

## **23 SUMMARY OF POTENTIAL IMPACTS AND MITIGATION MEASURES ASSOCIATED WITH THE PROPOSED RECONFIGURATION**

1. Tables 23.1.1 and 23.1.2 summarise the predicted effects associated with the reconfiguration of Felixstowe South in its construction and operational phases respectively. Details of proposed mitigation measures are also set out and residual impacts given. The following sub-sections provide a summary of the key effects expected to arise due to the proposals on the biological and physical resource, as well as the human and built environment.

### **23.1 ASSESSMENT OF HYDRODYNAMIC AND SEDIMENTARY IMPLICATIONS OF THE FELIXSTOWE SOUTH RECONFIGURATION**

#### **23.1.1 Effect on tidal current speeds**

1. The main predicted impact of the proposed development is to slightly reduce local current speeds in the Harbour area adjacent to the widened channel. The predicted magnitude of this reduction is of the order of 0.2 m/s. Some small (<0.05m/s) current speed increases were predicted at the edges of the proposed channel. Speed increases were also shown on the ebb tide adjacent to the Harwich foreshore and on the flood tide near to Landguard Point.

#### **23.1.2 Effect on tidal range**

1. The predicted effect of the proposed development on spring tidal range is to reduce it by approximately 2mm in the Harbour area adjacent to the works and 3mm in the estuaries.

2. The integrated effect of the changes in low water level corresponds to a conversion of about 0.7ha of lower intertidal to upper sub-tidal. However, in real terms, this represents the conversion of a strip approximately 120mm wide on average, around the estuary system.

#### **23.1.3 Effect on wave activity**

1. The conditions simulated in the modelling were for return period of 10 times a year for waves from the north, west and south respectively. For waves from the north, generated within the Harbour and Orwell Estuary, the effects of the works are localised to the area of reconfiguration and are minor. There are no significant changes to wave conditions over intertidal areas under this condition.

2. For waves from the west, generated within the Stour Estuary, the differences are again localised to the area of reconfiguration. There is a band of increased wave energy associated with reflections off the northern part of the reconfiguration and corresponding reductions to the south of this band. In addition, there is an area of intertidal between the Low Lighthouse and the Breakwater at Beacon Cliff where wave energy is predicted to be increased by 6%. These waves are not incident on the foreshore, but represent an increased potential for agitation of the bed.

3. For waves from the south, there are more widespread effects. The penetration of wave energy into the Harbour is increased. Predicted wave heights are increased by

up to 10% in the Lower Orwell; up to 3% over the Shotley foreshore; and up to 4% in parts of Erwarnton Bay. Wave heights on the Harwich foreshore and immediately to the south of the reconfiguration are slightly reduced, in the latter case by up to 4%. Reflection off the southernmost part of the reconfiguration increases wave heights along the Pilot Station breakwater and the Harwich Navyard frontage by about 0.02m, approximately 2%.

4. The effect on waves from the south has also been run for 10-year return period event. Differences along the eastern part of the Harbour are comparable to those for the 10 times a year event; elsewhere differences are reduced. Predicted wave heights are only increased by up to 1% over the Shotley foreshore and by less than 1% in parts of Erwarnton Bay.

#### 23.1.4 Harbour siltation and dredging

1. The conclusion of the mud transport modelling was that siltation in the berths and approaches to Felixstowe would decrease by between 2% and 3% compared to the baseline situation after completion of the reconfiguration. The total volume of siltation in the Harbour dredging area (based on a background rate of 9,000m<sup>3</sup>/day) is thus predicted to be about 3.1Mm<sup>3</sup>/year

#### 23.1.5 Coastal processes

1. There would be no change to the coastal processes on the **Felixstowe frontage** as a result of the reconfiguration proposals, there is no mechanism for a hydrodynamic effect to arise and the fine sediment regime would be effectively unaltered. Consequently, the supply of shingle around the Landguard shingle spit would remain unchanged. The wave conditions along the Landguard frontage inside the Harbour would also be unchanged for waves from offshore and, as a result, the expectation is that northward transport of shingle from this location would be unchanged. A requirement to manage the evolution of shingle features inside the Harbour would remain, but this would be seaward of the reconfiguration. Landguard Fort and the proposed relocated viewing area would be protected by the reconfiguration.

2. On the **Harwich foreshore to Blackman's Head** tidal currents peak at between 0.2m/s to 0.4m/s on the flood tide, these currents are not predicted to change. On the ebb tide baseline currents are weaker, but are predicted to increase. The area would remain flood dominant. Along the southern part of this foreshore (between Low Light House and Blackman's Head) it is only during conditions of westerly winds that an increase in wave energy is predicted. In the area between the Pilot Station breakwater and Low Light House it is predicted that, under southerly wave conditions, incident wave heights would slightly reduce. Southerly waves would still be the dominant energy in this location. Adjacent to the breakwater, wave heights are predicted to slightly increase and the potential for some scour along the Pilot Station breakwater exists. There would, however, be no significant change to coastal processes to the south of the breakwater.

3. Over **the Shelf**, the shallow subtidal area to the east of Harwich, peak tidal currents are predicted to be unchanged or slightly reduced. Additionally, southerly wave energy, which is of the greatest magnitude, is predicted to be unchanged or slightly reduced. Only during westerly wind conditions is wave energy predicted to increase.

These changes are small, of the order of a few percent, and would not significantly modify the behaviour of the shallow subtidal area.

4. Increased wave energy is predicted in the **Lower Orwell** as a result of the reconfiguration. The increases are all in the areas where the Trinity III Terminal Extension habitat enhancement schemes are being constructed. These schemes are expected/ designed to have a flood defence value in terms of protecting the toe of the existing defences and to erode in the medium term (decades). The increase in wave energy is predicted to be up to 10%, for waves with the greatest incident heights. The inference being that, with FSR in place, the enhancement schemes would evolve and erode more rapidly than they would have otherwise.

5. On the **Shotley foreshore** wave heights are predicted to increase by up to 3% during southerly wind conditions with no significant change in incident direction. The prediction is for some increase over the entire foreshore and frontage. It is to be expected that such an increase would exacerbate the coastal defence problems on this frontage and maintain or slightly increase the rate of erosion of the Shotley Flats.

6. It is, therefore, proposed that clay dredged as part of the reconfiguration of Felixstowe South is used beneficially along the Shotley frontage (i.e. placed along the base of the seawall, extending westwards from the entrance to Shotley Marina) in order to enhance the coastal defences in this area.

7. Reflections off the southern end of the reconfiguration are predicted to cause small increases in wave energy, of up to 4%, propagating into parts of **Erwarton Bay**. There would be no changes in current speeds. It can be concluded that while the underlying average vertical erosion rate of 13-28mm/year in Erwarton Bay would be expected to increase slightly, the increase, averaged over the Bay, would be less than 1mm/year, which is not considered to be significant.

8. Nevertheless, it is proposed that water column recharge be undertaken adjacent to the Bay to offset this localised erosion. The local erosion is estimated to be substantially less than 1,250 tonnes/year. It is therefore proposed that water column recharge of between 2,000 to 10,000 dry tonnes of material a year occurs adjacent to Erwarton Bay during periods when meteorological conditions are likely to promote retention of the material in the Bay.

### 23.1.6 Effect on estuarine sediment budget

1. The rate of intertidal erosion is predicted to decrease in the Stour by about 6,000m<sup>3</sup> per year, leading to a small decrease in the estuary-wide average vertical rate of erosion from 12.0mm/year to 11.7mm/year, due to the reconfiguration. This represents a decrease in the rate of erosion of intertidal areas of about 0.4 hectares a year. In the Orwell the predicted effects of the reconfiguration are small (<1,000m<sup>3</sup>/year) and lead to a small increase in the estuary-wide rate of intertidal accretion, of the order of 0.1 ha/year.

2. The combination of changes gives a combined decrease in the rate of erosion of the intertidal area within the estuary system of approximately 0.5 ha/year, compared to baseline conditions.

## **23.2 OVERVIEW OF POTENTIAL IMPACTS ON THE BIOLOGICAL AND PHYSICAL RESOURCE**

### **23.2.1 Marine ecology**

1. The direct impacts of the proposed development comprise the reclamation of approximately 1.7ha of intertidal and 26.7ha of subtidal and dredging approximately 40ha of subtidal area. The intertidal area is considered to be of little interest in terms of the marine communities present. In contrast, the subtidal area to the west of the existing approach channel (amounting to 25ha) is relatively species rich and diverse. However, the existing channel (15ha) has low species richness, diversity and total abundance due to regular maintenance dredging. When considered as a whole, the impact of the capital dredging and reclamation on the benthic invertebrate resource is considered to be of moderate adverse significance.

2. During capital dredging, there would be deposition of fine sediment that is resuspended by the dredging process. It is not considered that this would have a smothering effect on marine communities given the high variability in suspended sediment concentrations that occurs naturally and given that the deposition and erosion of fine material is characteristic of the marine environment. There is, however, the potential for an impact of minor significance to arise due to the resuspension of potentially contaminated sediments.

3. The predicted effect of the proposed development on tidal propagation is not predicted to have an impact on marine communities.

4. During the operational phase, the potential impacts on marine communities largely relate to the indirect effects that could arise due to changes to the hydrodynamic and sedimentary regime. A negligible effect is predicted due to a change in tidal currents. However, an impact of beneficial significance is expected due to the predicted effect of the reconfiguration on intertidal erosion rates (i.e. a net decrease is predicted). The effect of wave activity on the benthic resource would vary from no impact to an impact of minor adverse significance depending on location, although mitigation measures are proposed to reduce these effects to a negligible level, at worse.

### **23.2.2 Marine and coastal ornithology**

1. The reclamation is expected to have a negligible effect on waterfowl given the low value of the intertidal areas as a feeding habitat. Other potential impacts expected to arise during the construction phase (i.e. disturbance and reduced exposure of intertidal area) are also expected to be of negligible significance.

2. During the operational phase, the most significant effect predicted is the decreased in the rate of erosion of intertidal habitat. This is expected to give rise to an impact of beneficial significance.

### **23.2.3 Coastal and terrestrial ecology**

1. The works to View Point Road are expected to result in an impact of minor adverse significance due to the localised loss of habitat that would arise following the widening of the road. No significant impact is expected to arise on terrestrial habitats

during the construction works at the 'viewing area', although an impact of minor adverse significance is expected on coastal (i.e. shingle) habitat.

2. No significant impacts are predicted to arise during the operational phase.

#### **23.2.4 Sediment quality**

1. During the construction phase, it is predicted that there would be a minor beneficial impact on sediment quality due to the removal of surface sedimentary material and the exposure of geological material that would have a lower level of contamination.

2. There would be no effect on sediment quality during the operational phase.

#### **23.2.5 Water quality**

1. During capital dredging in the area adjacent to the proposed reclamation, the production rate would be lower than during the regular maintenance dredging that occurs in this area. Therefore, there would be no effect on suspended solid concentrations outside of the envelope of those that occur during maintenance dredging. Assuming that overflow from the barges is controlled during dredging to the west of the approach channel, it is considered that the water quality impact would, therefore, be negligible.

2. It is not expected that the resuspension of highly contaminated sediment would occur during dredging.

3. The risk of a pollution incident occurring is considered to be minimal during the construction phase or in the operational port. The Port of Felixstowe has a contingency plan in place in the event that an accident did occur.

4. The effect of the proposed development on bacterial dispersion from sewage outfalls has been considered and no impact on water quality at bathing water beaches is expected to occur. Furthermore, the relocation of the DSM outfall would provide a minor benefit (i.e. the performance of the outfall would be improved).

5. It is proposed that the surface water from the Port would discharge through outfalls in the quay face; this is currently the case at the existing terminal. Surface water draining from areas where spillages of oil and diesel are likely to occur (i.e. the RTG maintenance pad, areas around the workshop and the area around the refuelling point) would pass through light liquid bypass separators prior to discharge. Therefore, no impact is expected when compared to the existing situation.

#### **23.2.6 Fisheries and fishing activity**

1. The construction phase has the potential to give rise to a number of impacts on the fisheries resource. The resuspension of fine sediment could have a minor adverse impact on fish physiology due to the blocking of gill structures. In addition, the direct uptake of fish during dredging could occur.

2. The potential impact of noise from piling and dredging works on fish was also assessed, but considered to have a negligible influence, largely due to the existing high level of background noise in the estuary due to shipping activity.
3. The construction works would result in access to significant areas of the Harbour being restricted for fishing vessels; this is considered to represent an impact of minor to moderate adverse significance in the short term.
4. Ultimately the dredging works would result in the removal (affecting around 25ha) of potential feeding areas for estuarine fish and the subsequent maintenance of the dredged areas would limit the recovery of the invertebrate resource. The impact of this on fish is considered potentially to be of moderate adverse significance, locally.
5. Access to certain areas of the Harbour would be restricted during the operational phase; this situation is not unusual in the Harbour and, in particular, in the vicinity of the reclamation given the high level of use by container vessels. The impact would therefore be of minor adverse significance.
6. Operational lighting at the Port is not expected to have an impact on fish due to the high turbidity levels of the water column and the reduction in light spill associated with the proposed reconfiguration, as compared to the existing situation.

## **23.3 OVERVIEW OF POTENTIAL IMPACTS ON THE HUMAN AND BUILT ENVIRONMENT**

### **23.3.1 Traffic and transportation**

1. It is estimated that there would be a maximum of just over 20,000 HGVs generated during Phase 1 of construction. The main construction access is expected to be via Dock Gate 1 at the junction of the A14(T) with the A154 Walton Avenue. This is the existing entrance to Landguard Terminal and would be the principal access to the completed scheme. Some construction vehicles associated with the NNRT may use Dock Gate 2.
2. During peak construction, up to 290 HGVs a day would be generated (for a three-month period), rising to a peak of 540 for a single week. At all other times the levels of HGV traffic would be lower than this, often considerably so. If all construction staff travel to and from the site by private car, there would be a maximum of 173 car movements inbound between 06:00 and 07:00, with a corresponding number outbound between 19:00 and 20:00. If 50% of non-supervisory staff travel by minibus, the total number of one-way movements would reduce to 107.
3. It is unlikely that this volume of traffic would have a material impact on the trunk road network - increases are less than 5% - for the peak of construction activity. Furthermore, given the relatively small increases in flows and the fact that the site is immediately adjacent to the trunk network, once away from the A14(T), the construction traffic would dissipate very quickly and any impact on the wider network would be of negligible significance.
4. Traffic generated would inevitably add to baseline flows on the A14(T). These increases are generally in the order of between 2% and 4% in the peak hour. As a

result, one junction on the A14 - the A14(T)/A154 Candlet Road roundabout - would require some modification to enable it to perform satisfactorily. However, with mitigation in place, there would be no impact on the road network from generated traffic. In terms of the total number of rail movements, the effect of the reconfiguration (i.e. by 2023 up to nine additional trains a day) is also expected to be of negligible significance.

### 23.3.2 Noise

1. The main noise effect of the construction phase arises due to piling the quay wall. With mitigation, the impact of piling during the day would be of minor to moderate adverse significance. Given that night-time construction activities would be restricted to dredging and reclamation, and there is no significant concern relating to these activities, the night-time impact would be negligible.

2. During the operational phase, the acoustic modelling concludes that the impact of operational noise would be of negligible to minor adverse significance, depending on the location of the receptor.

3. The impact of noise generated by road traffic is expected to be of negligible significance. Increased rail traffic would result in an impact of minor adverse significance at Trimley St Mary. An impact of minor beneficial significance would arise at locations alongside the railway line between the spur to the existing North Rail Terminal and the South Rail Terminal, as activity moves to the NNRT.

### 23.3.3 Vibration

1. The effect of vibration on sensitive structures (Landguard Fort, Landguard Museum and surrounding flood defences) due to the construction phase has been assessed. In respect of these structures, it is proposed that vibration levels are monitored during the piling works; and where vibration levels look likely to exceed threshold levels for structural damage, then the maximum energy per blow should be reduced. With this precaution in place, the impact would be of negligible to minor adverse significance.

2. During the operational phase, no impact is expected due to container handling and vibration associated with additional train movements is expected to be of negligible significance.

### 23.3.4 Air quality

1. The potential impact, in terms of pollutant concentrations at ground-level receptors, of emissions from general site construction activities, hinterland HGV and car generation, and capital dredging is considered to be of minor adverse significance. Dust generation from construction activities is also considered to represent an impact of minor significance.

2. For the operational phase, detailed atmospheric dispersion modelling has been undertaken in order to assess the air quality implications of the proposed works. Nine scenarios were modelled in total, concluding that the impact of the reconfigured Port on air quality during the operational phase would be of minor adverse significance.

### 23.3.5 Landscape and visual environment

1. The visual impacts of the construction phase would be temporary in nature and the magnitude of effect is expected to vary, subject to the location of the visual receptor, from slight to substantial. However, overall, the impact on views during the construction phase is predicted to be of minor adverse significance due to the temporary nature of the works.
2. The landscape assessment included consideration of the effect of the completed reconfiguration on the setting of settlements, the setting of the Landguard Fort SAM and other Listed Buildings, and on the surrounding landscape as assessed from various viewpoints. In general, the impacts on landscape character vary from minor to moderate adverse significance. The impact of lighting would vary, depending on the viewpoint of the receptor, from minor adverse to moderately beneficial.
3. It is predicted that there would be an impact of minor to moderate adverse significance on the Felixstowe Conservation Area and the setting of relevant Listed Buildings, whilst the impact on the setting of Harwich and its Conservation Area would be of moderate significance. The impact on the setting of Dovercourt, Shotley Gate, Shotley and Church End, Parkeston, Trimley St Martin and Trimley St Mary would be of negligible to minor adverse significance; whereas the impact on Adastral Close would be of minor to moderate significance, although the reduction in light spill would represent a significant improvement over the existing situation.
4. An impact of minor to moderate adverse significance is predicted on the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB), depending on location.
5. The likely effects on views from each of 22 viewpoints have been assessed for the development and are considered to be of minor to moderate significance, depending on location. Overall, it is concluded that the zone of visual influence of the port area would not be significantly extended due to the reconfiguration, with the main visual effects being confined to the intensification of the existing cranes.

### 23.3.6 Land-based archaeology and cultural heritage

1. During construction, it is considered that there is limited potential for a significant impact on pre-dock archaeology to arise, given the implementation of appropriate mitigation measures. Potential impacts on the Dock Basin and its surroundings range from negligible to moderate adverse significance and for the erecting shed/hangar would be of moderate adverse significance due to its demolition.
2. The main consideration during the operational phase is the impact on the setting of the Landguard Fort SAM. The significance of the impact would range from negligible to major adverse depending on the location of the view and whether the effect is considered within the estuary-wide or peninsula-wide setting. In terms of the immediate approach, an impact of major beneficial significance is expected given the proposals for the enhancement of the setting to the Fort. This would make a positive contribution to the integrity of the historic asset and provide a robust separation between the Port and the Fort.

### **23.3.7 Marine archaeology**

1. During the dredging works, there is the potential for the removal of features of known and unknown archaeological interest. However, further investigation of potential features of interest is proposed which would, along with other mitigation measures such as maintaining a watching brief during the dredging, give rise to a potential impact of minor adverse significance.
2. No significant impacts are expected to arise during the operational phase.

### **23.3.8 Local community**

1. During the construction phase, the temporary loss of amenity in the vicinity of the viewing area would be of minor adverse significance.
2. During the operational phase, the improved infrastructure would represent an impact of beneficial significance. However, the increased rail traffic due to the NNRT would give rise to an impact of minor adverse significance for users of the bridleway.

### **23.3.9 Land drainage, flood and coastal defence**

1. During the construction phase, no impacts on land drainage or flood defences are predicted. Similarly, during the operational phase, the surface water would drain via interceptors and outfalls in the quay face and, therefore, there would be no change from the existing situation.
2. The proposed development would increase the standard of flood defence to the south of the existing Landguard Terminal, in front of Landguard Fort. This would represent an impact of moderate to major beneficial significance locally. The only potentially adverse impact would be on coast protection along the Shotley frontage. However, with the implementation of a beneficial use scheme comprising the placement of dredged clay, this impact would be avoided.

### **23.3.10 Commercial and recreational navigation**

1. During the construction phase, the potential impact of the works on recreational users is considered to be of negligible significance. Furthermore, it is not expected that there would be interference with navigational aids in the Harbour.
2. The marine traffic analysis concluded that there is significant spare capacity within the Harbour and, therefore, that there would be no impact on commercial navigation due to traffic generated by the proposed development.

### **23.3.11 Socio-economics**

1. The construction phase would result in increased employment, representing an impact of minor beneficial significance. There would also be an indirect multiplier effect equating to an impact of moderate beneficial significance (indirect economic benefit) and minor beneficial significance (indirect jobs generated).

2. During the operational phase, around 620 jobs would be directly created, representing an impact of moderate beneficial significance. Indirectly, the development would have an impact of moderate beneficial significance on the local economy through increased Gross Value Added output and the creation of additional jobs.

3. Other benefits would arise due to increases in associated port activities (minor beneficial), increased visitor expenditure (minor beneficial), effect on the labour market (moderate beneficial) and increased competitive advantage (moderate beneficial).

**Table 23.1.1 Summary of the significance of potential effects and environmental impacts, mitigation measures and residual impacts associated with the construction phase of the proposed development**

Potential impact	Significance	Mitigation	Residual impact
<b>HYDRODYNAMIC AND SEDIMENTARY REGIME</b>			
N/A (see Table 2)	N/A	N/A	N/A
<b>MARINE ECOLOGY</b>			
Direct removal of subtidal benthic invertebrate resource due to reclamation and dredging	Moderate adverse	None possible	Moderate adverse
Loss of intertidal communities due to reclamation	Negligible	None required	Negligible
Deposition of sediment resuspended during capital dredging	No impact (intertidal areas); Minor adverse (The Shelf)	Sediment resuspension during backhoe dredging is highly dependant on operator skill, but mitigation measures include limiting swinging of the bucket over open water and not smoothing the excavated area by dragging the bucket along the seabed	No impact (intertidal areas); Minor adverse (The Shelf)
Potential impact on benthic invertebrate communities due to disturbance of potentially contaminated sediment	Minor adverse	Beyond the mitigation measures described above, no further mitigation is required (contamination levels are low)	Minor adverse
Potential impact due to predicted effect on tidal propagation	No impact	None required	No impact
<b>MARINE AND COASTAL ORNITHOLOGY</b>			
Direct loss of potential feeding and roosting habitat	Negligible	None possible	Negligible
Disturbance to feeding and roosting birds during the construction works	Negligible	None possible	Negligible
Implications of the conversion of intertidal to subtidal habitat	Negligible	None possible	Negligible

**Table 23.2.1 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
<b>COASTAL AND TERRESTRIAL ECOLOGY</b>			
Potential disturbance to terrestrial habitats due to works to View Point Road	Minor adverse	Minimise the working area as far as possible	Minor adverse
Potential disturbance to terrestrial habitats in the vicinity of the viewing area	Negligible	Minimise the working area as far as possible	Negligible
Potential disturbance to coastal habitats in the vicinity of the viewing area	Minor adverse	None possible	Minor adverse
<b>SEDIMENT QUALITY</b>			
Potential change in sediment quality due to the construction works	Minor beneficial	None required	Minor beneficial
<b>WATER QUALITY</b>			
Elevated suspended sediment concentration during the dredging works	Negligible	Sediment resuspension during backhoe dredging is highly dependant on operator skill, but mitigation measures include limiting swinging of the bucket over open water and not smoothing the excavated area by dragging the bucket along the seabed	Negligible
Remobilisation of contaminants through sediment disturbance	Negligible	The mitigation measures described above would also apply here	Negligible
Accidental pollution	Impact significance is dependant on the nature of the incident; however, the risk of an incident occurring is Minimal	Good site practice should be adopted, particularly undertaking works in accordance with appropriate Pollution Prevention Guidelines (PPGs)	The significance of the residual impact depends on the nature of the incident; the risk of an incident occurring is Minimal

**Table 23.2.1 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
<b>FISHERIES AND FISHING ACTIVITY</b>			
Effect of increased suspended sediment concentrations on fish physiology	Minor adverse	The measures that are proposed to minimise the resuspension of fine material also apply here	Minor adverse
Direct uptake of fish during dredging	Minor adverse	None possible	Minor adverse
Effect of construction noise on fish	No impact	None required	No impact
Restriction of access to potential fishing grounds	Minor to Moderate adverse	None possible	Minor to Moderate adverse
<b>TRAFFIC AND TRANSPORTATION</b>			
Potential for increased traffic levels on the road network: generated traffic	Negligible	Mitigation measures have been incorporated into the construction programme (e.g. the movement of some material by sea). Other measures are proposed, such as the provision of staff minibuses. A Traffic Management Plan will be prepared with SCC; as part of this work, a number of general traffic mitigation measures would be implemented to ameliorate the effects of construction activities	Negligible
<b>NOISE</b>			
Increase in noise levels during the daytime	The impact of piling would be of Moderate adverse on Adastral Close and Major adverse significance for the fort and museum area; at other noise sensitive locations, the impact would be Minor adverse	Piling operations should be confined to the hours of 07:00 and 19:00 Monday to Saturday; the use of a shrouded piling rig should be considered; BS5228 should be adopted as the basic code of practice on controlling noise; regular noise monitoring should be undertaken; all mechanical plant should be fitted with effective silencers and plant should not be left running unnecessarily; all plant should comply with EC noise limits; good community relations to be maintained	Should the shrouded piling rig trial be successful, and this method adopted, the residual impact would be Minor to Moderate adverse

**Table 23.2.1 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
Increase in noise levels during the night-time	Negligible	None necessary beyond those listed for daytime construction activities (above)	Negligible
Potential noise generation from construction traffic	Negligible	None required	Negligible
<b>VIBRATION</b>			
Potential impact of vibration on sensitive structures	The impact of piling would generally be Negligible, but potentially Moderate adverse for Landguard Museum and the surrounding flood banks during the latter stages of piling the quay wall	Monitoring of vibration levels should take place on potentially sensitive structures during the latter stages of piling for the quay wall in Phase 2; where vibration levels look likely to exceed threshold levels for structural damage, the maximum energy per blow should be reduced (this could extend piling operations)	Negligible to Minor adverse
<b>AIR QUALITY</b>			
Increased particulate and gaseous emissions	Minor adverse	During the construction activities, there would be opportunities for the provision of minibus services for transporting workers to and from site; such measures would reduce congestion	Minor adverse

**Table 23.2.1 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
Fugitive dust releases during construction activities	Moderate adverse	Mitigation is based on the application of an Environmental Management Plan that would be imposed upon contractors. The key features relate to administration (i.e. identification of a primary point of contact who has authority to order cessation of works; identification of all individual and contractor responsibilities; good practice in dust management; maintenance of a contact register and provision of a capability statement from the contractor detailing experience of dust control measures) and operation and practice (i.e. regular cleaning and maintenance of site roads; implementation of a speed restriction; restricting releases of particulate matter through covering of loads; wheel washing; shielding construction material from the wind and utilising water misting or sprays during particularly dusty activities)	Minor adverse
Increased emissions from peak HGV traffic	Minor adverse	Investigate the potential for making alternative delivery arrangements to reduce congestion at peak periods and, therefore, emissions; other forms of delivery (e.g. ships) would reduce overall emissions	Minor adverse
Construction phase emissions on Landguard Common SSSI	Negligible	The Environmental Management Plan should require contractors to use only well-maintained plant on site and to reduce diesel engine idling time	Negligible

Table 23.2.1 (cont.)

Potential impact	Significance	Mitigation	Residual impact
<b>LANDSCAPE AND VISUAL ENVIRONMENT</b>			
Visual impacts during construction	The magnitude of effect would vary from slight to substantial, depending on viewpoint; however, due to the temporary nature of the works, the overall impact is considered to be Minor adverse	Good site management would ensure a tidy and ordered site, including the alignment of haul roads and site fencing, the siting of storage areas, site accommodation and compounds; lighting would be designed to take account of relevant statutory regulations and obligations; lighting would only be used during the hours of darkness, during periods of low light or where there are health and safety implications; all fixed lighting would be restricted to a maximum height of 12m and the tilt angle would be controlled to limit glare and sky glow	Minor adverse
<b>LAND-BASED ARCHAEOLOGY AND CULTURAL HERITAGE</b>			
Potential impact on pre-dock archaeology and the remains of Landguard Fort	The significance depends on the nature of the features; however, the impact is potentially Moderate adverse	Sub-surface works should be kept to a minimum; an archaeological watching brief is to be maintained during the excavation of trenches	Negligible
Loss of the Dock Basin and associated buildings, the seaplane station and effect on the modern port	Dock walls, Marriages Mill and Scotch Derricks (Moderate adverse); oil tanks (Moderate to Major adverse); lost buildings (Negligible); structures associated with the seaplane station (Negligible to Major adverse, depending on feature); container port (Minor adverse)	A permanent record on the site as a whole should be made by recording the buildings destined for demolition; the feasibility of relocating the erecting shed/hangar has been investigated but found to be unjustified	Negligible to Moderate adverse

**Table 23.2.1 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
Removal of potential features (wrecks) of archaeological interest	Potentially, Major adverse	A phased diving survey is proposed to evaluate the nature of the potential wrecks and features identified and to recommend, if appropriate, further investigation. Depending on the findings of the diver survey, a watching brief should be maintained on the dredger during the dredging works	Minor adverse
Removal of known features of archaeological interest	Potentially, Major adverse	The mitigation described above would also apply here. The value of the remains of the minesweeper would be assessed and, on the basis of this, English Heritage advice sought on appropriate mitigation	Minor adverse
Potential for removal of submerged prehistoric archaeology	Potentially, Major adverse	Pollen and foraminifera analyses would be undertaken to provide further information on the potential for archaeological features. In addition, a watching brief should be maintained during dredging to the west of the existing channel	Minor adverse
<b>LOCAL COMMUNITY</b>			
Temporary loss of amenity	Minor adverse	None possible	Minor adverse
Potential impact on television reception	Negligible	Given that Channel 5 is not currently available from the Ranelagh Road transmitter, the Port of Felixstowe would work with NTL to have this channel added as soon as possible	Negligible
Effect on the bridleway in the vicinity of the NNRT	Minor adverse	HPUK would ensure that the method of construction allows continued use of the bridleway; give 6 weeks notice in the local press of the intention to carry out the works; ensure that works do not adversely affect the health and safety of the public; and retain a port gate attendant	Negligible
Potential impact on informal recreation	Minor adverse	Signs should be erected at the junction of View Point Road with Langer Road to inform the public about the nature of the works	Minor adverse

**Table 23.2.1 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
<b>LAND DRAINAGE, FLOOD AND COASTAL DEFENCE</b>			
Potential effect on land drainage	No impact	None required	No impact
Potential effect on land drainage to the south of the existing Port	No impact	None required	No impact
Potential for increase in flood risk	No impact	None required	No impact
<b>COMMERCIAL AND RECREATIONAL NAVIGATION</b>			
Potential impact on existing business at the Landguard Terminal	No impact	None required	No impact
Potential impact on other commercial users of the navigation channels	Negligible	The HHA would issue a Notice to Mariners to inform other users of the construction works	Negligible
Interference with navigational aids in the Harbour	The potential exists for an increased risk of collision between vessels; the potential significance of which is Major adverse	All construction vessels must have appropriate signals as required by International Regulations; all construction working areas must be appropriately marked; all measures should be taken to ensure that navigational aids are not obscured; when dredging in critical locations, the HHA Harbour Master would co-ordinate one-way passage for larger commercial vessels; a Notice to Mariners would also be issued	Negligible
<b>SOCIO-ECONOMICS</b>			
Increased construction employment	Minor beneficial	None required	Minor beneficial
Indirect effects on the local and national economy	Moderate beneficial (indirect economic benefit) and Minor beneficial (indirect jobs generated)	None required	Moderate beneficial (indirect economic benefit) and Minor beneficial (indirect jobs generated)

**Table 23.2.2 Summary of the significance of potential effects and environmental impacts, mitigation measures and residual impacts associated with the operational phase of the proposed development**

Potential impact	Significance	Mitigation	Residual impact
<b>HYDRODYNAMIC AND SEDIMENTARY REGIME</b>			
Effect on current speeds	In general, a small local reduction in current speeds is predicted (no more than 5%); some small increases would occur at the edges of the proposed channel	None possible	N/A
Effect on tidal range	On spring tides, a reduction in tidal range of approximately 2mm in the Harbour and 3mm in the estuaries is predicted	None possible	N/A
Effect on the duration of slack water	An increase in the duration of slack water of up to 7% is predicted	None possible	N/A
Effect on wave climate	For waves from the north and west, effects are minor and localised to the reclamation area; for waves from the south, wave heights are predicted to increase by up to 10% in the lower Orwell, by up to 3% over the Shotley foreshore and up to 4% in parts of Erbarton Bay	None possible	N/A
Effect on siltation in the Harbour	Annual siltation is predicted to decrease by between 2% and 3%	N/A	N/A
Effect on coastal processes along the Felixstowe foreshore and Landguard frontage	No change is predicted and, therefore, the supply and movement of shingle would also be unchanged.	N/A	N/A
Effect on coastal processes on the Harwich foreshore (to Blackman's Head)	Tidal currents are not predicted to change. Under westerly waves, an increase in energy is predicted on the southern part of the foreshore; adjacent to the Pilot Station breakwater, wave heights are predicted to slightly increase; south of the breakwater, there would be no significant effect	N/A	N/A

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
Effect on coastal processes on The Shelf	Peak tidal currents and southerly wave energy (which is of the greatest magnitude) are predicted to be unchanged or slightly reduced; small increases in wave energy are predicted for westerly waves but would not affect the behaviour of this shallow subtidal area	N/A	N/A
Effect on coastal processes in the lower Orwell	Increased wave energy of up to 10%; the 'habitat enhancement' schemes constructed as part of the Trinity III Terminal (Phase 2) Extension would erode and evolve more rapidly	N/A	N/A
Effect on coastal processes on the Shotley foreshore	Wave heights are predicted to increase by up to 3% during southerly wind conditions, this would exacerbate coastal defence problems along this frontage	Beneficial use of dredged material would offset the effect of a predicted increase in wave energy on the Shotley frontage	The standard of coast protection would be increased compared with the existing situation
Effect on coastal processes in Erwarnton Bay	Small increases in wave energy (up to 4%) are predicted in parts of the Bay; the effect on coastal processes would be less than a 1mm/year increase in erosion	The predicted (minor) effect of the proposed development on parts of Erwarnton Bay would be mitigated through the sediment replacement programme	N/A
Effect on coastal processes in Bathside Bay	No effect on coastal processes in predicted	N/A	N/A

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	
<b>MARINE ECOLOGY</b>			
Potential impact due to predicted changes in current speeds	Negligible	None required	Negligible
Potential impact on the benthic invertebrate resource due to changes to intertidal erosion rates	Minor beneficial	None required	Minor beneficial
Potential impact of changes to wave activity on the invertebrate resource	Negligible within the habitat enhancement schemes in the lower Orwell Estuary; no impact elsewhere in the Orwell. Minor adverse in parts of Erwarton Bay; Negligible at Shotley	None required with respect to the habitat enhancement schemes. The sediment replacement strategy would mitigate the predicted impact in Erwarton Bay; no mitigation is required for Shotley	No impact in the Orwell Estuary or in Erwarton Bay; Negligible impact at Shotley
Potential impact due to the predicted change in the duration of slack water	No impact	None required	No impact
Potential impact of maintenance dredging on the invertebrate resource	Minor adverse	None possible	Minor adverse
<b>MARINE AND COASTAL ORNITHOLOGY</b>			
Indirect impact on potential feeding habitats due to effects of the development on current speeds	No impact	None required	No impact
Potential impact on waterfowl feeding and roosting habitats due to effects on the rate of intertidal erosion rates	Minor beneficial	None required	Minor beneficial
Potential impact on bird breeding sites (shingle spit)	No impact	None required	No impact
Potential impact on bird migration	No impact	None required	No impact

**Table 23.2.2 (cont.)**

Potential impact	Significance		Residual impact
Potential impact on feeding waterfowl due to changes in intertidal biotopes	Negligible to Minor adverse	The predicted (minor) effect of the proposed development on parts of Erwarnton Bay would be mitigated through the sediment replacement programme	No impact
<b>COASTAL AND TERRESTRIAL ECOLOGY</b>			
Potential disturbance to terrestrial and coastal habitats due to increased visitor pressure	Negligible	None possible	Negligible
<b>SEDIMENT QUALITY</b>			
Potential change in sediment quality	No impact	None required	No impact
<b>WATER QUALITY</b>			
Potential impact on bacterial dispersion	No impact	None required	No impact
Potential impact on dispersion of effluent from the DSM Bakery Ingredients outfall	Minor beneficial	None required	Minor beneficial
Potential effect of surface water run-off from the proposed development	No impact	None required	No impact
Accidental pollution	The significance of the impact depends on the nature of the incident; however, the risk of an incident occurring is Minimal	The contingency plan that is already in existence at the Port of Felixstowe would also apply to the proposed development and would be implemented in the event of a pollution incident	The significance of the residual impact depends on the nature of the incident; the risk of an incident occurring is Minimal
<b>FISHERIES AND FISHING ACTIVITY</b>			
Potential for effect on the feeding resource of estuarine fish	Minor to Moderate adverse	None possible	Minor to Moderate adverse
Restriction of access to fishing grounds	Minor adverse	None possible	Minor adverse
Potential effect of light on fish	No impact	None required	No impact

**Table 23.2.2 (cont.)**

Potential impact	Significance		Residual impact
<b>TRAFFIC AND TRANSPORTATION</b>			
Potential for increased traffic generation on the road network	No significant impacts are predicted at any of the junctions modelled; generated traffic can be accommodated on the highway network	Modification to the A14(T)/A154 Candlet Road roundabout would be undertaken to enable it to perform satisfactorily. Measures for a Travel Plan have been developed in conjunction SCC; it is intended that the plan would include an employee bus service, a car-sharing scheme undercover parking for motorcycles and the appointment of a site travel co-ordinator	No impact
Potential for additional freight rail traffic	Negligible	None required	Negligible

**Table 23.2.2 (cont)**

Potential impact	Significance	Mitigation	Residual impact
<b>NOISE</b>			
Potential impact of operational noise generated by the Port	Ranging from Negligible (Suffolk Sands Caravan Park, Martello Tower, Felixstowe Beach Holiday Village, Philip Avenue, Barrack Lane (Harwich), Bristol Hill (Shotley Gate), Landguard Museum and Fort) to Minor adverse (Adastral Close)	Ensure that environmental noise is an integrated design consideration and noise limit specifications are prepared for all major noise radiating plant; ensure that tractor units are fitted with the latest noise control technology; quayside cranes should be designed with minimisation of noise radiation as a major design feature; for RTGs, the engine pods and exhaust silencers should be of a high standard; to minimise container handling noise, drivers should be 'environmentally aware' and skill levels should be reviewed through training; vehicle noise on Dock Road would be reduced by using the north-east entrance; a barrier along the railway line near Landguard Engineering workshop would reduce noise levels at Adastral Close	Negligible to Minor adverse
Potential noise generation from increased shipping activity	Negligible (container ships); Minor adverse (HHA pilot boats)	None required (noise from shipping); reducing the speed on HHA pilot boats would reduce the noise from this source	Negligible (container ships); Minor adverse (HHA pilot boats)
Potential noise generation from road traffic	Negligible	None required	Negligible

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
Potential increase in railway noise	Minor adverse (due to increased traffic from the South Rail Terminal). At locations between the spur to the existing North Rail and the South Rail Terminal, noise would decrease when the South Rail Terminal is not in use; this would be of Minor beneficial significance.	The feasibility of moving the North Terminal spur away from the Trimley St Mary junction should be investigated and implemented if practicable; the proposed acoustic barrier near Adastral Close should be installed during the demolition and construction phase	Minor adverse (Trimley St Mary) and Minor beneficial (properties bordering the railway line in Felixstowe)
<b>VIBRATION</b>			
Potential impact of vibration on sensitive structures due to container handling	No impact	None required	No impact
Potential impact of vibration arising from port operations	Negligible (rail and road traffic)	Maintenance of the railway track and traffic in a good condition would ensure that vibration levels remain negligible; however, with the exception of sections of road and rail that are within the boundaries of the Port of Felixstowe, this is beyond the control of HPUK	Negligible (rail and road traffic)

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
<b>AIR QUALITY</b>			
Emissions from increased shipping, dredging, container terminal activities, rail movements and HGV traffic	Negligible (benzene, carbon monoxide) and Minor adverse (nitrogen dioxide, sulphur dioxide and PM <sub>10</sub> particulate matter)	Mitigation relies on government policies, technical improvements in vehicle emissions control and regulations placed on fuel specifications for shipping and road vehicles; increasing rail share would also relieve vehicles from roads; and the potential exists for HPUK to influence local ambient air quality by introducing green travel plans for employees	Minor adverse
Regional emissions as carbon dioxide	Negligible	Emissions are assessed on a national basis. If the Port were not to be reconfigured, it is assumed that the predicted increased requirement for Container Port capacity would be taken up elsewhere and, therefore, CO <sub>2</sub> emissions would be generated elsewhere. No mitigation measures are required	Negligible
Air pollutant effects on Landguard Common SSSI	Negligible	Well-maintained plant should be used on site and diesel engine idling time should be minimised	Negligible

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
<b>LANDSCAPE AND VISUAL ENVIRONMENT</b>			
Potential impact on vegetation and land cover	Moderate to Major beneficial (at a local level in the context of the fort setting); Negligible (proposed NNRT)	The impact significance is assessed incorporating 'mitigation by design'	Moderate to Major beneficial (at a local level in the context of the Fort setting); Negligible (proposed NNRT)
Potential impact on topography	Moderate to Major beneficial at a local level in the context of the Fort setting; the impact of the topography change on Harwich would be Negligible to Minor adverse	The impact significance is assessed incorporating 'mitigation by design'	Moderate to Major beneficial at a local level in the context of the fort setting; the impact of the topography change on Harwich would be Negligible to Minor adverse
Zone of Visual Influence	Moderate adverse to Moderate beneficial depending on viewpoint	The impact significance is assessed incorporating 'mitigation by design'	Moderate adverse to Moderate beneficial
Potential effects on landscape character	Minor to Moderate adverse depending on viewpoint	The impact significance is assessed incorporating 'mitigation by design'	Minor to Moderate adverse
Effects of proposed lighting	Minor adverse to Moderate beneficial depending on viewpoint	The impact significance is assessed incorporating 'mitigation by design'	Minor adverse to Moderate beneficial
Effects on the setting of settlements and the Harwich and Felixstowe Conservation Areas	The significance of the impact ranges from Negligible to Moderate adverse depending on viewpoint	The impact significance is assessed incorporating 'mitigation by design'	Negligible to Moderate adverse

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
Effects on Aadastral Close	Minor to Moderate adverse	The impact significance is assessed incorporating 'mitigation by design'	Minor to Moderate adverse
Effects on the setting of Listed Buildings and Scheduled Ancient Monuments	Minor to Moderate adverse depending on the location of the Listed Building/SAM	The impact significance is assessed incorporating 'mitigation by design'	Minor to Moderate adverse depending on the location of the Listed Building/SAM
Effects on designated landscapes	Negligible to Moderate adverse depending on location	The impact significance is assessed incorporating 'mitigation by design'	Negligible to Moderate adverse
<b>LAND-BASED ARCHAEOLOGY AND CULTURAL HERITAGE</b>			
Potential impact on the setting of the Landguard Fort and Peninsula Scheduled Ancient Monument	Impact on estuary-wide setting (Minor to Moderate adverse, depending on location); impact on peninsula wide setting (Negligible to Major adverse, subject to location); immediate approach setting (Minor to Major beneficial, subject to location)	The impact significance is assessed incorporating 'mitigation by design'	Impact on estuary-wide setting (Minor to Moderate adverse); impact on peninsula wide setting (Negligible to Major adverse); immediate approach setting (Minor to Major beneficial)
<b>MARINE ARCHAEOLOGY</b>			
Potential for the erosion of archaeological features outside of the development area	Negligible	None required	Negligible

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	Residual impact
<b>LOCAL COMMUNITY</b>			
Provision of improved infrastructure	Minor beneficial	None required	Minor beneficial
Increased visitor numbers	A beneficial impact would arise (see socio-economic impacts)	None required	A beneficial impact would arise
Effect on the bridleway	Minor adverse	Relevant safety measures would be provided	Minor adverse
<b>LAND DRAINAGE, FLOOD AND COASTAL DEFENCE</b>			
Effect on surface water drainage	No impact	None required	No impact
Effect on standard of flood defence at the Port of Felixstowe	Moderate to Major beneficial (locally)	None required	Moderate to Major beneficial (locally)
Effect on the standard of flood defence to the south of the proposed development	No impact	None required	No impact
Indirect effect of the proposed development on the 'habitat enhancement' bunds in the lower Orwell Estuary	No impact	None required	No impact
Effect on coastal defences on the Shotley frontage	Minor adverse	It is proposed that dredged clay would be used beneficially along the Shotley frontage to the west of the entrance to Shotley Marina	Negligible
<b>COMMERCIAL AND RECREATIONAL NAVIGATION</b>			
Potential interference with existing commercial navigation within the system	No impact	None required	No impact

**Table 23.2.2 (cont.)**

Potential impact	Significance	Mitigation	
<b>SOCIO-ECONOMICS</b>			
Increased direct employment	Moderate beneficial	None required	Moderate beneficial
Multiplier effects	Moderate beneficial	None required	Moderate beneficial
Increases in associated port activities	Minor beneficial	None required	Minor beneficial
Increased visitor expenditure	Minor beneficial	None required	Minor beneficial
Effect on the labour market	Moderate beneficial	None required	Moderate beneficial
Improved competitive advantage	Moderate beneficial	None required	Moderate beneficial

