

Havant Borough Council
Eastoke Beach Renourishment Scheme
Study to Inform Appropriate Assessment
July 2005

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Contents Amendment Record

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Issue	Revision	Description	Date	Signed
1	0	Draft Appropriate Assessment	Mar '05	RH
2	1	Updated Draft Appropriate Assessment	Apr '05	RH
3	2	Final Draft Appropriate Assessment	May '05	RH
4	3	Final Appropriate Assessment	July '05	RH

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1

Background

Havant Borough Council, acting within its capacity of Coast Protection Authority, proposes to undertake beach re-nourishment along the shore of Eastoke Beach for the purpose of providing the appropriate level of protection to the residents of Eastoke, Hayling Island.

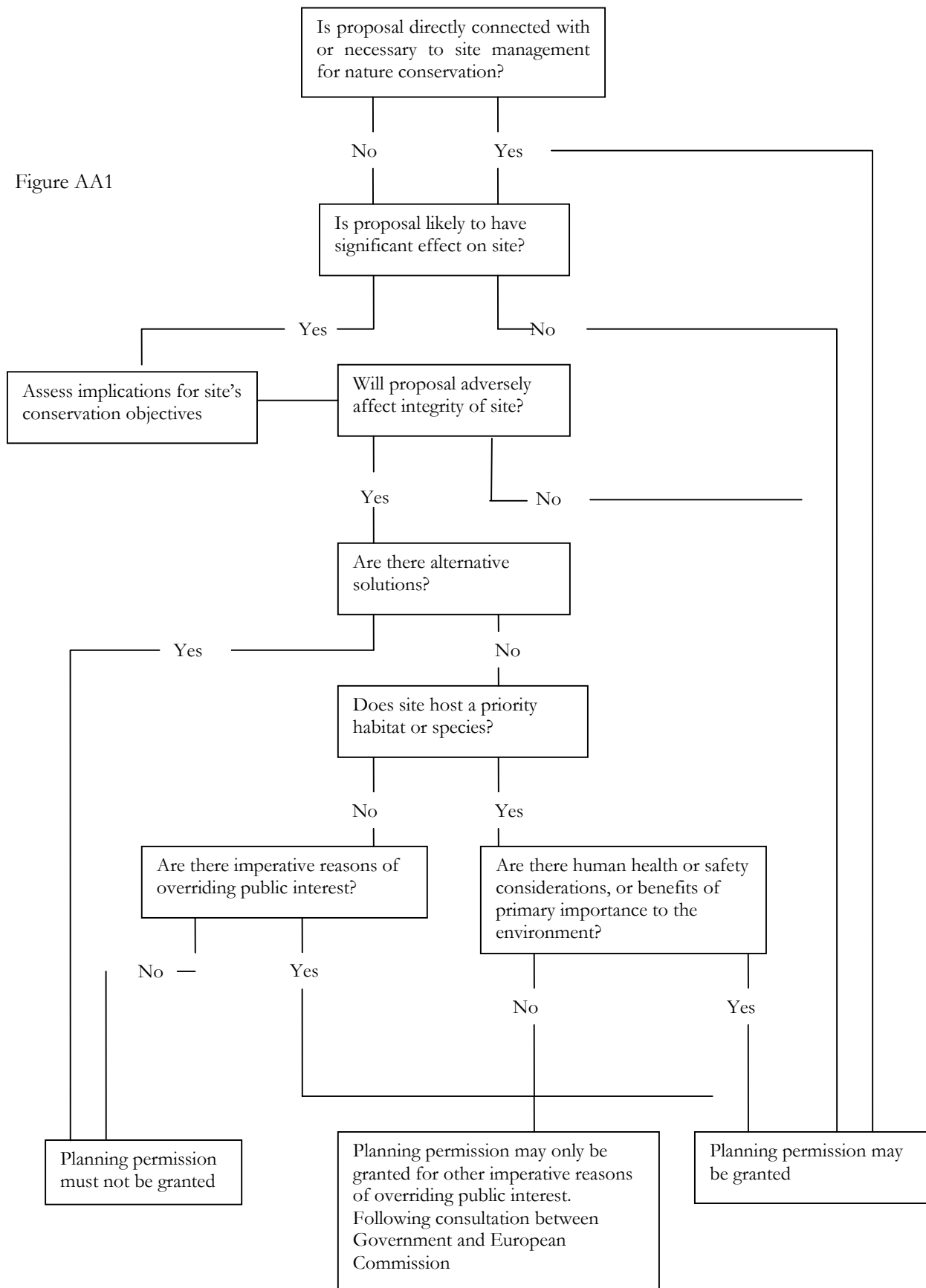
The re-nourishment material may be obtained from an existing licensed dredge site although there is also an opportunity to utilise the arisings from the navigational maintenance dredging of the approach channel to Chichester Harbour as nourishment material. The nourishment site is partly within Chichester and Langstone Harbours Special Protection area (SPA) and Ramsar Site and Solent Maritime Special Area of Conservation (SAC). Consequently, the requirements of the European Union Habitats Directive, as implemented in the UK by the Conservation (Natural Habitats &c) Regulations 1994 ("Habitats Regulations"), have to be addressed.

Regulation 48 of the Habitats Regulations provides that if English Nature advises that an operation taking place under permitted development rights is likely to have a significant effect on the designated site, an Appropriate Assessment must be undertaken by a Competent Authority. The purpose of the Appropriate Assessment is to determine whether the plan or project would have an adverse effect on the integrity of the site, either alone or in combination with other plans and projects. If it finds an adverse effect on integrity, then consent can only be given if there are no available alternatives, over-riding public interest and compensatory measures are taken. The procedure is summarised in Figure AA1.

At a meeting on 14 March 2005, English Nature requested that an "Appropriate Assessment" of the proposed beach re-nourishment be undertaken and that the document should consider the utilisation of arisings from the navigational maintenance dredging of the approach channel. The Competent Authority for the Assessment is Havant Borough Council, which will undertake it as part of the consideration of the planning application for the works. This study has been prepared to provide the necessary information and to inform the Council's evaluation. English Nature was consulted on draft versions of both this Appropriate Assessment and the Environmental Statement prepared to

accompany the planning application and has confirmed that it has no objection to the proposed scheme (pers. comm. 1 July 2005).

Figure AA1



2 Designated Sites

The Appropriate Assessment addresses the effects of the scheme on European sites (SPAs and SACs), to which the Habitats Regulations apply. The UK Government has also stated that, as a matter of policy, it wishes the same procedures to be applied to Ramsar Sites.

2.1

Chichester and Langstone Harbours SPA

The boundary of the SPA is shown on Figure 7.1. The site's qualifying features are:

- Internationally important populations of regularly occurring Annex 1 species; sandwich tern *Sterna sandvicensis*, common tern *Sterna hirundo* and little tern *Sterna albifrons*;
- Internationally important populations of regularly occurring migratory species; Grey Plover (*Pluvialis squatarola*), Sanderling (*Calidris alba*), Dunlin (*Calidris alpina*), Redshank (*Tringa totanus*), Brent Geese (*Branta bernicla*), Shelduck (*Tadorna tadorna*) and Teal (*Anas crecca*);
- Internationally important assemblage of waterfowl; and
- Nationally important populations of the following migratory species; Ringed Plover (*Charadrius hiaticula*), Curlew (*Numerius arquata*), Bar-tailed Godwit (*Limosa lapponica*), Turnstone (*Arenaria interpres*), Wigeon (*Anas penelope*), Pintail (*Anas acuta*), Shoveler (*Anas clypeata*) and Red-breasted Merganser (*Mergus serrator*).

Table 1 shows the qualifying interest of the SPA.

Table 1 *Qualifying Interest of Special Protection Area*

Article of Directive	Season	Species	Population	Supporting Habitat
Article 4.1 (Annex 1 species)	Breeding	Little tern	100 pairs (4.2% of British)	Sand and shingle, and shallow coastal waters
		Common tern	158 pairs (1.1% of British)	
		Sandwich tern	>1% of British	
Article 4.2 (Migratory species)	Wintering	Grey plover	3.9% of west European	Shingle, saltmarsh, intertidal mudflats and sandflats, and mixed sediment shores.
		Sanderling	3.1% of west European	
		Dunlin	2.6% of west European	
		Redshank	1.4% of west European	
		Dark-bellied brent goose	12% of west European	
		Shelduck	4% of west European	
		Teal	1% of west European	
Article 4.2 Waterfowl assemblage	Wintering		102,000 individual birds	Shingle, saltmarsh, intertidal mudflats and sandflats, mixed sediment shores and shallow coastal waters.

The key habitats on the site for which English Nature has defined conservation objectives are:

- sand and shingle
- shallow coastal waters
- saltmarsh
- intertidal mudflats and sandflats
- mixed sediment shores

2.2

Chichester and Langstone Harbours Ramsar Site

This site (Figure 7.1) lies within the study area and has been designated under Criterion 1a of the Convention as it comprises internationally important wetland characteristics of the Atlantic biogeographical region including:

- estuaries
- saltmarshes
- intertidal mudflats and sandflats

It qualifies under Criterion 3a of the Ramsar Convention as the wetland regularly supports 20,000 waterfowl. It also qualifies under Criterion 3c of the Convention by supporting 1% or more of the individuals in a population of waterfowl species.

2.3

The Solent Maritime Special Area of Conservation (SAC)

The candidate SAC was accepted by the European Commission in December 2004 and is now a Site of Community Importance. Its qualifying features are:

- estuaries (including saltmarsh communities, intertidal mudflat and sandflat communities, intertidal mixed sediment communities, subtidal sediment communities);
- annual vegetation of drift lines;
- atlantic salt meadow (including low marsh, mid marsh, upper marsh and transitional high marsh communities);
- *Salicornia* and other annuals colonising mud and sand (including *Salicornia* and *Sueda maritima* saltmarsh communities);
- cordgrass swards (including *Spartina maritima*, *Spartina alterniflora* and *Spartina x townsendii* communities);
- mudflats and sandflats not covered by sea water at low tide (including intertidal mud, muddy sand, sand and mixed sediment communities); and
- sandbanks which are slightly covered by the seawater all the time (including subtidal sand, gravelly sand, muddy sand and eelgrass *Zostera marina* beds).

National guidelines on what constitutes "favourable condition" have been prepared by English Nature for each habitat type. Conservation objectives have also been defined. A copy of the conservation objectives and accompanying favourable condition tables is provided in the 'Solent European Marine Site' (English Nature 2001).

English Nature has prepared a favourable condition table for the Solent Maritime cSAC interest features, against which the impacts of any proposed projects would be measured. The targets for the attributes of each interest feature supplement the conservation objectives as follows:

- (a) subject to natural change, maintain the estuaries in favourable condition, in particular:
 - no decrease in extent from an established baseline
 - the intra and inter-estuarine TP/CS relationship

- average temperature and salinity
 - average phytoplankton concentration
 - range and distribution of subtidal communities
- (b) subject to natural change, maintain the annual vegetation of drift lines in favourable condition, in particular:
- no decrease in linear extent of vegetation
 - no increase in extent constrained by introduced structures, landforms or operations
 - sediment supply to and within the site through coastal processes to allow a balance of accretion and erosion
 - substrate composition with sufficiently low levels of human induced disturbance
 - presence and broad distribution of stands of *Atriplex prostrata*/*Beta vulgaris maritime*- dominated community and other local variants
- (c) subject to natural change, maintain the Atlantic Salt Meadows in favourable condition, in particular:
- distribution and extent of low marsh, mid-marsh, upper-marsh and upper transitional marsh communities
 - presence and abundance of constant species of characteristic low-marsh, mid-marsh, upper-marsh and upper transitional marsh communities
- (d) subject to natural change, maintain the *Salicornia* and other annuals colonising mud and sand in favourable condition, in particular:
- no increase in algal material cover
 - no increase in extent
 - no change in distribution and extent of annual *Salicornia* saltmarsh communities
- (e) subject to natural change, maintain the cordgrass swards in favourable condition, in particular:
- distribution and extent of smooth and Townsend's cordgrass communities
- (f) subject to natural change, maintain the intertidal mudflats and sandflats in favourable condition, in particular:

- no decrease in extent
- no change in shore profile
- average abundance of macroalgal mats should not increase
- average PSA parameters, measure, organic carbon content and black layer depth should not deviate significantly
- range and distribution should not deviate significantly

(g) subject to natural change, maintain the sandbanks which are slightly covered by seawater at all times in favourable condition, in particular:

- no decrease in extent
- average grain size parameters, range and distribution and depth should not deviate significantly
- distribution and extent of characteristic biotopes should not deviate.

3 Environmental Baseline

3.1

Scope

The Appropriate Assessment only has to consider the effects of the project on the qualifying interests for which the European and Ramsar sites were designated. Effects on shoreline processes and evolution are only relevant insofar as they affect these interests. However, an understanding of coastal processes is essential to evaluate the potentially significant effects identified.

3.2

Coastal Processes

3.2.1

Chichester Harbour

The sediment circulation within Chichester Harbour is made up of complex circulations varying both spatially and temporally.

The combination of transport patterns over short and long term, suggests that there may be an overall counter-clockwise circulation of sediments in the entrance to Chichester Harbour, with material moving out of the estuary on the western side through the Emsworth Channel under the influence of the strong ebb currents (see Figure AA2), and into the estuary on the eastern side over the northern parts of the East Pole Sands and the Winner (Pontee *et al* 2003; ABPmer 2001). In addition, there is a south westerly transport pathway from East Head to the Emsworth Channel and Pole Sands and this counter-clockwise circulation on the north of the Winner contributes to the counter-clockwise circulation in the Harbour mouth.

The dynamics of the East Head and the Harbour Mouth have been largely governed by a reduction in sediment supply by littoral transport, mainly from the east, which has led to an expansion of a cross-section area of the estuary mouth (Pontee *et al* 2002). The cross-sectional area of the harbour mouth has been increased from 25,000m² in 1840 to 50,000m² in 2000 (Pontee *et al* 2002).

There also appears to have been a lowering of the Winner, which has apparently further reduced the aeolian supply of sand to East Head. The lowering has increased the incident wave energy, thus increasing the erosion potential. In addition, the West Wittering sea defences have held East Head to the east of its natural position. Not surprisingly, concern has been raised regarding a potential of a break through at the Hinge Point at the neck of the spit.

The weight of evidence suggests that sediment transport along the open coasts either side of Chichester Harbour is directed towards the entrance (Pontee *et al* 2003). There is westerly transport of littoral material on the West Wittering frontage, northerly transport of littoral material on East Head and easterly transport of littoral material on the Hayling frontage to the east of Creek Road car park.

3.2.2

Eastoke Beach

While the circulation of sediment in the Chichester Entrance Channel is controlled mainly by tidal currents, along the Eastoke frontage it is controlled by waves, in particular the easterly waves.

Studies indicate that there is a point of nil movement (drift divide) at the Creek Road, with the transport to the east being some 13,000m³ annually and to the west 20,000m³. To the east of Creek Road, west to east transport of littoral material is proposed by previous workers (Webber 1979, Harlow 1980), sediment trends analysis (Pontee *et al* 2003) and anecdotal evidence supplied by Havant Borough Council coastal engineers. The easterly transported material appears to feed into the Chichester Channel and most probably ends up on the bar in the entrance. Previous anecdotal evidence confirms that after the Hayling Island beaches were renourished in 1985-86, the beaches at East Head accumulated gravel. This might suggest that there is a pathway from Eastoke Point whereby gravel is transported across the Emsworth Channel to East Head via the Winner. However, neither Webber (1979) nor Harlow (1980) observed this transport pathway, which seems unlikely given the strong ebb tidal flows. Pontee *et al* (2003) concluded that any pathway would be for sand only and is likely to be episodic due to strong ebb dominated currents in Emsworth Channel and potentially induced by storm action.

Further to the west on Eastoke Beach at the Beachland Outfall, the westerly drift is thought to be 19,000m³, which reduces to 13,000m³ at the Inn on the Beach, but rises to 15,000m³ at Gunners Point.

Between the period 1991 to 1998, the average annual losses from the beach front have been calculated as 27,100m³ annually, with the actual amount varying from between 11,000m³ and 43,000m³ annually. Estimates indicate that between 2003 and 2008, the quantity of the losses will be 25,000m³ annually, but that this will rise to about 30,000m³ annually. The amount of beach material recycled on Eastoke

Beach between 1993 and 2004 varied between some 29,000m³ in 1993 to about 16,000m³ in 1995, with the average being nearer 21,000m³.

3.2.3

Benthic Flora and Fauna

“Sandbanks which are slightly covered by seawater all the time” is a qualifying feature of the cSAC. Subtidal gravel and sands is a recognised sub-feature of this habitat type, which is present within Chichester Harbour Channel. The diversity and types of associated biological communities depend on sediment type and other physical factors. Typical infauna are worms, crustaceans, bivalve molluscs and echinoderms. Surface mobile fauna often includes shrimps, crabs and fish.

In 2002, Baldock *et al* undertook subtidal surveys in Chichester Harbour, which recorded 127 species, which are typical of habitats sheltered from wave action but exposed to moderate to strong tidal currents. Of particular interest in the survey were a small sea anenome *Halcapa chrysantellum*, an opisthobranch mollusc *Haminoea* sp, a small nudibranch *Eubranchus doriae*, an alien bryozoan species *Tricellaria inopinata* and red alga *Callophyllis laciniata*.

A sandy reef of the polychaete Ross worm *Sabellaria spinulosa* is present on the steep eastern side of the entrance to Chichester Harbour, where strong currents scour out deep channels. These solid structures do not receive statutory protection but often represent important sub-features of other Annex 1 habitats. The worm itself is fairly common and widespread, often found attached to rocks and boulders in a rough tube of sand and gravel. In the right conditions, they can occur in dense aggregations, the tubes massing together to form large, irregular blocks. *Sabellaria spinulosa* extracts both food and tube-building materials from passing seawater. The right level of movement and the right grade of building materials are essential for the formation of large blocks.

4 Proposed Beach Re-nourishment Operation

4.1 *Description*

The proposed beach re-nourishment operation would comprise:

- (a) the dredging of shingle from either or both of the following potential sources:
 - (i) A licensed Aggregate Dredging Site - it is proposed that some of the shingle required for beach nourishment might be sourced from existing offshore licensed dredging sites, possibly at South West Needles 127 or St Catherines. The impacts of such dredging operations would have been considered as part of the consent for these sites and are not considered further here.
 - (ii) Beneficial use of the arisings from Chichester Harbour Approach Channel - it is proposed that suitable material accreted within Chichester Harbour Approach Channel to a maximum depth of between -1.5m and -2mCD be used beneficially for beach nourishment. The harbour entrance is currently dredged every five years in order to maintain safe navigability and only the minimum amount of dredging is performed in order to meet reasonable navigational requirements. Consequently, any re-nourishment material from the Approach Channel would be purely arisings from the navigational maintenance dredging.

The previously dredged extraction area and the desired extraction area (safe passage route) are shown on Figures 2.1 and 2.2. These figures show contours of bathymetric surveys undertaken in 2000 and 2004.

The total volume of shingle required from all potential sources would be largely dependent on the rates of material loss in the period prior to the works commencing. This will be determined through a pre-works survey.

Estimated quantities of material within the channel that need to be removed to create a safe passage of navigation (as highlighted by Chichester Harbour Conservancy) are provided in Table 4.1. The estimated volumes are based on the summer 2004 bathymetric survey. As the area is a dynamic system, the actual quantities at the time of dredging may vary from the estimates provided and the dredging depth has not yet been finalised. However, Chichester Harbour Conservancy has confirmed that in the interest of safe navigation, -2mCD is desirable.

It is estimated that a range of between 80,000m³ and 150,000m³ of material is required for beach re-nourishment although this estimate may increase by the time of the operation, due to ongoing erosion. If accreted material within the desired extraction area of Chichester Harbour is dredged to a depth of -1.5mCD, 11,935m³ could be obtained from the channel and the balance from offshore existing licensed sites. Similarly, if accreted material within the desired extraction area of Chichester Harbour is dredged to a depth of -2mCD, 53,532m³ could be obtained from the channel and the balance from offshore existing licensed sites.

Table 4.1 *Quantities of material requiring extraction from CHAC for safe navigation*

Estimated Volumes of Material to be Removed	To -1.5mCD (m³)	To -2mCD (m³)
Desired extraction area (safe passage) volume within area previously dredged	11,935	51,460
Desired extraction area (safe passage) outside of area previously dredged	0	2,072
Total	11,935	53,532

Sediment sizes from Chichester Harbour Approach Channel are naturally close to those from Hayling Island itself (HR Wallingford 2005). The median grain size of the surface sediments in the Chichester Entrance Channel is given as 9.1mm to 17.1mm (compared to an estimated median diameter of the material on Eastoke beach of 14mm to 27mm).

- (b) Pumping ashore of the shingle from the dredger. The method of placement for beach re-nourishment material is likely to comprise either flotation pipe, sunken pipe or rainbowing in a single operation. The operation in the past has been by rainbowing.
- (c) Transportation of the shingle along the beach through a pipeline and dumper truck and placement by bulldozer to the desired profile. Recent surveys have highlighted a material deficit along the southern Eastoke frontage of approximately 80,000m³, although this estimate may increase by the time of the operation, due to ongoing erosion.

This proposal for beach re-nourishment and the provision of a shingle beach to a designed profile would be maintained by Havant Borough Council's coastal monitoring and beach recycling activities, which will continue to be undertaken. Planning permission for recycling of shingle material along 'Hayling Seafront from land west of Inn on the Beach to Eastoke Corner and from the Ness inside Chichester Harbour back to the Eastoke frontage' over a 5 year period was granted in May 2003. The permission, which restricts the amount of shingle material to be moved to 25,000m³, will expire in June 2009.

4.2

Purpose

The purpose of the works is to maintain the defences of Eastoke Beach to manage the risk and defend against coastal erosion and flooding. The works will achieve a design beach profile with a crest height of 5.6mOD and a crest width in the region of 12 to 15m, to give a standard of protection capable of defending against a 1 in 200 year storm event.

4.3

Likely Significant Effects

The northern end of the proposed navigational maintenance dredge operation (if this is incorporated into the nourishment operation) is located about 250m within the southern boundary of the SPA and Ramsar Site. The whole dredge site is within the SAC.

The eastern boundary of the recharge area is located immediately adjacent to the western boundary of the SPA. The toe of the beach where recharge will take place forms the landward boundary of the SAC.

Consultation with English Nature has identified the potential for the following likely significant effects of the works on the European sites:

- Dredging of the entrance channel may increase wave penetration into Chichester Harbour, with consequent increased erosion of intertidal habitats.
- Dredging may affect communities of benthic flora and fauna.
- Dredging may increase turbidity of the water within Chichester Harbour.
- Contaminated materials may be present in sediments.
- Dredging of Chichester Harbour Approach Channel for the placement of material on Eastoke Beach may reduce the supply to East Head spit on the eastern side of Chichester Harbour entrance.
- Beach material placed on the western half of the Eastoke frontage can be transported westwards by longshore drift towards Langstone Harbour entrance. The east to west drift rate has been estimated to be approximately 20,000m³. The recycling operations which occur on the Hayling frontage return approximately 14,500 m³ per year of material to the Eastoke frontage, giving a net difference of some 5,500 m³. It is possible that a limited amount of the lost material leaving the western end of the frontage is returned to the vicinity of Chichester Harbour entrance, via a sediment transport pathway.
- Beach material placed on the eastern half of the Eastoke frontage will be transported eastwards by longshore drift around Eastoke Corner into the mouth of Chichester Harbour. The west to east drift rate has been estimated to be approximately 13,000 m³. The recycling operations which occur on the Hayling frontage return approximately 7,500 m³ per year of material to the Eastoke frontage, giving a net difference of some 6,500 m³. Some of this material may pass into Chichester Harbour, whilst some of it may be carried out of the Harbour by the strong ebb tidal currents in the entrance channel (see Figure AA2). Any material passing into the Harbour may cover intertidal habitats such as mudflats on the edges of Chichester Harbour.

4.4

Effects in Combination with other Plans and Projects

Regulation 60 of the Habitats Regulations requires that the likely significant effect of a plan or project on a European site be assessed in combination with other plans or projects.

Beach Recycling along Hayling Frontage (Havant Borough Council)

The current proposal for beach re-nourishment would be undertaken in conjunction with the existing annual recycling operation along Eastoke Beach by Havant Borough Council, which recycles shingle beach material moved by littoral

transport along Hayling seafront from Hayling Bay to Eastoke Corner and from the Ness inside Chichester Harbour back to the Eastoke frontage. As it is not possible to return all the material that is transported along the shoreline, the beach re-nourishment operation would assist in replacing the 'leaked' material. The proposed re-nourishment operation would not have any in-combination adverse impacts upon the integrity of the internationally designated sites.

Beach replenishment at East Head

There is a proposal by Chichester Harbour Conservancy and Chichester District Council, to recycle sand and shingle from approximately 1km north of the proposed deposition site (the northern tip of East Head adjacent to Chichester Channel) to the isthmus that connects the Head to the mainland. This material would be placed either seaward or landward of the rock revetment.

An Appropriate Assessment has been prepared by Chichester District Council and Chichester Harbour Conservancy, which has assessed the proposals and indicates that there would be no adverse impacts on the integrity of the internationally designated conservation sites. English Nature has not yet adopted the conclusions of this document. Owing to the direction of sediment transport in the channel, it is believed that the proposed Eastoke Beach re-nourishment scheme would not impact upon East Head spit itself and therefore there are no likely in combination effects.

No other proposed projects have been identified that need to be addressed under this heading.

4.5

Environmental Controls and Mitigation

The environmental control and mitigation measures that will be applied to the proposed works in order to offset the likely significant effects are as follows:

- (a) Beach material placed on the western half of the Eastoke frontage can be transported westwards by longshore drift towards Langstone Harbour entrance. The east to west drift rate has been estimated to be approximately 20,000m³. This will be offset by the current programme of annual recycling from west of the Inn on the Beach to the Eastoke frontage.

The recycling operations return approximately 14,500m³ per year of material to the Eastoke frontage, leaving only a net difference of some

5,500m³. It is possible, though not certain, that some of the sediment losses are subsequently returned to the vicinity of Chichester Harbour entrance, via an offshore transport route (see Figure). Approximately 5,500m³ per annum is therefore the maximum volume of material lost from the beach system westwards. However, it should be noted that this loss is not the result of the proposed beach recharge but would still occur even if the recharge were not undertaken.

Table 2 shows the total volumes recycled east to west and west to east in previous years and similar quantities will be recycled over the next five years.

- (b) The easterly drift of sediments to Eastoke Point and the mouth of Chichester Harbour will be offset by the current programme of annual recycling westwards. The west to east drift rate has been estimated to be approximately 13,000m³. The recycling operations which occur on the Hayling frontage return approximately 7,500m³ per year of material to the Eastoke frontage, giving a net difference of some 5,500m³. Some of this material may pass into Chichester Harbour, whilst some of it may be carried out of the Harbour by the strong ebb tidal currents in the entrance channel (see Figure AA2). Any material passing into the Harbour may cover intertidal habitats such as mudflats. However, due to the modest scale of the re-nourishment works, it is unlikely that additional material at Eastoke Beach is affecting annual losses of sediment or movement of material eastwards; it is just raising the beach profile.

Table 2 shows the total volumes recycled east to west and west to east in previous years and similar quantities will be recycled over the next five years.

Table 2 *Recycling Quantities*

YEAR OPERATION	TOTAL QUANTITY cu m	WEST TO EAST HAYLING BAY TO EASTOKE cu m	EAST TO WEST THE NESS TO EASTOKE cu m	Total
1993	28,884	14,928	13,956	28,884
1994	22,572	15,837	6,736	22,572
1995	15,800	9,290	6,510	15,800
1996	24,392	16,214	8,178	24,392
1997	20,256	15,636	4,620	20,256
1998	20,062	16,226	3,836	20,062
1999	20,328	12,516	7,812	20,328
2000	20,400	14,460	5,940	20,400
2001	23,925	14,025	9,900	23,925
2002	20,007	14,613	5,394	20,007
2003	21,351	12,359	8,993	21,351
2004	22,853	15,338	7,514	22,853
	Average	14,287	7,449	21,736
	Approximate values	14,500	7,500	22,000

5 Effect on Integrity of the European and Ramsar Sites

5.1

General Considerations

General guidance on what constitutes an adverse effect on site integrity within the meaning of the Habitats Regulations has been prepared by a number of organisations:

- (a) UK Government guidance is contained in PPG9 (Department of the Environment 1994). This defines the integrity of a site as "the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified".
- (b) The European Commission has prepared guidance on interpreting Article 6 of the Habitats Directive (European Commission 2000). In relation to interpreting effects on integrity, this states as follows: "It is clear from the context and from the purpose of the Directive that the 'integrity of a site' relates to the site's conservation objective.... For example, it is possible that a plan or project will adversely affect the integrity of a site only in a visual sense or only habitat types or species other than those listed in Annex I or Annex II. In such cases, the effects do not amount to an adverse effect for purposes of Article 6(3), provided that the coherence of the network is not affected. On the other hand, the expression "integrity of the site" shows that focus is here on the specific site. Thus, it is not allowed to destroy a site or part of it in the basis that the conservation status of the habitat types and species it hosts will anyway remain favourable within the European territory of the Member State. As regards the connotation or meaning of 'integrity', this can be considered as a quality or condition of being whole or complete. In a dynamic ecological context, it can also be considered as having the sense of resilience and ability to evolve in ways that are favourable to conservation.... A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under dynamic conditions is maintained, and a minimum of external management support is required. When looking at the 'integrity of the site', it is therefore important to take into

account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term." The section concludes that: **"The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives."**

The EU document also provides guidance on assessing deterioration of habitats. This states that: "Deterioration is a physical degradation affecting a habitat. The definition of the conservation status... means that the Member State has to take into consideration all the influences on the environment hosting the habitats (space, water, air, soils). If these influences result in making the conservation status of the habitat less favourable than it was before, the deterioration can be considered to have occurred. To assess this deterioration against the objectives of the Directive, one can refer to the definition of the *favourable conservation status of a natural habitat* set out in Article 1(e), on the basis of the following factors:

- Its natural range and areas it covers within that range are stable or increasing.
- The specific structure and functions of the area necessary for its long-term maintenance exist and are likely to continue to exist in the foreseeable future.
- The conservation status of its typical species is favourable".

This section concludes that: **"Habitat deterioration occurs in a site when the area covered by the habitat in this site is reduced or the specific structure and functions necessary for the long-term maintenance or the good conservation status of the typical species which are associated with this habitat are reduced in comparison to their initial status. This assessment is made according to the contribution of the site to the coherence of the network."**

- (c) Draft guidance on applying the Habitats Regulations has also prepared by the Environment Agency, English Nature and the Countryside Council for Wales (September 2000). This states "An adverse effect on integrity is likely to be one that prevents the site from making the same contribution

to favourable conservation status for the relevant feature as it did at the time of its designation".

In general, it can be assumed that an effect that compromised one of the cited interests for which the site was designated could constitute an adverse effect on site integrity. However, this does not mean that any effect, however minor, on designated interests would necessarily qualify; the meaning of site integrity as used in the Regulations implies that the purpose for which the *whole site* has been designated would have to be compromised. At the same time, a minor effect repeated many times could eventually damage site integrity, and it is clearly the intention of the Regulations that sites be protected from such incremental effects. For this reason, considerations relating to the duration and reversibility of small effects of a project on a site are relevant.

5.2

Evaluation of Potentially Significant Effects

(a) Wave penetration into Chichester Harbour

Dredging within Chichester Harbour Approach Channel is unlikely to affect wave penetration into the harbour unless large areas of gravel/sand are removed. While removing the accreted material from within the channel may in theory allow higher levels of wave energy into the harbour, there appears to be no evidence for past dredging having had a direct adverse impact such as mudflat erosion. This is most probably because the angle of dominant wave attack is easterly and not directly down the channel axis. However, should storm waves approach directly down the channel, then undoubtedly the bathymetry of the channel area would draw (refract) those waves onto the sides of the channel and thus the impact of any channel deepening within the harbour itself would be extremely small.

The present proposal includes dredging of a small area outside of the previously dredged box, however this lies at right angles to the main dredge channel so it cannot increase wave penetration down the main axis of the channel into the harbour.

(b) Impact on benthic flora and fauna

Although there are no detailed benthic survey data, the impact of dredging on benthic communities will be limited as the large majority of the area was previously dredged in 2002. Any flora and fauna present would have colonised the area within the last three years and would be adapted to mobile and rapidly accreting substrates. Accordingly, the effect of repeat

dredging would be temporary in that similar communities would re-form within a few years. The desired extraction area is significantly smaller than the area previously dredged and hence the overall impacts of the proposed operation on marine ecology are likely to be significantly less than those of previous dredging. No data are available to assess the impacts of dredging in the small part of Chichester Harbour Approach Channel that lies outside of the previously dredged area. However, it should be noted that the 2000 and 2004 bathymetric surveys show that the material to be dredged from this area to a maximum depth of -2mCD has all accreted over the last five years, so long-established benthic communities would not be present.

(c) Turbidity of water within Chichester Harbour

It is understood that the last time the dredging operation was undertaken, the vessels made 2 to 3 trips per tide, took approximately 1 hour to load, 20 minutes to travel to the beach, 1 hour to discharge and 20 minutes to return to the dredge site. The percentage time that the dredging was overspilling is not known, although for each tide the dredge times would indicate that this could be a maximum of three 1 hour periods, each separated by a period of 1 hour 40 minutes, during which the dredger travelled to and from the discharge site.

An assessment of the potential for the dispersal of sediments from the dredging operation has been made by considering the vertical settling velocity of the sediments, the horizontal velocity of the tidal waters on the flood and ebb tide and the depths of water. Previous surveys of the area to be dredged indicate a range of sediment sizes from sands to gravels (EMU, 2002; HR Wallingford 2005). For gravel material disposed of at the surface, calculations show that grain sizes with a D_{50} of 9.1mm, 12.4mm, 16.5mm and 17.1mm could be carried a maximum distance of 30m, 26m, 22m and 21m. For sand material disposed of at the surface, calculations show that grain sizes with a D_{50} of for coarse 0.17mm (coarse sand), 0.35mm (medium sand), 0.177mm (fine sand) and 0.088mm (very fine sand) could be carried a maximum distance of 34, 48, 68, and 96m respectively.

These calculations indicate that if overspilling occurred during the dredging operation the dredged material would settle relatively rapidly.

It is unlikely that there would be a substantial increase in turbidity in Chichester Harbour, particularly if undertaken on the ebb tide, and consequently it is not expected that there would be any adverse impacts on intertidal habitats. The *Sabellaria* reef on the eastern side of Chichester Harbour is unlikely to be impacted on by changes in turbidity as any material dredged from Chichester Harbour Approach Channel would not be directly transported to the eastern area adjacent to East Head. Also, if the dredged material is sandy, the losses generated by overspill would be small as the sand particles would have settled. It would also be in the interests of the contractor to retain as much material as possible.

(d) Contamination

As the material to be used for recharge will be coarse grained (sand/gravel), whether it comes from the Chichester Channel or from offshore sites, it is unlikely to contain pollutants. Information on whether pollutants are contained within the dredged sediment should be available for the licensed offshore extraction sites.

(e) Reduction of material available to East Head

It should be noted that East Head has experienced a long history of erosion and the predominance of erosion indicates a lack of sediment supply from the reduction in longshore drift to the east, but also aeolian transport from the Winner. Storm activity has also resulted in a history of erosion at East Head and behind the existing groyne system on the beaches to the east. The combination of these factors appears to be responsible for the reduction in sediment supply to East Head and the subsequent erosion of the spit. It cannot be said to be due to the dredging in Chichester Harbour Approach Channel, which only commenced in significant quantities in 1974 (Webber 1979).

Early studies have indicated that material circulates in a counter-clockwise manner in the Chichester Channel with material moving from the seaward end of it on to East Pole Sands. The potential exists for some of this material to find its way onto the beach area at East Head in the general area of the Winners. However, the transport of sand onto the East Pole Sands is not limited to the Channel but may well come from further offshore, with the majority coming alongshore from the east.

It is unlikely under normal conditions that the material dredged from Chichester Harbour Approach Channel would be transported to East Head. Thus it is unlikely that the removal of material from the channel will reduce the supply of sediment to East Head.

(f) Loss of beach material by longshore drift westwards

Beach material placed on the western half of the Eastoke frontage can be transported westwards by longshore drift towards Langstone Harbour entrance. The east to west drift rate has been estimated to be approximately 20,000m³ (Webber 1979). This will be offset by the programme of annual recycling from Hayling Bay to the Eastoke frontage. The recycling operations return approximately 14,500m³ per year of material to the Eastoke frontage, leaving only a net difference of some 5,500m³. It is possible, though not certain, that a limited amount of material leaving the frontage to the west is subsequently returned to the vicinity of Chichester Harbour entrance, via an offshore transport route. Table 2 shows the total volumes recycled east to west and west to east in previous years and similar quantities will be recycled over the next five years.

(g) Beach material transported eastwards by longshore drift onto intertidal habitats within Chichester Harbour

The easterly drift of sediments to Eastoke Point and the mouth of Chichester Harbour will be offset by a programme of annual recycling westwards. The west to east drift rate has been estimated to be approximately 13,000m³. The recycling operations which occur on the Hayling frontage return approximately 7,500m³ per year of material to the Eastoke frontage, giving a net difference of some 6,500m³. Some of this material may pass into Chichester Harbour, but most will be carried out of the Harbour by the strong ebb tidal currents in the entrance channel (see Figure AA2). Table 2 shows the total volumes recycled east to west and west to east in previous years and similar quantities will be recycled over the next five years.

The movement of shingle and sand around Eastoke Point and Sandy Point into the Harbour might smother the mud flats. However, there is little evidence for this movement happening (although it may be episodic) and unless large quantities of relatively fine materials (sand rather than shingle) were used as beach recharge it is very unlikely that the recharge

would change the present situation (the present situation is that we have been recycling a relatively fine material from the “ness”). This is because of the very strong ebb tidal currents in the Chichester Channel which carry material seawards in the area between Sandy Point and Eastoke Point. Also, due to the modest scale of the re-nourishment works, it is unlikely that additional material at Eastoke Beach is affecting annual losses of sediment or movement of material eastwards; it is just raising the beach profile.

6

Conclusions

The proposed conclusion that beach nourishment does not represent an adverse effect on the integrity of the SAC, SPA and Ramsar Site is supported by a number of observations:

- (a) Material in Chichester Harbour Channel accretes as a result of longshore transport, particularly from the west (Eastoke Beach). Dredging this material for recharge of Eastoke beach represents beneficial use and recycling of marine resources.
- (b) Loss of sediment to the west is limited to approximately 5,500m³ by annual recycling of material eastwards along the beach. A limited amount of the remaining material that leaves the western end of the frontage as losses may be returned to the entrance of Chichester Harbour by a sediment transport pathway. Introduction of new beach material from an offshore source for beach recharge would offset the net losses by replenishing the beach system. Provided this amounts to at least 25,000m³ over the five year life of the scheme, it would fully offset the predicted net loss of beach material westwards. It should also be noted that the recharge operation will not necessarily increase the amount of material transported westwards, it will essentially replace the transported material that would in any case be lost.
- (c) Under normal circumstances it is unlikely that the material obtained from Chichester Harbour Approach Channel (which is mainly shingle) would be carried to East Head (which is mainly sand). It is therefore unlikely that the removal of material for dredging would exacerbate the existing problem of erosion at the spit (which is largely caused by a reduction in longshore sediment supply).
- (d) The ebb-dominated tidal flows within Chichester Harbour will limit the recharge material being carried into the harbour and smothering intertidal habitats. Further investigations show that the dredged material will rapidly settle in the water column, thereby limiting the potential for its dispersal and the subsequent smothering of benthic communities.
- (e) Benthic organisms within and adjacent to the dredge area are adapted to highly mobile substrates, high turbidity and a management regime that includes previous dredging of the large majority of the same area and a significantly wider channel than currently proposed.

- (f) Sediment contamination is unlikely and tests will have already been undertaken on existing approved extraction sites which are presently under consideration as potential sources. The navigational dredge material will have originated from the Eastoke frontage and is therefore unlikely to contain any contaminants.

7

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