fines, is predicted to occur on these abstraction licences

Mitigation and residual impact

4. No mitigation measures are required and there would be **no residual impact**.

23.3.3 Effect on the dispersion of the Dabholm Gut outfall

1. The effect of the proposed development on the dispersion of the Dabholm Gut outflow has been specifically modelled as part of the EIA. This impact is addressed in Section 9.3.

23.3.4 Effect on surface water drainage as a consequence of the proposed development

1. Given the location of the proposed development (i.e. close to the discharge of the Tees into the North Sea) the Environment Agency confirmed during discussions on the Flood Risk Assessment that there are no concerns for the limiting of surface run-off flows from the site and do not have any special requirements for surface drainage attenuation. All existing and proposed surface water drainage will be directed through the quay wall directly into the estuary.

2. There is likely to be a short period at the peak of extreme tides, when storm water may not be able to discharge. The excess surface water would be stored within the drainage network and the higher ground levels would mean that storm flows should be discharged before localised pavement flooding occurs. The drainage network itself would be designed appropriately to accommodate this.

3. The construction of the terminal and the raising of any site areas will not compromise the existing drainage from other areas surrounding the development. Existing drainage systems from the car import terminal, Asda warehouse and Albemarle buildings to the south, and other areas, will not be affected by the development. The undeveloped land behind the new terminal will remain unchanged, and the existing localised flooding at low points in this area will continue. The development does not block surface drainage paths to the estuary or Dabholm Gut. Access by construction traffic may alter the levels in some areas, affecting the nature or location of localised flooding in the undeveloped area, but the volume of surface flooding will remain unchanged.

4. Given the above, it is concluded that the proposed development will have **no impact** on the existing risk of flooding of other facilities in the vicinity of the proposed development.

Mitigation and residual impact

5. No mitigation measures are required and there would be **no residual impact.**

24 SOCIO-ECONOMIC CONTEXT

1. An assessment of the socio-economic impact of the proposed NGCT development has been undertaken by Steer Davies Gleave. This section provides an overview of the existing socio-economic state of the region and discusses issues such as population and labour force, skills, unemployment and the economic context.

24.1 Existing environment

24.1.1 Regional context

1. The North East is the smallest of England's nine administrative regions in terms of population and, with the exception of London, is the smallest geographically.

2. While progress in absolute levels of economic performance has been positive, the North East's level of economic performance in comparison with other UK and international regions has been poor. Over the last decade, the North East was one of the slowest growing regions of the United Kingdom, and levels of prosperity are now among the lowest in the country. This poor performance relative to the rest of the UK has manifested itself in lower rates of productivity, participation, skills, wages, investment and business start ups. There is significant geographic variation within the region in terms of economic activity, with concentrations of areas of severe deprivation, poor health, and high rates of unemployment and economic inactivity.

3. The North East is a net exporter of goods and services, with 58% of its total international trade made up of exports. A comparable figure for the UK as a whole is 44%. The North East accounts for 4% of the UK's exports and receiving 2.8% of the country's imports. The automotive, chemicals and pharmaceuticals industry contributes 70% of the exports of the North East and the chemicals industry is the most productive in the UK with a productivity index of 187 against the UK average of 100.

4. In general terms, however, the North East is in a weak position in terms of both of the key factors of gross value added (GVA) growth (productivity and participation). This is shown in Figure 24.1. The participation axis (employment rate) in this figure illustrates the extent of unemployment amongst adults. The productivity axis focuses specifically on GVA per job (i.e. the contribution to GVA of the average worker). It is important to note that the GVA of the average job will to a large extent be determined by three elements: efficiency, the value added of individual businesses (e.g. the quality of the product or service), and the mix of business activities in the region.

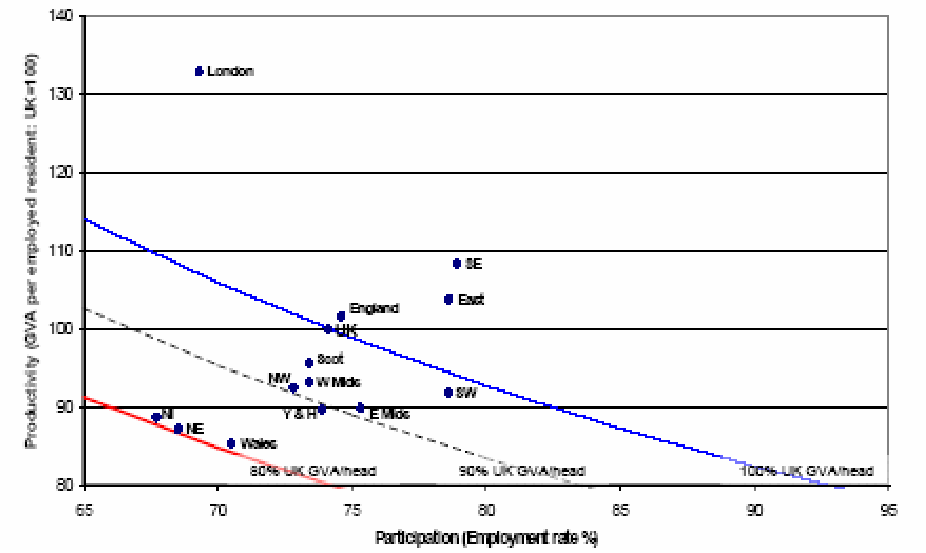

Figure 24.1 GVA per employed resident against working age employment rate (2003)

5. Figure 24.1 illustrates that the value added per employed resident in North East is lower than all regions in the UK with the exception of Wales. The participation rate itself is also lower than all regions with the exception of Northern Ireland. As illustrated by the coloured curves, the combination of these two factors suggests that the GVA per head of population in the North East is only around 80% of the UK average.

24.1.2 <u>Sub regional context</u>

1. The Tees Valley comprises five unitary authority areas: Hartlepool, Darlington, Stockton on Tees, Middlesbrough and Redcar and Cleveland. Figure 24.2 shows the location of the unitary authorities.

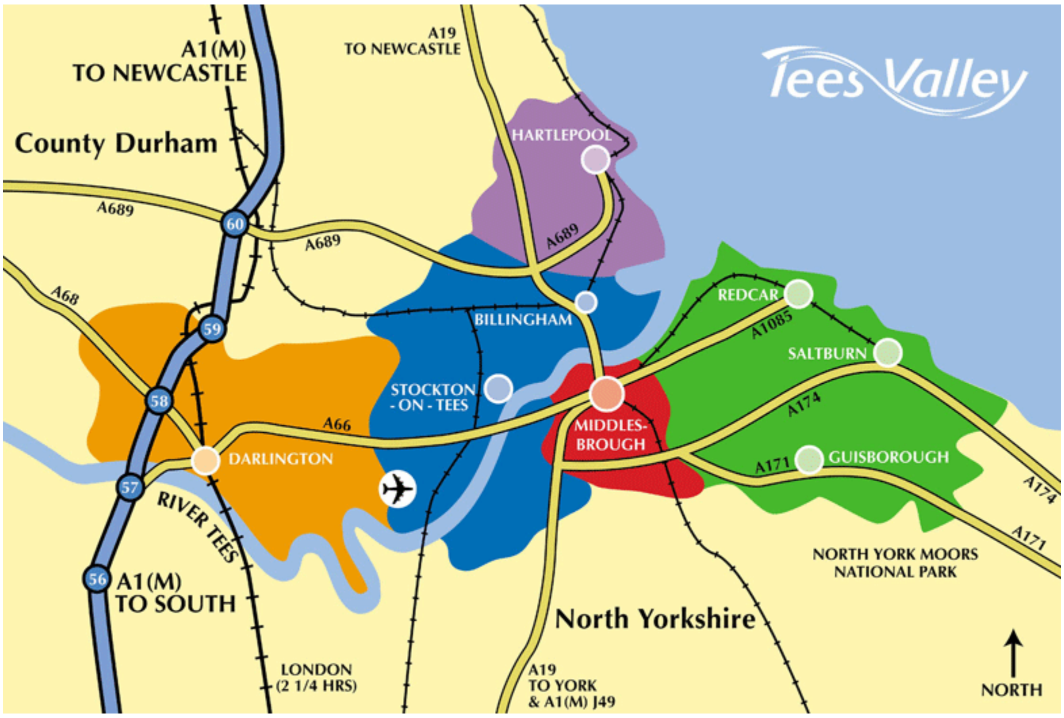

Figure 24.2 Tees Valley location plan (source: Tees Valley Partnership)

2. The Tees Valley city region has a population of approximately 875,000 people, almost half of whom live within the Teesside conurbation (Middlesbrough, Stockton and Redcar). There are a number of settlements across the area including the Teesside conurbation and the main towns of Darlington, Hartlepool and Sedgefield. However the sphere of influence extends from Peterlee in the north to Northallerton in the south and from Richmond in the west to Whitby in the east.

3. Statistical information in this section relates to the Tees Valley as defined by the five authorities of Darlington, Hartlepool, Middlesbrough, Redcar and Cleveland and Stockton on Tees.

4. The Tees Valley city region is located on two important north-south growth axes; the A1(M)/East Coast Main Line growth corridor and the A19 growth corridor which links Tees Valley with Tyne and Wear. A further important transportation link is the A66 connecting Teesport with the North West of England. This latter route forms an important growth corridor within the city region, which connects the two north south axes and gives ready access to both the port and the airport.

5. Tees Valley has a greater dependency on manufacturing and primary industries than the national economy; this is demonstrated in Figure 24.3.

	Tees Valley	North East	Great Britain
Primary Industries	5,000 (1.86%)	15,900 (1.6%)	398,800 (1.6%)
Manufacturing	39,200 (14.6%)	146,900 (14.5%)	3,236,400 (12.6%)
Construction	16,700 (6.2%)	53,400 (5.3%)	1,139,600 (4.4%)
Service Industries	207,400 (77.3%)	795,900 (78.6%)	20,941,400 (81.4%)
Includes :			
Distribution, hotels etc	*60,200 (22.4%)*	*225,800 (22.3%)*	*6,345,800 (24.6%)*
Transport & comms	*15,000 (5.6%)*	*51,200 (5.1%)*	*1,540,700 (6.0%)*
Banking, finance etc	*40,300 (15.0%)*	*142,900 (14.1%)*	*5,086,200 (19.8%)*
Public admin	*78,400 (29.2%)*	*319,700 (31.8%)*	*6,642,200 (25.8%)*
Other services	*13,600 (5.1%)*	*56,300 (5.6%)*	*1,326,500 (5.2%)*
Total	**268,300**	**1,012,100**	**25,716,200**

Source : Annual Business Inquiry (NOMIS)

Figure 24.3 Employment by industry in the Tees Valley, North East and Great Britain (2003)

6. Figure 24.3 also shows that the Tees Valley share in banking and financial services employment is 25% lower than the national average, whilst public administration is approximately 13% above the national average.

7. The GVA per head in the Tees Valley in 2002 was £11,777 compared to the UK figure of £15,614 (www.teesvalleypartnership.co.uk). As Figure 24.4 shows, this gap is growing.

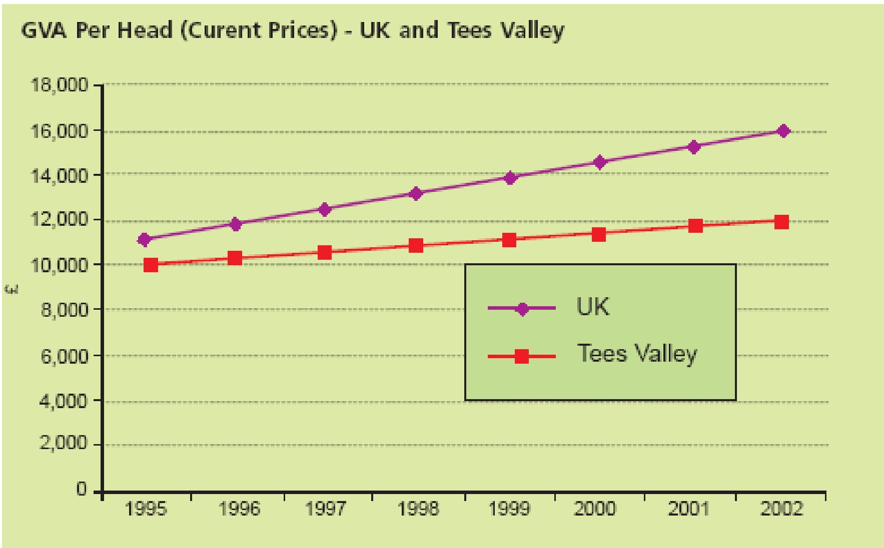

Figure 24.4 GVA per head (UK and Tees Valley)

8. The primary cause of the widening gap in GVA has been the decline in manufacturing employment in the Tees Valley. Almost 90,000 jobs were lost in manufacturing between 1971 and 2003, although these have been partly replaced by an increase in service employment of a smaller magnitude. There are, however, encouraging signs that the loss of manufacturing employment has been stabilised and the significant growth of services has added 15,000 new jobs to the economy in the period 2001 to 2003.

24.1.3 Population and labour force

Regional Population

1. The population of the region is gradually declining in size and ageing, with an increasing percentage of the workforce in the middle and upper working-age bands. Migration out of the region over the past 30 years represents a significant drain on the region's human resources and there has been a 4% drop in the total school population of the region compared with a 2% increase for England overall.

Tees Valley Population

2. Figure 24.5 presents the population trends for Tees Valley for the period 1981 to 2001, with projections forward to 2021. It is projected that the total population will continue to fall with the numbers of births projected to decrease and the number of deaths projected to increase slightly in the period 2016 to 2021. Net migration is projected to remain outwards.

	1981	1991	2001	2006	2011	2021
Darlington	98,700	99,400	97,900	99,800	100,300	99,300
Hartlepool	94,900	91,100	90,200	89,600	88,100	87,100
Middlesbrough	150,900	144,700	141,200	137,300	134,700	130,000
Redcar & Cleveland	151,000	145,900	139,200	137,200	134,800	131,900
Stockton-on-Tees	172,900	175,200	183,800	187,100	189,200	187,900
Tees Valley	668,500	656,200	652,200	651,000	647,000	636,200
North East	2,636,000	2,587,000	2,540,000	2,530,000	2,520,000	2,505,000
England & Wales	49,634,000	50,748,000	52,360,000	53,463,000	54,615,000	57,060,000

Source : TVJSU/ONS

Figure 24.5 Populations trends and forecasts

3. Overall, it is projected that these changes will lead to a 2.5% fall in population (2001 to 2021).

4. Over the period 1981 to 1991, the Tees Valley experienced an estimated net outward migration of 3,500 people per annum. Between 1991 and 2001, net migration losses fell to an average of 1,700 per annum and the net migration from mid 2001 to mid 2003 was close to zero. Hence the projections show a lower level of migration for the 2001 to 2006 period. However, it would be premature to assume that this level of migration will persist. It is projected by

the Tees Valley Joint Strategy Unit that the Tees Valley will experience net migration losses of around 1,300 per annum between 2003 and 2021.

5. It is important to note that these aggregate figures are made up of substantial flows into and out of the Tees Valley area (typically 65,000 to 75,000 each way, every five years). In addition, there are many more (about 250,000 every five years) who move within the Tees Valley, of whom 30,000 (every five years) move between districts within the Tees Valley (Tees Valley Joint Strategy Unit, 2005).

Employment

6. Figure 24.6 shows the number of jobs within each borough as well as how jobs within each of the boroughs are taken by residents of that borough (note that Tees Valley figures in italics are the sum of the boroughs, not figures for the Tees Valley as a whole). The number of jobs has increased significantly in Darlington and Stockton boroughs, but has fallen marginally in Middlesbrough and Redcar & Cleveland.

	1991					2001				
	Jobs	Resident in		Resident elsewhere		Jobs	Resident in		Resident elsewhere	
Darlington	39,830	29,270	73%	10560	27%	45,525	29,963	66%	15,562	34%
Hartlepool	30,280	23,420	77%	6860	23%	32,089	24,169	75%	7,920	25%
Middlesbrough	57,540	29,970	52%	27570	48%	57,428	29,115	51%	28,313	49%
Redcar & Cleveland	46,650	34,190	73%	12460	27%	45,656	32,550	71%	13,106	29%
Stockton-on-Tees	65,960	44,710	68%	21250	32%	76,308	49,342	65%	26,966	35%
Tees Valley	**240,260**	***161,560***	**67%**	**78700**	**33%**	**257,006**	**165,139**	**64%**	**91,867**	**36%**

Figure 24.6 Jobs in the Tees Valley for the period 1991-2001

7. It can also be seen that, in the period 1991 to 2001, the proportion of each borough's jobs taken by residents of that same borough has fallen slightly, most notably in Darlington. Further, the proportion of jobs in Middlesbrough taken by borough residents is much lower than in the other boroughs, reflecting the large inward flow of workers from other areas.

Unemployment

8. In 2001, some 17 percent of households in the North East were classified as "workless" compared to a UK average of just over 11 percent. However, there has been a steady growth in demand for labour in the North East since the mid-1990s. This growth is set to continue across a broad range of sectors, with 90,000 additional jobs forecast for the region by 2010. Alongside this growth, unemployment has fallen. It now stands at 3.4% across the region, compared with 7.5% in the mid-to-late 1990s (www.onenortheast.co.uk).

9. The total percentage of economically active people, of working age, without work (for whatever reason including those not seeking work) is shown in Table 24.1.

Table 24.1 Unemployed % of working age (March 2005) (source: The Tees Valley Partnership)

	Male %	**Female %**	**Total %**
Darlington	23.1	30.1	26.5
Hartlepool	31.4	37.3	34.3
Middlesbrough	34.4	40.7	37.6
Redcar & Cleveland	29.5	36.9	33.1
Stock-on-Tees	25.4	32.9	29.0
Tees Valley	**28.6**	**35.6**	**32.0**
Great Britain	***22.2***	***31.0***	***26.4***

24.1.4 Skills

Regional context

1. The proportion of economically active people qualified to at least NVQ level 3 has increased more than the national average increase and the proportion of economically active people with graduate level qualifications (Level 4+) has also increased. In addition, since April 2001, 113,100 adults in the North East have improved their literacy and numeracy skills. Of these, just under 50,000 have obtained Key Skills Qualifications (www.onenortheast.co.uk).

Local context

2. Figure 24.7 illustrates that the percentage of people with no qualifications or qualifications NVQ level 1 to 3 in the Tees Valley is still predominant among the total percentage of population economically active. The average of people with managerial and professional skills is still predominantly below the national average which implies a lack of retention skills in the area.

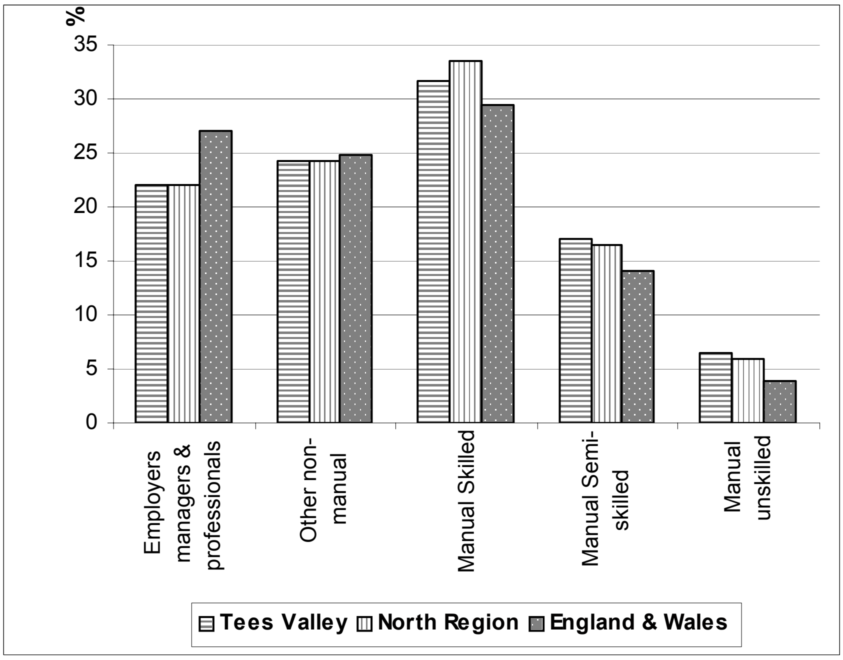

Figure 24.7 Socio-economic skills for the Tees Valley

3. Table 24.2 shows the percentage of people of working age (men aged 16-64 and women 16-64) by highest level of qualifications achieved. It indicates that the Tees Valley is performing at or above the national average in terms of qualifications except NVQ4. However there is a large part of the workforce which has no qualifications and 19% of school leavers in the Tees Valley do not go into education, training or employment compared with 13% in Great Britain.

Table 24.2 Percentage of people of working age by highest level of qualification achieved

	NV Q4 and above	NV Q3	Trade apprenticeships	NV Q2	NV Q1	Other qualifications	With no qualifications
Tees Valley	*18.4*	*14.7*	*8.5*	*17.0*	*16.5*	*6.2*	*18.8*
GB	**25.2**	**14.7**	**6.5**	**15.2**	**14.6**	**8.8**	**15.1**

24.1.5 <u>Local economic context (Port of Tees and Hartlepool)</u>

1. The River Tees is at the heart of an area strongly associated with petrochemicals, manufacturing and engineering. The area is home to many companies serving these industries as well as offshore and other river related activities.

2. PD Teesport operates the ports of Tees and Hartlepool and provides dock facilities and manages the river for all users. It offers the largest deep water port on the east coast, and handles around 6,000 vessels and 50 million tonnes of cargo per annum. The port is the second largest by volume in the UK and a key component of the North East's transport and economic infrastructure.

3. PD Teesport provide almost 2,000 core and directly related jobs, accounting for around 2.6% of Tees Valley employment, and contributes around £250m annually to the region's economy. It is critical to the success of the major industry sectors in Tees Valley, including the 12,000 jobs in the chemical processing industries. Teesport has the capability to handle rapidly increasing opportunities in European and Scandinavian trade, and to enhance prospects for future investment within the region.

4. Platform fabrication, historically important on Teesside, is now in decline. In the long term, prospects for growth in the decommissioning or abandonment of platforms and rigs are good. Whilst activity in engineering generally is slowing, there are wide sectoral variations, with good prospects for precision engineering, process engineering, electrical engineering, environmental engineering, and for companies servicing the transport equipment sector.

24.2 Potential impacts during the construction phase

24.2.1 Generation of employment during the construction phase

1. Since the construction phase is temporary, the analysis of construction employment has been considered in terms of direct jobs being created from construction activities. The analysis has not included the wider economic impacts of capital expenditure on the regional economy.

2. The construction of Phases 1 and 2 of NGCT is expected to require an average of 125 to 150 construction workers per annum.

3. Not all of the construction jobs will be filled by Teesside residents, although it is reasonable to believe that at least 50 of these temporary jobs would be filled within the Teesside economy.

4. The estimated number of construction jobs generated by NGCT for each phase is presented in Table 24.3.

Table 24.3 Construction employment at NGCT

Jobs	2010	2014	2029
Total Construction jobs	125	150	0

Source: PD Teesport OPEX model

5. The increased direct construction employment represents a temporary impact of **minor beneficial significance** for the Tees economy.

Mitigation and residual impact

6. No mitigation is required and the residual impact would be of **minor beneficial significance**.

24.3 Potential impacts during the operational phase

24.3.1 Increased direct employment by PD Teesport

1. The potential employers of direct labour are PD Teesport and other operators that will be operating at the port. Direct employees can be further divided into volume based and non-volume based employment. The number of people engaged in volume-based jobs is related to the throughput of containers at a port. Non-volume based employment is related to management, administration and marketing type roles.

2. The direct jobs generated by PD Teesport, described below, are net increases from the existing 570 jobs. The proposed NGCT will displace throughput at existing facilities, and can potentially lead to a decrease in demand for volume-based jobs; the displacement of existing jobs, however, is negligible.

3. Handling jobs are sub-divided into those that vary directly with the level of traffic at the port (e.g. maintenance jobs, cargo control and gate operations) and those that vary with the amount of equipment utilised at the port (e.g. lashing, checkers and drivers).

4. The employment forecasts for overhead employment are based on the current level of staff. PD Teesport's forecast of direct (cumulative) employment at NCGT is presented in Table 24.4.

Table 24.4 Direct employment by NGCT

Jobs	2010	2014	2029
Overhead	95	191	456
Handling	34	39	48
Total direct NGCT employment	**129**	**230**	**504**

Source: PD Teesport OPEX model

5. According to these forecasts, the TEU/ handling staff ratio is 2105 TEU/handling job in 2009 (compared to 2030 TEU/ handling staff at existing Teesport facilities). The forecasts imply a year-on-year productivity improvement of 2% amongst handling staff, which is deemed reasonable when compared to industry benchmarks.

6. The creation of 504 jobs as a direct result of the scheme constitutes an impact of **moderate beneficial significance**.

Mitigation and residual impact

7. No mitigation is required. The residual impact would, therefore, be of **moderate beneficial significance**.

24.3.2 Increased direct employment by other operators at port

1. In addition to PD Teesport, other operators at the port hire workers to participate in port-related activities.

2. Due to a lack of comprehensive data on the actual number of people currently working at the docks, an estimate of 1,322 "other employers' direct jobs", presented in Ove Arup and Partners Ltd (2005) is used in the assessment. The 1,322 estimate is derived by defining the types of roles that need filling, as well as productivity per worker.

3. Haulage and trucking jobs will represent a sizeable proportion of the "other employers' direct jobs" identified in Ove Arup and Partners Ltd (2005). Furthermore, many of these jobs, such as management and administration, do not necessarily vary by the level of throughput.

4. Taking into account PD Teesport's understanding of activities at the port, and the methodology used in ARUP's estimates, it is estimated that 18% of the "other employers' direct jobs" would increase as throughput increases. These include cargo movement, ship movement and quayside storage jobs. Taking into account economies of scale, productivity increases and the fact that some of these new jobs are accounted for in PD Teesport's direct employment estimates, a net increase in direct employment by other operators is expected of 279 jobs by the completion of NGCT. This is illustrated in Table 24.5.

Table 24.5 Direct employment by other operators

Jobs	2010	2014	2029
Total Direct employment by Other Operators	n/a	n/a	279

5. These 279 jobs, however, would not be created linearly between the start and completion of NGCT. Labour demand in some of the activity areas, such as cargo handling, depends on the availability of equipment and would likely form step-changes in labour requirement. There could also be changes in the

contractual arrangements which will allow an increasing level of third party labour as the terminal reaches maturity.

6. The creation of 279 jobs as a direct result of the scheme constitutes an impact of **minor beneficial significance**.

Mitigation and residual impact

7. No mitigation is required. The residual impact would therefore be of **minor beneficial significance**.

24.4 Increase in associated employment

1. Associated employment refers to jobs that are generated by the expansion of the port, but are not a consequence of increased expenditure by port employees. Examples of associated employment would be jobs in regulation, customs, health and safety and possibly haulage, storage and freight forwarding (provided these were not a consequence of expenditure by the port and its users). A ratio of 1:1 for direct jobs to associated jobs is predicted (this excludes jobs in road haulage).

2. NGCT will have a particularly significant impact on the road haulage sector in the region. The number of lorry driving jobs that NGCT will generate is derived by estimating that 70% of throughput at NGCT will be transported by road, at 1.7 TEU per HGV, for an average of 226km. It is further estimated that about 10% of trucks arriving at the port would be empty, but they always leave full, and that each driver drives an average of 111,622 km a year. It is estimated that by the end of Phase 2 of NGCT, an additional 1,193 truck drivers will be needed to support the growth in traffic at Teesport.

3. However, not all of the lorry jobs will be filled by Teesside residents. Approximately 50% of the expenditure associated with extra lorry miles is predicted to stay within the Teesside economy.

4. Predicted associated employment numbers are presented in Table 24.6.

Table 24.6 Predicted associated employment

Jobs	2010	2014	2029
Associated employment (non- drivers)	129	230	783
Truck driving jobs	87	262	596
Total associated employment	**216**	**492**	**1379**

8. The creation of 1379 jobs as a direct result of the scheme constitutes an impact of **moderate beneficial significance**.

Mitigation and residual impact

9. No mitigation is required. The residual impact would therefore be of **moderate beneficial significance**.

24.4.1 Improved competitive advantage

1. New employment is also likely to be generated through the fact that the port will confer a degree of competitive advantage to the area as a whole. This will be enjoyed by existing businesses which may expand even if they are not directly related to the port. Businesses might therefore choose, for example, to use freight forwarders or haulage businesses that locate in or near the port. Area wide competitive advantage could also result in the attraction of new economic activity to the area.

2. To demonstrate the sensitivity of competitive advantage employment estimates to occupancy and displacement estimates, low and high employment forecasts have been calculated. The most conservative employment impacts are deduced by assuming low employment/occupancy rate by the logistics sector (50% of ARUP's estimates) and a high proportion of these jobs being displacement from other areas in the region (25%).

3. The highest employment impacts are estimated by assuming that the logistics sector will generate 2,250 jobs (more than 6 times the current level) and that all of these jobs are indeed net increases for the region.

4. This aspect of development is speculative, and there are few, if any, available benchmark estimates for other UK port developments.

5. Estimations of direct, associated and competitive advantage employment are presented in Tables 24.7.

Table 24.7 Direct associated and competitive advantage employment

Jobs	2010	2014	2029
Competitive advantage employment (low estimate)	n/a	n/a	1125
Competitive advantage employment (high estimate)	n/a	n/a	2250

10. Using the lower estimate (as a conservative approach), the creation of 1125 jobs as a direct result of the scheme constitutes an impact of **moderate beneficial significance**.

Mitigation and residual impact

11. No mitigation is required. The residual impact would therefore be of **moderate beneficial significance**.

24.4.2 Multiplier effects

1. Directly employed workers at the NGCT would spend a proportion of their income in the local area. This in turn supports other jobs in the local economy. The more expenditure circulates within the region, the more it drives economic activity within the region with consequential employment of (mainly) regional labour (indirect employment impact). Eventually expenditure leaks out of the region depending on where the workers live and how they spend their money. Multiplier effects are, therefore, concerned with the way expenditure generates activity with each round of the process.

2. Again, figures calculated for low and high estimates have been used. The results are presented in Table 24.8.

Table 24.8 Total indirect and induced jobs due to the multiplier effect

Jobs	2010	2014	2029
Total indirect and induced jobs (low estimate)	218	367	1621
Total indirect and induced jobs (high estimate)	218	367	2183

3. Table 24.7 shows that the multiplier impact of the proposed NGCT is expected to result in an additional 1621 to 2183 jobs in the regional economy depending on which estimate is used.

4. Using the lower estimate, the creation of 1621 jobs as a direct result of the scheme constitutes an impact of **moderate beneficial significance**.

Mitigation and residual impact

5. No mitigation is required. The residual impact would therefore be of **moderate beneficial significance**.

24.4.3 Summary

1. In summary, the estimated total direct, induced and indirect jobs generated by the proposed NGCT in 2029 ranges from 4908 (low estimate) to 6595 (high estimate).

25 OFFSHORE DISPOSAL OF DREDGED MATERIAL

25.1 Introduction

1. As discussed in Section 3.1 there are two scenarios that are under consideration for the disposal of material arising from the capital dredging. These scenarios are summarised in Table 25.1 below.

Table 25.1 Summary of the two potential scenarios for the disposal of dredged material

Scenario	Reclamation (m3)	Terminal area (m3)	Bran Sands lagoon (m3)	Sea disposal (m3)
A	920,000	970,000	-	2,910,000
B	920,000	970,000	2,330,000	580,000

2. Scenario A is the preferred approach and the application under the Food and Environment Protection Act is made on the basis of this scenario. However, the environmental impacts associated with Scenario B are also considered. This section discusses the implications associated with the disposal of dredged material at sea.

25.2 History of offshore disposal

1. Under the preferred scenario A, the majority of the dredged material would be disposed offshore at disposal sites located in Tees Bay. There are two active disposal sites that could potentially accept the dredged material (termed Tees Bay A (TY 160) and Tees Bay C (TY 150)); the locations of these sites are shown on Figure 1.6

2. Both sites have historically been used for the disposal of dredged material and have received both capital and maintenance dredgings. ABPmer (2005) states that Tees Bay C (the offshore site) has predominantly been used for capital dredged material, but has received quantities of maintenance material in some years. Tees Bay A (the site closest to the shore) has been used for soft non-cohesive maintenance material.

3. ABPmer (2005) further state that DEFRA records show that the volume of material disposed of at Tees Bay A fluctuates from 0.3 million to 2.4 million wet tonnes over a 15 year period (although it is noticeable that the volumes drop off post-1996). The largest volume deposited since 1996 was in 2002 when 1.8 million wet tonnes were deposited.

4. DEFRA records from Tees Bay C show periodic small scale usage with a peak volume deposited in 1999 totalled some 1.9 million wet tonnes. However, the usual yearly volume is 0.1 million wet Tonnes, with some years showing no usage at all.

25.3 Current maintenance disposal practice

1. Presently the annual maintenance dredge in the Tees Estuary is about 1,350,000m^3 of which 20-25% of this material can be deemed to be silt and clay. In Tees Bay a series of near bed current measurements from a long term deployment of a CEFAS bed frame (HR Wallingford 1998b) were used to schematise the flow regime in the vicinity of the disposal sites as part of a detailed MAFF research project into the behaviour of dredged material. During this project a series of cores were taken from locations where maintenance dredging is undertaken in the estuary, from the hopper of the dredger and at the offshore disposal site. The results of the sampling are summarised in Table 25.2.

Table 25.2 Results of sampling of sediment in areas where maintenance dredging is undertaken

Location	Fines content (less than 63 microns) (%)	Median grain size (microns)
In estuary	87-97	7-17
In hopper	65-90	7-17
At disposal site	3-34	100-400

2. The cores taken from the disposal site generally comprised fine sand, silt and small particles of coal. Sectioning the cores clearly showed layers of fine sand separated by thinner layers of small granules of coal. It was assumed that the source of coal is a natural one rather than the dredgers transporting it to the site from the estuary.

3. Sampling of the disposal site was undertaken at locations where material had recently been placed by the Teesport TSHD dredgers. Only small amounts of fines were found in the cores suggesting that dispersion during disposal was very effective or that the strength of the placed material was very low so that it was washed off the surface of the cores during recovery.

4. Measurements of suspended solids concentrations close (approximately 2.25km away) to the disposal site were rarely (if ever) influenced by the disposal activities. There exists a repeating pattern in terms of turbidity during the tidal cycle and concentrations during spring tides were typically higher than those during neaps. However, the major influence on near bed suspended solids concentrations was clearly demonstrated to be associated with wave conditions. The measurements illustrated a mechanism whereby storm waves generate a sediment source that remains available for resuspension by smaller waves for 3-4 weeks before either being dispersed from the site of having undergone sufficient consolidation to resist erosion (HR Wallingford, 2000)

25.4 Modelling of the dispersion of capital dredged material placed at the disposal site

25.4.1 Particle size distribution of material to be disposed

1. DRL (2005) have predicted the particle size distribution of the material arising in the barge or hopper from the dredging of the stiff clays and marl with CSD. This material is likely to be placed offshore at the existing licensed maintenance or capital dredge disposal sites.

2. The predicted particle size distribution for a CSD loading into 4,000m^3 barges (as simulated in Section 6) is presented in Table 25.3. This prediction was undertaken by Dredging Research Ltd.

Table 25.3 Predicted particle size distribution of disposed material

Particle size (micron)	4,000m^3 barges loaded by CSD (percentage composition)	23,000m^3 TSHD (percentage composition)
Less than 20	1.20	0.63
20 to 60	1.67	0.77
60 to 80	1.29	0.56
80 to 100	2.54	1.11
100 to 150	10.55	4.72
150 to 200	17.61	10.70
200 to 300	14.21	8.67
300 to 400	8.29	7.60
400 to 600	5.92	10.87
600 to 1000	5.92	10.87
1000 to 2000	5.92	10.87
2000 to 4000	5.93	10.87
4000 +	18.96	21.75

25.4.2 Release of fine material at the offshore disposal sites

1. Both of the existing licensed offshore disposal sites are being considered for placement of dredged material from the proposed works. There has been previous detailed investigation on behalf of what was then MAFF into the behaviour of maintenance dredged material at the inshore disposal site (Tees Bay A) (HR Wallingford, 1998b).

2. For the simulation of the release of fine material at the disposal sites the case of the CSD operating for Scenario A was considered in this assessment because this scenario presents the largest disposal volume of fine material (hence this is a worse case scenario).

3. The simulation of the CSD barge disposal activities assumed a ten minute period for the disposal itself resulting in a release rate to the water column of 75kg/s over this period. Each placement from the CSD barge releases about 2977m^3 material, 3% of which will be fine (clay or silt). The remainder of the material being coarser, less dispersive, material. This compares to the hopper

size of the small TSHD routinely undertaking the maintenance dredging in the Tees Estuary which is about 1,500m^3, with the maintenance dredged material being fine. It can thus be seen that the capital dredging will result in far lower rates of introduction of fine material to the offshore disposal sites than presently occurs during the course of routine (and near continuous) maintenance dredging. It can thus be concluded based on the detailed monitoring undertaken in 1996 that the physical effect of fines released at the offshore disposal sites as part of the proposed capital dredging will be significantly less than that associated with the disposal of maintenance dredged material.

4. To further illustrate the dispersion of fines from the capital dredging a flow field for the offshore area was developed from the near bed currents measured by the CEFAS bed frame during deployment 139 over the spring-neap-spring period 12 to 26 December 1996 (HR Wallingford 1998b). The flows were measured at a fixed height of 0.42m above the bed. The measured currents were scaled by a factor of about 1.6 to provide an estimate of the depth average current speed. The measured directions were assumed to be uniform through depth.

5. The measured flow field was used in this way to avoid establishing a high resolution offshore depth averaged flow model. This approach is justified because of the relatively weak currents and small distances over which offshore dispersion under currents alone will occur.

6. Simulations were undertaken for disposal activities over an entire spring-neap cycle at both the maintenance disposal site (inshore; Tees Bay A) and the capital disposal site (Tees Bay C). The results of the simulations are illustrated in Figures 25.1 to 25.4. The figures show the dispersion under calm (no wave conditions) and illustrate that under these conditions most of the fines deposit remain close to the point of disposal. Concentrations are increased by approximately 5 mg/l within an area 2km from the boundary of the disposal area.

7. No peak deposition depths greater than 1mm were predicted outside the boundary of the disposal areas during the simulation.

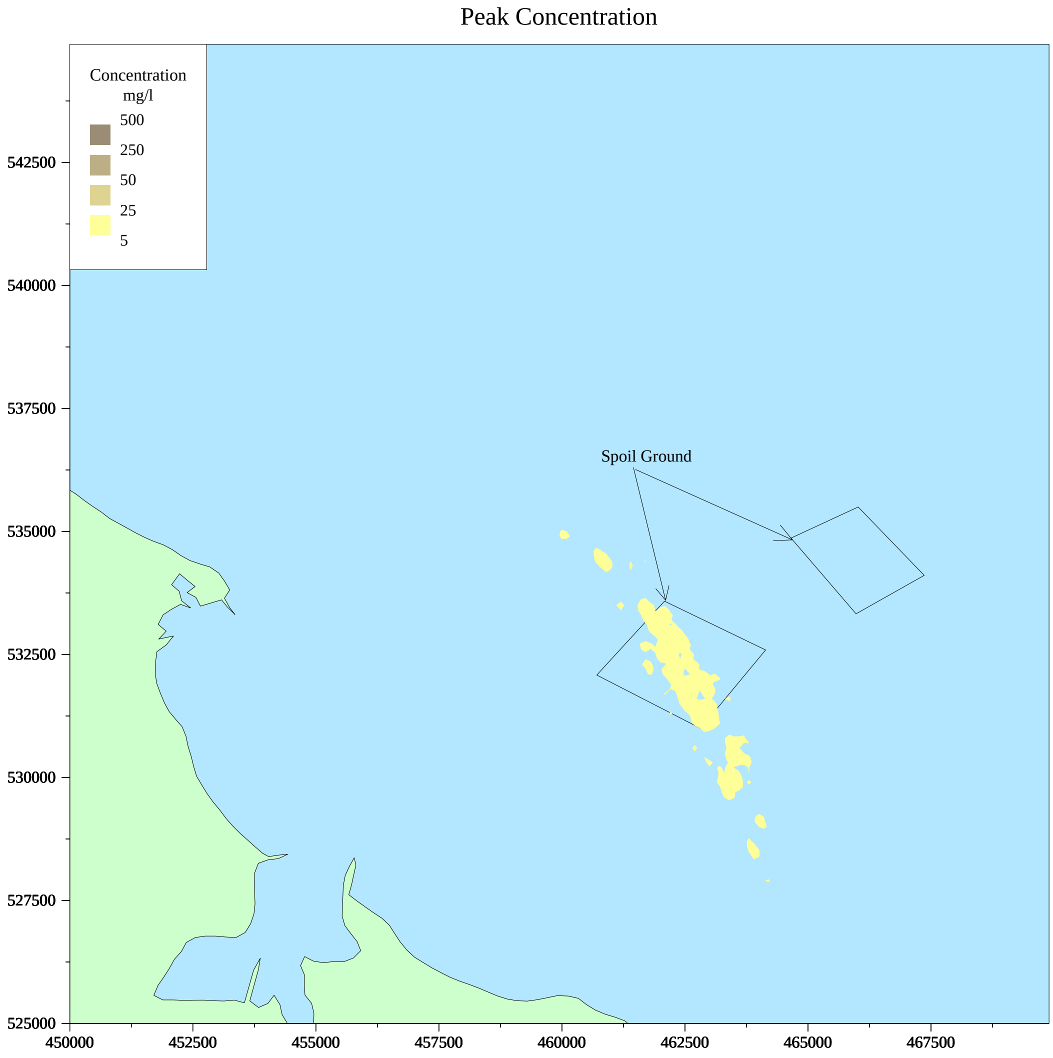

Figure 25.1 Simulated peak concentration for disposal operations at present maintenance disposal site

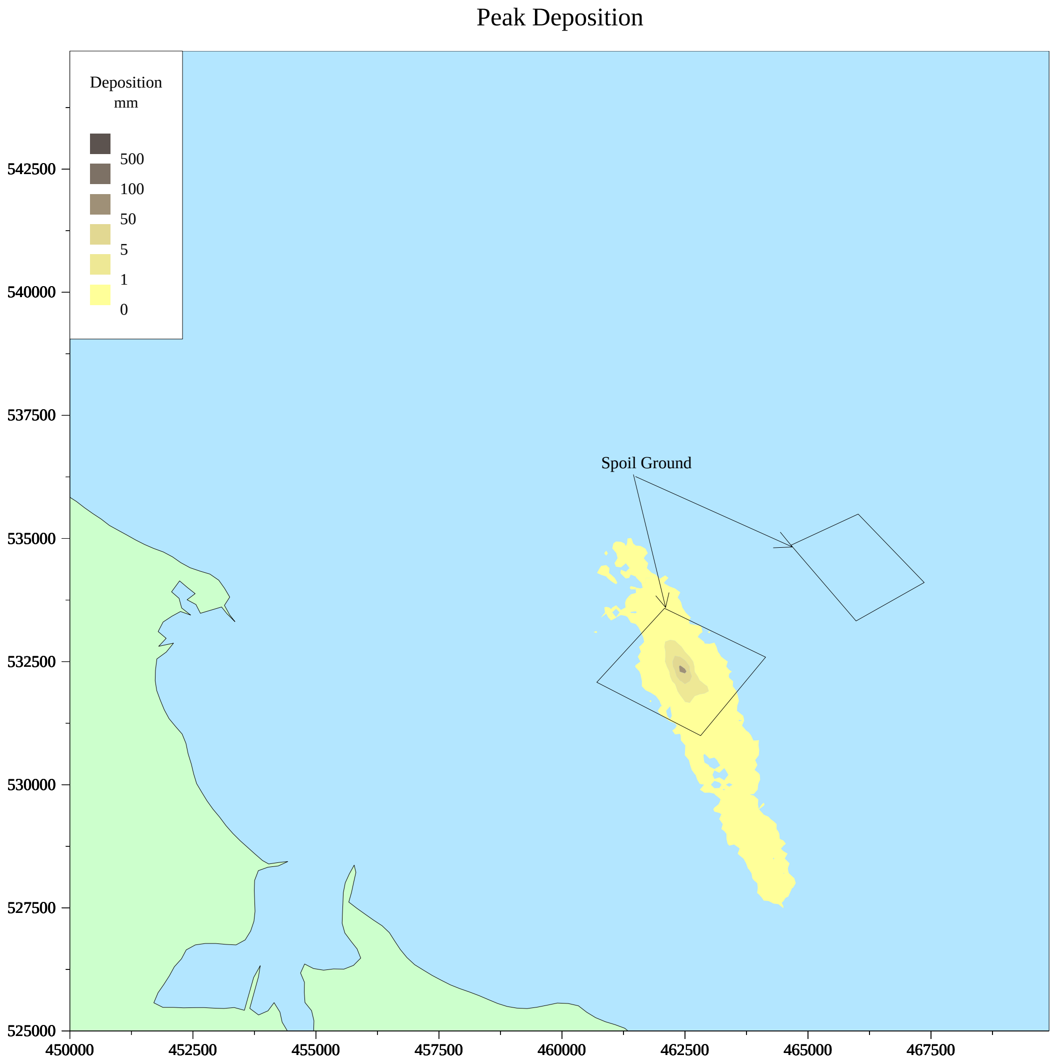

Figure 25.2 Simulated peak deposition for disposal operations at present maintenance disposal site

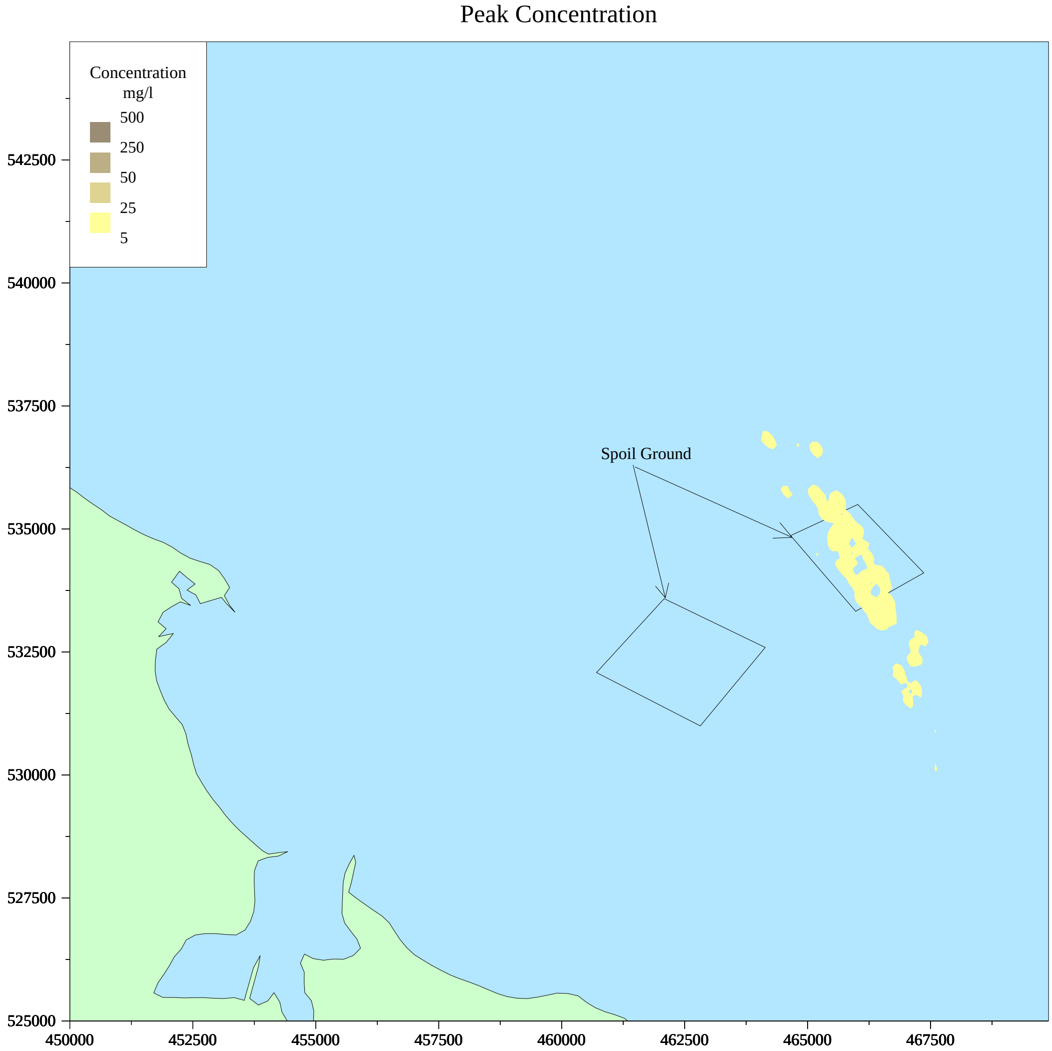

Figure 25.3 Simulated peak concentration for disposal operations at present capital disposal site

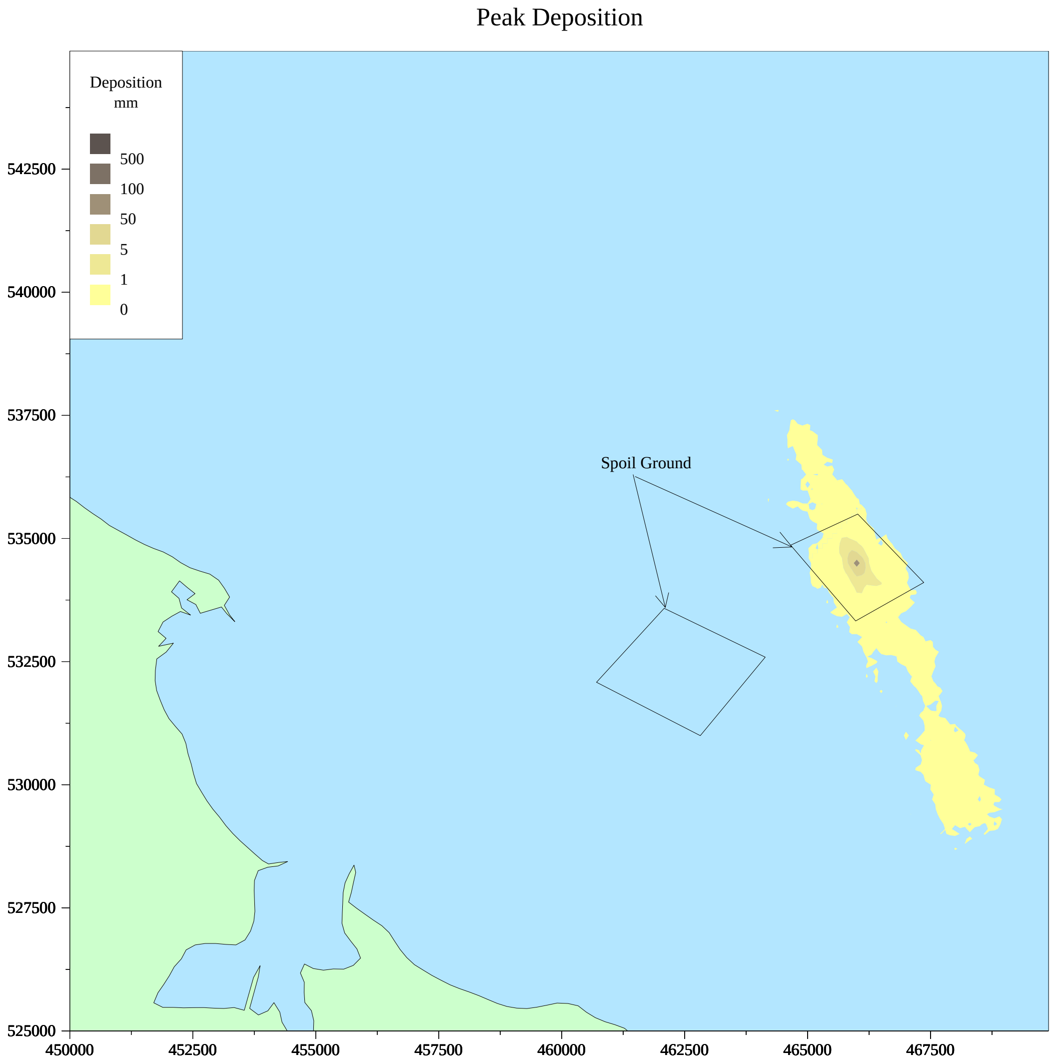

Figure 25.4 Simulated peak deposition for disposal operations at present capital disposal site

25.4.3 <u>Dispersion of fine sand from the offshore disposal sites</u>

1. Based on the DRL predictions 32% of the material placed by the barge from the CSD at the offshore disposal sites arising from the dredging of stiff clay and marls can be described as being fine sands (60 to 200 microns).

2. A series of calculations were undertaken to examine if fine sandy material deposited at the offshore sites would tend to accumulate or if local hydrodynamic forces at the sites were enough to quickly disperse placed material.

3. The measured current data from CEFAS minipod deployment 139 in the Tees disposal site during the winter of 1996-1997 (HR Wallingford, 1998b) was used in order to investigate the dispersal of sediment in the disposal site.

4. Figure 25.5 shows a conceptual sediment transport diagram over the maintenance disposal site (the figure also shows the location of the minipods used for the analysis). The analysis concludes that the site is generally dispersive. The fine sandy sediment is transported both in the ebb and the flood directions so that it will disperse away from the site, with a slight preference over the flood.

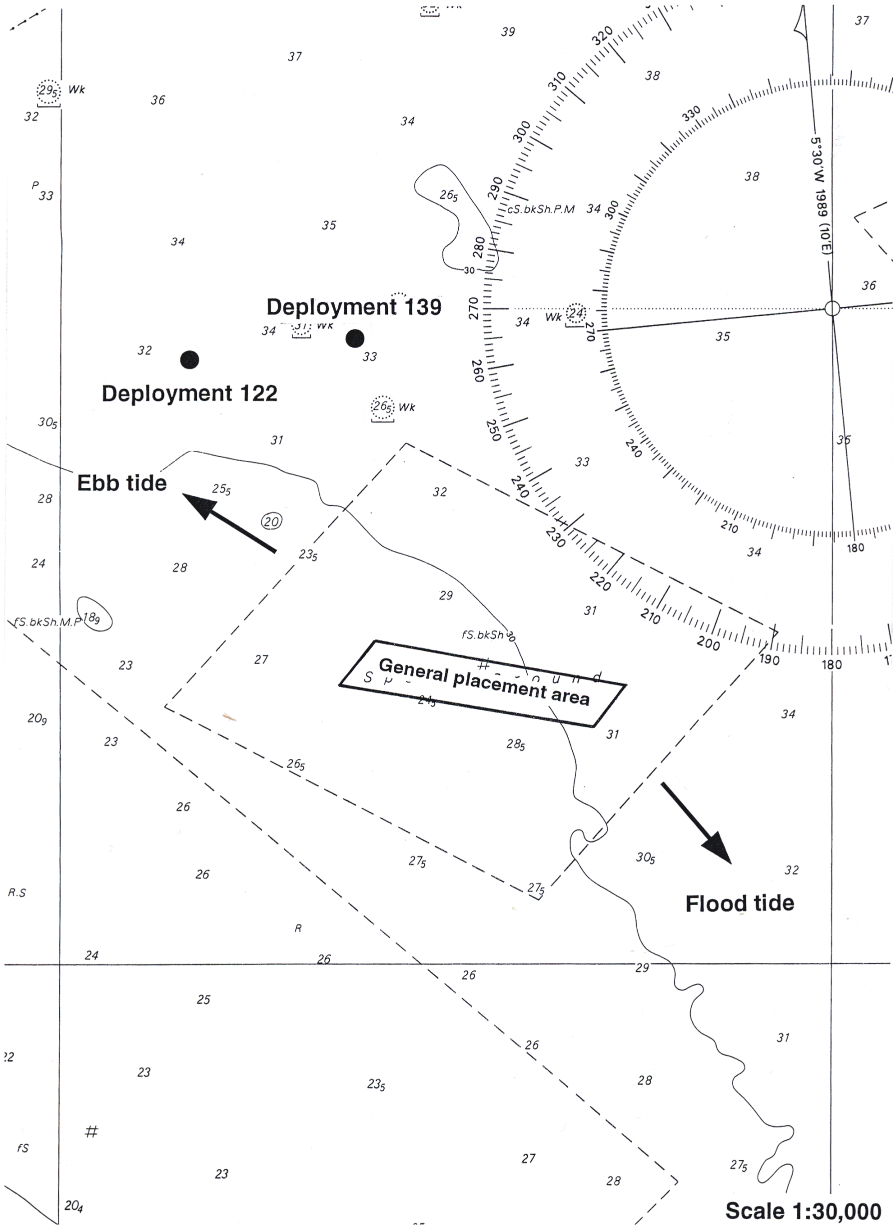

Figure 25.5 Conceptual sediment transport diagram at disposal sites

5. The calculated gross rate of dispersal over the full width of the disposal site, using the measured currents and the full wave climate, is 100m^3/tide for a representative neap tide and 200m^3/tide for a representative spring tide.

6. One of the measurement periods in the MAFF study included placement of maintenance dredging material covering a six week period during which a total of 92,500m^3 of dredged material were placed, 60% of which were sands. This gives a rate of sand placement of 1,100m^3/tide (i.e. 3-5 times the calculated dispersal rate due to tides alone). Short term accumulation would therefore be expected during disposal operations although once disposal operations are concluded the accumulated material would continue to be dispersed. However

within the recorded period storm event were shown to increase the dispersal rate by an order of magnitude confirming the medium term dispersive nature of the disposal sites.

7. A most likely case of sand disposal would come from assuming four placements of material from the CSD barges per day with a total amount of fine sandy material placed of about 3,500m^3/day . This is at an approximately 60% higher rate than that associated with the placement of maintenance material. Thus it would be expected that some coarser material would be retained in the vicinity of the disposal site particularly over periods of low wave activity.

8. The analysis described above was carried out assuming a sediment size of 0.1mm. Sensitivity to the sediment size was investigated calculating the rate of dispersal for a 0.2mm sediment size. The calculated transport rate for the 0.2mm sediment size is halved when comparing it to the 0.1mm. Consequently, the timescale of dispersal will also be doubled with the coarser sediment size.

9. The conclusion of these calculations is that some short term build up of fine sandy sediment in the area would be expected during the dredging and disposal operations. However in the medium term material placed at the sites will be dispersed. This dispersal will be in flood and ebb directions but with a small bias towards the flood direction (southeast). This bias towards the south east is also evident in the dispersion of fines.

25.4.4 Behaviour of coarser material at offshore disposal sites

1. Approximately 30% to 40% of the material arising from the dredging of stiff clay and marl is predicted by DRL to be greater than 1mm in size. This material will be relatively immobile at the disposal sites and apart from the gradual weathering of the material and abrasion into smaller fragments this material can be expected to remain within the disposal sites.

25.5 Conclusion

1. It is concluded that, in the context of the existing disposal of maintenance dredging, the effect of the disposal of fine material at the disposal sites is of minor significance. The capital dredging will result in far lower rates of introduction of fines to the disposal sites than occurs during maintenance dredging. Therefore, the physical effects of the material disposed at the site during capital dredging will be lower. There would be some short-term build up of fine sandy sediment and this will be dispersed over time. Some longer term accumulation of coarser sediments arising from the dredging of stiff clay will occur on the seabed.

2. Under scenario B, a significantly lower quantity of capital material would be disposed of at the offshore disposal sites. As a consequence, significantly smaller quantities of sand and coarser material would be expected to accumulate on the seabed.

25.6 Implications for fisheries interests

1. On the basis of the assessment of the dispersion of fine sediment from either disposal site described above, it is concluded that there a little potential for an impact on water quality and, therefore, fisheries interests beyond the boundaries of the licensed disposal sites as a consequence of the disposal of dredged material. It has been demonstrated that the rate of introduction of fine material to the disposal sites will be less than which currently occurs during the disposal of maintenance dredgings and there will be a negligible effect on suspended sediment concentrations outside of the boundary of the disposal site.

2. It is predicted that there will be a short term accumulation of sand on the seabed at the disposal site, with a longer term accumulation of coarser sediments. The sand will, over time, disperse away from the site and would be worked into the seabed.

3. Overall, it is concluded that the effects of disposal will be localised to the disposal sites and **no impact** is predicted on fisheries interests.

Mitigation and residual impact

4. No mitigation measures are required and there will be **no residual impact.**

25.7 Implications for marine ecology

1. The disposal of dredged material would be expected to result in an impact on the benthic ecology (smothering) at the disposal ground due to the predicted accumulation of material on the seabed. This impact would be associated with the disposal of clay which is predicted to accumulate on the seabed and remain on the seabed over the longer term (subject to gradual erosion).

2. Effectively, the disposal would result in the sterilisation of the seabed within the footprint of the clay. Any impact would, however, be within the boundaries of the existing disposal sites given that deposition outside of the disposal sites is predicted to be of very low magnitude (less than 1mm).

3. Overall, the potential impact would be of **negligible significance** given that impact on marine ecology would be confined to the disposal area. There would, however, be a loss of benthic community within the footprint of the material that will accumulate on the seabed.

Mitigation and residual impact

4. No mitigation measures are required and the residual impact will be of **negligible significance.**

25.8 Implications for navigation

1. During the disposal of dredged material, there will be a requirement for the dredger and disposal barges to cross the navigation channel. There is, therefore, the potential for a conflict with navigation. However, the dredging and

disposal activity will be effectively managed by PD Teesport and the existing VTS; as a result, there are no concerns with respect to conflict with navigation and **no impact** is predicted.

Mitigation and residual impact

2. No mitigation measures are required and there will be **no residual impact.**

25.9 Relative costs of disposal options

1. The proposed approach for the disposal of dredged material is to dispose of material at the offshore disposal site(s) in Tees Bay; no other options for the offshore disposal of dredged material are considered given the existence of these licensed sites.

2. Should the Bran Sands lagoon site come into the ownership of PD Teesport within the timescales of the NGCT project, the lagoon represents an option for the disposal of dredged material. Should this lagoon be used for the disposal of the majority of the material arising from the dredging, the cost would be less than that associated with offshore disposal due to the lower dredge/dispose cycle time. However, if the Bran Sands lagoon site is not acquired by PD Teesport within the timescale for the NGCT project then the offshore disposal of dredged material is the only practicable option for disposal.

26 PROPOSALS FOR MONITORING

26.1 Monitoring associated with the container terminal and capital dredging

1. In view of the fact that the proposed NGCT is not predicted to result in a significant impact on sensitive habitats or species (or other interests in the area such as fisheries) it is considered that there is no requirement for an extensive programme of monitoring to be implemented as a consequence of the proposed project.

2. It is, however, proposed that maintenance dredging records are monitored by PD Teesport to verify the conclusions of the hydraulic and sedimentary studies with respect to rates of infill of sediment entering the estuary from Tees Bay. Such monitoring could take the form of monitoring the volume of material that needs to be dredged during maintenance dredging and could be addressed specifically as part of the annual update to the Tees Maintenance Dredging Baseline Document.

26.2 Monitoring associated with offshore disposal

1. In view of the information regarding the potential effects of disposal of dredged material discussed in this section, it is recommended that the monitoring of the bathymetry at any disposal sites used would be valuable. The aim of such monitoring would be to determine whether, and to what extent, dredged material accumulates at the disposal sites.

2. It is recommended that a high resolution (i.e. tight line spacing) bathymetric survey of both disposal sites in Tees Bay should be undertaken immediately prior to the disposal of dredged material, with repeat surveys undertaken on completion of the disposal activity. Given that it is predicted that sand will temporarily accumulate, but then be dispersed, a further survey after (say) six months should be undertaken to determine whether any material that is detected on the seabed immediately following the disposal activity has dispersed and the magnitude of any longer term accumulation of material on the seabed.

3. It is concluded that no further monitoring other than that set out above is required.

4. Prior to undertaking any monitoring, the proposed programme of monitoring (and the rationale behind the monitoring) would be discussed and agreed with CEFAS.

27 SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES

1. Table 27.1 provides an overall summary of the findings of the ES and lists the potential environmental impacts that are predicted to arise during the construction and operational phases of the proposed development, including the disposal of dredged material. The significance of each of the potential impacts is stated, along with any mitigation measures that are recommended to reduce or avoid adverse impacts. The residual impact (i.e. the significance of the potential impact remaining following mitigation) is also stated.

Table 27.1 Summary of potential impacts, impact significance, mitigation measures and residual impacts

Impact	Significance	Mitigation	Residual impact
HYDRODYNAMICS AND SEDIMENTARY REGIME			
Construction			
Increased suspended sediment concentration during capital dredging	Peak increases in suspended sediment concentrations of between 500mg/l and 1000mg/l are predicted in the immediate vicinity of the dredger and in the vicinity of the run-off from the reclamation. Beyond these areas, peak increases are in the order of 25mg/l to 50mg/l.	None required	It is not appropriate to assess this predicted effect in terms of impact significance; the potential impact on other environmental parameters associated with this change is addressed elsewhere (e.g. water quality, marine ecology, etc)
Operational			
Effect on current speeds	In general, changes to current speeds are of very low magnitude, with localised increases and decreases of up to 0.2 m/s predicted.	None required	It is not appropriate to assess this predicted effect in terms of impact significance; the potential impact on other environmental parameters associated with this change is addressed elsewhere (e.g. water quality, marine ecology, etc)
Effect on tidal propagation	The tidal range is increased by less than 4mm in the upper estuary, with a smaller predicted effect in the vicinity of the proposed reclamation. No effect is predicted downstream of the proposed development site. The tide is predicted to arrive up to 2 minutes earlier	None required	See above
Effect on wave climate	Wind waves generated within the estuary are not predicted to be significantly affected by the proposed development,	None required	See above

	although there will be wave reflection from the quay face. Swell waves are also not predicted to be significantly affected under the majority of scenarios. Under extreme conditions an increase in significant wave height is predicted.		
Effect on sediment transport	The main predicted effect of the proposed capital dredging is to increase the import of sediment from Tees Bay into the Tees estuary by 10%	None required	See above
Effect on the dispersion of Dabholm Gut	The proposed scheme is not predicted to have a significant effect on the dispersion of the discharge from Dabholm Gut	None required	See above
Effect on coastal processes in the subtidal area between the proposed development and the Tees Barrage	Tidal range is predicted to increase by a small amount and timing of tides will advance by 2mins. No significant change to current speeds is predicted. Increase in siltation will be restricted within the deepened area and slightly more wave energy from swell waves will reach the upstream channel.	None required	See above
Effect on coastal processes in the intertidal area upstream of the development (North Tees mudflat)	No effects are predicted as a result of the change in high water. Increase in low water has the potential to convert 160m^2 of intertidal to subtidal. Wind induced waves remain unchanged. Swell wave energy increase unlikely to have a significant effect .	None required	See above
Effect on coastal processes in the Tees Dock and turning circle	10% increase in fine material infill predicted. Local redistribution of wave energy is predicted but no increase for swell waves entering the system. Slight increase in material from Dabholm gut predicted to deposit here.	None required	See above
Effect on coastal processes in the proposed container terminal area	Predicted infill of fine material to increase by 10%. Wind and swell waves predicted to decrease.	None required	See above
Effect on coastal processes on Dabholm gut	Currents are predicted to decrease at and upstream of the entrance with small increases downstream.	None required	See above
Effects on coastal processes on the deepened approach channel	Increase in import of fine material. Distribution of increase will reflect present pattern. Increase in swell wave penetration predicted.	None required	See above

Effect on coastal processes on Seaton Channel	No changes to tidal or wave conditions predicted. Infill rate of fine material is predicted to increase by 10%.	None required	See above
Effect on coastal processes on Seal Sands	The main change to the processes on Seal Sands was a general reduction in erosive forces	None required	See above
Effect on coastal processes on North Gare and Bran Sands	No changes to the hydrodynamics are predicted.	None required	See above
MARINE SEDIMENT QUALITY			
Construction			
Impact of dispersion and redistribution of sediment on the physical composition of the receptor sites	Negligible	None possible	Negligible
Remobilisation, dispersion and redistribution of potentially contaminated sediments during capital dredging	Negligible	None possible	Negligible
Remobilisation, dispersion and redistribution of potentially biologically contaminated sediments during capital dredging	No impact	None required	No impact
Operational			
Potential change in sediment quality	Minor beneficial	None required	Minor beneficial
Potential effects on the sediment quality of the receptor sites due to maintenance dredging required as a consequence of the proposed development	No impact	None required	No impact

SOIL QUALITY AND GEOLOGY			
Construction			
Potential for risk to humans and the environment	Moderate adverse	Various mitigation measures are proposed and include recommendations concerning risk management and assessment. Use building/services materials suitable for ground conditions and ensure new services are installed to avoid creation of migration pathways.	Minor adverse
Operational			
Potential for risk to humans and the environment	Minor adverse	The covering of the area with hardstanding will reduce the risk associated with contaminated soil. Ensure hardstanding covers all of the areas where site users might be exposed to residual contamination in ground. Drainage must avoid mobilisation of contamination in soils.	Minor beneficial
WATER QUALITY			
Construction			
Increase in suspended solid concentrations and turbidity as a consequence of capital dredging	Minor adverse	None possible	Minor adverse

Resuspension of chemical contaminants during capital dredging	Minor adverse	None possible	Minor adverse
Impact on dissolved oxygen levels as a consequence of re-mobilisation of suspended solids	Minor adverse	None possible	Minor adverse
Impact on bathing waters as a result of resuspending bacteriological contaminants	No impact	None required	No impact
Accidental spillage of polluting substances	It is not possible to assess the significance of pollution incidences as the impact depends on the nature of the incident.	Implementation of an oil spill plan and adherence to recommended pollution prevention guidance	The risk of a significant pollution event occurring is low.
Operational			
Periodic increases in suspended solids concentrations and turbidity as a consequence of period maintenance dredging	No impact	None possible	No impact
Changes in water quality due to erosion and remobilisation of potentially contaminated sediment caused by changes in tidal flows or wave action.	No impact	None required	No impact
Potential effects on water quality due to changes to the dispersion characteristics of outfalls	Negligible	None required	Negligible
Accidental spillage of polluting substances	It is not possible to assess the significance of pollution incidences as the impact depends on the nature of the	Implementation of an oil spill plan and adherence to	The risk of a significant pollution event occurring is

	incident.	recommended pollution prevention guidance	low.
Potential effect of surface water run off and domestic wastewater from the proposed development	No impact	None required	No impact
MARINE ECOLOGY			
Construction			
Direct loss of subtidal benthic invertebrate resource due to reclamation and dredging	Minor adverse	None possible	Minor adverse
Potential smothering effect caused by sedimentation of material resuspended by capital dredging within intertidal areas	Negligible	None possible	Negligible
Potential deposition of fine sediment within areas of saltmarsh	Negligible	None possible	Negligible
Potential smothering effect caused by sedimentation of material resuspended by capital dredging within subtidal areas	Negligible in the short term. No impact in the long term	None possible	Negligible in the short term. No impact in the long term
Implications for benthic intertidal and subtidal communities arising from an increase in suspended solids concentrations and turbidity	Negligible	None required	Negligible
Remobilisation of potentially contaminated sediments and subsequent effects on subtidal communities	Minor adverse	None possible	Minor adverse

Potential impact on seal colonies due to increased noise levels (both airborne and underwater)	See Section on Noise		
Operational			
Potential impact on marine communities due to changes in the flow regime	Negligible	None required	Negligible
Effect of decreased exposure of intertidal area at North Tees mudflat on benthic community structure	No impact	None required	No impact
Effect of increased supply of fine sediment to Seal Sands on benthic community structure	Negligible	None required	Negligible
Potential impact on marine communities due to changes in the regime for maintenance dredging	No impact	None required	No impact
Recovery of marine communities within the footprint of the capital dredging	Minor beneficial	None required	Minor beneficial
MARINE AND COASTAL ORNITHOLOGY			
Construction			
Disturbance to feeding and roosting waterbirds	See section on noise		
Direct loss of intertidal habitat due to reclamation and capital dredging	No impact	None required	No impact
Potential effect on intertidal	No impact for intertidal areas downstream of the	None possible	No impact for intertidal areas

habitats available to feeding waterbirds due to predicted effect on tidal prism	development. Impact of negligible significance at North Tees Mudflat		downstream of the development. Impact of negligible significance at North Tees Mudflat
Potential effect of sediment deposition on intertidal food resources due to capital dredging	No impact	None required	No impact
Effect of increased suspended solids on the food resources for terns	Negligible	None required	Negligible
Potential for effect on areas used by designated Annex 1 species	No Impact	None required	No impact
Loss of waterbird interest within the Bran Sands lagoon during reclamation	Moderate adverse	It is proposed that some of the capital dredged material will be used to reinstate bird islands in the Bran Sands area	Negligible to minor adverse in the long term due to natural erosion of islands if not maintained
Operational			
Potential effect on the morphology of the intertidal habitats and implications for waterbird populations	Negligible impact is predicted for intertidal morphology and no impact with respect to changes to tidal flows and wave heights	None required	Negligible impact is predicted for intertidal morphology and no impact with respect to changes to tidal flows and wave heights
Potential effect of increased supply of fine sediment to Seal Sands on feeding resources for waterbirds	Negligible	None required	Negligible
Potential disturbance to feeding and roosting waterbirds due to increased shipping activity	An impact of negligible is predicted for North Gare Sands and no impact is predicted for Seal Sands	None possible	An impact of negligible is predicted for North Gare Sands and no impact is

			predicted for Seal Sands
Potential effect of maintenance dredging on food resources for Annex 1 species	No impact	None required	No impact
Potential disturbance to feeding and roosting waterbirds due to noise generated by the container terminal	This impact is addressed under noise		
TERRESTRIAL AND COASTAL ECOLOGY			
Construction			
Direct loss of ecological interest within the footprint of the proposed terminal and dredging	Minor to moderate adverse	A number of mitigation measures are recommended: • Schedule reclamation works outside of bird breeding season or manage site to discourage breeding in advance of construction (i.e. clear vegetation)	Minor adverse
Potential for indirect effects on ecological interest	Negligible	None possible	Negligible
Direct loss of ecological interest within the footprint of the disposal in Bran Sands Lagoon if secured for the disposal of dredged material	Negligible	None required	Negligible
Operational			
None predicted			
FISHING RESOURCES			
Construction			

Direct uptake and disturbance of fish during capital dredging	Negligible	None possible	Negligible
Potential impacts on shellfish and fish species caused by increases in suspended sediment concentrations due to dredging and dewatering of the reclamation area	Moderate adverse	It is recommended that PD Teesport programme the dredging to occur during the winter months to avoid potential impacts on migratory fish.	Minor adverse
Potential impacts on fish species caused by effects on water quality (contaminants and dissolved oxygen)	No impact	None required	No impact
Effect of noise and vibration during construction on fish populations	See section on noise		
Effect of construction light on fish populations	Negligible	Lighting will be directed away from the estuary	Negligible
Restriction of access to potential fishing grounds	No impact	None required	No impact
Operational			
Potential impact on feeding resource for fish populations	Minor adverse	None possible	Minor adverse
Effect of lighting for the container terminal on fish populations	Negligible	None required	Negligible
COMMERICAL NAVIGATION			
Construction			
Potential conflict between construction activities and	Major adverse	The Harbour Master has confirmed that potential	No impact

commercial navigation within the Tees Estuary		conflicts would be avoided and that there are no concerns over the ability of the VTS to deal with the increase in traffic.	
Operational			
Navigational safety for larger vessels	No impact	None required	No impact
Increased risk of collision due to increase in vessel traffic numbers	No impact	None required	No impact
Potential for delays due to increased shipping activity	Negligible	None required	Negligible
ARCHEOLOGY AND HERITAGE			
Construction			
Potential impact associated with the removal of existing structures on site	No impact	None required	No impact
Potential impact of development works on existing reclaimed land	No impact	None required	No impact
Potential impact of berth construction, quay wall construction and capital dredging on the potential archaeological resource	Moderate to major adverse	Borehole data should be collected from the channel and berth area and examined to determine whether unknown buried archaeological or palaeoecological remains exist. Sampling strategy to be agreed with relevant bodies.	Residual impact will depend on the outcome of the surveys
Operational			

Potential effect on the setting of designated structures	No impact	None required	No impact
RECREATION AND ACCESS			
Construction			
Potential impact on water-based recreation due to construction activities in the estuary	Negligible significance is predicted for marine activities. No impact is predicted for land based activities	Notice to mariners will be issued.	Negligible significance is predicted for marine activities. No impact is predicted for land based activities
Operational			
Potential conflict between water-based recreation due to changes in commercial shipping traffic	No impact	None required	No impact
ROAD TRAFFIC			
Construction			
Impact of construction traffic on road network	Negligible	None possible	Negligible
Operational			
Generation of additional road traffic: A66/A1053	Adverse effect	Widen A1053 entry width and extend flare length	No impact
Generation of additional road traffic: A1053/A1085	Adverse effect	Widen A1053 (s) entry width and extend flare length. Introduce a dedicated left-turn slip for traffic between A1053(s) and A1085(w)	Beneficial impact
Generation of additional road traffic: A1053/A174	Adverse effect	Widen A174(w) approach from 3 to 4 lanes with nearside lane for left turning traffic only. Widen flare length on B1380	No impact

		Easton Road approach and widen A1053 approach. Revise signal timings at each of the A174 approach arms.	
Impacts of increased traffic generation on accident statistics	Negligible	None required	Negligible
RAIL TRAFFIC			
Construction			
Potential for effect on existing rail operations at Teesport	No impact	None required	No impact
Operational			
Potential for additional rail traffic and impact on the rail network capacity	Negligible	None required	Negligible
Consideration of gauge issues	No impact	None required	No impact
NOISE AND VIBRATION			
Construction			
Impacts on ambient noise levels in sensitive residential areas as a result of construction	Negligible to no impact depending on location of sensitive receiver	No specific mitigation will be required. However, all construction and site operations will be conducted in accordance with the principles of Best Practicable Means (BPM) as outlined in BS 5228: Part 1: 1997 and the Control of Pollution Act 1974.	No impact
Impact of construction activity on vibration levels	No impact	None required	No impact
Impacts on ambient noise levels as a consequence of	No impact	None required	No impact

construction traffic			
Impacts of increased traffic on vibration levels	No impact	None required	No impact
Impacts of piling on sites and features of ecological interest	Negligible to minor adverse depending on location of site	None required.	Negligible to minor adverse
Impacts associated with underwater noise as a consequence of piling and capital dredging	Negligible	None required	Negligible
Operational			
Potential impacts on features of ecological interest: impact of airborne noise from ship movements	No impact	None required	No impact
Potential impacts on features of ecological interest: Impact of underwater noise from ship movements	Negligible	None required	Negligible
Impact of increased operational road traffic on noise levels in residential areas	Negligible	None required	No impact
Impact of increased rail traffic on noise levels in residential areas	Negligible	None required	No impact
Impact of increased rail traffic on vibration levels in residential areas	No impact	None required	No impact
Impact of increased port traffic on noise levels in residential areas	No impact	None required	No impact

Impact of increased port traffic on vibration levels in residential areas	No impact	None required	No impact
AIR QUALITY			
Construction			
Generation of dust during construction activities	Negligible	A number of mitigation measures are proposed such as dampening of dusty materials and covering stockpiles. Details are provided in the main report.	Negligible
Emission of pollutants from construction plant: Nitrogen Dioxide	Minor adverse	None required	Minor adverse
Emission of pollutants from construction plant: Particulate Matter	Negligible	None required	Negligible
Emission of pollutants from construction plant: sulphur dioxide	During phase 1 the impact is deemed to be of negligible significance. During phase 2, the impact is deemed to be of moderate adverse significance in the short term	The assessment has considered the benefits associated with the introduction of low-sulphur marine fuels required under the EC Directive. In the long term, the provision of electrical power to berthed vessels would reduce emissions. In the short term there are no measures that would significantly reduce emissions.	During phase 1 the impact is deemed to be of negligible significance. During phase 2, the impact is deemed to be of moderate adverse significance in the short term
Emission of pollutants from construction plant: Carbon	Negligible	None required	Negligible

monoxide			
Emission of pollutants from construction plant: Annual deposition of nitrogen	Negligible	None required	Negligible
Emission of pollutants from construction plant: Annual deposition of acid	Negligible	None required	Negligible
Operational			
Emission of pollutants due to increased road, rail and shipping traffic: Nitrogen Dioxide	Minor adverse	None required	Minor adverse
Emission of pollutants due to increased road, rail and shipping traffic: Particulate matter	Negligible	None required	Negligible
Emission of pollutants due to increased road, rail and shipping traffic: sulphur dioxide	Negligible	None required	Negligible
Emission of pollutants due to increased road, rail and shipping traffic: Annual nitrogen deposition	Negligible	None required	Negligible
Emission of pollutants due to increased road, rail and shipping traffic: Annual acid deposition	Negligible	None required	Negligible
Emission of pollutants due to increased road, rail and shipping traffic: Cumulative impacts	Negligible	None required	Negligible

LANDSCAPE AND VISUAL SETTING			
Construction			
Impact on the visual character of the area due to the presence of construction plant	Negligible	None required	Negligible
Operational			
Effect of the proposed development on landscape character	No impact	None required	No impact
COASTAL PROTECTION AND FLOOD DEFENCE			
Construction			
Potential effect on the integrity of flood defences during the construction works	No impact	None required	No impact
Operational			
Potential for effect on risk of flooding at and immediately adjacent to the proposed development site	Moderate beneficial	None required	Moderate beneficial
Potential for effect on risk of tidal flooding elsewhere in the estuary system	Negligible	None required	Negligible
Consideration of the effect of fluvial flows on flood risk throughout the estuary	Negligible	None required	Negligible
Potential effect on frequency of overtopping	Minor adverse	None possible	Minor adverse
INFRASTRUCTURE AND LAND DRAINAGE			
Construction			
Impact on tunnels, pipelines and	No impact	None required	No impact

other infrastructure			
Impact on abstractions due to the construction works	No impact	None required	No impact
Impact on Dabholm Gut and other discharges due to the construction works	No impact	None required	No impact
Implications of construction in the vicinity of a hazardous installation	No concern	None required	No concern
Operational			
Impact on infrastructure due to maintenance dredging	No impact	None required	No impact
Impact on outfalls and abstractions	No impact	None required	No impact
Effect on the dispersion of Dabholm Gut	Addressed water quality impacts		
Effect on surface water drainage as a consequence of the proposed development	No impact	None required	No impact
SOCIO-ECONOMIC			
Construction			
Generation of employment due to the construction phase	Minor beneficial	None required	Minor beneficial
Operational			
Increased indirect employment by PD Teesport	Moderate beneficial	None required	Moderate beneficial
Increased direct employment by other operators at port	Minor beneficial	None required	Minor beneficial
Increase in associated employment	Moderate beneficial	None required	Moderate beneficial

Improved competitive advantage	Moderate beneficial	None required	Moderate beneficial
Multiplier effects	Moderate beneficial	None required	Moderate beneficial
OFFSHORE DISPOSAL OF DREDGED MATERIAL			
Release of fine material	Deposition peaks predicted to be less than 1mm outside of the disposal site boundary. Suspended solids concentrations predicted to increase by 5mg/l within a 2km area from the site boundary.		
Dispersion of sand from the offshore disposal site	Some short term build up is expected however in the medium term, sandy sediment will disperse away from the site.		
Behaviour of coarser material at the offshore disposal sites	This material is predicted to be relatively immobile and therefore will remain at the disposal sites.		
Implications for fisheries interests	No impact	None required	No impact
Implications for marine ecology	Negligible	None required	Negligible
Implications for navigation	No impact	None required	No impact

28 IMPLICATIONS FOR DESIGNATED STATUS

28.1 Introduction

1. This section describes the implications of the proposed development for the designated status of the Teesmouth and Cleveland Coast SPA and Ramsar site. When read in parallel with other relevant sections of this ES (for example, Section 6 describing the predicted effects on estuarine habitats, Section 10 which deals with marine biological communities and Section 11 which addresses potential impacts on waterbird populations), this section is intended to provide the information that is required to inform the appropriate assessment of the implications of the proposed development on the designated status of the SPA as required under Regulation 48 of the Conservation (Natural Habitats &c.) Regulations 1994. The potential effects on the designated features of the Teesmouth and Cleveland Coast Ramsar site are also discussed. The boundaries of the SPA and Ramsar site are coincident.

2. The relevant predicted effects and impacts of the proposed development as reported in the remainder of this ES have been drawn into this section in order to demonstrate the implications of the proposed development on designated status.

3. In its informal response to the Environmental Scoping Report, English Nature has stated that a formal response to each competent authority for the various consents required to implement the proposed development will be provided on receipt of a formal application for such consents. Therefore, at the informal scoping stage, English Nature did not specifically state that the proposed development would be likely to have a significant effect on the European site and, therefore, that appropriate assessment would be required. Consequently, the information provided in this section is intended to inform English Nature in providing advice to the competent authorities as to whether or not appropriate assessment is required.

4. The approach adopted in providing this information is intended to satisfy the requirements of Policy Planning Statement 9 (PPS9) (Biodiversity and Geological Conservation) (ODPM, 2005a) and the accompanying Government Circular 06/05 (ODPM, 2005b). Circular 06/05 states that the procedures described in Circular are to be applied to Ramsar sites as well as SPAs as a matter of policy, even though the former are not European sites as a matter of law.

28.2 Teesmouth and Cleveland Coast SPA

28.2.1 <u>Overview of the SPA</u>

1. Teesmouth and Cleveland Coast is an SPA, including both marine areas and land which is not subject to tidal influence. The marine component qualifies as a European marine site. The seaward boundary of the European marine site is concurrent with the SPA and the landward boundary is the same as the upper boundary of the SPA or, where that extends above land that is covered

continuously or intermittently by tidal waters, it is at the limit of the marine habitats. The citation for the SPA and Ramsar sites, together with a map of the site boundaries, is included in Appendix 2.

28.2.2 Interest features of the Teesmouth and Cleveland Coast SPA

1. The following details are taken from the citation for the SPA as provided by English Nature. The Teesmouth and Cleveland Coast SPA is of European importance because it is used regularly by at least 1% of the Great Britain population of the following species listed on Annex 1 of the Birds Directive (79/409/EC).

Annex 1 species	5 year peak mean	% of GB population
Little tern *Sterna albifrons*	40 pairs (1995-1998)	1.7
Sandwich tern *Sterna sandvicensis*	1900 birds (1988-1992)	4.0

2. In addition, the SPA is used regularly by 1% or more of the biogeographical population of the following migratory species (other than those listed in Annex 1) in any season.

Non-Annex 1 migratory species	5 year peak mean	% East Atlantic Flyway
Knot *Calidris canutus*	5509 (1991/92-1995/96	1.6
Redshank *Tringa totanus*	1648 (1987-1991)	1.1

3. The SPA further qualifies as it is used regularly by over 20,000 waterbirds or 20,000 seabirds in any season; the SPA supported a peak mean of 21,312 individuals over the period 1991/92 to 1995/96.

4. In addition to the above, the SPA also supports nationally important populations of cormorant *Phalacrocorax carbo*, shelduck *Tadorna tadorna*, teal *Anas crecca*, shoveler *Anas clypeata*, ringed plover *Charadrius hiaticula* and sanderling *Calidris alba*.

28.2.3 Conservation objectives

1. Under Regulation 33(2)(a) of the Conservation (Natural Habitats &c.) Regulations 1994, English Nature has the duty to advise relevant authorities as to the conservation objectives for the European site. English Nature's advice for the Teesmouth and Cleveland Coast European marine site under Regulation 33, detailing the conservation objectives and information on how to recognise 'favourable condition' (as defined through the conservation objectives), was published in November 2000 (English Nature, 2000).

2. The conservation objective for the internationally important populations of the regularly occurring Annex I bird species are as follows:

- Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex 1 bird species, under the Birds Directive, in particular:

- Sand and shingle;
- Intertidal sandflat and mudflat; and
- Shallow coastal waters.

3. The conservation objective for the internationally important populations of the regularly occurring migratory bird species are as follows:

- Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring migratory bird species, under the Birds Directive, in particular:

- Rocky shores;
- Intertidal sandflat and mudflat;
- Saltmarsh.

4. The conservation objectives for the internationally important assemblage of waterfowl are as described above for migratory bird species.

28.3 Teesmouth and Cleveland Coast Ramsar site

1. The Teesmouth and Cleveland Coast Ramsar site is of international importance because:

a) The site is used regularly by 1% or more of the individuals in a population of waterbirds (Ramsar site selection criterion 3c) as follows:

Species	5 year peak mean	Population
Knot *Calidris canutus*	5509 (1991/92 – 1995/96)	1.6% EAF
Redshank *Tringa totanus*	1648 (1987 – 1991)	1.1% EAF
Little tern *Sterna albifrons*	40 pairs (1995 – 1998)	1.7% GB
Sandwich tern *Sterna sandvicensis*	1900 (1988 – 1992)	4.0% GB

b) The site is used regularly by over 20,000 waterfowl (Ramsar site selection criteria 3a) (21,312 individuals over the period 1991/92 – 1995/96)

28.4 Consideration of 'likely significant effect'

1. If a proposed development is not directly connected with or necessary to site management, then it must be determined whether the proposal is likely to have a significant effect on a European site. Appropriate assessment is required for a plan or project which, either alone or in-combination, is likely to have a significant effect on the site. It is important to assess the likelihood of significant effect with respect to each of the interest features for which the site is classified

and for each designation where a site is classified under more than one international obligation. In this case, the potential for likely significant effect must therefore be considered for each interest feature of both the SPA and Ramsar site (see Table 28.1).

2. It is recognised that the conclusion as to whether or not a likely significant effect would arise rests with the competent authority and that the authority would be advised by English Nature. In the case of the proposed development it is considered that there is a likelihood of a significant effect on each designated feature of the SPA and Ramsar site, as summarised in Table 28.1. The final column of Table 28.1 summarises (in broad terms) the reasons why a likely significant effect may arise on each of the designated interest features. Tables 28.2 and 28.3 expand on this information, drawing from the conclusions made in the ES.

Table 28.1 Consideration of the potential for likely significance effect with respect to SPA and Ramsar interest features

Designated interest feature	Potential likely significant effect?	Reason
Teesmouth and Cleveland Coast SPA		
Little tern *Sterna albifrons*	Yes	▪ Disturbance during capital dredging and port operation ▪ Effects on breeding and roosting sites ▪ Effects on food availability
Sandwich tern *Sterna sandvicensis*	Yes	
Knot *Calidris canutus*	Yes	▪ Disturbance during capital dredging and port operation ▪ Direct (e.g. reclamation) and indirect (e.g. hydraulic and sedimentary) effects on habitat extent ▪ Effects on food availability (e.g. sediment deposition during dredging)
Redshank *Tringa totanus*	Yes	
Overall waterbird assemblage	Yes	
Nationally important waterbirds (cormorant, shelduck, teal, ringed plover, sanderling)	Yes	
Teesmouth and Cleveland Coast Ramsar site		
Knot *Calidris canutus*	Yes	▪ Disturbance during capital dredging and port operation ▪ Direct (e.g. reclamation) and indirect (e.g. hydraulic and sedimentary) effects on habitat extent ▪ Effects on food availability (e.g. sediment deposition during dredging)
Redshank *Tringa totanus*	Yes	
Overall waterbird assemblage	Yes	
Little tern *Sterna albifrons*	Yes	▪ Potential for reclamation of Bran Sands lagoon ▪ Disturbance during capital dredging and port operation ▪ Effects on breeding and roosting sites ▪ Effects on food availability
Sandwich tern *Sterna sandvicensis*	Yes	

3. In light of the information provided in Table 28.1, it is concluded that appropriate assessment is required in this instance.

28.5 Appropriate assessment

28.5.1 Introduction

1. Assuming that the competent authority agrees with the conclusion made in the preceding section, an appropriate assessment must be made of the implications of the proposed scheme in view of the site's conservation objectives. Appropriate assessment must be made in respect of each interest feature for which the site is designated and for each designation (i.e. SPA and Ramsar site).

2. English Nature has provided its advice under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994 ('Regulation 33 advice').

This advice has been used as guidance in assessing the implications of the proposed scheme on the conservation objectives of the European marine site

28.5.2 Favourable condition

1. English Nature's Regulation 33 advice contains a favourable condition table. This table is intended to supplement the conservation objectives in relation to the management of activities and requirements on monitoring the condition of the site and its features. It is important to note that the table does not, by itself, provide a comprehensive basis on which to assess plans and projects through the appropriate assessment process but it does inform the scope and nature of any appropriate assessment. Therefore, given this context, it is useful, as part of the provision of information to English Nature as to the potential implications of the proposed development on the designated status of the European site, to present the implications of the development in light of the various favourable conditions targets.

2. Tables 28.1 and 28.2 present the favourable condition tables for the Teesmouth and Cleveland Coast European marine site. These tables have been reproduced from English Nature (2000) with modification to present the implications of the proposed scheme specifically in light of the attributes of importance to the interest features of the European marine site. In addition, preventative measures (i.e. measures that have been designed into the construction works to minimise or avoid potential adverse impacts) and mitigation measures have been described.

3. Given that the features for which the SPA is designated encompass the features for which the Ramsar site is designated, it is concluded that the favourable conditions tables within the Regulation 33 advice (based on the SPA interest features) also apply for the interest features of the Ramsar site. Tables 28.2 and 28.3 therefore provide an assessment of the implications of the proposed scheme on both the SPA and Ramsar site interest features.

Table 28.2 Favourable condition table for the Teesmouth and Cleveland Coast European marine site showing the potential impacts associated with the construction phase, proposed preventative and mitigation measures, the significance of potential residual impacts and the implications for each favourable condition target (adapted from English Nature, 2000)

Sub - feature	Attribute	Target	Potential effect during the construction phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
FEATURE: Internationally important populations of regularly occurring Annex I bird species (i.e. little tern, Sandwich tern)							
	Disturbance	No significant reduction in numbers or displacement of wintering birds attributable to disturbance from an established baseline, subject to natural change	No disturbance due to the proposed works are predicted on these species due to the locations used by these species for breeding or roosting	N/A	None required	No impact	No effect
	Extent and distribution of habitat	No decrease in extent from an established baseline, subject to natural change	Areas that are favoured by these species do not have the potential to be affected by the scheme. A small number of little terns breed at North Gare but the scheme is not predicted to affect the areas used	N/A	None required	No impact	No effect
Sand and shingle	Vegetation characteristics	Vegetation height and density at nesting sites should not deviate significantly from an established baseline, subject to natural change	The proposed scheme does not have the potential to affect vegetation characteristics is areas used for breeding	N/A	None required	No impact	No effect
Intertidal sand and mudflats	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The proposed scheme does not have the potential to influence sight lines to sand and mudflats	N/A	None required	No impact	No effect

Sub - feature	Attribute	Target	Potential effect during the construction phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
Shallow coastal waters	Food availability	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change	The capital dredging is predicted to result in an increase in suspended sediment concentrations at the mouth of the Tees estuary and in the near-shore waters of Tees Bay. This is predicted to result in the localised, short-term redistribution of small fish	N/A	None required	Negligible	No effect
FEATURE: Internationally important populations of regularly occurring migratory species (knot (winter), redshank (autumn) and of the internationally important assemblage of waterbirds							
	Disturbance	No significant reduction in numbers or displacement of wintering birds attributable to disturbance from an established baseline, subject to natural change					
	Extent and distribution of habitat	No decrease in extent from an established baseline, subject to natural change	The scheme is not predicted to result in the loss of habitat used by waterbirds. It is predicted that as a consequence of effects on the tidal prism, approximately 160m^2 of North Tees mudflat would convert from intertidal to very shallow subtidal habitat. The ability of the mudflat to support waterbirds would not be affected as a consequence of this effect	N/A	None possible	Negligible	Strictly, the extent of intertidal habitat will be marginally reduced at low water on spring tides. No effect on waterbird populations are predicted as a consequence

Sub - feature	Attribute	Target	Potential effect during the construction phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
Rocky shores	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
	Food availability	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change	The scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
Intertidal sand and mudflats	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
	Food availability	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change	Although deposition of fine material is predicted on Seal Sands as a consequence of capital dredging, no adverse impact on benthic community structure is predicted. Deposition would be of the order of 0.05mm per tide, with a maximum overall predicted deposition of 1mm	N/A	None required	No impact	No effect
Saltmarsh	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
	Vegetation characteristics	Vegetation height throughout areas used for roosting should not deviate significantly from an established baseline, subject to	The scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect

Sub - feature	Attribute	Target	Potential effect during the construction phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
		natural change					
	Food availability	Presence and abundance of prey species (aquatic invertebrates) and food species (seed-bearing plants) should not deviate significantly from an established baseline, subject to natural change	Saltmarsh is mapped as being present in the eastern part of Seal Sands. Less than 1mm of peak deposition of sediment is predicted at this location. No adverse effect is predicted on benthic communities and saltmarsh vegetation as a result	N/A	None required	No impact	No effect

Table 28.3 Favourable condition table for the Teesmouth and Cleveland Coast European marine site showing the potential impacts associated with the operational phase, proposed preventative and mitigation measures, the significance of potential residual impacts and the implications for each favourable condition target (adapted from English Nature, 2000)

Sub - feature	Attribute	Target	Potential effect during the operational phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
FEATURE: Internationally important populations of regularly occurring Annex I bird species (i.e. little tern, Sandwich tern)							
	Disturbance	No significant reduction in numbers or displacement of wintering birds attributable to disturbance from an established baseline, subject to natural change	The proposed scheme does not have the potential to result in an increase in the level of disturbance to areas used by these species	N/A	None required	No impact	No effect
	Extent and distribution of habitat	No decrease in extent from an established baseline, subject to natural change	No effect on extent and distribution of habitat used by these species is predicted	N/A	None required	No impact	No effect
Sand and shingle	Vegetation characteristics	Vegetation height and density at nesting sites should not deviate significantly from an established baseline, subject to natural change	The scheme does not have the potential to impact on vegetation characteristics of sand and shingle areas	N/A	None required	No impact	No effect
Intertidal sand and mudflats	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The scheme does not have the potential to impact on sight lines of intertidal areas used by waterbirds	N/A	None required	No impact	No effect
Shallow coastal waters	Food availability	Presence and abundance of prey species should not deviate significantly from an established	The scheme does not have the potential to affect food availability for Annex I species	N/A	None required	No impact	No effect

Sub - feature	Attribute	Target	Potential effect during the operational phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
		baseline, subject to natural change					
FEATURE: Internationally important populations of regularly occurring migratory species (knot (winter), redshank (autumn) and of the internationally important assemblage of waterbirds							
	Disturbance	No significant reduction in numbers or displacement of wintering birds attributable to disturbance from an established baseline, subject to natural change	It is considered that shipwash generated by passing vessels could result in some limited additional disturbance to birds feeding on North Gare Sands, Bran Sands and Vopak foreshore. No effects on waterbird populations as a whole are predicted	N/A	None required	Negligible	No effect
	Extent and distribution of habitat	No decrease in extent from an established baseline, subject to natural change	The proposed scheme is not predicted to result in a decrease in the extent or distribution of habitats used by waterbird assemblages	N/A	None required	Negligible	No effect
Rocky shores	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The proposed scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
	Food availability	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change	The proposed scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
Intertidal sand and mudflats	Absence of obstruction to	No increase in obstructions to existing bird sight lines, subject to	The proposed scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect

Sub - feature	Attribute	Target	Potential effect during the operational phase	Preventative measures	Mitigation	Significance of residual impact	Implications for favourable condition target
	bird sight lines	natural change					
	Food availability	Presence and abundance of prey species should not deviate significantly from an established baseline, subject to natural change	The predicted increase in supply of fine material to Seal Sands via Seaton Channel will make a minor contribution to the elevation of the intertidal zone.				
Saltmarsh	Absence of obstruction to bird sight lines	No increase in obstructions to existing bird sight lines, subject to natural change	The proposed scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
	Vegetation characteristics	Vegetation height throughout areas used for roosting should not deviate significantly from an established baseline, subject to natural change	The proposed scheme does not have the potential to affect this attribute	N/A	None required	No impact	No effect
	Food availability	Presence and abundance of prey species (aquatic invertebrates) and food species (seed-bearing plants) should not deviate significantly from an established baseline, subject to natural change	The predicted increase in supply of fine material to Seal Sands via Seaton Channel will make a minor contribution to the elevation of the intertidal zone.				

28.5.3 Consideration of in-combination effects

1. When assessing the implications of a plan or project in light of the conservation objectives for the European site (i.e. ascertaining the potential for effect on site integrity) it is necessary to consider the potential for in-combination effect on the designated interest features of the site. It is worth noting that the consideration of in-combination effects is also required when assessing the potential for a plan or project to have a 'likely significant effect' (see Section 28.4) and therefore whether or not appropriate assessment in required in the first instance. In this case (as described in Section 28.4) it is concluded that the proposed scheme has, by itself, the potential to have a likely significant effect on the interest features of the SPA and Ramsar site and, therefore, the consideration of potential for in-combination effect is not relevant in this respect.

2. English Nature's Habitats Regulations Guidance Note 4 (English Nature, 2001) provides guidance on in-combination effect and, at paragraph 2.3, states that other plan or projects should include:

- Approved but as yet uncompleted plans or projects;
- Permitted ongoing activities such as discharge consents or abstraction licenses, and,
- Plans and projects for which an application has been made and which are currently under consideration but not yet approved by competent authorities.

3. It is also noted that in some circumstances it may be appropriate to include plans and projects not yet submitted to a competent authority for consideration but for which sufficient details exists on which to make judgements on their impact on the European site.

4. The potential effect on the site is assessed for each of the interest features of each designation (i.e. SPA and Ramsar site) and, therefore, conservation objectives for the site.

5. The in-combination assessment includes the following plan and projects:

- Deepening of Tees Dock (PD Teesport);
- Recharge of North Tees Mudflat (PD Teesport);
- Capital dredging in the Seaton Channel (Able UK);
- Tees Wind North (AMEC);
- Tees offshore windfarm (EDF Energy).

6. The level of environmental information required in connection with each of the above varied with the type of consents and permissions required and the magnitude of each project. Published information has been used (where available) to inform the potential for in-combination effects. Where little or no information is available, a judgement has been made on the implications for the European site based on the characteristics of the scheme.

Deepening of Tees Dock

7. PD Teesport undertook a deepening of the Tees Dock; the berths within Tees Dock were not deepened and berths 1, 2, 3, 4, 5 (on No 1 quay) 6 and 7 (on quay 2) remain dredged to 10.9m below CD. The two Ro-Ro terminals at the head of Tees Dock are also dredged to 10.9m below CD.

8. The dredging of Tees Dock involved the removal of approximately 54,000m^3 of 'soft' material and approximately 100,000m^3 of marl. This work did not require EIA to be undertaken but PD Teesport consulted with English Nature when undertaking the work.

9. The potential for effect on the European site associated with this scheme is considered to be very low. No intertidal areas were directly affected and the potential for indirect effects on intertidal areas is very low given the small quantity of the dredge. This scheme is, therefore, scoped out from the assessment of in-combination effects.

Recharge of North Tees mudflat

10. This scheme involved the beneficial use of dredged material arising from maintenance dredging undertaken by PD Teesport. The aim of the scheme was to recharge this area of mudflat (which is part of the Teesmouth and Cleveland Coast SPA and Ramsar site) to provide a raised intertidal level, of better quality than exists at present, for feeding waterbirds.

11. The consideration of the effects of the recharge on North Tees mudflat is relevant in that the proposed NGCT scheme is predicted to have an effect on this designated intertidal area as a consequence of the effect on tidal propagation. That is, the proposed NGCT scheme is predicted to result in the decreased exposure of approximately 160m^2 of intertidal area at low water on spring tides.

12. The recharge of North Tees mudflat would, in-combination with the predicted effect of the proposed NGCT scheme, result in a net enhancement of the ecological potential of this area of mudflat. Although EIA was not required to undertake the recharge, discussions were held with English Nature throughout the development of the proposals and, overall, the effect on the mudflat is considered to be beneficial in light of the interest features of the SPA and Ramsar site.

13. During the consultation process for the proposed NGCT scheme, it was agreed (between PD Teesport, CEFAS and English Nature) that an ongoing programme of the improvement of the quality of North Tees mudflat should be put in place. This would take into account the potential for future deterioration in the ecological quality of this area of mudflat due to, for example, sea level rise. This initiative would not be required as a consequence of the proposed NGCT development, but would be a wider collaborative initiative which would result in an overall ecological benefit for this area of designated mudflat.

Capital dredging in the Seaton Channel

14. Able UK submitted a planning application for consent to construct, repair, refurbish or decommission ships at the Seaton Port TERRC facility. In addition, Able UK wished to construct a cofferdam across the dock, which is currently open to Seaton Channel, and subsequently to install purpose-made dock gates. Other works for which permission was sought include reconstructing the quays facing onto Seaton Channel and along the eastern side of the dock basin and deepening the Seaton Channel. An EIA was undertaken to accompany the applications for the consents and permissions that were required (RPS, 2005).

15. RPS (2005) concludes that the dredging would result in increases in suspended sediment concentrations with the result that Seal Sands may experience a higher sedimentation rate. It is also noted that the sediment fractions may also become coarser. It was concluded that the overall effect of the proposals on the hydraulic regime would be limited to minor effects in Seaton Channel.

16. In order to properly address the potential in-combination effects of the proposed Seaton Channel dredging with the dredging for the proposed Northern Gateway Container Terminal on the hydrodynamics and sediment transport regime during the operational phase, the two schemes have been modelled together. The same suite of numerical models developed for this EIA was used to assess the potential for in-combination effect.

17. The effects of the proposed channel deepening for the Northern Gateway Container Terminal development on Seaton Channel (as demonstrated through the studies presented in this ES) can be summarised as follows:

- No changes to tidal or wave conditions within the channel;
- An increased infill rate (approximately 10%) of fine material due to an increased import of fine material into the Tees estuary system; and,
- No increase in infill from marine sand.

18. The proposed Seaton Channel deepening has been studied on behalf of Able UK by Det Norske Veritas (DHV, 2004) and on behalf of PD Teesport by ABPmer (ABPmer, 2003). Their predictions of the effect of the Seaton Channel deepening were that there would be reduced currents with an associated increase in the siltation rate in the Seaton Channel, but with little effect on the adjacent intertidal areas of Seal Sands.

19. Since the above studies were undertaken the proposed design of the deepened Seaton Channel has been refined resulting in a proposed channel depth of 9m below CD. The proposed width of the deepened channel is 100m. The deepening of the Seaton Channel to the presently proposed depth of 9m below CD was added to the proposed channel deepening associated with the Northern Gateway Container Terminal. The two model bathymetries and the difference between them are plotted on Figure 28.1. The channel is deepened by a maximum of just over 5m. The proposed slight narrowing of the channel means that all the bed changes appear within the exiting channel extents.

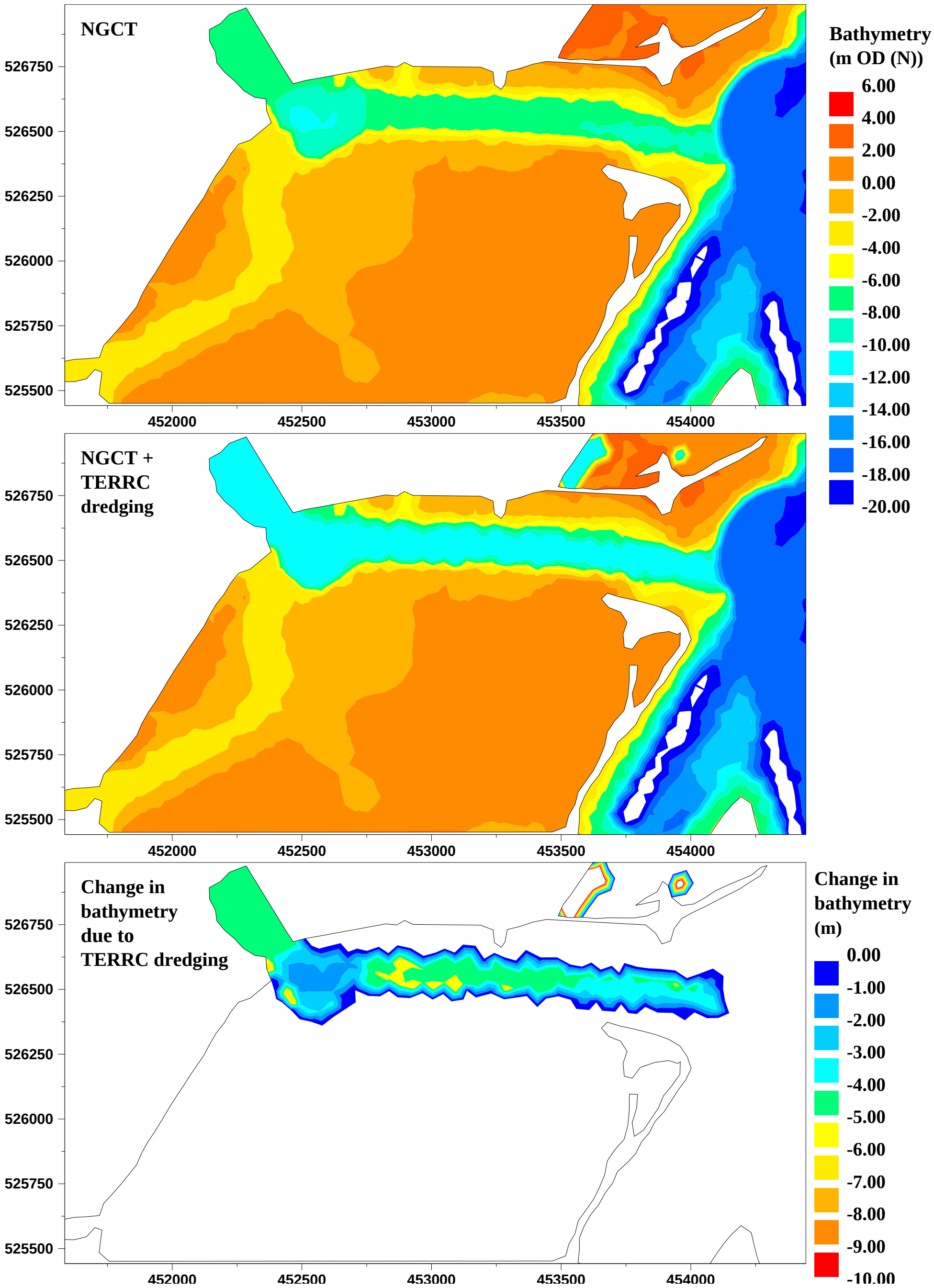

Figure 28.1 Model bathymetry for in-combination test

20. Figures 28.2 and 28.3 show the current magnitude before and after the proposed Seaton Channel deepening and the speed difference at times of peak ebb and flood current. The conditions illustrated are for depth averaged flows during a spring tide with high freshwater flow. At both stages of the tide a general reduction of current magnitude of 0.2 to 0.4m/s is shown. The ebb tide

results show a small area of speed increase to the north of the channel which does not appear at time of peak flood currents.

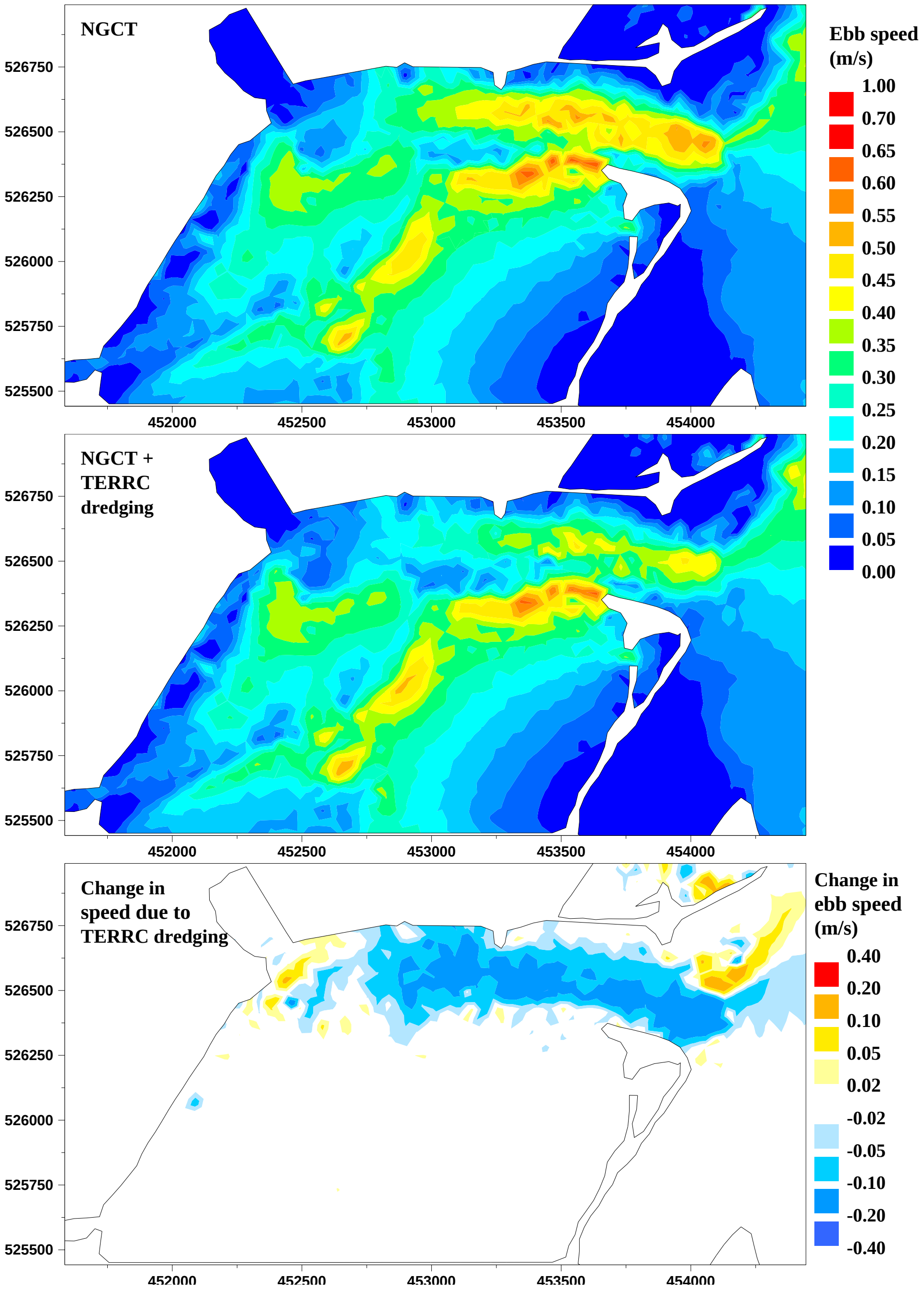

Figure 28.2 Peak ebb tidal currents before and after Seaton Channel deepening

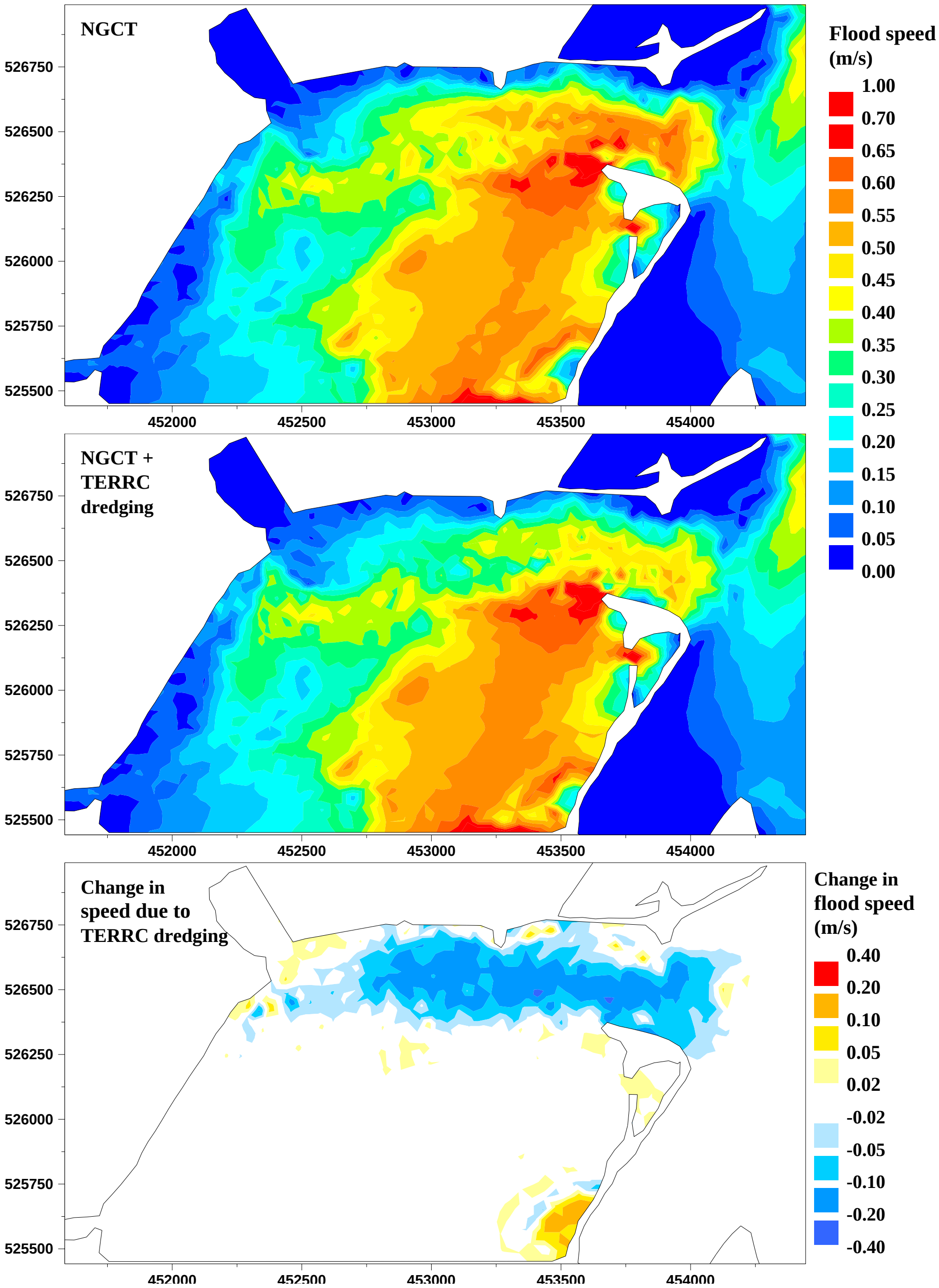

Figure 28.3 Peak flood tidal currents before and after Seaton Channel deepening

21. Figures 28.4 and 28.5 show the changes in the near-bed and near-surface current pattern for the before and after deepening cases. Some changes in the current pattern in the eastern end of Seaton Channel, as it meets the Seaton Channel turning circle, are shown.

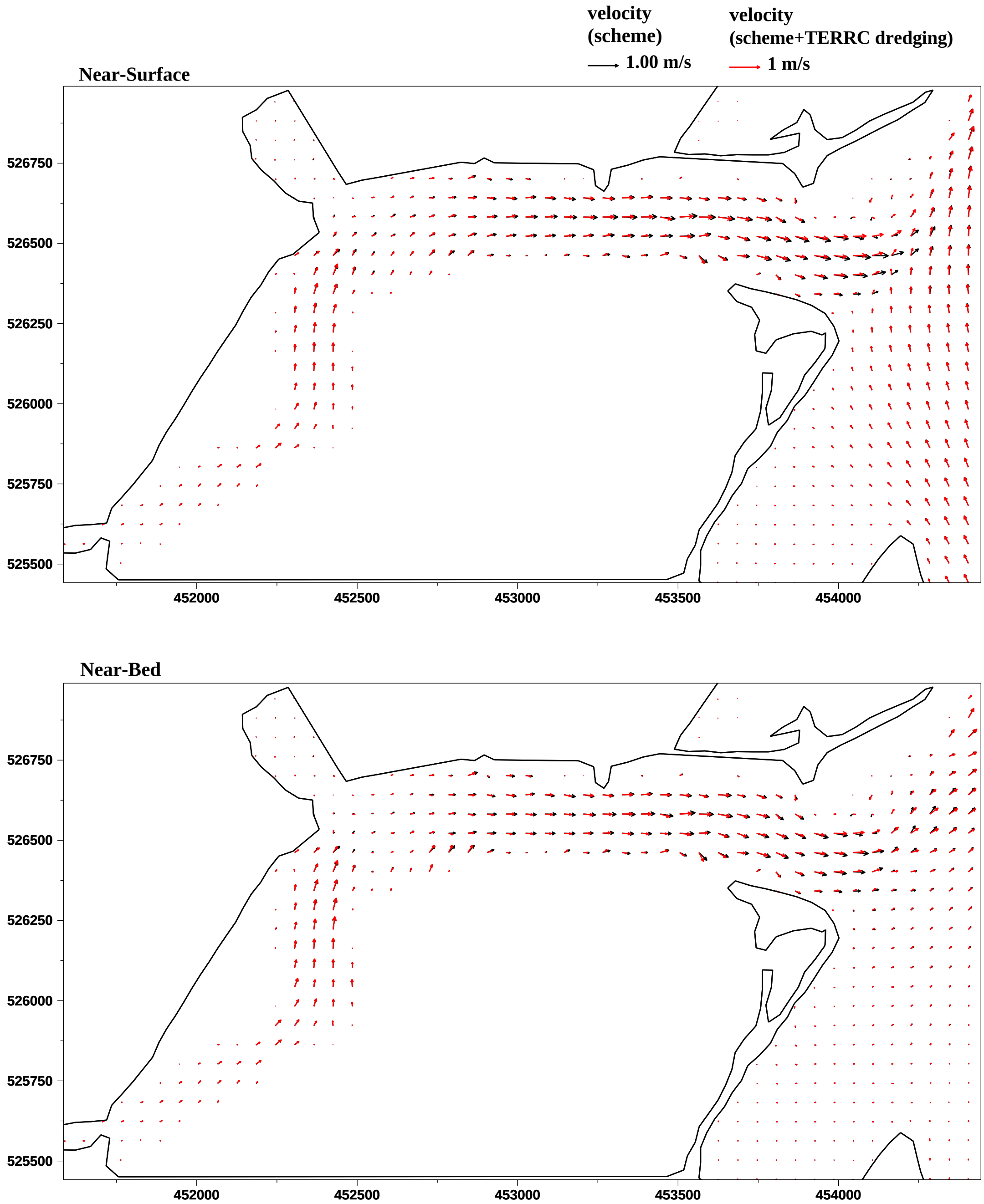

Figure 28.4 Peak ebb tidal current patterns before and after Seaton Channel deepening

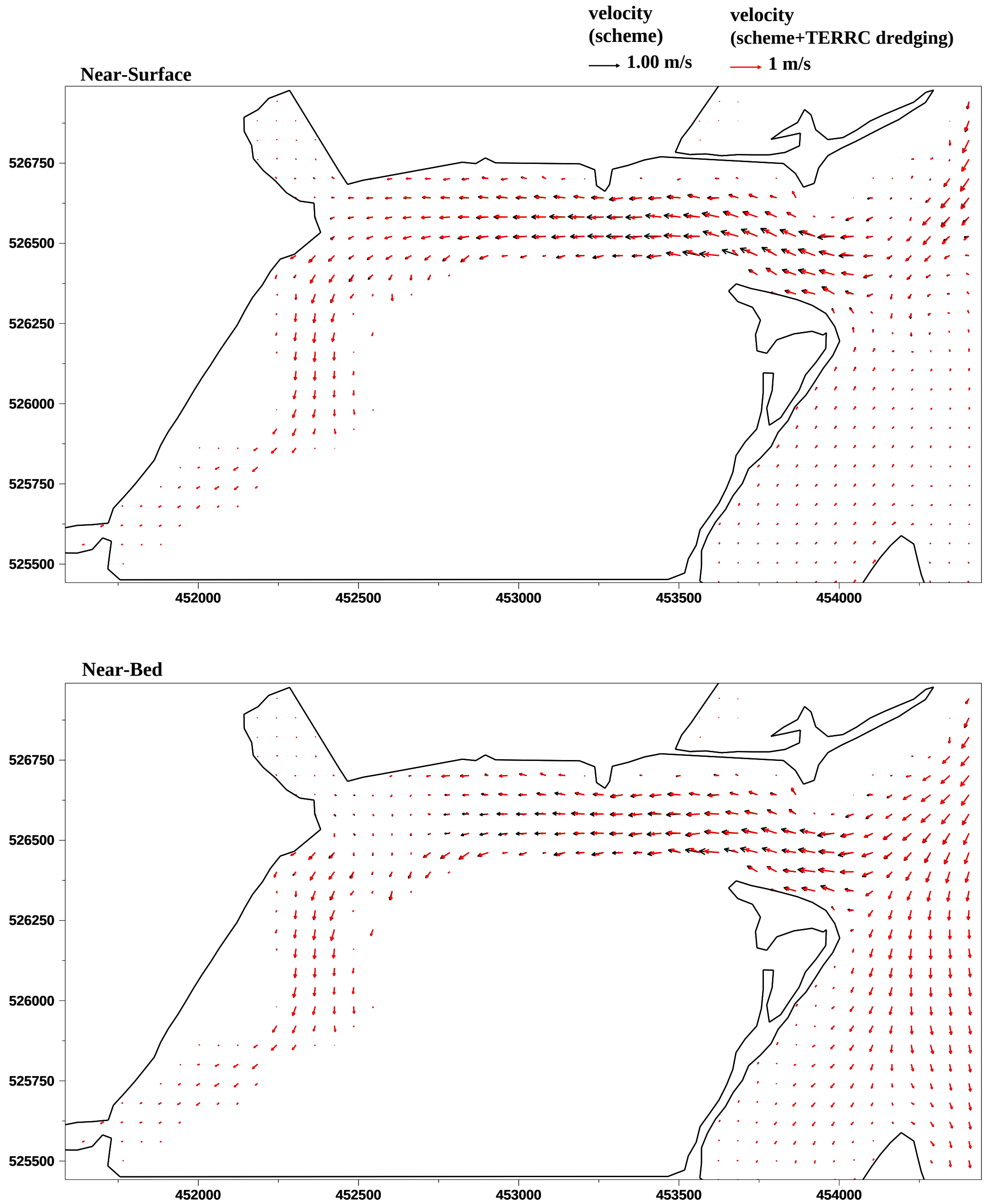

Figure 28.5 Peak flood tidal current patterns before and after Seaton Channel deepening

22. Further detail of any changes to the 3D nature of the current is shown in Figures 28.6 and 28.7 where time histories of near-surface, mid-depth and near-bed currents are shown at two locations, one at the entrance to Seaton Channel (1) and one adjacent to the Hartlepool power station intake (2). The general reduction of the currents is confirmed by these plots, with particular reductions in

the near-bed current shown at Position 2 during the flood tide. The balance of the near surface and near bed currents does not appear to be altered.

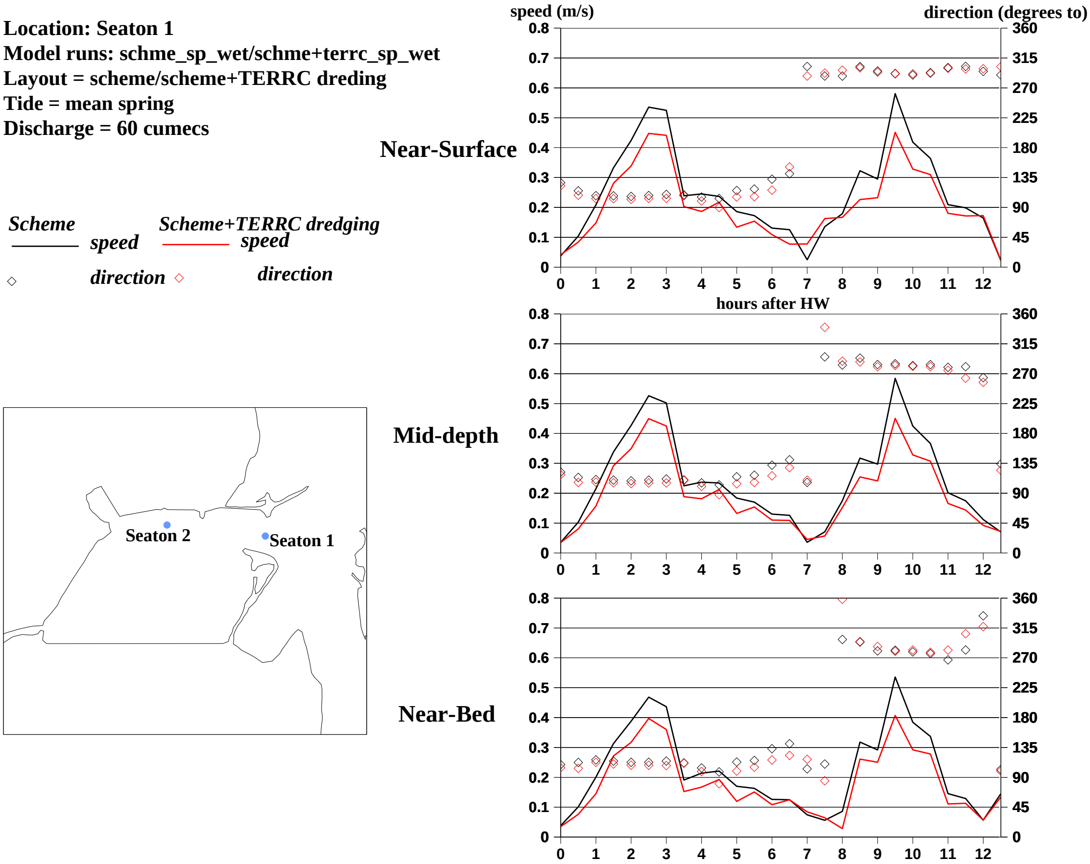

Figure 28.6 Time series of 3D currents at entrance to Seaton Channel before and after Seaton Channel deepening

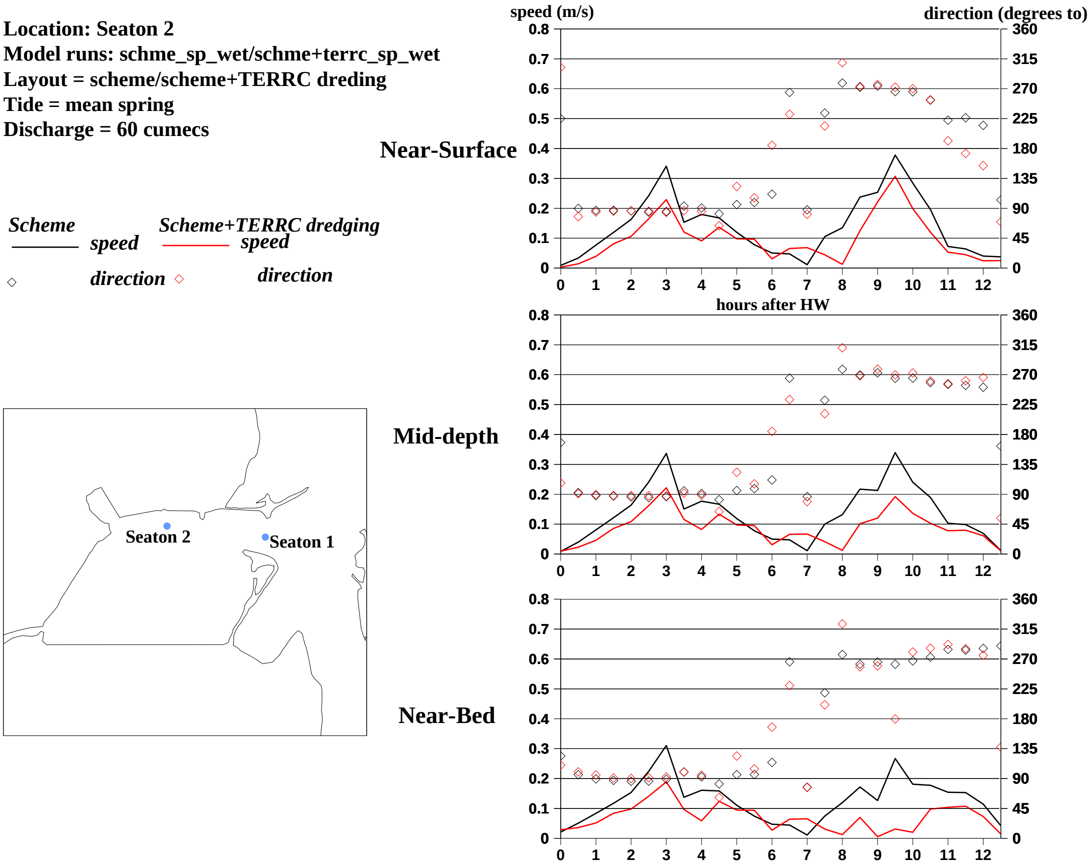

Figure 28.7 Time series of 3D currents near power station intake to Seaton Channel before and after Seaton Channel deepening

23. At present, Seaton Channel does not undergo regular maintenance, with dredging campaigns focused around major vessel movements. In the 3 year period following a recent dredging campaign, siltation rates of approximately 90,000m^3 per year were observed, mostly occurring at the eastern end of the channel (ABPmer, 2005), although longer term data is not available to see if this rate diminished for subsequent years. DNV (2004) estimated the infill rate in Seaton Channel from the overall volume removed from Chart area 9 scaled by plan area. This analysis produced an estimate of 36,000m^3 per year. Application of the 3D flow and fine sediment transport model as part of the present studies suggested a rate of infill of 33,000m^3 per year of fine material, which would be added to by any sands.

24. The deepening of the main approach channel was predicted, as part of the present EIA studies, to increase the source of fine material at the entrance of the Seaton Channel by approximately 10%; this material would enter the channel on the flood tide. When the Seaton Channel deepening is included in the model, the predicted deposition rate was 34,000m^3 per year (an increase of approximately 3% compared to baseline infill). This increased deposition was a result of the generally reduced currents in Seaton Channel, which is also where the increase in deposition was predicted to occur mostly at the seaward end of the channel and decreasing towards the west. No increased import of sediment is predicted as the 3D nature of the currents is unaffected. However, because the width of the channel is reduced compared to present conditions the increase in sedimentation in Seaton Channel accounts for only a third of the predicted increase in sediment supply to the Seaton Channel / Seal Sands area that is predicted to arise as a result of the deepening associated with the Northern Gateway Container Terminal.

25. The implications of the in-combination test for Seal Sands are that the deepening of Seaton Channel will result in deposition of approximately a third of the increase of supply of fine sediment entering Seaton Channel resulting from the proposed Northern Gateway Container Terminal deepening. This would also imply that a deepening of Seaton Channel alone would reduce the supply of fine material to Seal Sands.

26. It is concluded, therefore, that the two schemes in combination would have a lower effect on Seal Sands, in terms of potential elevation of intertidal area, compared with the predicted effect of the Northern Gateway Container Terminal in isolation.

Tees Wind North

27. AMEC Wind is proposing to construct a wind farm on land owned by Corus. The scheme, which received consent in 2002, comprises the construction of 18 turbines with a combined capacity of 45MW. An ES was prepared for the proposed scheme (AMEC Wind, 2001).

28. Section 6 of the ES prepared for Tees Wind North (AMEC Wind, 2001) addresses the potential effects on ornithology and concludes that no significant impacts on ornithology would result as a consequence of the proposed scheme.

Northern Offshore Wind farm

29. EDF Energy are proposing to build an offshore wind farm up to 100MW consisting of 30 turbines occupying approximately 10km^2 approximately 1 to 1.5km offshore of Redcar. An EIA was undertaken in connection with this development and therefore an ES is available (Entec, 2004). It is understood that this application currently remains to be determined. Importantly, with respect to potential for in-combination effect, a number of issues with respect to impacts on the interest features of the Teesmouth and Cleveland Coast SPA and Ramsar site appear to be unresolved (e.g. www.rspb.org.uk/england/north/policy/objection). However, the assessment of

potential for in-combination effect must be made on the basis of available information (the ES).

30. Section 11 of the ES prepared for the Northern Offshore Wind Farm (Entec, 2004) describes the existing wader, wildfowl and seabird populations of the study area and identifies and assesses the significance of potential impacts on these populations as a consequence of the construction, operation and decommissioning of the proposed wind farm. The ES (Entec, 2004) concluded that a number of species that are listed in the citation for the Teesmouth and Cleveland Coast SPA were present within the study area in internationally, nationally, regionally and locally important numbers.

31. With respect to potential impacts, it was predicted that there was no collision risk that would give rise to a significant impact on any species; furthermore, disturbance impacts would be very unlikely to be significant for any species. With respect to disturbance during construction, mitigation would ensure that no significant impacts would arise.

32. The overall conclusion of the ES was that no significant residual impacts on the site's bird populations are predicted during the construction, operation or decommissioning (Entec, 2004).

Extension of new hydrocracking plant (Petroplus), Stockton

33. It is understood that this proposal does not involve any works within the estuary and as such it is discounted from this assessment.

28.6 Summary of effect on the SPA and Ramsar site

28.6.1 <u>Effect on site integrity (Northern Gateway Container Terminal)</u>

1. The potential impacts of the proposed development in relation to the interest features of the Teesmouth and Cleveland Coast SPA and Ramsar site are described in Section 28.4; this section draws from the findings of the EIA process. In summary, it is concluded that the proposed scheme would not result in an adverse effect on the integrity of the SPA and Ramsar site.

28.6.2 <u>Effect on site integrity (in-combination)</u>

1. It is considered that, given the characteristics of the various schemes listed in Section 26.5.3 above, there are two routes of potential effect that could result in an effect on site integrity. First, there is the potential for an effect on waterbird populations themselves (e.g. disturbance) and second there is the potential for an effect on habitats within the boundaries of the SPA and Ramsar site (e.g. morphological effects on intertidal mudflats) which could have knock-on consequences for waterbird populations.

2. With respect to the first category of effect, it is concluded on the basis of the information contained within this ES that the proposed scheme does not have the potential to result in a significant effect directly on the waterbirds for which

the SPA and Ramsar site is designated. Given the predicted effects of the other plans or projects, it is considered that the proposed scheme does not have the potential to result in a significant in-combination effect with the other plans or projects.

3. With respect to potential impact on designated habitats, it is concluded that there are three plans or projects that have the potential to have an effect; the proposed NGCT, the proposed deepening of the Seaton Channel by Able UK and the recharge of North Tees mudflat. The other plans or projects do not have the potential to result in a significant impact on habitats within the SPA and Ramsar site.

4. A discussion of the predicted (modelled) in-combination effect of the proposed NGCT development and the deepening of Seaton Channel is provided above. In summary, it is concluded that the potential in-combination effect on designated habitats would be less than the effect of the proposed Northern Gateway Container Terminal in isolation.

5. The net effect of the recharge of North Tees mudflat in-combination with the predicted effect of the proposed NGCT development would be beneficial, with an improvement in the quality of this area of designated intertidal habitat.

6. In light of the above, it is concluded that the proposed scheme would not give rise to an adverse effect on the integrity of the Teesmouth and Cleveland Coast SPA and Ramsar site, either alone or in-combination with other plans or projects.

28.7 Sites of Special Scientific Interest

1. In addition to the consideration of the potential of the proposed scheme to have an effect on the designated status of the Teesmouth and Cleveland Coast SPA and Ramsar site, it is necessary to consider the potential for effect on the condition of SSSI's.

28.7.1 <u>Seal Sands</u>

1. As a result of the studies presented in this ES, it is concluded that the proposed NGCT development has the potential to affect Seal Sands SSSI through predicted effects on the hydraulic and sediment regime of the Tees estuary. Seal Sands SSSI forms a significant part of the Teesmouth and Cleveland Coast SPA and Ramsar site in terms of area; the implications of the proposed scheme on the SPA and Ramsar site are described in detail above. It is predicted that the proposed scheme does not have the potential to affect other SSSI's.

2. For the purposes of describing the current ecological condition of Seal Sands SSSI, the site is divided into three units by English Nature. Unit 1 is of particular relevance here as this unit comprises the intertidal sediments of the Seal Sands. Unit 2 is considered by English Nature to be 'Destroyed' through reclamation. Unit 3 is considered to be in 'Favourable' condition. Unit 3 is subject to controlled tidal inundation by a sluice, although this unit has experienced

maximum tidal inundation over the last 12 months as the sluice has been maintained in a fully opened position (www.english-nature.org.uk).

3. Unit 1 is described by English Nature as being in 'Unfavourable' condition due to the continuing high coverage of *Enteromorpha* algal mats. It is concluded from the findings of the studies, as presented in this ES, that the proposed NGCT does not have the potential to influence the coverage of *Enteromorpha* and, therefore, the proposed scheme will not contribute to the reasons why Unit 1 of the Seal Sands is in 'Unfavourable' condition.

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Appendix 1

Scoping responses

Appendix 2

Citations and designated site map

Appendix 3

Sediment quality data

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Appendix 4

Soil quality data

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Appendix 5

Marine ecology data

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Appendix 6

Terrestrial ecology

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Appendix 7

Archaeology

Appendix 8

Flood Risk Assessment