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CONSERVATION OBJECTIVES and DEFINITIONS OF FAVOURABLE CONDITION for DESIGNATED FEATURES OF INTEREST:

These Conservation Objectives relate to all designated features on the SSSI, whether designated as SSSI, SPA, cSAC or Ramsar features.

Name of Site of Special Scientific Interest (SSSI)	
The Wash	
Names of designated international sites	
Special Area for Conservation (SAC)	The Wash and North Norfolk Coast
Special Protection Area (SPA)	The Wash
Ramsar:	The Wash
Relationship between site designations	

Version Control information	
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Prepared by:	Ian Evans & Conor Donnelly
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Other notes/version history :	

Quality Assurance information		
Checked by	Name:	Date:
	Signature	

Conservation Objectives and definitions of Favourable Condition: notes for users

Conservation Objectives

SSSIs are notified because of specific biological or geological features. Conservation Objectives define the desired state for each site in terms of the features for which they have been designated. When these features are being managed in a way which maintains their nature conservation value, then they are said to be in 'favourable condition'. It is a Government target that 95% of the total area of SSSIs should be in favourable or unfavourable recovering condition by 2010.

Definitions of Favourable Condition

The Conservation Objectives are accompanied by one or more habitat extent and quality definitions for the special interest features at this site. These are subject to periodic reassessment and may be updated to reflect new information or knowledge; they will be used by Natural England and other relevant authorities to determine if a site is in favourable condition. The standards for favourable condition have been developed and are applied throughout the UK.

Use under the Habitats Regulations

The Conservation Objectives and definitions of favourable condition for features on the SSSI may inform the scope and nature of any 'appropriate assessment' under the Habitats Regulations. An appropriate assessment will also require consideration of issues specific to the individual plan or project. The habitat quality definitions do not by themselves provide a comprehensive basis on which to assess plans and projects as required under Regulations 20 - 21, 24, 48 - 50 and 54 - 85. The scope and content of an appropriate assessment will depend upon the location, size and significance of the proposed project. Natural England will advise on a case by case basis.

Following an appropriate assessment, competent authorities are required to ascertain the effect on the integrity of the site. The integrity of the site is defined in paragraph 20 of ODPM Circular 06/2005 (DEFRA Circular 01/2005) 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. The determination of favourable condition is separate from the judgement of effect upon integrity. For example, there may be a time-lag between a plan or project being initiated and a consequent adverse effect upon integrity becoming manifest in the condition assessment. In such cases, a plan or project may have an adverse effect upon integrity even though the site remains in favourable condition.

The formal Conservation Objectives for European Sites under the Habitats Regulations are in accordance with paragraph 17 of ODPM Circular 06/2005 (DEFRA Circular 01/2005), the reasons for which the European Site was classified or designated. The entry on the Register of European Sites gives the reasons for which a European Site was classified or designated.

Explanatory text for Tables 2 and 3

Tables 2, 2a and 3 set out the measures of condition which we will use to provide evidence to support our assessment of whether features are in favourable condition. They are derived from a set of generic guidance on favourable condition prepared by Natural England specialists, and have been tailored by local staff to reflect the particular characteristics and site-specific circumstances of individual sites. Quality Assurance has ensured that such site-specific tailoring remains within a nationally consistent set of standards. The tables include an audit trail to provide a summary of the reasoning behind any site-specific targets etc. In some cases the requirements of features or designations may conflict; the detailed basis for any reconciliation of conflicts on this site may be recorded elsewhere.

Conservation Objectives

The Conservation Objectives for this site are, subject to natural change, to maintain the following habitats and geological features in favourable condition (*), with particular reference to any dependent component special interest features (habitats, vegetation types, species, species assemblages etc.) for which the land is designated (SSSI, cSAC, SPA, Ramsar) as individually listed in Table 1.

Habitat Types represented (Biodiversity Action Plan categories)

- Coastal Saltmarsh
- Saline Lagoon
- Vegetated shingle
- Littoral sediment
- Sub-littoral sands and gravels
- Sabellaria reefs

Geological features (Geological Site Types)

Not Applicable

(*) or restored to favourable condition if features are judged to be unfavourable.

Standards for favourable condition are defined with particular reference to the specific designated features listed in Table 1, and are based on a selected set of attributes for features which most economically define favourable condition as set out in Table 2 and Table 3:

Table 1 Individual designated Special Interest Features
BAP Broad
Habitat type /
Geological Site
Type

BAP Broad Habitat type / Geological Site Type	Specific designated features	Explanatory description of the feature for clarification	SSSI designated Interest features	SAC designated Interest features	SPA bird populations dependency on specific habitats				Ramsar criteria applicable to specific habitats			
					Annex 1 species	Migratory species	Waterfowl assemblage	1 Represent- ative wetland	3 plant/ animal populations	5 20,000 waterfowl	6 1% of waterbird	
Saline lagoons	Coastal lagoons		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
Coastal saltmarsh	Atlantic salt meadows		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
Coastal saltmarsh	Mediterranean and thermo-Atlantic halophilous shrubs		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
Coastal saltmarsh	Salicornia and other annuals colonising mud and sand		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
Littoral sediment	Mudflats and sandflats not covered by sea water at low tide		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
Sub littoral sands and gravels	Sandbanks which are slightly covered by sea water at all times		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
Sabellaria spinulosa reefs	Biogenic reefs		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
	Large shallow inlets and bays		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
	Common Seal (<i>Phoca vitulina</i>)		*	*				*	*			
	Otter (<i>Lutra Lutra</i>)		*	*				*	*			
Coastal vegetated shingle	Coastal vegetated shingle		*	*	(*)	(*)	(*)	*	*	(*)	(*)	
	Aggregations of non-breeding birds - internationally important populations of individual species: Pink-footed Goose, Dark-bellied Brent Goose, Shelduck, Pintail, Oystercatcher, Grey Plover, Knot, Dunlin, Bar-tailed Godwit, Curlew, Redshank, Turnstone, Sanderling.	Internationally important populations	*	*							*	
	Aggregations of non-breeding Annex 1 birds: Bewick's Swan, Whooper Swan, Bar-tailed Godwit	Nationally important populations of birds listed in Annex 1 of the Birds Directive	*	*				*	*		*	
	Aggregations of non-breeding birds - >20,000 waterfowl	Internationally important water fowl population	*	*				*	*		*	

Conservation Objectives: The Wash SSSI

Draft 21 February 2008

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	Aggregations of breeding Annex 1 birds: Common Tern, Little Tern	Nationally important populations of birds listed in Annex 1 of the Birds Directive	*		*						*
	Aggregation of non-Annex 1 breeding birds: Redshank	Exceptionally high breeding densities of Redshanks	*		*						

NB. 1). Features where asterisks are in brackets (*) indicate habitats which are not notified for specific habitat interest (under the relevant designation) but because they support notified species. 2) The requirements of species (including SPA bird species) are reflected in the Conservation Objectives for habitat features on which they depend. In some specific situations, direct population measures for species may also be used to provide supporting information to confirm habitat quality measures.

Table 2a Large Shallow Inlet & Bay – Extent Objectives

<p>Conservation Objective for habitat extent To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:</p>				
<p>Extent Dynamic balance On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.</p>				
Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)	Estimated extent (ha) and date of data source	Site Specific Target range and Measures	Method of assessment	Comments
Large shallow inlets and bays	63, 135ha (Wash SSSI citation)	No change in extent of whole feature	Assessment of extent should be measured periodically against a baseline map/aerial image or through the review of any known activities that may have caused an alteration in extent. Possible sources of baseline data are archive remote sensing, aerial photographs and intertidal resource mapping.	Where changes in extent are known to occur as a result of cyclical natural processes, then the target value should accommodate this variability. If required a declining value may be established where sufficient information is available to predict a trend. Where the field assessment judges the extent to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities which interrupt natural coastal processes such as hard sea defences, land reclamation, etc. or unrecoverable natural losses) then condition should be considered unfavourable. Staff should refer to the flow diagrams in the introductory text to the generic marine features guidance for more information on these issues.
Audit Trail				
Rationale for habitat extent attribute				
(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).				
Rationale for site-specific targets (including any variations from generic guidance)				
Other Notes				

Table 2b Saline Lagoons – Extent Objectives

Conservation Objective for habitat extent	To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:			
Extent Dynamic balance	On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.			
Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)	Estimated extent (ha) and date of data source	Site Specific Target range and Measures	Method of assessment	Comments
Saline lagoons	17.38ha using Mapinfo GIS (based on OSMaster Map)	No reduction in extent of saline lagoon area.	Extent should be assessed periodically using aerial imagery assessed against baseline aerial image. Alternatively can be assessed through the review of any known activities that may have caused an alteration in extent. For details of assessment techniques see Davies <i>et al.</i> , 2001.	Target should allow for natural variability. For example, erosion following winter storms or floods. (However, some erosion may be exacerbated by coastal defences and should be treated as coastal squeeze and then condition should be considered unfavourable.) Where the field assessment judges the extent to be unfavourable, and subsequent investigation reveals that the cause is clearly attributable to natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site (eg due to anthropogenic or unrecoverable natural losses) then condition should be considered unfavourable. For created and actively managed lagoons, natural processes leading to loss of extent may cause the site to become unfavourable and management action can be taken. In all cases changes in extent would be considered unfavourable if attributable to the following: anthropogenic alterations to the separating barrier; artificial infilling, land claim or other development; loss or damage to a sluice or other flow control mechanism, coastal squeeze.

Audit Trail

Rationale for habitat extent attribute

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

Boundary of lagoon mapped used GIS Ordnance Survey Mastermap based on aerials from c. 2000.

Lagoons appear physically stable and the integrity of their surroundings is not under obvious threat. The site is afforded protection as an RSPB reserve which is wardened and fenced. The existence and maintenance of the lagoonal community is compatible with the use of the site as a bird reserve as along as the water levels are maintained (lagoonal specialists are sublittoral species) and the salinity levels are not allowed to drop too low (Bamber & Evans, 2006).
When determining extent it is important to account not only for extent of the water body but also for the extent of the basin itself. Extent of water in late winter / spring may be taken as the likely extent of the lagoon basins. Extent of water in late summer is likely to be less than extent of the basins. Therefore important to consider timing (tidal and seasonal) when measuring extent.

Rationale for site-specific targets (including any variations from generic guidance)

Other Notes

Northerly lagoon at Snettisham is bordered by chalet development on seaward side on shingle ridge. Unregulated development of these chalets and associated development eg car parks, patios etc has the potential to impact upon the extent of the lagoons.

Table 2c Saltmarsh - Extent Objectives

Conservation Objective for habitat extent	To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:		
Extent Dynamic balance	On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.		
Habitat Feature (BAP Broad Habitat level)	Estimated extent (ha) and date of data source	Site Specific Target range and Measures	Method of assessment
Coastal saltmarsh	The total extent of saltmarsh in The Wash SSSI estimated during 1982-85 (Hill 1988) was 4,158ha. In 2001-02, the extent of saltmarsh was estimated to be 4,886ha (Hemphill, Whittle and Meakins 2003). Aerial photographs (Aerial Perspectives 2000) of The Wash show that the extent of saltmarsh in 2000 was in the region of 4,265ha (see Figure 1a-e).	No decrease in extent from the established baseline, subject to natural change.	<p>Details on how baseline information was determined can be obtained from:</p> <ul style="list-style-type: none"> (i) Hill, M.I. (1988). Saltmarsh Vegetation of The Wash. An Assessment of Change from 1971 to 1985. NCC Research Report No 13. NCC, Peterborough (ii) Hemphill, P., Whittle A. & Meakins, N. (2003) NVC Survey of Saltmarsh and Other Habitats in The Wash European Marine Site, English Nature, Peterborough. (iii) UK Perspectives Aerial Photographs. (2000). ukperspectives.com <p>The main difficulty in determining the extent of saltmarsh habitats is defining the extent of the pioneer zone. This is because the plant communities that are characteristic of this zone are ephemeral, have an annual life cycle and their extent may vary from year to year. Some underestimation of pioneer zone extent will therefore arise if the timing of the aerial photograph survey does not coincide with the peak annual extent of the pioneer zone at low tide.</p> <p>Saltmarsh extent estimates also need to exclude specific areas which are not being managed for the purpose of maintaining saltmarsh habitats. For example, the air weapons targets and roads within the MOD weapons ranges, the outfalls from Internal Drainage Board pumping stations and the training wall that extends within the saltmarsh at Wyberton Marsh.</p>

Audit Trail
<p>Rationale for habitat extent attribute</p> <p>(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).</p>
<p>The methods used to assess saltmarsh extent are relatively broad-scale estimates and include habitats (such as borrow pits and creeks) which may not specifically support saltmarsh vegetation. In the 1982-85 saltmarsh survey, saltmarsh extent information was obtained using aerial photographs and ground measurements. The 2001-02 survey used a similar approach although the extent estimate is 62.1ha greater than the extent estimate obtained using aerial photographs taken in 2000. The main reason for this discrepancy is largely the result of differences in determining the boundary of the pioneer zone from aerial photographs. Consequently, it is likely that changes in extent will be difficult to assess accurately assess and will be subject to a margin of error and/or natural variation.</p> <p>The use of Lidar data (where available) to establish actual ground level elevations could assist in the interpretation of the overall saltmarsh extent – elevation being all important for saltmarsh colonisation and zonation of course. The level of accuracy achievable with Lidar could allow an assessment to be made independent of vegetation coverage, which as the text points out, will vary year to year, season to season etc.</p>
<p>Rationale for site-specific targets (including any variations from generic guidance)</p>
<p>Other Notes</p>
<p>Land claim prior to 1980 established the current landward boundary of the saltmarsh (and the majority of the SSSI) as a result of the construction of a series of earth embankments. After the period of land claim, the saltmarsh has continued to expand as a result of the accretion of sediment and is the reason for the net increase in saltmarsh recorded between 1985 and 2002. However, whilst some parts of the saltmarsh are expanding e.g. southern shore, some other areas are either stable or eroding e.g. Freiston shore.</p>

Table 2d Extent Objectives - Intertidal Flats

Conservation Objective for habitat extent	To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:		
Extent Dynamic balance	On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.		
Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)	Estimated extent (ha) and date of data source	Site Specific Target range and Measures	Method of assessment
Littoral sediment	The total extent of littoral sediment in The Wash is x ha	No decrease in extent of littoral sediment.	<p>Extent should be assessed periodically (once per monitoring cycle ie every 6 years) against a baseline map showing the distribution of littoral sediment, or through the review of any known activities that may have caused an alteration in extent. Possible sources of baseline data are archive remote sensing, aerial photographs and intertidal resource mapping.</p> <p>No existing baseline information on total extent of intertidal flats. EA Monitoring Program (aerial photography, beach surveys etc) doesn't extend to low water mark, although does give useful information on saltmarsh / intertidal flat boundary. Currently seeking to set up contract to use remote sensing data to collect this baseline data.</p> <p>Where changes in extent are known to occur due to cyclical natural processes, then the target value should accommodate this variability. If required a declining value may be established where sufficient information is available to predict a trend. Where the field assessment judges extent to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable. Changes in extent would be considered unfavourable if attributable to activities which interrupt natural coastal processes e.g. hard sea defences.</p> <p>Other issues to consider:</p> <ul style="list-style-type: none"> • Boundary with saltmarsh communities (especially samphire) difficult to measure • Important to define low water boundary – should be low water mark but can be difficult to measure

Audit Trail
Rationale for habitat extent attribute
(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).
Rationale for site-specific targets (including any variations from generic guidance)
Other Notes
<ul style="list-style-type: none"> Wash still recovering from effects of land claim which is impacting extent of intertidal flats in several locations, including the coast between the Witham and Gibraltar Point. Problems occur where saltmarsh is accreting laterally seaward and there is a fixed LWM resulting in decreased intertidal mudflat (see Pethick 2002). Need to maintain minimum width of intertidal flat to avoid erosion. Erosion at Freiston thought to be due to narrow intertidal flat (<3.5km width) (Univ. of Newcastle 1998). Relationship between offshore intertidal banks and intertidal flats needs to be considered. There is seaward movement of the low water mark of the foreshore between Rivers Welland and Nene which may be due to landward advance of eroding offshore banks (Posford Duvivier 1997). Changes in watercourses (eg Ouse low flows?)

Table 2e Extent Objectives – Subtidal Sandbanks

Conservation Objective for habitat extent	To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:		
Extent Dynamic balance	On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.		
Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)	Estimated extent (ha) and date of data source	Site Specific Target range and Measures	Method of assessment
			Comments

<p>Sub littoral sands and gravels</p>	<p>Lack of data</p>	<p>No change in extent of inshore sub littoral sediment habitat</p>	<p>Extent should be assessed and compared periodically against a baseline map or through the review of any known activities which may have caused an alteration in extent.</p> <p>Baseline information on extent: EA bathymetric survey. Uses side scan sonar. Along profiles to 15m depth. 1km spacing between profiles. Surveys undertaken once every 5 years. One survey available for entire Wash.</p>	<p>Where changes in extent are known to occur due to cyclical natural processes, then the target value should accommodate this variability. If required a declining value may be established where sufficient information is available to predict a trend.</p> <p>Where the field assessment judges extent to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable.</p> <p>Changes in extent would be considered unfavourable, if attributable to activities which remove parts of the feature i.e. dredging, aggregate extraction.</p> <p>Acoustic mapping to determine the extent of the sediment habitats within the whole site is unlikely to be used after initial mapping exercises are undertaken. A stratified sampling strategy guided by the initial inventory of the whole resource is likely. In shallow areas it might be appropriate to use air photo/satellite remote sensing, with suitable ground validation.</p> <p>Issues:</p> <ul style="list-style-type: none"> EA Shoreline monitoring programme. Coverage? If stratified approach to be used focus on areas where change most likely to occur eg maintenance dredging disposal sites? subtidal channels being filled by landward movement of offshore banks? Dredge fisheries?
Audit Trail				
Rationale for habitat extent attribute				
(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).				
Little / no comprehensive data available on extent, assessment of whether target being met should be achieved through the review of any known activities which may have caused an alteration in extent.				
Rationale for site-specific targets (including any variations from generic guidance)				
Other Notes				

Table 2f Sabellaria spinulosa (ross worm) Reef – Extent Objective

<p>Conservation Objective for habitat extent</p>	<p>To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:</p>		
<p>Extent Dynamic balance</p>	<p>On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.</p>		
<p>Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)</p>	<p>Estimated extent (ha) and date of data source</p>	<p>Site Specific Target range and Measures</p>	<p>Method of assessment</p>
			<p>Comments</p>

<p>Sabellaria spinulosa reefs</p>	<p>1846.5ha (Jessop & Stoutt, 2006)</p> <p>Note: several discrete areas of reef, not one continuous feature.</p>	<p>No change in extent of <i>Sabellaria spinulosa</i> reef allowing for natural succession / known cyclical change</p>	<p>Extent should be assessed periodically against a baseline map or through the review of any known activities that may have caused an alteration in extent, such as use of mussel dredges / demersal shrimp trawls, disposal of dredgings etc.</p> <p>Baseline from a survey undertaken in November 2005 (Jessop & Stoutt, 2006). Reef was identified using AGDS ground-truthed by day grab sampling. Survey targeted the Lynn Deepes and The Well area of the outer Wash were dense <i>S. spinulosa</i> communities have been consistently identified by previous surveys (eg Foster-Smith & Sotheran, 1999; Foster-Smith & White, 2001 & Foster-Smith, 2001) . 1,570ha of reef was found in this area (85%), however reef was also found elsewhere: in the Boston Deepes (60ha), Boston Lower Road (36.5ha), East of Roger Sand (169ha) and intertidally (at LWM) at Inner West Mark Knock (11ha).</p>	<p>Activities that may have affected the baseline: Trawling and dredging activities can damage and destroy reef (reviewed in Foster-Smith & Hendrick, 2003, see also Pearce et al 2007). Pink shrimp <i>Pandalus montagui</i> are known to have a particularly strong association with <i>S. spinulosa</i> reefs (Foster-Smith & Hendrick, 2003) and historically beam trawling for pink shrimp has occurred in the central areas of The Wash targeted by this survey. However, since the late 1980s the brown shrimp <i>Crangon crangon</i> fishery has dominated and currently there is only 1 vessel regularly fishing for pink shrimp. The brown shrimp fishery targets a different area than the pink shrimp fishery - the bordering shallower slopes but there is potential for this fishery to overlap with reef distribution. ESFJC note that although supporting environmental conditions likely to be suitable for reef development and surveyed regularly by AGDS prior to 2005 only broken fragments of <i>S. spinulosa</i> have previously been found in the Boston Deepes. Both this site and Boston Lower Road are heavily targeted by Boston brown shrimp vessels and are therefore subject to frequent disturbance by beam trawls (Jessop & Stoutt, 2006). Sublittoral mussel settlements are also frequently known to occur in similar areas as <i>S. spinulosa</i> and so dredge fisheries targeting these stocks can damage reef. In 2005 no sublittoral mussel settlements were found and so no fishery occurred. In conclusion, given the presence of reef in areas of the Boston Deepes where previously only degraded reef has been found, 2005 probably represents a good baseline indicating the potential extent and distribution of reef within The Wash. Since there are activities currently undertaken in the site, notably brown shrimp trawling, that can damage reef, and our understanding of the extent of reef increases with further survey effort, it may be that this target should be increased.</p>
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		<p>Reef should be defined using methodology set out in 'other notes' section below. Jessop & Stoutt approach seems consistent with this.</p> <p>Important to consider survey techniques selected, for example remote sensing techniques need to be properly calibrated and ground-truthed. Careful consideration should be taken in selecting ground-truth methods for example, grab sampling is destructive, video survey is requires low turbidity, currents so timing of survey is important (see Davies et al., 2001).</p>	<p>Where the field assessment judges extent to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Changes in extent would be considered unfavourable if attributable to anthropogenic activities.</p>
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Audit Trail

Rationale for habitat extent attribute

(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).

S. spinulosa communities have been reported as being frequently ephemeral, persisting for one or two years only, unless reinforced by new settlement (Schafer 1972, cited in Foster-Smith & Hendrick 2003). However, reefs can also be long lived, persisting for at least several years eg the aggregate extraction zone Area 107 off the Lincolnshire coast supported observed well developed reefs from at least 1997 through to 2001 (Foster-Smith & Sothran 1999, Foster-Smith, 2001) and size-frequency analysis of individual *S. spinulosa* collected from studies of an aggregate extraction site at Hastings Shingle Bank, Eastern English Channel aged reefs at 4-5 years old (Pearce et al, 2007).

No studies of the longevity of individual *S. spinulosa* worms have been undertaken but the closely related *S. alveolata* may live for 10 years and it is possible that *S. spinulosa* may be similarly long-lived (Wilson, 1971, cited in Holt et al, 1997). It is important to note that reef structures may exceed the age of the oldest individual worms present and can persist for some time in the marine environment even if empty. George & Warwick (1985, cited in Holt et al, 1997) in seasonal observations of reef in the Bristol Channel, found that most of the species found within the reef matrix are slow growing and long lived with very low turnover rates, indicating reefs can be relatively old and stable. As noted below these reefs increase biodiversity, species richness and biomass of associated species significantly above that of surrounding areas. Pearce et al, (1997) found a very steep increase in biomass of some associated species – particularly the porcelain crab *Pisidia longicornis* - with age of reef. Pearce et al note that this relationship is almost certainly mirrored in other areas although the exact species may differ. It is possible this crustacean is replaced by pink shrimp in the reefs further north in The Wash. Pearce et al also note that this relationship will have implications for the food web as these crustaceans are likely to be an important component in the diet of fish and large invertebrates. The removal of *S. spinulosa* aggregations may therefore have repercussions for fish populations.

It is also important to note that *S. spinulosa* are strongly stimulated to metamorphose and settle on contact with the cement secretions of other *S. spinulosa*, whether the latter are adult, newly settled young or old., deceased colonies. The ability of newly settled young to stimulate settlement of other larvae suggests that they can accelerate the settlement process once started and may help explain massive settlement events (Foster-Smith & Hendrick, 2003). In the absence of suitable stimulation, metamorphosis and settlement sometimes occurred but always more slowly (Holt et al, 1997).

In general it is thought likely stability of reefs is related to stability of substratum. The more transient reefs that have been reported occur principally on relatively unstable substrates, while longer lasting reefs probably occur on more stable substrates (Foster-Smith & Hendrick). Other environmental conditions that are likely to be important are sediment loadings, presence of sand waves and slopes). The survey data from The Wash indicates the central area has consistently supported high densities of *S. spinulosa* over many years and is an important stable area to protect. However, as noted above it may be that there are other areas supporting suitable environmental conditions for reef development such as the Boston Deep.

Rationale for site-specific targets (including any variations from generic guidance)

Other Notes

Before using this conservation objective it is important to define what constitutes reef as distinct from other non-reef *S. spinulosa* communities. A meeting was held on 1-2 May 2007 bringing together those working on *S. spinulosa* (JNCC, Natural England, SNH, CEFAS, Newcastle Univ., Envision Ltd, Marine Ecol. Surveys Ltd) to discuss definition and management of *S. spinulosa* reef (S. Gubbay, 2007). The workshop endorsed the multi-criteria 'scoring' approach to defining *S. spinulosa* developed by Hendrick & Foster-Smith (2006). The criteria identified include consolidation of sediment; density of worms, characteristic species and biodiversity. However, the most important criteria are elevation of structure, spatial extent, patchiness and temporal stability. These four criteria are also the most pragmatic to use in defining reef (in terms of using existing technology available in the site, cost and time taken to obtain results). The workshop proposed thresholds for these criteria to measure 'reefiness':

Measure of 'reefiness'	NOT a REEF	LOW	MEDIUM	HIGH
Elevation (cm, average tube height)	<2	2-5	5-10	>10
Area (m ²)	<25	25-10,000	10,000-1,000,000	> 1,000,000
Patchiness (% cover)	<10%	10-20	20-30	>30

To some extent these criteria will also act as surrogates for the biological criteria since it is known from other work that *S. spinulosa* reef support more diverse communities than surrounding sediments. For example, the National Rivers Authority surveys of The Wash in 1991 found those sites associated with *S. spinulosa* had twice as many species and almost three times as many individuals as sites with low or no *S. spinulosa*. In the NRA survey the distinction between '*S. spinulosa* sites' and 'low or no *S. spinulosa*' was made at only 100 individuals per 3 grab samples (covering 0.3m²), raising the possibility that even relatively sparse *S. spinulosa* can strongly influence community structure (NRA, 1994, reviewed in Foster-Smith & Hendrick, 2003). This is significant since even low lying crust may have relatively high biodiversity value – this is something that requires further research and may result in modification to the working definition above.

Table 2g Common Seal – Extent Objectives

Conservation Objective for habitat extent	To maintain the designated habitats in favourable condition, which is defined in part in relation to a balance of habitat extent (extent attribute). Favourable condition is defined at this site in terms of the following site-specific standards:		
Extent	On this site favourable condition requires the maintenance of the extent of each designated habitat type. Maintenance implies restoration if evidence from condition assessment suggests a reduction in extent.		
Dynamic balance			
Habitat Feature (BAP Broad Habitat level, or more detailed level if applicable)	Estimated extent (ha) and date of data source	Site Specific Target range and Measures	Method of assessment
			Comments

Harbour (Common) seal	Moult distribution as shown in SMRU annual moult data (see also Thompson 2005, Fig 3 & Table). Breeding distribution as shown in Fig 3 & Table 1 (Thompson, 2007).	Distribution of harbour seals within the site: A stable or increasing area of usage within the site	SMRU annual aerial surveys of moulting seals. Surveys undertaken during the annual moult in August when the greatest and most consistent number of seals are ashore. To further maximise the number of seals counted, surveys are restricted to the period 1.5hrs before and 2hrs after low water. These surveys produce an estimate of the minimum number of harbour seals in the area surveyed. SMRU have also been undertaking annual aerial breeding surveys in June / July (data from 2001, 2004, 2005 and 2006) (Thompson, 2007). Breeding success is a more sensitive index of current population health .	Moulting seals widely distributed around site. Key areas for moulting seals include Inner Dogs Head; Black Buoy; Toft East; Kenzies Creek, Fleet Haven and Evans Creek (Holbeach); Thief West, Seal Sand. Breeding distribution – high proportion of pups born along creeks in southern edge of Wash on Holbeach range. However, recent increase in proportion born on outer banks of Eastern (eg Seal Sand) and Western Wash (eg Long Sand, Friskney) (Thompson, 2007). Maintenance of viable populations within protected sites is clearly linked to the availability of suitable haul-out sites with foraging areas nearby (<60km) throughout the life cycle. In The Wash, the seals diet is dominated by whiting, sole, dragonet and gobies, with a strong seasonality apparent (Hall et al, 1998). Harbour seals are a mobile species and there is some evidence of redistribution over a period of a few years, which suggests that they may alter the emphasis of use of certain areas in favour of others. Since harbour seals highly mobile important to consider the numbers and distribution of seals in areas adjacent to the SAC to put local population into context. Recent SMRU survey data suggests there may be a re-distribution of individuals between The Wash and Donna Nook / Blakeney: The Wash (c. 3000 seals pre-epidemic) seemed to decline about 22% in 2002 when PDV hit with steady decline since, but for the smaller colonies at Blakeney Point and Donna Nook (c 700, 250 seals respectively pre-epidemic) the epidemic only seemed to cause a temporary interruption to steady growth rates. This may be a cause for concern and require further investigation. However, pup production is increasing in The Wash and is at a higher rate than prior to the epidemic despite the smaller adult population so The Wash population may start increasing again. A similar trend in pup production was observed following the 1988 epidemic.
Audit Trail				
Rationale for habitat extent attribute (Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).				
Rationale for site-specific targets (including any variations from generic guidance)				
Other Notes				

Table 2h Species population objectives – Common Seal

<p>Conservation Objective for species populations</p>	<p>To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards:</p>	
<p>Population balance</p>	<p>On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.</p>	
<p>Species Feature (species or assemblage)</p>	<p>Population Attribute (eg presence/absence, population size or assemblage score)</p>	<p>Site Specific Target range and Measures (specify geographical range over which target applies ie site, BAP broad habitat or more specific) Comments</p>

<p>Harbour seals</p>	<p>Number of harbour seals present during moulting season in the site.</p> <p>Seals are resident in site throughout year</p>	<p>A stable or increasing number of harbour seals present throughout the site, measured during the moulting season.</p> <p>Assessment method: SMRU annual aerial surveys of moulting seals. SMRU undertake annual moult counts as part of NERC's statutory obligation under the Conservation of Seals Act 1970). Surveys undertaken during the annual moult in August when the greatest and most consistent number of seals are ashore. To further maximise the number of seals counted, surveys are restricted to the period 1.5hrs before and 2hrs after low water. These surveys produce an estimate of the minimum number of harbour seals in the area surveyed.</p> <p>Since SMRU surveys began peak count has been c. 3,000 seals achieved in 1988 and in 2000-2002 prior to the two PDV epidemics. After the 1988 epidemic the seal population dropped by approx 50% to c. 1,600 seals in 1989 before increasing gradually until a population of c. 3,000 was attained in 2000. Following the 2002 epidemic The Wash population decreased by 22% in 2003 to c.2,500 seals and has since declined gradually further (2004: c. 2200, 2005: c. 2100, 2006: c. 1,700). See comments.</p> <p>SMRU have also been undertaking annual aerial breeding surveys in The Wash in June / July (data from 2001, 2004, 2005 and 2006) (Thompson, 2007). Breeding success is a more sensitive index of current population health than moult counts. The latter are undertaken when the highest / most stable numbers of seals haul-out and so best detect medium to long term changes in population size.</p> <p>Pup production has increased from 550 seals in 2001 to 1013 in 2006.</p>	<p>Numbers of seals at haul-out sites varies throughout year. In winter months, seals appear to spend more time at sea, presumably feeding. During the breeding season (late May – early July) seals appear more dispersed and in smaller groups than during their moult. From late July to early Sept, during the annual moult, groups tend to be larger than at other times of year and numbers at many haul-out sites appear to be at maximum.</p> <p>Since harbour seals highly mobile important to consider the numbers and distribution of seals in areas adjacent to the site to put local population into context. Recent SMRU survey data suggests there may be a re-distribution of individuals between The Wash and Donna Nook / Blakeney: The Wash (c. 3000 seals pre-epidemic) seemed to decline about 22% in 2002 when PDV hit with steady decline since, but for the smaller colonies at Blakeney Point and Donna Nook (c 700, 250 seals respectively pre-epidemic) the epidemic only seemed to cause a temporary interruption to steady growth rates. This may be a cause for concern and requires further investigation. However, pup production is increasing in The Wash and is at a higher rate than prior to the epidemic despite the smaller adult population so The Wash population may start increasing again. A similar trend in pup production was observed following the 1988 epidemic.</p>
<p>Audit Trail</p>		<p>Rationale for species population attributes</p> <p>(Include methods of estimation (measures), and the approximate degree of change which these are capable of detecting).</p>	

Rationale for site-specific targets (including any variations from generic guidance)	
Other Notes	
References:	
Common Standards Monitoring Guidance for Marine Mammals. JNCC, May 2005	
Hall et al (1998). Seasonal variation in the diet of harbour seals in the south-western North Sea: prey availability and predator preferences. Marine Ecology Progress Series 170: 269-281.	
Thompson (2005). Distribution of harbour seals Phoca vitulina in The Wash. Report of surveys carried out in July 2004. Sea Mammal Research Unit contract report to English Nature.	
Thompson (2007). Distribution of harbour seals Phoca vitulina in The Wash. Final Report covering surveys carried out in 2004, 2005 and 2006. Sea Mammal Research Unit, contract report to Natural England.	

Table 2| Species population objectives – non-breeding birds

Conservation Objective for species populations	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards: On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.	
Species Feature (species or assemblage)	List supporting BAP Broad Habitats	Comments
Aggregations of non-breeding birds – individual species exceeding internationally important population thresholds.	Coastal saltmarsh, saline lagoons, vegetated shingle and littoral sediment.	The non-breeding waterbirds cited in the SPA and Ramsar citations are mandatory interest features which must be assessed when a condition assessment of the site is undertaken. The same species are also mandatory interest features of The Wash SSSI. Any species failing the site specific target will move or (if other features have failed previously) maintain the site in unfavourable condition. However, population counts for non-breeding waterbirds cited in the SPA and Ramsar citations cannot be traced to any credible published source. As a result, the baseline population for each non-breeding waterbird species cited in the SPA and Ramsar citations has been established from the original data using 5-year mean counts from 1979/80 to 1983/84. The year 1984 has been established as the
	<p>Bird population size – Five-year mean peak winter counts for each species is the main measure of population size. The winter period is November to March.</p> <p>However, for some species (as indicated), five-year mean peak passage</p>	<p>The site should be judged unfavourable if population declines of 50% or more from the baseline level are recorded for non-breeding internationally significant populations of individual non-breeding waterbird species cited in the SPA and Ramsar site citations.</p> <p>Mandatory features – non-breeding waterbirds listed in the SPA & Ramsar Citations: Pink-footed Goose (*5,300), Dark-bellied Brent Goose (*14,713), Shelduck (*17,043),</p>

<p>Species Feature (species or assemblage)</p>	<p>List supporting BAP Broad Habitats</p>	<p>counts are used instead and refer to the periods July to October (autumn) and April to June (spring).</p> <p>Annual WeBS counts for most species go back to 1969. As a result, more sophisticated analyses can be undertaken to assess condition where applicable.</p>	<p>Pintail (*1,497), Oystercatcher (*19,602), Grey Plover (*7,396), Knot (*67,839), Dunlin (*33,791), Bar-tailed Godwit (*7,396), Curlew (*3,072), Redshank (*3,715), Turnstone (*899), Sanderling (*300).</p> <p>Discretionary features – waterbirds listed in the JNCC SPA Review and WeBS reports:</p> <p>Ringed Plover (*passage 1,431), Golden Plover (*7,980), Lapwing (*28,297), Black-tailed Godwit (*853), Sanderling (*passage 1,195).</p> <p>(*baseline population) \$ baseline population no longer internationally significant due to higher qualifying thresholds in 2008</p>	<p>temporal baseline because Wash SSSI notification was completed and both the SPA declaration and Ramsar site listing were formalised (although the official designation took place 4 years later) in early 1984. This approach has been adopted so that the baseline population for each mandatory interest feature is the same for both the SSSI and SPA to ensure consistency between future condition assessments for all designations.</p> <p>Non-breeding waterbirds which have subsequently qualified as internationally important since site designation are considered discretionary interest features. Their baseline populations were established from the original count data for the 5-year period (1991/92 to 1995/96) cited in the JNCC SPA review. These features can be individually condition assessed as these species contribute significantly to the biodiversity of The Wash. However, failure by these species to achieve site specific targets will not impact upon the condition of the designated site as this is only influenced by the mandatory features.</p>
<p>Aggregations of non-breeding birds – individual species exceeding nationally important population thresholds.</p>	<p>Coastal saltmarsh, saline lagoons, coastal vegetated shingle and littoral sediment.</p>	<p>Bird population size - Five-year mean peak winter counts for each species is the main measure of population size. The winter period is November to March.</p> <p>Annual WeBS counts for most species go back to 1969. As a result, more sophisticated analyses can be undertaken to assess condition where</p>	<p>Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)</p> <p>The site should be judged unfavourable if population declines of 50% or more from the baseline level are recorded for non-breeding Annex 1 species, cited in the SPA citation:</p> <p>Mandatory features – non-breeding Annex 1 birds listed in the SPA Citation: Bewick's Swan (*43)⁺, Whooper Swan (*28)⁺, Bar-tailed Godwit (*7,396)^{\$}</p> <p>Discretionary features – non-breeding Annex 1 birds listed in the JNCC SPA Review and WeBS reports: Avocet (*109), Golden Plover (*7,980) (*baseline population)</p>	<p>Comments</p>
<p>Aggregations of non-breeding birds – individual species exceeding nationally important population thresholds.</p>	<p>Coastal saltmarsh, saline lagoons, coastal vegetated shingle and littoral sediment.</p>	<p>Bird population size - Five-year mean peak winter counts for each species is the main measure of population size. The winter period is November to March.</p> <p>Annual WeBS counts for most species go back to 1969. As a result, more sophisticated analyses can be undertaken to assess condition where</p>	<p>Baselines</p> <p>The population counts for nationally important Annex 1 species cited in the SPA citation cannot be traced to any credible published source. As a result, only peak counts from the original data have been used to determine baseline population figures using the same methodology as the above feature.</p> <p>Nationally important Annex 1 species cited in the SPA citation are mandatory interest features which must be assessed when a condition assessment of the site is undertaken. The same species are also mandatory interest features of The Wash SSSI. Any species failing the site specific target will move or (if other features have failed previously) maintain the site in unfavourable condition. However, population counts for Bewick's Swan and Whooper Swan relate mainly to records of birds either flying over the site or settling briefly in or adjacent to it. The transitory and variable nature of these populations means that obtaining representative and meaningful counts is very</p>	<p>Comments</p>

	applicable.	<p>+ <i>Baseline population not of national significance</i> § <i>Baseline population of international significance.</i></p>	<p>difficult. Annual population levels cannot therefore be reliably recorded. For this reason, assessments of site specific targets for Bewick's Swan and Whooper Swan cannot be reliably determined as unfavourable recovering, no change or declining. Consequently, the overall site condition assessment of The Wash SSSI and SPA will not take into consideration the condition of Bewick's Swan and Whooper Swan non-breeding populations.</p> <p>Annex 1 species which have subsequently qualified as nationally important since site designation are considered discretionary interest features. These features can be individually condition assessed as these species contribute significantly to the biodiversity of The Wash. However, failure by these species to achieve site specific targets will not impact upon the condition of the designated site as this is only influenced by the mandatory features.</p>
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Species Feature (species or assemblage)	List supporting BAP Broad Habitats	Population Attribute (e.g. presence/absence, population size or assemblage score)	Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
Aggregations of non-breeding birds – >20,000 waterfowl	Coastal saltmarsh, saline lagoons, coastal vegetated shingle and littoral sediment.	Bird population size - Five-year mean counts of the total number of waterfowl is the main measure of population size.	<p>Baselines The peak waterfowl population cited in the SPA citation cannot be traced to any credible published source. As a result, the baseline peak winter waterfowl population at the time of notification (i.e. 1984) was 203,829. This figure has been established from the original WeBS core count data for The Wash (as analysed by the BTO) and represents the mean 5-year peak winter count for the period 1979/80 to 1983/84. This peak winter waterfowl population increased to 314,851 at the time of the JNCC SPA review (based on the 5-year mean for 1991/92 – 1995/96).</p> <p>The following species have been cited (JNCC SPA Review/WeBS annual reports) as contributing to the non-breeding species assemblage: Avocet <i>Recurvirostra avosetta</i>[*], Golden Plover <i>Pluvialis apricaria</i>[*], Lapwing <i>Vanellus vanellus</i>[*], Ringed Plover <i>Charadrius hiaticula</i>^P, Black-tailed Godwit <i>Limosa limosa islandica</i>[*], Bar-tailed Godwit <i>Limosa lapponica</i>[*], Oystercatcher <i>Haematopus ostralegus</i>[*], Grey Plover <i>Pluvialis squatarola</i>[*], Dunlin <i>Calidris alpina alpina</i>[*], Knot <i>Calidris canutus</i>[*], Sanderling <i>Calidris alba</i>^P, Curlew <i>Numenius arquata</i>[*], Whimbrel^P <i>Numenius phaeopus</i>[*], Redshank <i>Tringa totanus</i>[*], Turnstone <i>Arenaria interpres</i>[*], (Little Grebe <i>Tachybaptus ruficollis</i>), Cormorant <i>Phalacrocorax carbo</i>[*], (Whooper Swan <i>Cygnus cygnus</i>), (White-fronted Goose <i>Anser albifrons albifrons</i>), Pink-footed Goose <i>Anser brachyrhynchus</i>[*], Dark-bellied Brent Goose <i>Branta bernicla bernicla</i>[*], Shelduck <i>Tadorna tadorna</i>[*], Pintail <i>Anas acuta</i>[*], (Wigeon <i>Anas penelope</i>), Teal <i>Anas crecca</i>[*], Mallard <i>Anas platyrhynchos</i>[*], Eider <i>Somateria mollissima</i>[*], Common Scoter <i>Melanitta nigra</i>[*], Black-headed Gull <i>Larus ridibundus</i>[*], Lesser Black-backed Gull <i>Larus fuscus</i>[*], Herring Gull <i>Larus argentatus</i>[*], Great Black-backed Gull <i>Larus marinus</i>[*].</p> <p>* Internationally important [*] Nationally important ^Q Locally significant ^P Passage population</p>	

Species Feature (species or assemblage)	List supporting BAP Broad Habitats	Population Attribute (e.g. presence/absence, population size or assemblage score)	Site Specific Target range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
Aggregations of non-breeding birds	Coastal saltmarsh, saline lagoons, coastal vegetated shingle and littoral sediment.	Habitat extent of the saltmarsh and littoral sediment as defined in the conservation objectives for these habitats.	No decrease in extent of saltmarsh and littoral sediment habitats from established baselines, as defined in the conservation objectives for these habitats, subject to natural change.	All designated habitats within The Wash SSSI and The Wash and North Norfolk Coast SAC support the non-breeding bird interest features of The Wash SSSI/SPA. These designated habitats of The Wash SSSI and The Wash and North Norfolk Coast SAC. As a result these habitats have their own conservation objectives and will be assessed separately under these criteria.

Audit Trail
Rationale for species population attributes (Include methods of estimation (measures) and the approximate degree of change which these are capable of detecting).

Rationale for site-specific targets (including any variations from generic guidance)
For the attributes covering non-breeding birds, only WeBS data from the count sectors directly applicable to The Wash SSSI/SPA should be used as the primary data source for assessing individual non-breeding bird populations. WeBS count sectors covering adjacent SSSIs/SPAs should be excluded. However, it should be noted that prior to 1993/94, the WeBS peak waterfowl population data held by the BTO is only available for The Wash WeBS site as a whole and not for each count sector. As a result, the baseline peak waterfowl population for The Wash SSSI/SPA will be slightly over-estimated because The Wash WeBS site is not entirely contiguous with The Wash SSSI/SPA but includes count sectors within and adjacent to The Wash SSSI/SPA.
Discretionary interest features can be individually condition assessed as these species contribute significantly to the biodiversity of The Wash. However, failure by these individual features to achieve site specific targets will not impact upon the condition of the designated site as this is only influenced by the mandatory features.

Other Notes
Monitoring of bird populations is fundamental to assessing the condition of the ornithological interest features of The Wash SSSI and SPA and as a result the above attributes are mandatory. Failure of a mandatory attribute means that the site is considered to be in "unfavourable condition". Detailed monitoring of habitat quality have not been included as mandatory largely because the influences of each on the bird attributes are poorly understood, so meaningful targets cannot be set. The guidance relies on using an indirect way of assessing habitat condition and disturbance by the direct monitoring of bird population size and diversity; both typically respond relatively quickly to deterioration in habitats or living conditions and so provide an effective means of early detection of problems in a site.

Table 2j. Species population objectives – Breeding birds

<p>Conservation Objective for species populations</p>	<p>To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards:</p>		
<p>Population balance</p>	<p>On this site favourable condition requires the maintenance of the population of each designated species or assemblage. Maintenance implies restoration if evidence from condition assessment suggests a reduction in size of population or assemblage.</p>		
<p>Species Feature</p>	<p>Attribute</p>	<p>Site Specific Target Range and Measures</p>	<p>Comments</p>
<p>Breeding birds – exceptionally high densities of breeding Redshanks (Cvii(f))</p>	<p>Population density - To enable direct comparison of density estimates the survey methodology should be compatible and comparable with the survey methodologies used at designation and this should be fully documented.</p>	<p>The site should be judged unfavourable if the baseline mean peak breeding density of Redshank within the mature saltmarsh declines by 25% or more.</p> <p>The current baseline of 85 pairs/km² was established in 1985 based on sample surveys within the saltmarshes at Kirton, Dawsmere, Gedney and Wolferton.</p>	<p>Baselines This interest feature was designated in accordance with criteria Cvii(f) in the 1983 Guidelines for the Selection of Biological SSSIs.</p> <p>A breeding Redshank survey of the mature saltmarsh at Friskney, Frampton, Dawsmere, Terrington and Wolferton was undertaken in 1972/73 (<i>Cadbury C.J. et al. 1975. Breeding Birds on The Wash, Wash Water Storage Scheme Feasibility Study. Ecological Report. Scientific Study L. Unpublished report to the Central Planning Unit</i>). It reported Redshank breeding densities of 47 pairs/km² in the mature saltmarsh. However, some of the areas surveyed have since been lost due to land claim and conversion to agricultural land. Later breeding surveys of The Wash saltmarshes (<i>Allport, G., O'Brian, M. & Cadbury, C.J. 1986. Breeding redshanks. Survey on Saltmarshes 1985. CSD Research Report No. 649, NCC/RSPB, Peterborough</i>) reported mean peak breeding densities of 85 pairs/km².</p> <p>The differences in population estimates were largely attributed to the use of different sampling methods. Consequently, subsequent population assessments will need to ensure that the survey methodology used is comparable with the methodology in above studies to be able to assess changes from the above baselines.</p> <p>The habitats supporting the bird interest features of The Wash SSSI/SPA are also designated habitats of The Wash SSSI and The Wash and North Norfolk Coast SAC. As a result, the saltmarsh habitat has its own conservation objectives and will be assessed separately under the conservation objectives for this habitat.</p>
<p>Habitat extent – Mature coastal saltmarsh</p>	<p>No decrease in extent of saltmarsh habitat from established baselines, as defined in the conservation objectives for this habitat, subject to natural change.</p>		

Species Feature	Attribute	Site Specific Target Range and Measures	Comments
Breeding Annex 1 birds - Common Tern	Population size - Five-year mean of the total number of breeding pairs.	Based on the known natural fluctuations of the Snettisham population within the site, maintain the population above 59 pairs <i>i.e.</i> the minimum recorded at this site.	<p>Baselines SPA citation cites 220 pairs (data source unknown), while SPA Review (1999) cites 152 pairs (based on the 1993 survey of 88 pairs at Snettisham and 64 pairs on the Outer Trial Bank).</p> <p>It is likely that during The Wash's recent history, Common Terns have always struggled to breed on this SSSI/SPA. A census report dated 1978 noted 160 pairs, while The Wash Bulletin No. 10 (October 1972) reported Common Terns attempting to breed on at least five sites. However, it was concluded that more suitable habitats (<i>i.e.</i> undisturbed sites which were free from flooding) were needed to help the breeding colonies establish.</p> <p>The dynamic breeding status of this species is illustrated by the situation on the Outer Trial Bank at Terrington which supported a breeding colony of Common Terns from 1985 to 1997 with a peak of 187 pairs in 1990. The site is now unsuitable due to the establishment of a large gull colony on this site and as a result of habitat changes brought about by natural ecological succession.</p> <p>The only regular breeding colony within The Wash SSSI/SPA breeds in the Snettisham/Wolferton area. During the 1960s, up to 100 pairs bred on the saltmarsh at Wolferton but this colony subsequently moved to the Snettisham Nature Reserve, which in 1984 supported 97 pairs (5-year mean of actual breeding data for the period 1979 to 1983).</p> <p>In 2005, a new breeding colony established on islands within a saline lagoon at Freiston Nature Reserve directly adjacent to The Wash SSSI/SPA. In 2006, the Freiston colony supported 14 pairs which suggests that The Wash SSSI/SPA population could be larger if suitable habitat was made available.</p>
	Habitat extent - Record extent of all habitat types used by the feature - Methods could include aerial photographs, mapping broad habitat types, Phase 1 habitat survey, NVC.	Maintain the extent (up to 0.25ha) and general location of existing shingle islands within the saline lagoons in the Snettisham Nature Reserve (subject to natural change). Losses >5% of the shingle island habitat that are not caused by natural change	<p>It is likely that sustainable semi-natural habitat which is used by Common Tern for breeding is limited within The Wash SSSI/SPA. Currently, it is largely restricted to Snettisham Nature Reserve and the lack of suitable breeding habitat elsewhere is one key factor influencing Common Tern population size within The Wash SSSI/SPA. The recent colonisation of new tern breeding habitat adjacent to The Wash SSSI/SPA at Freiston, and the loss of temporary habitat on the Outer Trial Bank demonstrates this point. As a result, only the Common Tern breeding habitat at Snettisham should be assessed when determining the condition of this attribute for The Wash SSSI/SPA.</p>

	are not acceptable.
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Species Feature (species or assemblage)	Attribute	Site Specific Target Range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
Breeding Annex 1 birds – Little Tern	Population size - Five-year mean of the total number of breeding pairs.	There is no site specific target for Little Tern for The Wash SSSI/SPA as it is evident that the species does not regularly breed within the site and was erroneously included in The Wash SPA citation.	<p>Baselines SPA citation (1988): 30 pairs. SPA Review population: 33 pairs (5 year mean 1992-96).</p> <p>The above population figures for breeding Little Tern cannot be traced to any credible published source. All legitimate data sources confirm that there has never been any regular breeding by Little Terns in The Wash SSSI/SPA since designation. Breeding has been sporadic and very limited.</p> <p>Little terns have been recorded breeding in The Wash prior to designation. More recently, Little Terns bred briefly on the Outer Trial Bank from 1985 to 1992, with a peak of 11 pairs in 1989 and 1990. The only other recent breeding recorded was at Wainfleet where up to 2 pairs bred in 2005.</p> <p>On the basis of current breeding data, the population of breeding Little Tern within The Wash SSSI/SPA has never achieved 1% of the GB population and therefore it is not a qualifying interest feature of the SSSI/SPA. It is considered the population figures in the The Wash SPA citation are erroneous being derived from combining breeding figures from the Outer Trial Bank with those from neighbouring Gibraltar Point SSSI/SPA (which supported about 22 pairs when The Wash SSSI/SPA was designated).</p>
	Habitat extent	There is no site specific target for Little Tern for The Wash SSSI/SPA as it is evident that the species does not regularly breed within the site and was	

Species Feature (species or assemblage)	Attribute	Site Specific Target Range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
		erroneously included in The Wash SPA citation.	
Species Feature (species or assemblage)	Attribute	Site Specific Target Range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
Breeding Annex 1 species – Mediterranean Gull	<p>Population size - Five-year mean of the total number of breeding pairs.</p> <p>As a very recent colonist with only an extremely small population, 5 year means are probably not yet an appropriate measure for assessing the condition of this feature.</p> <p>Habitat extent - Record extent of all habitat types used by the feature. Methods could include aerial photographs, mapping broad habitat types, Phase 1 habitat survey, NVC.</p>	<p>This is a discretionary interest feature because the species was not recorded in the SSSI or SPA when designated or when the JNCC SPA review was undertaken. However, the current breeding population of this Annex 1 species in The Wash is of national importance and should be maintained.</p> <p>Maintain the extent (up to 0.25ha) and general location of existing shingle islands within the saline lagoons in the Snettisham Nature Reserve (subject to natural change). Losses >5% of the shingle island habitat that are not caused by natural change are not acceptable.</p>	<p>Attempted to breed in 1996, 1999 and 2003 with first successful breeding recorded in 2004. Has bred annually since 2004 with 8 pairs in 2007, but regular breeding has yet to be established.</p> <p>The Mediterranean Gull breeds in the same habitats as Common Tern and as a result they share the same site specific habitat extent targets.</p>
Audit Trail			
Rationale for species population attributes			

Species Feature (species or assemblage)	Attribute	Site Specific Target Range and Measures (specify geographical range over which target applies i.e. site, BAP broad habitat or more specific)	Comments
Rationale for site-specific targets (including any variations from generic guidance)			
Little Tern is not considered to be a specific interest feature of The Wash SSSI/SPA that requires a condition assessment on account of the erroneous data included in the SPA citation and JNCC SPA review.			
The baseline population for Common Tern should only be based on the regular breeding population at Snettisham, since the breeding population on the Outer Trail Bank was short-lived and lost due to natural change.			
Other Notes			
The Marsh Harrier has been cited in the JNCC SPA Review as being a discretionary feature of the SPA and SSSI. However, the breeding population is mainly associated with habitats outside the designated site and whilst birds may use the SSSI and SPA for hunting and breeding, it is impossible to assess what proportion of the GB population is dependent upon habitat features within The Wash SSSI and SPA.			
The Montague Harrier also breeds sporadically within and outside The Wash SSSI and SPA. However, at current population levels it is very hard to determine if the breeding population is dependent upon habitat features within The Wash SSSI and SPA. Consequently, Marsh Harrier and Montague Harrier have been excluded specifically from the Conservation Objectives for The Wash SSSI and SPA, although the interest features supporting the breeding harrier populations will be assessed separately under the conservation objectives for the saltmarsh habitat.			

Table 3a Site-Specific definitions of Favourable Condition – Large shallow inlets and bays

Conservation Objective for this habitat type	To maintain the large shallow inlet and bay habitats at this site in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:		
Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)			
Site-specific standards defining favourable condition			
Attribute	Target	Method of assessment	Comments
			Use for CA?

<p>Diversity of component habitats</p>	<p>Maintain the variety of habitats identified for the site, allowing for natural succession/known cyclical change.</p> <p>These habitats are:</p> <ul style="list-style-type: none"> Subtidal boulder and cobble communities Subtidal mixed sediment communities Subtidal sandbanks¹ Intertidal flats¹ Samphire and other annuals colonising mud and sand¹ Atlantic salt meadows¹ Mediterranean saltmarsh scrub¹ Reef¹ Saline lagoons¹ 	<p>Repeated assessment of overall habitat composition or a subset of specified habitats identified for the site. For details of assessment techniques see Section 3 and Davies <i>et al.</i> (2001).</p>	<p>Where changes in habitat composition are known to be attributable to natural processes then the target value should accommodate this variability. Where there is a change in habitat composition outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.</p>	<p>Yes</p>
<p>Distribution/spatial pattern of habitats</p>	<p>Maintain the pattern of distribution of predominant habitats throughout the feature.</p> <p>Subtidal boulder and cobble communities:</p> <p>MCR.ByH.Flu (Rich faunal Turf dominated by both tall and short bryozoans and hydroids)</p> <p>ECR.EFaPomBYC (Encrusting bryozoans and coralline algae mixed with short tufted bryozoans)</p> <p>MCR.ByH (Sparse to moderately rich bryozoan/hydroid turf epifauna on a silty gravely sand substratum with a <i>Sabellaria</i> gravel/shell component)</p>	<p>Assessment of the distribution of habitats identified for the site. Confirm the presence of named habitats at selected locations in the inlet or bay. The habitats will be representative of the inlet and bay. For details of assessment techniques see Davies <i>et al.</i> (2001).</p>	<p>Where changes in distribution/spatial pattern are clearly attributable to cyclical succession or expected shifts in distribution, or they occur as a consequence of natural geomorphological changes in the estuary (e.g. change in the position of the low water channel) then the target value should accommodate this variability. Where there is a change outside the expected variation or a loss of the conservation interest of the site, possibly as a consequence of anthropogenic developments, then condition should be considered unfavourable.</p>	<p>Yes</p>

¹Individual interest features in their own right in the site.

<p>Water quality</p> <p><i>The specific representation of this attribute will depend on the local conservation interest of the feature and take into account any perceived threat to the system.</i></p> <p>Nutrients – algal mats</p>	<p>Subtidal mixed sediment communities: IMX.MytX (Sub-littoral mussel beds)</p> <p>Key biotopes listed in Appendix 5</p> <p>Distribution of biotopes as set out in Fig 7.3 and 7.4 of Foster-Smith & Sotheran, 1999, and Fig 2.1 and 2.2 of Bailey, Coad & Bamber, 2005.</p> <p>For other habitats see individual interest feature conservation objectives.</p> <p>Target values should default to appropriate national or international standards where appropriate.</p> <p>If sufficient local data are available to establish the baseline condition, site-specific targets can be set.</p>	<p>Water quality parameters could be assessed directly using in water measurements or in appropriate biota, or using one or more indicators (for example, indicators of nutrient status are phytoplankton levels, chlorophyll-a concentrations or through the presence/thickness of green algal mats).</p> <p>For details of assessment techniques see Section 3 of JNCC, 2004.</p>	<p>Water quality standards are currently being established by the environmental protection agencies for European Directives (Water Framework Directive, Urban Waste Water Treatment Directive) and the OSPAR Convention.</p> <p>Monitoring data are or will be available from these agencies to support feature assessment under common standards monitoring.</p> <p>In all cases, local measurements should be compared with regional or national assessments to establish whether any local changes are part of a wider trend.</p> <p>Eutrophication due to effluent discharge or agricultural run-off will result in the condition of the attribute being designated as unfavourable.</p>	<p>Yes</p>
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Audit Trail	
Rationale for limiting standards to specified parts of the site	
Rationale for site-specific targets (including any variations from generic guidance)	
<p>Rationale for selection of measures of condition (features and attributes for use in condition assessment)</p> <p>(The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).</p>	
Other Notes	
References:	
Davies et al. 2001. Marine Monitoring Handbook. JNCC.	
Bailey, Coad & Bamber, 2005. Wash Sublittoral Grab Survey Report 1991, 1993, 1999 and 2002. Draft Ecomatis Report to English Nature.	
Foster-Smith & Sotheran, 1999. Broadscale remote survey and mapping of sublittoral habitats and biota of The Wash and the Lincolnshire and the north Norfolk coasts. English Nature Research Reports, Number 336.	
JNCC, 2004. Common Standards Monitoring Guidance: Inlets and Bays. JNCC Feb 2004.	

Table 3b Site-Specific definitions of Favourable Condition – Saline lagoons

Conservation Objective for this habitat type	To maintain the saline lagoon habitat at this site in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:		
Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)			
The lagoons at Snettisham consist of 4 basins which are former gravel pits excavated between 1919 and 1957. The basins are percolation lagoons, largely receiving their water from the adjacent sea by percolation through the wide shingle bank which comprises the sea-wall or by ground-water. No freshwater stream input is observed. There is a further seawall embankment to landward. Site management of water levels is enabled by sluiced culverts between each lagoon (Bamber & Evans, 2006)			
Site-specific standards defining favourable condition			
Attribute	Target	Method of assessment	Use for CA?
Isolating barrier – presence and nature	No change in structure of shingle bank. This will maintain the percolation route into the lagoon system (based on shingle bank at	For details of assessment techniques see Davies <i>et al.</i> , 2001.	Yes
		Where changes in the isolating barrier are attributable to natural processes (e.g. coastal erosion) also when restorative measures are not viable, the final assessment will require expert judgement to	

	<p>time of submission of site to Europe in October 1996?).</p>		<p>determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site (eg due to anthropogenic or unrecoverable natural losses) then condition should be considered unfavourable.</p> <p>Changes in presence, nature and integrity of the isolating barrier would be considered unfavourable if attributable to alterations in structure arising from anthropogenic activities or due to loss or damage of a sluice or other flow control mechanism.</p>	
<p>Salinity regime</p>	<p>Salinity should be maintained within the range 10 ppt to 50 ppt.</p> <p>Average salinity throughout a saline lagoon would be expected to lie within a range of between 15ppt and 40ppt. Sustained levels of <10ppt and >50ppt should trigger management action in many cases, but a good understanding of local ranges and periodic variability's is essential to individual site management.</p> <p>At this site it is expected that a salinity gradient occurs ranging from less saline waters in the northern lagoons to higher salinities in the southern lagoons.</p>	<p>Seasonal averages (ppt) to be assessed periodically. Salinity measurements should be made at different states of the tide and in different seasons to account for variation in the short term (tidal cycles), medium term (in direct response to rainfall) and in the longer term (in response to seasonal rainfall and periods of drought). Preferably in late winter/early spring and later summer to determine seasonal lows and highs. Information relating to recent / annual weather patterns should be considered when comparing records over time, to help interpret any variations observed. Depending on the size and shape of the lagoon, it may be necessary to measure along a salinity gradient. In complex lagoon systems salinity gradients may occur on more than one horizontal axis and may also include vertical stratification.</p>	<p>Where the field assessment judges the salinity change to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the expected variation or a loss of the conservation interest of the site (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable.</p> <p>Changes in salinity would be considered unfavourable if attributable to the following: anthropogenic alterations to the isolating barrier; water abstraction or discharge altering the freshwater input; loss or damage to a sluice or other flow control mechanism.</p> <p>Only one set of samples available. Bamber & Evans (2006) measured salinity in lagoons in November 2005. Salinities were below sea-water normal,</p>	<p>Yes</p>

		<p>Essential that salinity regime is always assessed at a similar time of the year and state of tide. Salinity of adjacent source marine waters should be considered at the same time.</p> <p>Percolation lagoons have a long-term trend to become freshwater. This is a result of natural siltation preventing percolation of seawater into the system. It may also be a result of the separating barrier building up and preventing overtopping. The target may require revision over time to reflect such changes in salinity regime.</p> <p>In cases where reliable baseline data are unavailable the presence and abundance of lagoon species/biotopes may act as a proxy measure of salinity. Changes in the biota that indicate sustained change in the salinity regime should act as a trigger for more intensive salinity surveillance surveys.</p> <p>For details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>reflecting a fresh-water influence. Salinities decreased from the southern to northern lagoon. The southern two lagoons averaged 26ppt, the next lagoon measured 20ppt and the most northern lagoon was 18ppt. At the time of sampling the adjacent sea-water was 35ppt.</p>	
<p>Biotope composition of lagoon</p>	<p>Maintain the variety of biotopes identified for the site, allowing for succession/ known cyclical change.</p> <p>Bamber & Evans (2006), identified benthic community throughout lagoonal system as ENLag.IMS.Ann.</p>	<p>Repeated assessment of overall biotope composition or a subset of biotopes identified for the site. For details of assessment techniques see and Davies <i>et al.</i>, 2001.</p>	<p>Where the field assessment judges the biotope composition to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change outside the</p>	<p>Yes</p>

			<p>expected variation or a loss of the conservation interest of the site, (e.g. due to anthropogenic activities or unrecoverable natural losses) then condition should be considered unfavourable.</p> <p>Little baseline information. Need for further monitoring over time to obtain better understanding of physical and biological characteristics of lagoonal system including absence of submerged plants. Barnes (2000) infers barley straw may be used in site - which has algacidal properties.</p> <p>Shift to ENLag. IMS. Ann. Imp indicates impoverished biotope, stressed by low salinity or anthropogenic interference.</p> <p>Barnes & Evans noted lack of submerged plants eg tasselweed (<i>Ruppia</i> spp.) and algae, although clumps of wireweed (<i>Chaetomorpha linum</i> – a lagoonal specialist alga) in one lagoon. Wireweed was also found in Barnes' survey in 2000.</p>	
Extent of water	<p>Lagoonal specialists are sublittoral species. At least 60% of the water of the lagoon persisting at all times of year and states of tide.</p> <p>Based on OS MasterMap data for the site.</p>	<p>Area of water occupying the basin should be assessed periodically, at the same time of year (preferably in late winter/early spring and late summer). This may be assessed by direct measurement of the position of the waterline by dGPS or in relation to fixed surface features. For details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>Condition should be judged unfavourable if loss in extent of water is due to factors other than cyclical natural processes that are part of a wider coastal geomorphological management regime. See OS MasterMap data for the site.</p> <p>Where natural events (such as storm damage causing a barrier breach) cause a loss of extent of water greater than 40% of baseline value, then this would also be considered unfavourable.</p>	<p>Yes: not a mandatory CSM attribute but important measure of condition at this site</p>
Distribution of biotopes	<p>Maintain the distribution of ENLag. IMS. Ann biotope (identified throughout lagoonal system by Bamber & Evans, 2006), allowing for natural succession/known cyclical change.</p>	<p>Assessment of the distribution of biotope(s) identified for the site. For details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>Where a field assessment judges the condition of this attribute to be unfavourable and subsequent investigation indicates the cause is due to natural factors, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its</p>	<p>Yes: not a mandatory CSM attribute but important measure of condition at this site</p>

<p>Species population measures - Presence or abundance of specified species</p>	<p>Maintain presence and/or abundance of the specified species (to ensure no decline in ENLag.IMS:Ann biotope quality due to changes in presence / abundance of specified species, allowing for natural succession/known cyclical change).</p> <p>Expect to find following characterising species identified in Bamber & Evans (2006), Barnes (2000):</p> <p>Lagoonal specialists: Polychaeta: <i>Polydora cornuta</i>² Mollusca: <i>Ventrosa ventrosa</i> (formerly <i>Hydrobia ventrosa</i>), <i>Hydrobia arcana</i> (formerly <i>H. neglecta</i>), <i>Littorina saxatilis lagunae</i> Crustacea: <i>Corophium insidiosum</i>, <i>Idotea chelipes</i>, <i>Gammarus insensibilis</i>, <i>Gammarus duebeni</i>² Bryozoa: <i>Conopeum seurati</i> Other species: Polychaeta: <i>Nereis diversicolor</i>, <i>Tubificoides pseudobogaster</i>² Chironimidae Fish: <i>Pomatoschistus microps</i></p>	<p>Assessment of the presence / absence or abundance of a specified species identified for the feature.</p> <p>For details of assessment techniques see Section 2 (JNCC, 2004) and Davies et al, 2001.</p>	<p>target condition. Where there is a change in biotope distribution outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.</p> <p>Little baseline information. Need for further monitoring over time to obtain better understanding of physical and biological characteristics of lagoonal system including absence of submerged plants. Barnes (2000) infers barley straw may be used in site - which has algacidal properties.</p> <p>Where disturbance causes a species of nature conservation importance to be lost, or if there is a significant reduction in abundance, then condition would be considered unfavourable.</p> <p>Species selected should reflect the specific biological characteristics of the lagoon. Species should be used from the list of lagoonal specialists in Appendix A of JNCC 2004.</p> <p>The advice concerning judgement of the feature condition provided under species composition equally applies to this section and should be consulted:</p> <p>"Where the field assessment judges the species composition to be unfavourable, and subsequent investigation reveals the cause is clearly attributable to cyclical natural processes such as mass recruitment and dieback of characterising species, the final assessment will require expert judgement to determine the reported condition of the feature. The feature's condition could be declared favourable where the officer is certain that the conservation interest of the feature is not compromised by the failure of this attribute to meet its target condition. Where there is a change in species composition outside the expected variation or a loss of the conservation interest of the site (e.g. due to anthropogenic activities or unrecoverable natural</p>	<p>Yes: not a mandatory CSM attribute but important measure of condition at this site</p>
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	<p>Underlined = key characterising species ¹Found in Barnes, 2000 only (& present at relatively abundant levels) ²Found in Bamber & Evans, 2006 only (& present at relatively abundant levels) Highlighted = Annex A (JNCC 2004, listed species)</p>		<p>losses) then condition should be considered unfavourable.” Little baseline information. Need for further monitoring over time to obtain better understanding of physical and biological characteristics of lagoonal system including absence of submerged plants. Barnes (2000) infers barley straw may be used in site - which has algaecidal properties.</p>	
Audit Trail				
Rationale for limiting standards to specified parts of the site				
Rationale for site-specific targets (including any variations from generic guidance)				
Rationale for selection of measures of condition (features and attributes for use in condition assessment) (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).				
<p>Bamber & Evans (2006) noted surprising lack of submerged plants eg algae and tasselweeds (<i>Ruppia spp.</i>) in lagoonal system. The lagoons did not support the second major lagoonal biotope, ENLag. Veg. However, phosphate levels in lagoons high, particularly in southern lagoons. Phytoplankton blooms were noted in the northern lagoons. The survey was undertaken in November so it is possible the blooms had utilised the high dissolved organic content and in so doing created conditions unfavourable to other vegetation growth? Some clumps of wire weed were found in one of the southern lagoons.</p>				
<p>Bamber & Evans (2006) note that lagoonal communities usually tolerant of the naturally stressed lagoonal environment which shows variation in pH, oxygen, salinity, temperature etc, in short term in both time and space. In the absence of research, they assume communities are also tolerant of high organic content. They note that phytoplankton blooms are not unusual in lagoons and specialist lagoonal species are observed to thrive in lagoons where these occur. They speculate lack of plant life may be due to abundance of feeding wildfowl or the coarse substrate and lack of fine material which is not conducive to growth of vascular plants (eg tasselweeds prefer mud substratum).</p>				
<p>We have some concerns over these conclusions. Whilst lagoonal fauna may be resilient to algal blooms and high nutrient levels / pollution, no evidence exists that the faun is resilient to regular blooms and high nutrient levels / pollution over a sustained period of time. The two surveys are also not consistent which may be due to differences in sampling or real changes in the lagoon. As a result it is difficult to draw firm and favourable conclusions especially when the Habitats Directive requires a more precautionary approach to be adopted when considering priority habitats.</p>				
<p>There is little baseline information. Need for further monitoring over time to obtain better understanding of physical and biological characteristics of lagoonal system including absence of submerged plants. Barnes (2000) refers to barley straw being used in site - which has algaecidal properties.</p>				

Other Notes
<p>References</p> <p>Bamber & Evans (2006). Saline lagoon survey, Snettisham lagoons, Norfolk, November 2005. Natural History Museum Report to English Nature.</p> <p>Barnes (2000). Lagoon specialist surveys of RSPB Snettisham reserve. Brief report to RSPB.</p> <p>Davies et al, 2001. Marine Monitoring Handbook. JNCC</p> <p>JNCC (2004). Common Standards Monitoring Guidance for lagoons. JNCC, February 2004.</p>

Table 3c Site-Specific definitions of Favourable Condition – Saltmarsh

Conservation Objective for this habitat type	Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)		
	To maintain the coastal saltmarsh habitat at this site in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:		
The location of saltmarsh within The Wash SSSI is shown in Figure 1a-g. This area includes habitats (such as borrow pits and creeks) which do not necessarily support saltmarsh vegetation but which contribute to the integrity of the saltmarsh. Artificial structures such as old training walls, buildings, air weapons targets and associated developments that have either been fully authorised since notification or were present prior to notification are excluded from the favourable condition standards.			

Site-specific standards defining favourable condition

Attribute	Target	Method of assessment	Comments
Physical structure: creeks and pans	There should be no alteration of natural creek patterns or loss of pans as determined at the time of notification as a result of anthropogenic factors.	The baseline information for established creek patterns and pans can be obtained from the series of aerial photographs taken by the Environment Agency and UK Perspectives in the period 1984 to 2000. Future changes to be monitored using aerial photographs combined with information gathered from site visits.	Major erosion of saltmarsh is indicated by internal dissection and enlargement of the drainage network, ultimately leading to the creation of mud basins.. However, caution needs to be taken when assessing creeks patterns in front of areas of set-back behind the sea wall. This is because considerable re-adjustment of natural creek patterns will occur for several years after the sea wall is breached.
Vegetation structure: zonation of vegetation	Maintain the baseline range of saltmarsh zonation, NVC communities and Annex 1 habitats within the levels recorded in the 1982-85 and 2001-02 saltmarsh surveys.	Details on how baseline information was determined can be obtained from: (i) Hill, M.I. (1988). Saltmarsh Vegetation of The Wash. An Assessment of Change from 1971 to 1985. NCC Research Report No 13. NCC, Peterborough	Saltmarsh has up to five main zones: pioneer, low-mid marsh, mid-upper marsh, saltmarsh strand plus transitions. The NVC saltmarsh categories recorded within The Wash SSSI are: SM6, SM8, SM9, SM10, SM11, SM13, SM14, SM16, SM17, SM23, SM24. However, nearly all the upper marsh around The Wash was lost by land reclamation prior to 1980. Many of the current upper marsh communities have since developed as a result of continuing accretion

	<p>Vegetation structure: sward height</p>	<p>Maintain the saltmarsh area as a mosaic of short turf swards (5 – 15 cm) interspersed with areas of tussocks (>15cm). These habitats should ideally occur together in roughly equal amounts, although actual levels will be determined by accessibility to grazing animals/birds, vulnerability to coastal erosion as well as the distribution and requirements of nationally important species.</p>	<p>(ii) Hemphill, P., Whittle A. & Meakins, N. (2003) . NVC Survey of Saltmarsh and Other Habitats in The Wash European Marine Site. English Nature, Peterborough</p> <p>Visual assessment during standard condition monitoring site visit.</p>	<p>and ecological succession.</p> <p>Structural heterogeneity within the saltmarsh is best achieved by grazing the saltmarsh with cattle, sheep or horses. Grazing management should, however, be limited to the period April to November and stocking levels must be managed to avoid overgrazing and poaching.</p> <p>As a general guide, stocking levels on mature upper saltmarsh to be within the range of 0.4 – 1.0 LSU per hectare during the grazing period while in lower saltmarsh, stocking levels must not exceed 0.5 LSU per hectare at any one time during the grazing period.</p>
<p>Vegetation composition: characteristic species</p>	<p>Maintain frequency of characteristic species of saltmarsh zones as follows:</p> <p><u>Pioneer zone</u>: At least one of the following species frequent and another occasional: <i>Salicornia</i> spp, <i>Suaeda maritima</i>, <i>Puccinellia maritima</i>, <i>Aster tripolium</i></p> <p><u>Low-mid marsh</u>: At least one of the following species dominant: <i>Puccinellia maritima</i>, <i>Atriplex portulacoides</i> or <i>Salicornia</i> spp;</p> <p>and two of the following species at least frequent: <i>Puccinellia maritima</i>, <i>Triglochin maritima</i>, <i>Plantago maritima</i>, <i>Atriplex portulacoides</i>, <i>Aster tripolium</i>, <i>Spergularia maritima</i>, <i>Suaeda maritima</i>, <i>Salicornia</i> spp.</p> <p><u>Mid-upper marsh</u>: At least one of</p>	<p>Visual assessment of cover, using structured walk using methodology recommended in Watts, S. & Brockington, S. (2004). Common standards monitoring: generic guidance on objective setting and condition assessment for saltmarsh. English Nature, Peterborough.</p>	<p>Communities may be dynamic in their distribution and are linked to the physical processes operating at the site, including topography, creek patterns etc.</p> <p>A variety of communities may also occur at the transition zone at the top of the salt marsh such as mesotrophic grassland, tall fen and swamp communities.</p>	

	<p>the following species abundant and three frequent: <i>Festuca rubra</i>, <i>Armeria maritima</i>, <i>Agrostis stolonifera</i>, <i>Juncus maritimus</i>, <i>Limonium vulgare</i>, <i>Glaux maritima</i>, <i>Plantago maritima</i>, <i>Aster tripollium</i>, <i>Triglochin maritima</i>, <i>Artemisia maritima</i></p>	<p>Aerial photographs, together with visual assessment of cover, using structured walk (see Watts, S. & Brockington, S. (2004). Common standards monitoring: generic guidance on objective setting and condition assessment for saltmarsh. English Nature, Peterborough).</p>	<p><i>Spartina anglica</i> is a species that is considered undesirable in intertidal habitats where it is expanding at the expense of mudflats. However it can be a precursor to the development of saltmarsh where sediments are accreting. Natural die-back has occurred in some areas.</p>
<p>Vegetation composition: negative indicator species <i>Spartina anglica</i></p>	<p>Existing <i>Spartina anglica</i> stands to show no evidence of expansion into pioneer saltmarsh zone (with an indicative target of less than 10 % expansion in a 10 year time-span)</p>	<p>Visual assessment during site visit</p>	<p>Baseline levels are determined at the time of notification of the site or from the time authorisation was granted for the operation to be undertaken on the SSSI.</p>
<p>Other negative indicators</p>	<ul style="list-style-type: none"> ▪ Artificial drainage channels to be limited to those established by Internal Drainage Boards at their drainage outfalls prior to notification of SSSI and to be maintained at baseline levels. ▪ No unauthorised loss of saltmarsh through the erection of artificial structures. Artificial structures include roads, air weapons targets, embankments and associated developments ▪ No obvious signs of pollution. ▪ Turf cutting to be absent ▪ No creation of bare substrate as a result of anthropogenic activities such as vehicle use or trampling. ▪ With the exception of localised pathways created 		

	<p>by livestock or horses to access the saltmarsh, poaching damage from livestock should not exceed 0.001 ha at any one location.</p> <ul style="list-style-type: none"> ▪ No artificial decrease in fresh groundwater flows on to the saltmarsh. 		
<p>Indicators of local distinctiveness* *If part of the reason for the notification of the site, this is a mandatory attribute</p>	<ul style="list-style-type: none"> ▪ Maintain Annex 1 habitats (i.e. Pioneer SM8 and SM9 communities, SM10-17 Atlantic Salt Meadows and SM21 and SM25 Mediterranean and thermo-Atlantic halophilous scrubs) at the levels recorded in 2001-02. ▪ Maintain populations of nationally scarce plants (e.g. <i>Limonium bellidifolium</i>, <i>Limonium binervosum</i>, <i>Hordeum marinum</i>, <i>Sarcocornia perenne</i>, <i>Spartina maritime</i> and <i>Sueda vera</i>). ▪ Maintain populations of nationally scarce invertebrates (<i>Conocephalis dorsalis</i>, <i>Eupithecia extensaria occidua</i> and <i>Haematopota bigoti</i>). 	<p>Site specific surveys</p>	<p>This attribute is intended to cover any site-specific aspects of this habitat feature (forming part of the reason for notification) which are not adequately covered by the other attributes, or by separate guidance e.g. for notified species features.</p>

Audit Trail	
Rationale for limiting standards to specified parts of the site	
Areas of saltmarsh which are being grazed with livestock or horses in 2005 are shown in Figure 2. Locations of IDP pumping station outfalls are shown in Figure 3 and features excluded from favourable condition standards are shown in Figure 4.	
Rationale for site-specific targets (including any variations from generic guidance)	
<p style="text-align: center;">Rationale for selection of measures of condition (features and attributes for use in condition assessment)</p> (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).	
Other Notes	

Table 3d Site-Specific definitions of Favourable Condition – Intertidal Flats

<p>To maintain the littoral sediment habitats at this site in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:</p>				
Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)				
Site-specific standards defining favourable condition				
Attribute	Target	Method of assessment	Comments	Use for CA?
Biotope composition of littoral sediment	Maintain the variety of biotopes in each sub-feature (mud, muddy sand, sand & gravel) identified for the site in Yates et al (2002) allowing for natural succession/ known cyclical change. Biotopes are listed in Appendix 1. 12 biotopes in The Wash.	Repeated assessment of overall biotope composition. Details on how baseline information was determined can be found in: Yates et al (2002), 118 sites sampled in 1998, 103 sites sampled in 1999. Both 1998 and 99 surveys included offshore banks. Comparison with ITE's 1985/1986 survey (192 sites but excluded offshore banks).	Target requires presence of biotopes listed in Appendix 1. Where changes in biotope composition are known to be attributable to natural processes (e.g. winter storm/flood events, changes in supporting processes or mass recruitment or dieback of characterising species) then the target value should accommodate this variability. Where there is a change in biotope composition outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.	Yes

		<p>Survey undertaken September to Nov 1998 & 1999, during low water springs. Methodology as per Davies et al 2001 (Quantitative sampling of intertidal sediment species using cores). 1ha sample sites, arranged down shore in series of line transects. At each sample site 5 cores (10cm diameter, 30cm deep, sieved through 0.5mm mesh) & 5 surface sediment samples taken for particle size analysis.</p> <p>For further details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>Important to note characteristics of baseline years. For example CEH surveys 1986 seems to have been a particularly good recruitment year for range of invertebrates (eg when compared with 1973, 1998 & 1999 data see pg43, Yates et al, 2002).</p> <p>CEH surveys don't include mussel beds. Also ESFJC data showed good cockle recruitment in 1998 but not recorded in CEH survey?</p> <p>Biotope code used in baselines is version 97.06, updated recently version 04.05.</p>	
<p>Sediment character: sediment type</p>	<p>Maintain distribution of mud, muddy sand and sand and gravel across the feature, allowing for natural succession/known cyclical change.</p> <p>Spatial distribution of sediment types shown in: Figures 3.3.2a and b p88-89, Yates et al (2002).</p> <p>ESFJC qualitative sediment on shellfish beds.</p> <p>Yates et al (1993). CEH satellite imagery of The Wash as re-analysed in Bell & Walker 2007, Fig 2.2.</p>	<p>Distribution of sediment types should be assessed across the whole feature and compared to baseline conditions. Target requires maintenance of spatial juxtaposition of specified sediment types (mud, muddy sand, sand) across the feature.</p> <p>Details on how baseline information was determined can be found in:</p> <p>Yates et al (2002). PSA data from 1985/86, 1998 and 1999. For details of method see above.</p> <p>ESFJC qualitative assessment of sediment on shellfish beds. Visual inspection of sediment collected in day grabs during ESFJC cockle surveys.</p>	<p>Where changes in sediment type are known to be clearly attributable to natural processes (e.g. winter storm/flood events, changes in supporting processes) then the target value should accommodate this variability.</p> <p>Where extreme events cause a change in sediment type, then this may have caused a change in the structure of the feature, which may lead to the condition of the feature being considered as unfavourable.</p> <p>Sediment distribution across site is generally consistent between each survey. However, although CEH found sediments of The Wash changed little between 1986, 1998 & 1999 surveys the area to the east of Great Ouse became sandier. This was a marked change that occurred between 1997 & 98 (Yates et al, 2002) and is thought to be due to winter storm (extreme event?).</p> <p>Higher shore levels in the inner Wash may get muddier over time as a result of accretionary processes. Change is likely to be particularly marked in sites near most recent landclaim. Changes due to coastal squeeze are</p>	<p>Yes</p>

	<p>All the above data is compared in Fig 2.2-2.6 of Bell and Walker, 2007.</p>	<p>Yates et al (1993). ITE satellite imagery of Wash sediments. LANDSAT Thematic Mapper imagery collected in Dec 1986 & July 1989. Re-analysed by Bell & Walker (2007).</p> <p>For further details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>unfavourable change</p>	
<p>Distribution of biotopes</p>	<p>Maintain the distribution of biotopes in each sub-feature (mud, muddy sand, sand & gravel) set out in Appendix 1, allowing for natural succession/ known cyclical change.</p> <p>Map of biotopes see 1986, 1998 & 1999 biotope maps (Yates et al, 2002)</p> <p>See composition of biotopes attribute for selected biotope partners.</p> <p>See Appendix 2 for distribution of Wash mussel biotope</p> <p>See Appendix 3 for distribution of Wash cockle biotope</p>	<p>Assessment of the distribution of biotopes identified for the site in Appendix 1, key biotopes shown in bold.</p> <p>Details on how baseline information was determined can be found in Yates et al (2002) for details of method see above.</p> <p>ESFJC mussel and cockle survey methodology – for details see ESFJC Research Reports</p> <p>For further details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>Unlike biotope composition this attribute is concerned with presence or absence of biotopes at specific locations.</p> <p>Sediment biotopes show cyclical succession and have no clearly defined perimeter in the field. Target takes account of likely succession between biotopes & likely differences expected between biotopes. Where changes in distribution are known to be clearly attributable to cyclical natural processes (for example due to a movement of a drainage channel) then the target value should accommodate this variability.</p> <p>Where there is a change in biotope distribution outside the expected variation, or a loss of the conservation interest of the site, then condition should be considered unfavourable.</p> <p>Important to note characteristics of baseline years. For example CEH surveys 1986 seems to have been a particularly good recruitment year for range of invertebrates (eg when compared with 1973, 1998 & 1999 data see pg43, Yates et al, 2002).</p> <p>NB CEH surveys don't include mussel beds. ESFJC data showed good cockle recruitment in 1998 but not seemingly recorded in CEH survey.</p> <p>Biotope code used in baselines is version 97.06, updated recently 04.05. Need to convert biotopes.</p>	<p>Yes</p>

			<p>Indicators:</p> <p>HedMac biotope complex: spionids (<i>Pygospio</i>) take advantage of perturbations to get foothold. They stabilise sediment and then disappear once long-lived species become established. Change in proportion of HedMac.Pyg sub-biotope relative to other HedMac sub-biotopes could be an effective indicator of sediment changes.</p> <p>Declines in density of <i>N. hombergii</i>, <i>S. armiger</i> and <i>A. marina</i> all associated with increased organic content (Yates et al., 2002), suggesting declines in these species could be used as indicators of organic enrichment. Indicator biotopes would be MacAre and MacAre.Mare</p>	
Extent of mussel biotope	See Appendix 2 for extent of Wash mussel biotope			<p>Yes: not a mandatory CSM attribute but mussel beds key conservation feature of the site.</p>
Extent of cockle biotope	See Appendix 3 for extent of Wash cockle biotope			<p>Yes: not a mandatory CSM attribute but cockle beds key conservation feature of the site</p>
Species composition of representative or notable biotopes	<p>No decline in biotope quality due to changes in species composition or loss of notable species, allowing for natural succession/known cyclical change.</p> <p>MacAre</p>	<p>Assessment of biotope quality through assessing species composition, where the biotope is representative of the site or contains a number of species of conservation importance. Assessing this attribute will require specialist taxonomic expertise. For details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>Where a change in species composition is known to be clearly attributable to natural succession, known cyclical change or mass recruitment or dieback of characterising species, then the target value should accommodate this variability.</p> <p>Where there is a change in biotope quality outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.</p>	<p>Yes: not a mandatory CSM attribute but Macoma, Arenicola and annelids beds key conservation feature of the site</p>
Species population	Maintain age/size class structure & abundance of	Population structure and abundance should be assessed	Dependant on future quantitative surveys Where there is a sizeable shift in the age/size class structure (i.e. loss of mature adults or recruitment failure) or	Yes: not a mandatory CSM

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<p>measures – Population or structure of a species.</p> <p>- Presence or abundance of specified species</p>	<p>mussel <i>Mytilus edulis</i> (see Appendix 2) and cockle <i>Cerastoderma edule</i> (see Appendix 3)</p> <p>Maintain abundance of named positive indicator species (see Appendix 4)</p> <p>No increase in presence or abundance of named negative indicator species: non-native <i>Ensis directus</i>, <i>Crassostrea gigas</i>, <i>Crepidula fornicata</i></p>	<p>in terms of viability of the named species identified for the feature. For details of assessment techniques see Appendices 2 and 3. See also Davies <i>et al</i> 2001.</p> <p>Assessment of the presence or abundance of positive indicator species identified for the feature. For details of assessment techniques see Davies <i>et al</i>, 2001.</p> <p>Assessment of the presence or absence of negative indicator species identified for the feature. CEFAS <i>Ensis directus</i> surveys since 1998 (Palmer, 2003).</p>	<p>if disturbance causes a species of nature conservation importance to be lost, or if there is a significant reduction in abundance, then condition would be considered unfavourable.</p> <p>Increased abundance of negative indicator species i.e. those indicative of stressed habitats which would be detrimental to the feature as a whole, would also cause condition to be considered unfavourable. Abundance of <i>Ensis directus</i> cited as potential cause for poor productivity of shellfish on Daseley's Sand in recent years.</p>	<p>attribute but mussel, cockle, Macoma, Arenicola and annelids beds key conservation feature of the site.</p> <p>Invasive non-natives present in site.</p>
<p>Topography</p>	<p>No change in topography of the littoral sediment, allowing for natural responses to hydrodynamic regime.</p> <p>Topography as shown in EA beach profiles 1992-2006</p>	<p>Tidal elevation and shore slope to be assessed periodically.</p> <p>EA undertake beach profile surveys down transects around The Wash. Surveys from fixed point inland to Mean Low Water. Transects are spaced at intervals of 1km.</p> <p>For details of assessment techniques see Davies <i>et al</i>, 2001.</p>	<p>Obvious changes in topography in terms of an overall lowering (shallowing) of the shore slope may act as a trigger for further investigation. Scouring adjacent to sea defences, which lowers the shore slope, should be considered unfavourable. A suitable period over which to ascertain trends resulting in a net lowering of shore profiles is 5 years.</p> <p>Pethick (2002) indicated intertidal flat between Gibraltar Point and Witham lowering – particularly at Butterwick and Wrangle.</p>	<p>Yes: not a mandatory CSM attribute but changes in topography give an indication of the stability of the shore, whether erosion is occurring etc.</p>

Audit Trail	
	Rationale for limiting standards to specified parts of the site
	Rationale for site-specific targets (including any variations from generic guidance)
	Rationale for selection of measures of condition (features and attributes for use in condition assessment)
	(The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).
	Other Notes
	References:
	Bell & Walker (2007). Cockle suction dredging in The Wash & North Norfolk Coast European marine site. Part II – analysis of existing data. Unpublished report to Natural England
	Davies et al (2001). Marine Monitoring Handbook. JNCC
	Palmer (2003). The introduced razor fish <i>Ensis directus</i> in The Wash and North Norfolk. Shellfish News, No 16, Nov 2003.
	Pethick (2002). Coastal Data Analysis: The Wash. Study 3: long-term intertidal profile evolution modelling. Report to Environment Agency
	Posford Duvivier (1997). Wash extended shoreline evolution analysis. Report to Environment Agency
	University of Newcastle (1998). Management Options at North Sea Camp. Report to Environment Agency
	Yates et al (1993). The use of satellite imagery to determine distribution of surface sediments of The Wash. Estuarine, Coastal & Shelf Sciences, 36, 333-344.
	Yates et al (2002). Littoral sediments of The Wash and North Norfolk Coast SAC: The 1998 and 1999 surveys of intertidal sediment and invertebrates. English Nature Research Report 470.

Table 3e Site-Specific definitions of Favourable Condition – Subtidal sandbanks

Conservation Objective for this habitat type	Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)
	To maintain the sub littoral sands and gravel habitats at this site in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:

Site-specific standards defining favourable condition

Attribute	Target	Method of assessment	Comments	Use for CA?
Topography	No alteration in topography of the inshore sub littoral sediment, allowing for natural responses to hydrodynamic regime. Topography as shown on Admiralty Charts. Also Figure 8.7 and 8.8 of Foster-Smith & Sotheran (1999).	Assessment of the depth distribution/profile of the inshore sub littoral sediment and periodic comparison with baseline conditions. For details of assessment techniques see Davies <i>et al.</i> , 2001. Foster-Smith & Sotheran used AGDS supported by Admiralty Chart data to produce their bathymetric maps (Foster-Smith & Sotheran, 1999). Other potential data sources are from ESFJC AGDS / Sidescan surveys. Also EA shoreline monitoring programme bathymetric surveys (Uses side scan sonar. Along profiles to 15m depth. 1km spacing between profiles. Surveys undertaken once every 5 years. One survey available for entire Wash).	The depth distribution of the sediment has a direct influence on the structure and function of the system.	Yes
Sediment character: sediment type	No change in composition of sediment types across the feature, allowing for natural succession/ known cyclical change. Composition of sediment types as shown in Fig 1.3 Bailey, Coad & Bamber, 2005. Fig 7.2 and 9.2 of	Distribution of sediment types should be assessed across the whole feature and compared with baseline conditions. For details of assessment techniques see Davies <i>et al.</i> , 2001.	Where changes in sediment type are known to be clearly attributable to natural processes then the target value should accommodate this variability. Where extreme events cause a change in sediment type, then this may have caused a change in the structure of the feature, which may lead to the condition of the feature being considered as unfavourable.	Yes

Distribution of biotopes	<p>Foster-Smith & Sotheran, 1999.</p> <p>Maintain the distribution of biotopes in each sub-feature (gravel and sand communities, muddy sand communities), allowing for natural succession/ known cyclical change.</p> <p>Key biotopes listed in Appendix 5:</p> <p>Gravel & Sand communities sub-feature: CGS. VenBra (<i>Ophiura</i> beds) IGS. Fas.Lcon (<i>Lanice conchilega</i> beds)? Muddy Sand communities sub-feature: CMS.AbrNucCor (<i>Sabella pavonina</i> community; <i>Sabella discifera</i> / <i>Sabellaria</i> community; <i>Abra alba</i> community; dense <i>Ophiura albida</i> beds) IMS.FaMS.SpiSpi (<i>Scoloplos</i> / <i>Spiophanes</i> community)</p> <p>Distribution of biotopes as set out in Fig 7.3 and 7.4 of Foster-Smith & Sotheran, 1999, and Fig 2.1 and 2.2 of Bailey, Coad & Bamber, 2005.</p>	<p>Assessment of the distribution of range of biotopes identified for the site. For details of assessment techniques see Davies <i>et al.</i>, 2001.</p>	<p>Where changes in distribution are known to be clearly attributable to cyclical succession or expected shifts in distribution then the target value should accommodate this variability. Where there is a change in biotope distribution outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable</p> <p>Biotopes of The Wash have been mapped using two different survey techniques. One is based on Environment Agency 'Wash grid' surveys which involves 3 day grab samples being taken at each survey site. 4 surveys have been undertaken – in 1991, 1993, 1999 and 2002. The number of sites surveyed varied each year (66, 14, 20, 66 respectively) (collectively analysed in Bailey, Coad & Bamber 2005). The other is based on acoustic techniques (AGDS, Sidescan Sonar) which were ground-truthed by grab and video (Foster-Smith & Sotheran, 1999).</p> <p>Difficulties arise in comparing the two sets of survey reports as the 1997 UK marine biotope classification used by Foster-Smith & Sotheran was replaced in 2004 and the updated version was used by Bailey, Coad & Bamber. The authors have also reported difficulties in assigning Wash samples to the national classification so have developed their own 'Wash biotopes'. Differences may also arise due to the different survey techniques used – although this may be minimised because Foster-Smith & Sotheran produced separate infaunal and epifaunal biotope maps (ie based on separate analysis of video and grab ground-truth data).</p> <p>Appendix 5 lists subtidal biotopes in The Wash using the national biotope classification but highlighted local distinctiveness where relevant based on the two reports. Foster-Smith & Sotheran, 1999 is probably the best baseline for the whole site as the survey covered the whole site whereas The Wash grid surveys only covered The Wash.</p>	Yes
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			<p>Points of note:</p> <ul style="list-style-type: none"> - deep central area of Wash, very stable and diverse . It's extent and distribution has been mostly consistent over the 12 years of EA surveys (Bailey, Coad & Bamber, 2005). -Marked change from mixed sediment (muddy sands) to fine sediments (coarser, cleaner sands) in north-west and south-east Wash and corresponding change in biotope (see Bailey, Coad & Bamber, 2005) -Abundance of non-native <i>Ensis directus</i> in 2002 Wash surveys. 	
Extent of sub-feature	<p>No change in extent of inshore sublittoral sediment biotopes or sub-feature (gravel and sand communities, muddy sand communities) identified for the site allowing for natural succession / known cyclical change</p>	<p>Assessment of the extent of biotopes identified for the site because of their nature conservation importance.</p> <p>For details of assessment techniques see Davies et al, 2001.</p>	<p>Where there is a clearly established natural variation in extent or in cyclical succession between biotopes, then the target value should accommodate this variability.</p> <p>Where there is a change in extent outside the expected variation or a change in the structure of the sub-feature leading to a loss of the site, then condition should be considered unfavourable.</p>	<p>Yes although not a mandatory CSM attribute</p>
<p>Species population measures:</p> <p>Presence or abundance of specified species</p>	<p>No increase in presence or abundance of negative indicator species (non-native American razor shell <i>Ensis directus</i>, Pacific oyster <i>Crassostrea gigas</i>, Slipper limpet <i>Crepidula fornicata</i>).</p>	<p>Assessment of the presence or abundance of positive/negative indicator species identified for the feature.</p> <p>For details of assessment techniques see Davies et al., 2001.</p> <p>CEFAS have undertaken regular surveys of <i>Ensis directus</i> since 1999, using Hamon or Day grabs (Palmer 2003).</p>	<p>Where there is a sizeable shift in the age/size class structure (i.e. loss of mature adults or recruitment failure) or if disturbance causes a species of nature conservation importance to be lost, or a significant reduction in abundance then condition would be considered unfavourable.</p> <p>Increased abundance of negative indicator species i.e. those indicative of stressed habitats or polychaete worms indicative of organic pollution, which would be detrimental to the feature as a whole, would also cause the condition of the feature to be considered unfavourable.</p> <p>CEFAS hamon grab surveys have estimated adult populations of 200 per square metre in 1999 (Palmer, 2003). Distribution seems concentrated in south and east side of Wash ie Nene to Thornham although can occur in other areas (eg off Long Sand, Roger, Scullridge) Current population is estimated as exceeding 10,000 tonnes (Addison et al, 2006). Large settlements can occur but populations seem extremely sporadic and frequently fail</p>	<p>Yes not a mandatory CSM attribute but non-natives present in site which can have a serious negative impact on native communities</p>

		altogether. There are concerns about inter-specific competition with other filter feeders including mussel and cockle.
Audit Trail		
Rationale for limiting standards to specified parts of the site		
Rationale for site-specific targets (including any variations from generic guidance)		
Rationale for selection of measures of condition (features and attributes for use in condition assessment) (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).		
Other Notes		
References		
Addison, Palmer, Lart, Misson & Swarbrick, 2006. Development of a suitable dredge for exploitation of razorfish (<i>Ensis directus</i>) in The Wash. CEFAS & Seafish Report.		
Davies et al. 2001. Marine Monitoring Handbook. JNCC.		
Bailey, Coad & Bamber, 2005. Wash Sublittoral Grab Survey Report 1991, 1993, 1999 and 2002. Draft Ecomaris Report to English Nature.		
Foster-Smith & Sotheran, 1999. Broadscale remote survey and mapping of sublittoral habitats and biota of The Wash and the Lincolnshire and the north Norfolk coasts. English Nature Research Reports, Number 336.		
JNCC, 2004. Common Standards Monitoring Guidance for inshore sublittoral sediment habitats. JNCC Feb 2004.		
Palmer, 2003. The introduced razor fish <i>Ensis directus</i> in The Wash and north Norfolk. Shellfish News, No 16 Nov 2003.		

Table 3f Site-Specific definitions of Favourable Condition – *Sabellaria spinulosa* (ross worm) Reef

Conservation Objective for this habitat type	To maintain the <i>Sabellaria spinulosa</i> reef habitats at this site in favourable condition, with particular reference to relevant specific designated interest features. Favourable condition is defined at this site in terms of the following site-specific standards:
Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)	

Site-specific standards defining favourable condition

Attribute	Target	Method of assessment	Comments	Use for CA?
<p>Distribution of reef biotope. Spatial arrangement of biotopes at specified locations</p>	<p>Assess the geographic distribution of specified biotopes identified for the site. Assess the zonation pattern or the juxtaposition of specified biotopes.</p> <p>Baseline distribution as set out in Jessop & Stoutt, 2006.</p>	<p>Maintain the distribution and/or spatial arrangement of biotopes, allowing for natural succession/known cyclical change</p>	<p>Most reef is concentrated in the Lynn Deepes, The Well area. However, reef also occurs in the Boston Deepes, Boston Lower Road, East of Roger Sand and intertidally (at LWM) at Inner West Mark Knock.</p> <p>See guidance on defining reef, and comments on baseline and considerations in selecting survey techniques in extent attribute section above.</p> <p>As noted above the target may need to be increased in future as understanding of reef distribution in relation to potentially damaging activities such as brown shrimp trawling increases.</p> <p>Where changes in distribution/spatial pattern are known to be clearly attributable to cyclical succession or an expected shift in distribution then the target value should accommodate this variability. Where there is a change in biotope distribution/spatial pattern outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.</p>	<p>Yes</p>
<p>Biotope composition of reef</p>	<p>Repeated assessment of overall biotope composition or a subset of specified biotopes identified for the site.</p> <p>Wash reef biotope identified in Foster-Smith & Sotheran, 1999. They identified two <i>Sabellaria</i> biotopes (based on 97.06 classification): CMX.SpiMx.reef - <i>Sabellaria</i> (super-abundant, including</p>	<p>Maintain the variety of biotopes identified for the site, allowing for natural succession or known cyclical change.</p>	<p>Where changes in biotope composition are known to be attributable to natural processes (e.g. winter storm/flood events, changes in supporting processes or mass recruitment or dieback of characterising species) then the target value should accommodate this variability. Where there is a change in biotope composition outside the expected variation or a loss of the conservation interest of the site, then condition should be considered unfavourable.</p>	<p>Yes</p>

	reefs) and CMX.SpiMx - Sabellaria / Lanice (see pps 58-59).			
Topography	No alteration in topography of the inshore sub littoral sediment, allowing for natural responses to hydrodynamic regime.	Assessment of the depth distribution/profile of the inshore sub littoral sediment and periodic comparison with baseline conditions. For details of assessment techniques see Davies <i>et al.</i> , 2001.	<i>S. spinulosa</i> often favours slope areas. Where changes in topography are known to be clearly attributable to natural processes then the target value should accommodate this variability. Where extreme events cause a change in topography, then this may have caused a change in the structure of the feature, which may lead to the condition of the feature being considered as unfavourable.	Yes: not a CSM attribute for this feature but reef known to favour slopes
Sediment character: sediment type	No change in composition of sediment types across the feature, allowing for natural succession/ known cyclical change.	Distribution of sediment types should be assessed across the whole feature and compared with baseline conditions. For details of assessment techniques see Davies <i>et al.</i> , 2001	<i>S. spinulosa</i> typically associated with edges of sandbanks or areas where there are sand waves. Where changes in sediment type are known to be clearly attributable to natural processes then the target value should accommodate this variability. Where extreme events cause a change in sediment type, then this may have caused a change in the structure of the feature, which may lead to the condition of the feature being considered as unfavourable.	Yes: not a CSM attribute for this feature but reef known to favour particular substrates
Audit Trail				
Rationale for limiting standards to specified parts of the site				
Rationale for site-specific targets (including any variations from generic guidance)				
Rationale for selection of measures of condition (features and attributes for use in condition assessment)				
(The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).				

Other Notes

References:

- Davies et al, 2001. Marine Monitoring Handbook. JNCC
- Foster-Smith & Sotheran (1999). Broad scale remote survey and mapping of sublittoral habitats and biota of The Wash and the Lincolnshire and the North Norfolk Coasts. English Nature Research report 336.
- Foster-Smith & Whyte (2001). *Sabellaria spinulosa* reef in The Wash and North Norfolk cSAC and its approaches: Part I Mapping techniques and ecological assessment. English Nature Research Report 545.
- Foster-Smith (2001) *Sabellaria spinulosa* reef in The Wash and North Norfolk cSAC and its approaches: Part II Fine scale mapping of the spatial and temporal distribution of reefs and the development of techniques for monitoring condition. English Nature Research Report 544.
- Foster-Smith & Hendrick (2003). *Sabellaria spinulosa* reef in The Wash and North Norfolk cSAC and its approaches: Part III Summary of Knowledge, recommended monitoring strategies and outstanding research requirements. English Nature Research Report 543.
- Gubbay S (2007). Defining and managing *Sabellaria spinulosa* reefs: Report of an inter-agency workshop 1-2 May, 2007. JNCC Report 405
- Hendrick & Foster-Smith (2006). *Sabellaria spinulosa*: a scoring system for evaluating 'reefiness' in the context of the Habitats Directive. J Mar. Biol. Ass. UK 86: 66-677
- Holt et al (1997). Sensitivity and vulnerability to man-induced change of selected communities: intertidal brown algal shrubs, *Zostera* beds and *Sabellaria spinulosa* reefs.
- Jessop & Stoutt (2006). Broad scale *Sabellaria spinulosa* distribution in the central Wash (Southern North Sea), as predicted with the Acoustic Ground Discriminating System (AGDS) Roxam™. Draft report by ESFJC for English Nature.
- Pearce et al (2007). Recoverability of *Sabellaria spinulosa* following aggregate extraction. Marine Ecological Surveys Ltd report for Natural England, the Crown Estate, Marine Ecological Surveys Ltd & Resource Management Assoc.

Table 3g Site-Specific definitions of Favourable Condition – Otter

Conservation Objective for species	To maintain the designated species in favourable condition, which is defined in part in relation to their population attributes. Favourable condition is defined at this site in terms of the following site-specific standards:
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Site-specific details of any geographical variation or limitations (where the favourable condition standards apply)

Site-specific standards defining favourable condition

Attribute	Target	Method of assessment	Comments	Use for CA?
Food availability	Fish biomass stays within expected natural fluctuations.	Environment Agency, local fishery trusts data.	Accurate information on fish stocks is difficult to obtain according to a recent review of data from England, produced by the Environment Agency (Research and Development Technical Report TR W256, Otters- Fish Prey Availability, Biomass and Sustainability) and may be extremely difficult to interpret. However, there is an obligation to monitor fish communities under the Water Framework Directive and a more comprehensive monitoring system is being instigated by the Environment Protection Agencies.	Yes
Habitat requirements coastal areas: Freshwater for rinsing sea salt from the fur	No reduction in overall availability of freshwater.	Number of streams or small pools on or near the site	Freshwater may be outside the site boundary. Due to the distance otters can range, this attribute can only be indicative for a site. Can be assessed on site and using map information.	Yes
Toxic chemicals	No increase in pollutants potentially toxic to otters.	Monitoring by relevant Environment Agency. Specialist group to meet at intervals to identify national trends and extract information on individual SACs.	Liaison between Country Agency Staff and EA essential.	Yes
Otter population - coastal	No decline in otter distribution or abundance. Interpretation of broadscale maps from 2000-02 national survey report suggests new positives found on river systems close to site on River Steeping and Babingley. There were no on-going positives and many negatives. NOTE: most recent	National surveys undertaken at approx 7 year intervals (surveys undertaken in 1977-79, 1984-86, 1991-94, 2000-2002). Survey sites selected at 5-8km intervals along main rivers / coasts / lake shore. Survey carried out in alternate 50-km squares. At each site 600m survey undertaken along one bank by searching for otter signs	The baseline data suggests otter are relatively few and far between in The Wash, with no on-going positive sites and most sites negative for otter presence, which contrasts with adjacent areas such as the Louth Coastal and Cam LEAP (Local Environment Agency Plan) areas. It is worth noting however, that there have been sightings in or close to the site, including in the most recent survey, which indicate otter can use habitat within the site. So the site may become more	Yes

	<p>survey only covered the coast from Nene to Blakeney and a short section near F riskney (due to survey methodology of only surveying alternate 50 km - squares).</p> <p>Interrogation of full survey data set held on National Biodiversity Network reveals otter present in Wash at Snettisham coastal marshes (1978) and close to site R. Babingley (Sluice Gates nr Vinegar Middle, 2000; Hillington, Castle Rising, Wootton – all 1978), R. Ingol (Sluice Gate, 1978), R. Steeping (Wainfleet all Saints, Firsby Clough - both 2001).</p>	<p>usually 300m upstream and downstream of a bridge or other access point. Survey halted at first positive sign of an otter.</p> <p>Survey noted whether location is positive (and whether this is a new positive or on-going positive) or negative for otter.</p>	<p>important as otter extend their range into suitable habitats as their population recovery continues.</p>	
Anthropogenic mortality	<p>Otter populations not significantly impacted by human induced kills.</p>	<p>Road and rail casualties. -Deaths due to fishing gear etc. -Any site where there is a feature causing otter mortality. -Data from EA's reporting system.. Obtain views from EA on implications of recent data. -JNCC otter data on the CITES database.</p>	<p>Monitoring this attribute, where appropriate should provide data for installing mitigation.</p> <p>This attribute is not mandatory and should be assessed at a local level for individual sites where anthropogenic mortality appears to be a problem.</p>	Disc
Audit Trail				
Rationale for limiting standards to specified parts of the site				
Rationale for site-specific targets (including any variations from generic guidance)				
Rationale for selection of measures of condition (features and attributes for use in condition assessment) (The selected vegetation attributes are those considered to most economically define favourable condition at this site for the broad habitat type and any dependent designated species).				

Other Notes

Reference:

Common Standards Monitoring Guidance for Terrestrial Mammals. JNCC, August 2004