European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features

Braunton Burrows Special Area of Conservation (SAC)
Site code: UK0012570

View of Braunton Burrows SAC from Saunton Down; © Rob Large, 2018

Date of Publication: 6 February 2019

About this document

This document provides Natural England's supplementary advice about the European Site Conservation Objectives relating to Braunton Burrows SAC. This advice should therefore be read together with the SAC Conservation Objectives which are available here.

You should use the Conservation Objectives, this Supplementary Advice and any case-specific advice given by Natural England, when developing, proposing or assessing an activity, plan or project that may affect this site.

This Supplementary Advice to the Conservation Objectives presents attributes which are ecological characteristics of the designated species and habitats within a site. The listed attributes are considered to be those that best describe the site's ecological integrity and which, if safeguarded, will enable achievement of the Conservation Objectives. Each attribute has a target which is either quantified or qualitative depending on the available evidence. The target identifies as far as possible the desired state to be achieved for the attribute.

The tables provided below bring together the findings of the best available scientific evidence relating to the site's qualifying features, which may be updated or supplemented in further publications from Natural England and other sources. The local evidence used in preparing this supplementary advice has been cited. The references to the national evidence used are available on request. Where evidence and references have not been indicated, Natural England has applied ecological knowledge and expert judgement. You may decide to use other additional sources of information.

In many cases, the attribute targets shown in the tables indicate whether the current objective is to 'maintain' or 'restore' the attribute. This is based on the best available information, including that gathered during monitoring of the feature's current condition. As new information on feature condition becomes available, this will be added so that the advice remains up to date.

The targets given for each attribute do not represent thresholds to assess the significance of any given impact in Habitats Regulations Assessments. You will need to assess this on a case-by-case basis using the most current information available.

Some, but not all, of these attributes can also be used for regular monitoring of the actual condition of the designated features. The attributes selected for monitoring the features, and the standards used to assess their condition, are listed in separate monitoring documents, which will be available from Natural England.

These tables do not give advice about SSSI features or other legally protected species which may also be present within the European Site.

If you have any comments or queries about this Supplementary Advice document please contact your local Natural England adviser or email HDIRConservationObjectivesNE@naturalengland.org.uk

About this site

European Site information

Name of European Site	Braunton Burrows Special Area of Conservation (SAC)
Location	Devon
Site Map	The designated boundary of this site can be viewed here on the MAGIC website
Designation Date	1st April 2005
Qualifying Features	H1140 Mudflats and sandflats not covered by seawater at low tide H2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes). (Shifting dunes with marram) H2130 Fixed dunes with herbaceous vegetation (grey dunes). (Dune grassland)* H2170 Dunes with *Salix repens ssp. argentea* (Salicion arenariae). (Dunes with creeping willow) H2190 Humid dune slacks S1395 Petalwort *Petalophyllum ralfsii*
Designation Area	1346.64 ha
Designation Changes	n/a
Feature Condition Status	Details of the feature condition assessments made at this site can be found using Natural England's Designated Sites System
Names of component Sites of Special Scientific Interest (SSSIs)	Braunton Burrows; Taw Torridge Estuary
Relationship with other European or International Site designations	North Devon UNESCO Biosphere Reserve

Site background and geography

Braunton Burrows SAC lies within the Exmoor National Character Area (NCA), an area of predominantly upland plateau of Devonian sandstones and slates terminating in the north at the Bristol Channel with a spectacular cliff coastline. The Devonian geological time period was first described and recorded in association with this area. Braunton Burrows is situated on the North Devon coastline in close proximity to Barnstaple on the Taw Torridge Estuary and also lies at the heart of the UNESCO North Devon Biosphere Reserve.

Braunton Burrows SAC is one of the largest dune systems in Britain, about 5km long north-south and 1km wide, with lime-rich dunes up to 30 m high, and an extensive system of variably-flooded slacks, grassland and scrub, inland of a wide sandy foreshore. This provides a rich variety of dune habitat for many flowering and lower plants, and for many birds and invertebrates. Several species are nationally rare or vulnerable. There are also important features of geological interest. Braunton Burrows is a key site for coastal geomorphology. It is one of the three largest sand dune systems on the west coast of Britain and the one least affected by underlying geology and afforestation. It is also important for its diversity of form and has the greatest height range of any west coast dune system.

About the qualifying features of the SAC

The following section gives you additional, site-specific information about this SAC's qualifying features. These are the natural habitats and/or species for which this SAC has been designated.

Qualifying habitats:

H1140 Mudflats and sandflats not covered by seawater at low tide

Intertidal mudflats and sandflats are submerged at high tide and exposed at low tide. They form a major component of 1130 Estuaries and 1160 Large shallow inlets and bays in the UK but also occur extensively along the open coast and in lagoonal inlets.

The physical structure of the intertidal flats ranges from mobile, coarse-sand beaches on wave-exposed coasts to stable, fine-sediment mudflats in estuaries and other marine inlets. This habitat type can be sub-divided into two broad categories (or sub-features) (clean and muddy sands; intertidal muds), although in practice there is a continuous and natural gradation between them. Within this range the plant and animal communities present vary according to the type of sediment, its stability and the salinity of the water.

H2120 Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")

This SAC contains a substantial area of mobile dune vegetation, including representative examples of most of the main variants found in the south-west of the UK. There are good numbers of characteristic specialist plants typical of this region, such as Portland spurge *Euphorbia portlandica*, sea spurge *Euphorbia paralias* and sea-holly *Eryngium maritimum*. Transitions to dune slack and fixed dune are a prominent feature of this site.

Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") encompasses most of the vegetation of unstable dunes where there is active sand movement. Under these conditions sand-binding marram *Ammophila arenaria* is always a prominent feature of the vegetation and is usually dominant. In the UK the majority of such vegetation falls within NVC type SD6 *Ammophila arenaria* mobile dune community. This is a dynamic vegetation type maintained only by change. It can occur on both accreting and eroding dunes, but will rapidly change and disappear if stability is imposed. It rarely occurs in isolation because of its dynamic nature and because it is successionally related to other dune habitats.

The species composition of shifting dunes is constrained by the harsh conditions, but the vegetation is by no means uniform. The most marked floristic variation relates to the degree of instability. Where sand accretion is extremely rapid it is possible to find vegetation that consists only of *A. arenaria*. As rates of sand deposition decline the marram is joined by more species, first by other specialised dune plants, then by less specialised grasses, drought-tolerant annuals and a restricted number of specialised bryophytes.

H2130 Fixed coastal dunes with herbaceous vegetation ("grey dunes") * Priority feature

This SAC is one of the largest dune sites in the UK and is of particular importance because it is virtually intact and still active. There are very extensive areas of species-rich calcareous dune grassland with good examples of a variety of important communities. The short turf areas are extremely rich in herbs and lichens, including a number of nationally rare species. Flowering herbs such as large thyme *Thymus pulegioides*, common restharrow *Ononis repens* and common bird's-foot-trefoil *Lotus corniculatus* are locally dominant.

Fixed dune vegetation occurs mainly on the largest dune systems, being those that have the width to allow it to develop. It typically occurs inland of the zone dominated by marram *Ammophila arenaria* on coastal dunes, and represents the vegetation that replaces marram as the dune stabilises and the

organic content of the sand increases. In the UK the vegetation corresponds to the following NVC types:

SD7 *Ammophila arenaria – Festuca rubra* semi-fixed dune community

SD8 *Festuca rubra – Galium verum* fixed dune grassland

SD9b *Ammophila arenaria – Arrhenatherum elatius* dune grassland, *Geranium sanguineum* sub-community

SD11 *Carex arenaria – Cornicularia aculeata* dune community

SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland.

The herbaceous vegetation of fixed dunes in the UK exhibits considerable variation. The most widespread type is Atlantic dune grassland, consisting of a short sward characterised by red fescue *Festuca rubra* and lady's bedstraw *Galium verum* and typically rich in species of calcareous substrates. In south-west England and in Wales wild thyme *Thymus polytrichus* often dominates this type of vegetation.

At Braunton Burrows there are very extensive areas of species-rich calcareous dune grassland with good examples of a variety of important communities. The short turf areas are extremely rich in herbs and lichens, including a number of nationally rare species. Flowering herbs such as large thyme *Thymus pulegioides*, common restharrow *Ononis repens* and common bird's-foot-trefoil *Lotus corniculatus* are locally dominant.

H2170 Dunes with *Salix repens ssp. argentea* (Salicion arenariae)

This habitat type comprises dunes or parts of dunes where creeping willow *Salix repens* ssp. *argentea* is dominant, forming prominent, low scrubby growth. Creeping willow is found on dunes throughout the UK. It grows predominantly in and around dune slacks, though on some sites it may spread up the drier ridges.

This type of vegetation marks the mature phase in the life cycle of calcareous dune slacks. When found with other wetland and dry dune vegetation it indicates that successional processes are still active and that the structure and function of the dune system are well-conserved.

This SAC is one of the largest virtually intact dune sites in the UK and is representative of dunes with *Salix repens* ssp. *argentea* in south-west England. The habitat is scattered across the site and form part of a complex mosaic of vegetation containing creeping willow, including early and mature successional stages of dune slack vegetation. There are transitional stages between this type and more mature scrub vegetation. On most of the highest-quality sites this habitat type occurs alongside a number of others, particularly H2190 Humid dune slacks, calcareous and acidic fixed dune vegetation and, locally, dune heath.

Salix repens ssp. *argentea* is often found in dune slack vegetation, and the boundaries between Dunes with *Salix repens* ssp. *argentea* and H2190 humid dune slacks are often diffuse and difficult to define on the ground. The examples which have been selected to represent the former habitat type in the UK sites series are those where creeping willow is dominant and forming prominent, low, scrubby growth, Much of this habitat corresponds to NVC type SD16 *Salix repens – Holcus lanatus* dune slack community, although not all examples of SD16 are referable to this Annex I type. This type of vegetation tends to occur in and around mature slacks where there has been little or no sand movement for some time and where grazing is light. Creeping willow tends to grow most vigorously at the drier end of the spectrum of slack vegetation types and it is also mainly associated with calcareous dune sites.

H2190 Humid dune slacks

Humid dune slacks are low-lying areas within dune systems that are seasonally flooded and where nutrient levels are low. The range of communities found is considerable and depends on the structure of the dune system, the successional stage of the dune slack, the chemical composition of the dune sand, and the prevailing climatic conditions.

Dune slacks are often rich in plant species, particularly rare and local species. Several species, such as the Annex II species 1395 Petalwort *Petalophyllum ralfsii*, 1903 Fen orchid *Liparis loeselii*, and the round-leaved wintergreen *Pyrola rotundifolia*, are found mainly in this habitat type.

In the UK the predominant NVC types include:

SD13 *Sagina nodosa – Bryum pseudotriquetrum* dune-slack community,

SD14 *Salix repens – Campylium stellatum* dune-slack community,

SD15 *Salix repens – Calliergon cuspidatum* dune-slack community,

SD16 *Salix repens – Holcus lanatus* dune-slack community,

SD17 *Potentilla anserina – Carex nigra* dune-slack community

This SAC is one of the largest virtually intact dune sites in the UK, with an exceptionally large area of Humid dune slack vegetation, representing a significant proportion of the national resource. The slacks have formed in base-rich sand and are rich in species such as marsh pennywort *Hydrocotyle vulgaris*, marsh helleborine *Epipactis palustris* and round-leaved wintergreen *Pyrola rotundifolia*. Vegetation types range from those with almost permanent water to those dominated by scrub. The site contains representative examples of most of the communities of base-rich humid slacks in south-west England, namely those characterised by creeping willow *Salix repens* ssp. *argentea*, those with bryophytes or those with Yorkshire-fog *Holcus lanatus*.

Qualifying species:

S1395 Petalwort *Petalophyllum ralfsii*

Petalwort *Petalophyllum ralfsii* is a small pale green thalloid liverwort with erect lamellae on its upper surface which mainly grows in damp, calcareous dune-slack systems. At some sites, it appears to be increasing as a result of trampling and soil compaction. At one site, the area where *P. ralfsii* grows is used by vehicles and it can be found on the sides of paths. It does not grow in water-filled slacks or in slacks where willow *Salix* spp. scrub predominates.

A large population (around 22,000 thalli) of petalwort *Petalophyllum ralfsii* is recorded from Braunton Burrows, one of two SAC sites selected for this species in south-west England. There are extensive open dune slack habitats of the types required by this species for survival.

Petalwort is also specially protected under Schedule 8 of the Wildlife and Countryside Act 1981 (as amended). It is currently found at about 26 sites across the UK.

Table 1: Supplementary Advice for Qualifying Features: H1140 Mudflats and sandflats not covered by seawater at low tide

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution	**Extent of the feature**	Maintain the total extent of mudflats and sandflats at a mean of 303 hectares.	The extent describes the presence and area of the habitat. It's the total area of the habitat across the site as a whole, even where it's patchy. The distribution describes the more detailed location(s) and pattern of habitat across the site. The distribution will influence the component communities present, and also help increase the health and resilience of the feature (Joint Nature Conservation Committee (JNCC), 2004). A reduction in extent would alter the biological and physical functioning of the feature (Elliott et al., 1998). It's difficult to put an extent objective on a mobile, changing feature. An understanding of the supporting processes will be more helpful in determining site integrity. However, the extent can also be defined where the proportion of sediment-sensitive invertebrates (PSI) indicates a change to the sediment character. If there is insufficient evidence, the existing extent occurring at any one time should be the focus of an assessment due to the natural variation, and a fresh survey is likely to be required at the point of assessment, to ascertain what the existing extent is. Extent figure is derived from the SSSI Conservation Objectives. The true extent will fluctuate seasonally and following (e.g.) storm events. Total extent within the SAC, of the zone between MHW and MLW is approximately350 Hectares, but this will include a variable amount of deep water	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Inshore Sublittoral Sediment Habitats. Version August 2004 Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_sublittoral_sediment.pdf ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				(draft). Available from Natural England. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Distribution	**Presence and spatial distribution of biological communities**	Restore the presence and spatial distribution of mudflat and sandflat communities.	A variety of communities make up the habitat. Listed component communities reflect the habitat's overall character and conservation interest. Communities are described as biotopes using EUNIS or the Marine Habitat Classification. Communities include, but are not limited to, those that are notable or representative of the feature. Representative communities include, for example, those covering large areas and notable communities include those that are rare, scarce or particularly sensitive to pressure. Changes to the spatial distribution of communities across the feature could highlight changes to the overall feature (Joint Nature Conservation Committee (JNCC), 2004). Distribution of biological communities may be subject to change as sediment is redistributed seasonally and following storm events. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the distribution of biological communities.	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. HALCROW, 2010, North Devon and Somerset Coastal Advisory Group ('NDASCAG') Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP available here.
Structure	**Non-native species and pathogens**	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Non-native species may become invasive and displace native organisms by preying on them or out-competing them for resources such as food, space or both. In some cases this has led to the loss of indigenous species from certain areas (Joint Nature Conservation Committee (JNCC), 2004). A pathogen causes disease or illness to its host. Pathogens include bacteria, viruses, protozoa and fungi (Biology-Online, 2008).	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Marine Advice: Non-Native Species [Online]. JNCC. [Accessed 10/03/2015]. http://jncc.defra.gov.uk/default.aspx?page=1532 Biology-Online. 2008. Dictionary:

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Pathogen [Online]. [Accessed 27/04/2015]. http://www.biology-online.org/dictionary/Pathogens
Structure	**Sediment composition and distribution**	Restore the distribution of sediment composition across the feature.	Sediment character is important in determining the biological communities present. Intertidal sediments (ranging from highly stable mudflats and saltmarshes, to highly mobile shingle and sand beaches) are subject to a range of deposition and erosion processes, which human activity can influence. Most intertidal sediments stabilise over time so maintaining the sediment composition supports natural succession of the habitats and communities. Where they are subject to constant (net) erosion, the natural processes will be adversely affected (Gray and Elliott, 2009). Distribution of sediment composition may be subject to change seasonally and following storm events. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the distribution of sediment composition.	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. HALCROW, 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Structure	**Sediment total organic carbon content**	Maintain total organic carbon (TOC) content in the sediment at existing levels.	Total Organic Carbon (TOC) content can be used for measuring change in the organic input to the mudflat / sandflat. TOC content of the sediment can influence community structure and contaminant levels (Viaroli et al., 2004). There does not appear to be sufficient data about TOC to make a judgement about this attribute.	VIAROLI, P., BARTOLI, M., GIORDANI, G., MAGNI, P. AND WELSH, D. T. 2004. Biogeochemical indicators as tools for assessing sediment quality/vulnerability in transitional aquatic ecosystems. Aquatic Conservation: Marine and Freshwater Ecosystems, 14, S19-S2. http://dx.doi.org/10.1002/aqc.647
Structure	**Species composition of component communities**	Maintain the species composition of component communities.	Species composition of communities includes a consideration of both the overall range of species present within the community, as well as their relative abundance. Species considered need not be restricted to sessile benthic species but could include mobile species associated with the benthos. Species composition could be altered by human activities without changing the overall community type. Within each	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Rock and Inshore Sublittoral Rock Habitats.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			component community, species composition and population structure should be taken into consideration to avoid diminishing biodiversity and affecting ecosystem functioning within the habitat (Joint Nature Conservation Committee (JNCC), 2004). The sediment community composition will change when the habitat is subjected to pollutants and other forms of disturbance (Joint Nature Conservation Committee (JNCC), 2004), but will also be subject to significant natural variation annually. Benthic invertebrate communities are a good indicator of the health of the feature, if assessed over time.	Version August 2004. Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_rock.pdf JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf
Structure	**Topography**	Restore the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity. .	Topography is considered an essential structural component for this feature. Alterations in topography can cause changes in the slope angle of the foreshore or result in increases or decreases in surface elevation. Topographic changes can alter the way the sediment drains and holds water, and can also alter the tidal exposure, meaning areas can be covered by the tide for longer or shorter periods. This can influence the animal and plant communities supported (Gray and Elliott, 2009) and reduce the areas available to coastal birds for feeding. Such changes could occur through direct interaction, such as sand extraction, or indirect impacts, such as changes in wave height or tidal flow regime, which cause erosion or deposition (Elliott et al., 1998). Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the sediment topography More work may be needed to develop a baseline from e.g. LIDAR derived DTM data.	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Summary of Draft Final SMP, Available here. ENVIRONMENT AGENCY, 2015. CASI & LIDAR Habitat Map unpublished
Structure and function	**Presence and abundance of key structural and influential species**	Maintain the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Natural England has included an attribute for the abundance of key structural and influential species for habitat features. **Structural species** are those that form part of the habitat structure or help to define a key biotope. **Influential species** are those that are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat). These will be identified at a national level in accordance with the working criteria defined by Natural England. *For each species listed the reason for its inclusion as structural or influential and the information supporting its presence within the community of this site will be provided. Further work is needed to determine the appropriate species locally.	
Supporting processes	**Energy / exposure**	Restore the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes and stability, across the habitat.	The amount of energy received across the site significantly affects the communities present. Physical energy can be received through wave energy and / or tidal flow, and can be altered through human activity. Any such alterations to energy should be avoided (Hiscock et al., 2006). Ambient energy levels related to wave and tidal action influence the amount of physical disturbance experienced by seabed sediments. Physically stable or immobile sediments often support different animal and plant communities when compared with mobile or disturbed sediments (Gray and Elliott, 2009). Therefore, understanding the site's baseline conditions is very importance. However, due to the complexity of measuring the energy and disturbance levels of an area, it's unlikely that a quantifiable objective could be determined.	HISCOCK, K., MARSHALL, C., SEWELL, J. AND HAWKINS, S. J. 2006. The structure and functioning of marine ecosystems: an environmental protection and management perspective: English Nature. http://www.marlin.ac.uk/assets/pdf/ENRR699.pdf GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition,

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence exposure	Oxford Biology. HALCROW, 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP. Available here.
Supporting processes	**Physico-chemical properties**	Maintain the natural physico-chemical properties of the water.	The physico-chemical properties that influence habitats include salinity, pH and temperature. They can act alone or in combination to affect habitats and their communities in different ways, depending on species-specific tolerances. In coastal habitats they can vary widely and can influence the abundance, distribution and composition of communities at relatively local scales. Changes in any of these properties, as a result of human activities, may impact habitats and the communities they support (Elliott et al., 1998), (Gray and Elliott, 2009), (Little, 2000). Available information does not suggest that there are any human activities which are directly affecting salinity, pH or temperature.	ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. LITTLE, C. 2000. The biology of soft shores and estuaries, Oxford University Press. ENVIRONMENT AGENCY Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Sediment contaminants**	Restrict surface sediment contaminants (<1cm from the surface) to below the OSPAR Environment Assessment Criteria (EAC) or Effects Range Low (ERL)	Various different contaminants are known to affect the species that live in or on the surface of sediments. These include heavy metals (Mercury (Hg), Arsenic (As), Zinc (Zn), Nickel (Ni), Chlorine (Ch), Cadmium (Cd), etc), poly-aromatic hydrocarbons (PAHs), poly-chlorinated biphenyls (PCBs), organotins (TBT) and pesticides such as hexachlorobenzene. These can impact species sensitive to particular contaminants, degrading the community structure (eg heavy metals) and bioaccumulating within organisms, entering the marine food chain (eg PCBs) (OSPAR Commission, 2012). Target set to Restrict as EA (2016) Data for Barnstaple Bay and Taw-Torridge Estuary listed as High status (for Arsenic (As), Copper (Cu), Iron (Fe) & Zinc (Zn). High status is defined as 'near natural conditions. No restrictions on the beneficial use of the waterbody. No impacts on amenity, wildlife or fisheries'.	OSPAR COMMISSION. 2012. Co-ordinated Environmental Monitoring Programme (CEMP) 2011 Assessment Report.: OSPAR. http://www.ospar.org/documents/dbase/publications/p00563/p00563_cemp_2011_assessment_report.pdf ENVIRONMENT AGENCY Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Sediment movement and hydrodynamic regime**	Maintain sediment transport pathways to and from the feature to ensure replenishment of the feature, and / or replenishment of habitats that rely on the sediment supply from the feature.	Sedimentary habitats are often influenced by tide and wave-driven water flow that drives the movement of sediment on and in areas surrounding the feature. These flow regimes can control both the shape and size of the feature, in addition to its sedimentary characteristics and biological composition. It's important that these hydrodynamic and sedimentary processes persist and are allowed to change in response to environmental conditions without hindrance. Hydrodynamic conditions include the speed and direction of wave and tidal currents, seabed shear stress and wave exposure (Little, 2000), (Elliott et al., 1998). No information available on impediments to sediment transport	LITTLE, C. 2000. The biology of soft shores and estuaries, Oxford University Press. ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				management of marine SACs. Oban, Scotland: English Nature.
Supporting processes	**Water quality - contaminants**	Restrict aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	Contaminants may impact the ecology of the Marine Protected Area by having a range of biological effects on different species within the habitat, depending on the nature of the contaminant (Joint Nature Conservation Committee (JNCC), 2004, (UK Technical Advisory Group on the Water Framework Directive (UKTAG), 2008), (Environment Agency, 2014). Target set to Restrict as EA (2016) data for Barnstaple Bay and Taw-Torridge Estuary listed as High status for chemical pollutants	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Rock and Inshore Sublittoral Rock Habitats. Version August 2004.: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_rock.pdf UK TECHNICAL ADVISORY GROUP ON THE WATER FRAMEWORK DIRECTIVE (UKTAG). 2008. Proposals for Environmental Quality Standards for Annex VIII Substances. : UK Technical Advisory Group on the Water Framework Directive. http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Specific%20pollutants%20proposals_Final_010608.pdf ENVIRONMENT AGENCY. 2014. WFD - Surface Water Classification Status and Objectives [Online]. Environment Agency. [Accessed 20/03/15]. http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcDataDownload.xml

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				ENVIRONMENT AGENCY Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - dissolved oxygen**	Maintain the dissolved oxygen (DO) concentration at levels equating to High Ecological Status avoiding deterioration from existing levels.	Dissolved Oxygen (DO) levels affect the condition and health of features. Excessive nutrients and / or high turbidity can lead to a drop in DO, especially in warmer months. Low DO can have sub-lethal and lethal impacts on fish and infauna and epifauna communities (Best et al., 2007. However, there's a significant amount of natural variation that needs to be considered (Environment Agency Marine Monitoring Service, 2014. Target set to Restrict as EA (2016) data for Barnstaple Bay and Taw-Torridge Estuary listed as High status for dissolved oxygen	BEST, M. A., WITHER, A. W. AND COATES, S. 2007. Dissolved oxygen as a physico-chemical supporting element in the Water Framework Directive. Marine Pollution Bulletin, 55, 53-64. http://www.sciencedirect.com/science/article/pii/S0025326X06003171 ENVIRONMENT AGENCY MARINE MONITORING SERVICE. 2014. TraC Dissolved Oxygen tool-level classifications (at water body level, aggregated to MPA). Peterborough: Environment Agency. ENVIRONMENT AGENCY Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				planning/WaterBody/GB540805015500
Supporting processes	**Water quality - nutrients**	Recover water quality to mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macro-algal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.	High concentrations of nutrients in the water column can cause phytoplankton and opportunistic macro-algae blooms, leading to reduced dissolved oxygen availability. These seaweeds can smother the sediment, preventing aeration and causing anoxia (lack of oxygen). This can impact sensitive fish, epifauna and infauna communities. The aim is to seek no further deterioration or improve water quality (Devlin et al., 2007), (Best, 2014). Target set to recover as EA (2016) data for Taw-Torridge Estuary listed as Moderate for Phytoplankton and dissolved inorganic Nitrogen	DEVLIN, M., PAINTING, S. AND BEST, M. 2007. Setting nutrient thresholds to support an ecological assessment based on nutrient enrichment, potential primary production and undesirable disturbance. Marine Pollution Bulletin, 55, 65-73. http://www.sciencedirect.com/science/article/pii/S0025326X06003249 BEST, M. 2014. Practitioners guide to the Nutrient Assessment of coastal and transitional waters, Water Framework Directive (draft). Version 7.3. : Environment Agency. ENVIRONMENT AGENCY Catchment Data Explorer. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - turbidity**	Maintain natural levels of turbidity (eg concentrations of suspended sediment, plankton and other material) across the habitat.	Water turbidity is a result of material suspended in the water, including sediment, plankton, pollution or other matter washed into the sea from land sources. In coastal environments turbidity levels can rise and fall rapidly as a result of biological (eg plankton blooms), physical (eg storm events) or human (eg coastal development) factors. Prolonged changes in turbidity may influence the amount of light reaching the seabed, affecting the primary production and nutrient levels of the	ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			habitat's associated communities. Changes in turbidity may also have a range of biological effects on different species within the habitat, eg affecting their abilities to feed or breathe. A prolonged increase in turbidity is indicative of an increase in suspended particulates. This has a number of implications for the marine environment, such as affecting fish health, clogging the filtering organs of suspension feeding animals and affecting seabed sedimentation rates (Elliott et al., 1998).	dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature.
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 1a: Supplementary Advice for Qualifying Features: H1140 Mudflats and sandflats not covered by seawater at low tide (Sub-feature: A2.2 Intertidal sand and muddy sand)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution	**Extent of the sub-feature**	Maintain the total extent and spatial distribution of intertidal sand and muddy sand.	The extent describes the presence and area of the habitat. It's the total area of the habitat across the site as a whole, even where it's patchy. The distribution describes the more detailed location(s) and pattern of habitat across the site. The distribution will influence the component communities present, and also help increase the health and resilience of the feature (Joint Nature Conservation Committee (JNCC), 2004). A reduction in extent would alter the biological and physical functioning of the feature (Elliott et al., 1998). It's difficult to put an extent objective on a mobile, changing feature. An understanding of the supporting processes will be more helpful in determining site integrity. However, the extent can also be defined where the proportion of sediment-sensitive invertebrates (PSI) indicates a change to the sediment character. If there is insufficient evidence, the existing extent occurring at any one time should be the focus of an assessment due to the natural variation, and a fresh survey is likely to be required at the point of assessment, to ascertain what the existing extent is. The precise extent and distribution of the sub-feature is uncertain in the estuarine portion of the SAC, but is likely to occupy most of the area in Barnstaple Bay (with the remainder being deep water.	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Distribution	**Presence and spatial distribution of biological communities**	Restore the presence and spatial distribution of intertidal sand and muddy sand communities.	A variety of communities make up the habitat. Listed component communities reflect the habitat's overall character and conservation interest. Communities are described as biotopes using EUNIS or the Marine Habitat Classification. Communities include, but are not limited to, those that are notable or representative of the feature. Representative communities include, for example, those covering large areas and notable communities include those that are rare, scarce or particularly sensitive to pressure. Changes to the spatial distribution of communities across the feature could highlight changes to the overall feature (Joint Nature Conservation Committee (JNCC), 2004). Distribution of biological communities may be subject to change as sediment is redistributed seasonally and following storm events. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the distribution of biological communities.	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available **here**
Structure	**Non-native species and pathogens**	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Non-native species may become invasive and displace native organisms by preying on them or out-competing them for resources such as food, space or both. In some cases this has led to the loss of indigenous species from certain areas (Joint Nature Conservation Committee (JNCC), 2004). A pathogen causes disease or illness to its host. Pathogens include bacteria, viruses, protozoa and fungi (Biology-Online, 2008).	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Marine Advice: Non-Native Species [Online]. JNCC. [Accessed 10/03/2015]. http://jncc.defra.gov.uk/default.aspx?page=1532 BIOLOGY-ONLINE. 2008. Dictionary: Pathogen [Online]. [Accessed 27/04/2015]. http://www.biology-online.org/dictionary/Pathogens
Structure	**Sediment composition and**	Restore the distribution of sediment composition types across the sub-feature.	Sediment character is important in determining the biological communities present. Varied sediment type and grain size ensure structural complexity and connectivity. Intertidal	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	distribution		sediments (ranging from highly stable mudflats and saltmarshes, to highly mobile shingle and sand beaches) are subject to a range of deposition and erosion processes, which human activity can influence. Most intertidal sediments stabilise over time so maintaining the sediment composition supports natural succession of the habitats and communities. Where they are subject to constant (net) erosion, the natural processes will be adversely affected (Gray and Elliott, 2009). Distribution of sediment composition may be subject to change seasonally and following storm events. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the distribution of sediment composition.	Management, Second Edition, Oxford Biology. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Structure	**Sediment total organic carbon content**	Maintain total organic carbon (TOC) content in the sediment at existing levels.	Total Organic Carbon (TOC) content can be used for measuring change in the organic input to the mudflat / sandflat. TOC content of the sediment can influence community structure and contaminant levels (Viaroli et al., 2004). There does not appear to be sufficient data about TOC to make a judgement about this attribute	VIAROLI, P., BARTOLI, M., GIORDANI, G., MAGNI, P. AND WELSH, D. T. 2004. Biogeochemical indicators as tools for assessing sediment quality/vulnerability in transitional aquatic ecosystems. Aquatic Conservation: Marine and Freshwater Ecosystems, 14, S19-S2. http://dx.doi.org/10.1002/aqc.647
Structure	**Species composition of component communities**	Maintain the species composition of component communities.	Species composition of communities includes a consideration of both the overall range of species present within the community, as well as their relative abundance. Species considered need not be restricted to sessile benthic species but could include mobile species associated with the benthos. Species composition could be altered by human activities without changing the overall community type. Within each component community, species composition and population structure should be taken into consideration to avoid diminishing biodiversity and affecting ecosystem functioning within the habitat (Joint Nature Conservation Committee (JNCC), 2004).	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Rock and Inshore Sublittoral Rock Habitats. Version August 2004.: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_rock.pdf

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The sediment community composition will change when the habitat is subjected to pollutants and other forms of disturbance (Joint Nature Conservation Committee (JNCC), 2004), but will also be subject to significant natural variation annually. Benthic invertebrate communities are a good indicator of the health of the feature, if assessed over time.	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf
Structure	**Topography**	Restore the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity.	Topography is considered an essential structural component for this feature. Alterations in topography can cause changes in the slope angle of the foreshore or result in increases or decreases in surface elevation. Topographic changes can alter the way the sediment drains and holds water, and can also alter the tidal exposure, meaning areas can be covered by the tide for longer or shorter periods. This can influence the animal and plant communities supported (Gray and Elliott, 2009) and reduce the areas available to coastal birds for feeding. Such changes could occur through direct interaction, such as sand extraction, or indirect impacts, such as changes in wave height or tidal flow regime, which cause erosion or deposition (Elliott et al., 1998). Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the sediment topography More work may be needed to develop a baseline from e.g. LIDAR derived DTM data.	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here. ENVIRONMENT AGENCY, 2015. CASI & LIDAR Habitat Map unpublished

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function	**Presence and abundance of key structural and influential species**	Maintain the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Natural England has included an attribute for the abundance of key structural and influential species for habitat features. **Structural species** are those that form part of the habitat structure or help to define a key biotope. **Influential species** are those that are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat). These will be identified at a national level in accordance with the criteria defined by Natural England . *For each species listed the reason for its inclusion as structural or influential and the information supporting its presence within the community of this site will be provided. Further work is needed to determine the appropriate species locally.	
Supporting processes	**Energy / exposure**	Restore the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes and stability, across the habitat.	The amount of energy received across the site significantly affects the communities present. Physical energy can be received through wave energy and / or tidal flow, and can be altered through human activity. Any such alterations to energy should be avoided (Hiscock et al., 2006). Ambient energy levels related to wave and tidal action influence the amount of physical disturbance experienced by seabed sediments. Physically stable or immobile sediments often support different animal and plant communities when compared with mobile or disturbed sediments (Gray and Elliott, 2009). Therefore, understanding the site's baseline conditions is very importance. However, due to the complexity of measuring the energy and disturbance levels of an area, it's unlikely that a quantifiable objective could be determined. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence exposure	HISCOCK, K., MARSHALL, C., SEWELL, J. AND HAWKINS, S. J. 2006. The structure and functioning of marine ecosystems: an environmental protection and management perspective.: English Nature. http://www.marlin.ac.uk/assets/pdf/ENRR699.pdf GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Supporting processes	**Physico-chemical properties**	Maintain the natural physico-chemical properties of the water.	The physico-chemical properties that influence habitats include salinity, pH and temperature. They can act alone or in combination to affect habitats and their communities in different ways, depending on species-specific tolerances. In coastal habitats they can vary widely and can influence the abundance, distribution and composition of communities at relatively local scales. Changes in any of these properties, as a result of human activities, may impact habitats and the communities they support (Elliott et al., 1998), (Gray and Elliott, 2009), (Little, 2000). Available information does not suggest that there are any human activities which are directly affecting salinity, pH or temperature.	ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. LITTLE, C. 2000. The biology of soft shores and estuaries, Oxford University Press. ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB5408050

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				15500
Supporting processes	**Sediment contaminants**	Restrict surface sediment contaminants (<1cm from the surface) to below the OSPAR Environment Assessment Criteria (EAC) or Effects Range Low (ERL)	Various different contaminants are known to affect the species that live in or on the surface of sediments. These include heavy metals (Hg, As, Zn, Ni, Ch, Cd, etc), poly-aromatic hydrocarbons (PAHs), poly-chlorinated biphenyls (PCBs), organotins (TBT) and pesticides such as hexachlorobenzene. These can impact species sensitive to particular contaminants, degrading the community structure (eg heavy metals) and bioaccumulating within organisms, entering the marine food chain (eg PCBs) (OSPAR Commission, 2012). Target set to Restrict as EA (2016) Data for Barnstaple Bay and Taw-Torridge Estuary listed as High status for As, Cu, Fe & Zn	OSPAR COMMISSION. 2012. Co-ordinated Environmental Monitoring Programme (CEMP) 2011 Assessment Report.: OSPAR. http://www.ospar.org/documents/dbase/publications/p00563/p00563_cemp_2011_assessment_report.pdf ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Sediment movement and hydrodynamic regime**	Maintain sediment transport pathways to and from the sub-feature to ensure the replenishment of habitats that rely on the sediment supply.	Sedimentary habitats are often influenced by tide and wave-driven water flow that drives the movement or stability of sediment on and in areas surrounding the feature. These flow regimes can control both the shape and size of the feature, in addition to its sedimentary characteristics and biological composition. It's important that these hydrodynamic and sedimentary processes persist and are allowed to change in response to environmental conditions without hindrance. Hydrodynamic conditions include the speed and direction of wave and tidal currents, seabed shear stress and wave exposure (Little, 2000), (Elliott et al., 1998). No information available on impediments to sediment transport	LITTLE, C. 2000. The biology of soft shores and estuaries, Oxford University Press. ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature.
Supporting	**Water quality**	Restrict aqueous contaminants to	Contaminants may impact the ecology of the Marine Protected	JOINT NATURE

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
processes	**- contaminants**	levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	Area by having a range of biological effects on different species within the habitat, depending on the nature of the contaminant (Joint Nature Conservation Committee (JNCC), 2004, (UK Technical Advisory Group on the Water Framework Directive (UKTAG), 2008), (Environment Agency, 2014). Target set to Restrict as EA (2016) data for Barnstaple Bay and Taw-Torridge Estuary listed as High status for chemical pollutants	CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Rock and Inshore Sublittoral Rock Habitats. Version August 2004.: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_rock.pdf UK TECHNICAL ADVISORY GROUP ON THE WATER FRAMEWORK DIRECTIVE (UKTAG). 2008. Proposals for Environmental Quality Standards for Annex VIII Substances. : UK Technical Advisory Group on the Water Framework Directive. http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Specific%20pollutants%20proposals_Final_010608.pdf ENVIRONMENT AGENCY. 2014. WFD - Surface Water Classification Status and Objectives [Online]. Environment Agency. [Accessed 20/03/15]. http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcDataDownload.xml ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - dissolved oxygen**	Maintain the dissolved oxygen (DO) concentration at levels equating to High Ecological Status avoiding deterioration from existing levels.	Dissolved Oxygen (DO) levels affect the condition and health of features. Excessive nutrients and / or high turbidity can lead to a drop in DO, especially in warmer months. Low DO can have sub-lethal and lethal impacts on fish and infauna and epifauna communities (Best et al., 2007. However, there's a significant amount of natural variation that needs to be considered (Environment Agency Marine Monitoring Service, 2014. Target set to Restrict as EA (2016) data for Barnstaple Bay and Taw-Torridge Estuary listed as High status for dissolved oxygen	BEST, M. A., WITHER, A. W. AND COATES, S. 2007. Dissolved oxygen as a physico-chemical supporting element in the Water Framework Directive. Marine Pollution Bulletin, 55, 53-64. http://www.sciencedirect.com/science/article/pii/S0025326X06003171 ENVIRONMENT AGENCY MARINE MONITORING SERVICE. 2014. TraC Dissolved Oxygen tool-level classifications (at water body level, aggregated to MPA). Peterborough.: Environment Agency. ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB5408050

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				15500
Supporting processes	**Water quality - nutrients**	Recover water quality at mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macro-algal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.	High concentrations of nutrients in the water column can cause phytoplankton and opportunistic macroalgae blooms, leading to reduced dissolved oxygen availability. These seaweeds can smother the sediment, preventing aeration and causing anoxia (lack of oxygen). This can impact sensitive fish, epifauna and infauna communities. The aim is to seek no further deterioration or improve water quality (Devlin et al., 2007), (Best, 2014). Target set to recover as EA (2016) data for Taw-Torridge Estuary listed as Moderate for Phytoplankton and dissolved inorganic Nitrogen	DEVLIN, M., PAINTING, S. AND BEST, M. 2007. Setting nutrient thresholds to support an ecological assessment based on nutrient enrichment, potential primary production and undesirable disturbance. Marine Pollution Bulletin, 55, 65-73. http://www.sciencedirect.com/science/article/pii/S0025326X06003249 BEST, M. 2014. Practitioners guide to the Nutrient Assessment of coastal and transitional waters, Water Framework Directive (draft). Version 7.3. : Environment Agency. ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB610807680003 and https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - turbidity**	Maintain natural levels of turbidity (e.g concentrations of suspended sediment, plankton and other material) across the habitat.	Water turbidity is a result of material suspended in the water, including sediment, plankton, pollution or other matter washed into the sea from land sources. In coastal environments turbidity levels can rise and fall rapidly as a result of biological (eg plankton blooms), physical (eg storm events) or human (eg coastal development) factors.	ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Prolonged changes in turbidity may influence the amount of light reaching the seabed, affecting the primary production and nutrient levels of the habitat's associated communities. Changes in turbidity may also have a range of biological effects on different species within the habitat, eg affecting their abilities to feed or breathe. A prolonged increase in turbidity is indicative of an increase in suspended particulates. This has a number of implications for the marine environment, such as affecting fish health, clogging the filtering organs of suspension feeding animals and affecting seabed sedimentation rates (Elliott et al., 1998).	dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature.
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 1b: Supplementary Advice for Qualifying Features: H1140 Mudflats and sandflats not covered by seawater at low tide (Sub-feature: A2.3 Intertidal mud)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution	**Extent of the sub-feature**	Maintain the total extent and spatial distribution of intertidal mud.	The extent describes the presence and area of the habitat. It's the total area of the habitat across the site as a whole, even where it's patchy. The distribution describes the more detailed location(s) and pattern of habitat across the site. The distribution will influence the component communities present, and also help increase the health and resilience of the feature (Joint Nature Conservation Committee (JNCC), 2004). A reduction in extent would alter the biological and physical functioning of the feature (Elliott et al., 1998). It's difficult to put an extent objective on a mobile, changing feature. An understanding of the supporting processes will be more helpful in determining site integrity. However, the extent can also be defined where the proportion of sediment-sensitive invertebrates (PSI) indicates a change to the sediment character. If there is insufficient evidence, the existing extent occurring at any one time should be the focus of an assessment due to the natural variation, and a fresh survey is likely to be required at the point of assessment, to ascertain what the existing extent is. (Joint Nature Conservation Committee (JNCC), 2004 The precise extent and distribution of the subfeature is uncertain (and probably variable) but is likely to be entirely within the estuarine portion of the SAC	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Inshore Sublittoral Sediment Habitats. Version August 2004 Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_sublittoral_sediment.pdf NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Distribution	**Presence and spatial distribution of biological communities**	Restore the presence and spatial distribution of intertidal mud communities.	A variety of communities make up the habitat. Listed component communities reflect the habitat's overall character and conservation interest. Communities are described as biotopes using EUNIS or the Marine Habitat Classification. Communities include, but are not limited to, those that are notable or representative of the feature. Representative communities include, for example, those covering large areas and notable communities include those that are rare, scarce or particularly sensitive to pressure. Changes to the spatial distribution of communities across the feature could highlight changes to the overall feature (Joint Nature Conservation Committee (JNCC), 2004). Distribution of biological communities may be subject to change as sediment is redistributed seasonally and following storm events. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the distribution of biological communities.	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Structure	**Non-native species and pathogens**	Restrict the introduction and spread of non-native species and pathogens, and their impacts.	Non-native species may become invasive and displace native organisms by preying on them or out-competing them for resources such as food, space or both. In some cases this has led to the loss of indigenous species from certain areas (Joint Nature Conservation Committee (JNCC), 2004). A pathogen causes disease or illness to its host. Pathogens include bacteria, viruses, protozoa and fungi (Biology-Online, 2008).	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Marine Advice: Non-Native Species [Online]. JNCC. [Accessed 10/03/2015]. http://jncc.defra.gov.uk/default.aspx?page=1532

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				BIOLOGY-ONLINE. 2008. Dictionary: Pathogen [Online]. [Accessed 27/04/2015]. http://www.biology-online.org/dictionary/Pathogens
Structure	**Sediment composition and distribution**	Restore the distribution of sediment composition types across the sub-feature.	Sediment character is important in determining the biological communities present. Varied sediment type and grain size ensure structural complexity and connectivity. Intertidal sediments (ranging from highly stable mudflats and saltmarshes, to highly mobile shingle and sand beaches) are subject to a range of deposition and erosion processes, which human activity can influence. Most intertidal sediments stabilise over time so maintaining the sediment composition supports natural succession of the habitats and communities. Where they are subject to constant (net) erosion, the natural processes will be adversely affected (Gray and Elliott, 2009. Distribution of sediment composition may be subject to change seasonally and following storm events. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the distribution of sediment composition.	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Structure	**Sediment total organic carbon content**	Maintain total organic carbon (TOC) content in the sediment at existing levels.	Total Organic Carbon (TOC) content can be used for measuring change in the organic input to the mudflat / sandflat. TOC content of the sediment can influence community structure and contaminant levels (Viaroli et al., 2004). There does not appear to be sufficient data about TOC to make a judgement about this attribute.	VIAROLI, P., BARTOLI, M., GIORDANI, G., MAGNI, P. AND WELSH, D. T. 2004. Biogeochemical indicators as tools for assessing sediment quality/vulnerability in transitional aquatic ecosystems. Aquatic Conservation: Marine and Freshwater Ecosystems, 14, S19-S2. http://dx.doi.org/10.1002/aqc.647
Structure	**Species composition of component**	Maintain the species composition of component communities.	Species composition of communities includes a consideration of both the overall range of species present within the community, as well as their relative abundance. Species	JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	communities		considered need not be restricted to sessile benthic species but could include mobile species associated with the benthos. Species composition could be altered by human activities without changing the overall community type. Within each component community, species composition and population structure should be taken into consideration to avoid diminishing biodiversity and affecting ecosystem functioning within the habitat (Joint Nature Conservation Committee (JNCC), 2004). The sediment community composition will change when the habitat is subjected to pollutants and other forms of disturbance (Joint Nature Conservation Committee (JNCC), 2004), but will also be subject to significant natural variation annually. Benthic invertebrate communities are a good indicator of the health of the feature, if assessed over time.	Standards Monitoring Guidance for Littoral Rock and Inshore Sublittoral Rock Habitats. Version August 2004.: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_rock.pdf JOINT NATURE CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Sediment Habitats Peterborough: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_littoral_sediment.pdf
Structure	**Topography**	Restore the presence of topographic features, while allowing for natural responses to hydrodynamic regime, by preventing erosion or deposition through human-induced activity.	Topography is considered an essential structural component for this feature. Alterations in topography can cause changes in the slope angle of the foreshore or result in increases or decreases in surface elevation. Topographic changes can alter the way the sediment drains and holds water, and can also alter the tidal exposure, meaning areas can be covered by the tide for longer or shorter periods. This can influence the animal and plant communities supported (Gray and Elliott, 2009) and reduce the areas available to coastal birds for feeding. Such changes could occur through direct interaction, such as sand extraction, or indirect impacts, such as changes in wave height or tidal flow regime, which cause erosion or deposition (Elliott et al., 1998). Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence the sediment topography More work may be needed to develop a baseline from e.g. LIDAR derived DTM data	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here. ENVIRONMENT AGENCY, 2015. CASI & LIDAR Habitat Map unpublished
Structure and function	**Presence and abundance of key structural and influential species**	Maintain the abundance of listed species*, to enable each of them to be a viable component of the habitat.	Natural England has included an attribute for the abundance of key structural and influential species for habitat features. **Structural species** are those that form part of the habitat structure or help to define a key biotope. **Influential species** are those that are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat). These will be identified at a national level in accordance with the criteria defined by Natural England. *For each species listed the reason for its inclusion as structural or influential and the information supporting its presence within the community of this site will be provided. Further work is needed to determine the appropriate species locally.	
Supporting processes	**Energy / exposure**	Restore the natural physical energy resulting from waves, tides and other water flows, so that the exposure does not cause alteration to the biotopes and stability, across the habitat.	The amount of energy received across the site significantly affects the communities present. Physical energy can be received through wave energy and / or tidal flow, and can be altered through human activity. Any such alterations to energy should be avoided (Hiscock et al., 2006). Ambient energy levels related to wave and tidal action influence the amount of physical disturbance experienced by seabed sediments. Physically stable or immobile sediments often support different animal and plant communities when	HISCOCK, K., MARSHALL, C., SEWELL, J. AND HAWKINS, S. J. 2006. The structure and functioning of marine ecosystems: an environmental protection and management perspective.: English Nature. http://www.marlin.ac.uk/assets/pdf/ENRR699.pdf

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			compared with mobile or disturbed sediments (Gray and Elliott, 2009). Therefore, understanding the site's baseline conditions is very importance. However, due to the complexity of measuring the energy and disturbance levels of an area, it's unlikely that a quantifiable objective could be determined. Target set to Restore as sea defences, especially at Crow Point, and shoreline management policies within and outside the SAC are likely to influence exposure	GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Supporting processes	**Physico-chemical properties**	Maintain the natural physico-chemical properties of the water.	The physico-chemical properties that influence habitats include salinity, pH and temperature. They can act alone or in combination to affect habitats and their communities in different ways, depending on species-specific tolerances. In coastal habitats they can vary widely and can influence the abundance, distribution and composition of communities at relatively local scales. Changes in any of these properties, as a result of human activities, may impact habitats and the communities they support (Elliott et al., 1998), (Gray and Elliott, 2009), (Little, 2000). Available information does not suggest that there are any human activities which are directly affecting salinity, pH or temperature.	ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature. GRAY, J. AND ELLIOTT, M. 2009. Ecology of Marine Sediments:From Science to Management, Second Edition, Oxford Biology. LITTLE, C. 2000. The biology of soft shores and estuaries, Oxford University Press. ENVIRONMENT AGENCY CATCHMENT DATA

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Sediment contaminants**	Restrict surface sediment contaminants (<1cm from the surface) to below the OSPAR Environment Assessment Criteria (EAC) or Effects Range Low (ERL)	Various different contaminants are known to affect the species that live in or on the surface of sediments. These include heavy metals (Hg, As, Zn, Ni, Ch, Cd, etc), poly-aromatic hydrocarbons (PAHs), poly-chlorinated biphenyls (PCBs), organotins (TBT) and pesticides such as hexachlorobenzene. These can impact species sensitive to particular contaminants, degrading the community structure (eg heavy metals) and bioaccumulating within organisms, entering the marine food chain (eg PCBs) (OSPAR Commission, 2012). Target set to Restrict as EA (2016) Data for Taw-Torridge Estuary listed as High status for As, Cu, Fe & Zn	OSPAR COMMISSION. 2012. Co-ordinated Environmental Monitoring Programme (CEMP) 2011 Assessment Report.: OSPAR. http://www.ospar.org/documents/dbase/publications/p00563/p00563_cemp_2011_assessment_report.pdf ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Sediment movement and hydrodynamic regime**	Maintain sediment transport pathways to and from the sub-feature to ensure replenishment of habitats that rely on the sediment supply.	Sedimentary habitats are often influenced by tide and wave-driven water flow that drives the movement or stability of sediment on and in areas surrounding the feature. These flow regimes can control both the shape and size of the feature, in addition to its sedimentary characteristics and biological composition. It's important that these hydrodynamic and sedimentary processes persist and are allowed to change in response to environmental conditions without hindrance. Hydrodynamic conditions include the speed and direction of wave and tidal currents, seabed shear stress and wave exposure (Little, 2000), (Elliott et al., 1998). No information available on impediments to sediment transport	LITTLE, C. 2000. The biology of soft shores and estuaries, Oxford University Press. ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature.
Supporting	**Water quality**	Restrict aqueous contaminants to	Contaminants may impact the ecology of the Marine Protected	JOINT NATURE

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
processes	**- contaminants**	levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels.	Area by having a range of biological effects on different species within the habitat, depending on the nature of the contaminant (Joint Nature Conservation Committee (JNCC), 2004, (UK Technical Advisory Group on the Water Framework Directive (UKTAG), 2008), (Environment Agency, 2014). Target set to Restrict as EA (2016) data for Taw-Torridge Estuary listed as High status for chemical pollutants	CONSERVATION COMMITTEE (JNCC). 2004. Common Standards Monitoring Guidance for Littoral Rock and Inshore Sublittoral Rock Habitats. Version August 2004.: Joint Nature Conservation Committee (JNCC). http://jncc.defra.gov.uk/PDF/CSM_marine_rock.pdf UK TECHNICAL ADVISORY GROUP ON THE WATER FRAMEWORK DIRECTIVE (UKTAG). 2008. Proposals for Environmental Quality Standards for Annex VIII Substances. : UK Technical Advisory Group on the Water Framework Directive. http://www.wfduk.org/sites/default/files/Media/Environmental%20standards/Specific%20pollutants%20proposals_Final_010608.pdf ENVIRONMENT AGENCY. 2014. WFD - Surface Water Classification Status and Objectives [Online]. Environment Agency. [Accessed 20/03/15]. http://www.geostore.com/environment-agency/WebStore?xml=environment-agency/xml/ogcDataDownload.xml Environment Agency Catchment Data Explorer. https://environment.data.gov.uk/c

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				atchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - dissolved oxygen**	Maintain the dissolved oxygen (DO) concentration at levels equating to High Ecological Status, avoiding deterioration from existing levels.	Dissolved Oxygen (DO) levels affect the condition and health of features. Excessive nutrients and / or high turbidity can lead to a drop in DO, especially in warmer months. Low DO can have sub-lethal and lethal impacts on fish and infauna and epifauna communities (Best et al., 2007. However, there's a significant amount of natural variation that needs to be considered (Environment Agency Marine Monitoring Service, 2014. Target set to Maintain as EA (2016) data for Taw-Torridge Estuary listed as High status for dissolved oxygen	BEST, M. A., WITHER, A. W. AND COATES, S. 2007. Dissolved oxygen as a physico-chemical supporting element in the Water Framework Directive. Marine Pollution Bulletin, 55, 53-64. http://www.sciencedirect.com/science/article/pii/S0025326X06003171 ENVIRONMENT AGENCY MARINE MONITORING SERVICE. 2014. TraC Dissolved Oxygen tool-level classifications (at water body level, aggregated to MPA). Peterborough.: Environment Agency. ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - nutrients**	Recover water quality to mean winter dissolved inorganic nitrogen levels where biological indicators of eutrophication (opportunistic macro-algal and phytoplankton blooms) do not affect the integrity of the site and features, avoiding deterioration from existing levels.	High concentrations of nutrients in the water column can cause phytoplankton and opportunistic macroalgae blooms, leading to reduced dissolved oxygen availability. These seaweeds can smother the sediment, preventing aeration and causing anoxia (lack of oxygen). This can impact sensitive fish, epifauna and infauna communities. The aim is to seek no further deterioration or improve water quality (Devlin et al., 2007), (Best, 2014). Target set to recover as EA (2016) data for Taw-Torridge	DEVLIN, M., PAINTING, S. AND BEST, M. 2007. Setting nutrient thresholds to support an ecological assessment based on nutrient enrichment, potential primary production and undesirable disturbance. Marine Pollution Bulletin, 55, 65-73. http://www.sciencedirect.com/science/article/pii/S0025326X060032

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Estuary listed as Moderate for Phytoplankton and dissolved inorganic Nitrogen	49 BEST, M. 2014. Practitioners guide to the Nutrient Assessment of coastal and transitional waters, Water Framework Directive (draft). Version 7.3. : Environment Agency. ENVIRONMENT AGENCY CATCHMENT DATA EXPLORER. https://environment.data.gov.uk/catchment-planning/WaterBody/GB540805015500
Supporting processes	**Water quality - turbidity**	Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.	Water turbidity is a result of material suspended in the water, including sediment, plankton, pollution or other matter washed into the sea from land sources. In coastal environments turbidity levels can rise and fall rapidly as a result of biological (e.g. plankton blooms), physical (e.g. storm events) or human (e.g. coastal development) factors. Prolonged changes in turbidity may influence the amount of light reaching the seabed, affecting the primary production and nutrient levels of the habitat's associated communities. Changes in turbidity may also have a range of biological effects on different species within the habitat, e.g. affecting their abilities to feed or breathe. A prolonged increase in turbidity is indicative of an increase in suspended particulates. This has a number of implications for the marine environment, such as affecting fish health, clogging the filtering organs of suspension feeding animals and affecting seabed sedimentation rates (Elliott et al., 1998).	ELLIOTT, M., NEDWELL, S., JONES, N. V., READ, S. J., CUTTS, N. D. AND HEMINGWAY, K. L. 1998. Volume II Intertidal Sand and Mudflats & Subtidal Mobile Sandbanks. An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Oban, Scotland: English Nature.
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 2: Supplementary Advice for Qualifying Features: H2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('White dunes')

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Restore the total extent of the H2120 feature to 11 hectares.	There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. The baseline-value of extent given has been generated using data gathered from the listed site-based surveys. Area measurements given may be approximate depending on the methods, age and accuracy of data collection, and as a result this value may be updated in future to reflect more accurate information. The extent of an Annex I habitat feature covers the sum extent of all of the component vegetation communities present and may include transitions and mosaics with other closely-associated habitat features. Where a feature is susceptible to natural dynamic processes, there may be acceptable variations in its extent through natural fluctuations. Where a reduction in the extent of a feature is considered necessary to meet the Conservation Objective for another Annex I feature, Natural England will advise on this on a case-by-case basis. If loss (or gain) of area is due to natural causes, this is not a decline in condition; but any significant loss due to human interference (e.g. sand extraction, visitor impacts) is to be regarded as unfavourable. Increase in area is favourable unless related to coast protection. Strandline may be absent in some years as a result of natural causes, but continued absence over the six year period would cause condition to be unfavourable. Extent, particularly of embryonic dunes, may be subject to periodic and seasonal variation. Target set to restore as natural processes, particularly sediment supply, may be interrupted or prevented by coastal protection or artificial stabilisation (currently groynes at Airy Point (SS457324), rock armouring along Crow Neck to Crow Point (c.SS463321-SS466319)). The natural accumulation of drift-line organic material (seaweed	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			etc.) is essential for trapping sand and initiating dune formation. Mechanical beach cleaning can adversely affect this process. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential.	Natural England on request.
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Restore the distribution and configuration of the H2120 feature, including where applicable its component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. For this feature, this strongly relates to the coastal processes (sand deposition by wind, tideline debris to initiate sand trapping and lack of disturbance during growing season) as well as seed/propagule supply that determine the presence of the habitat. • Distribution of habitat relates to the availability of blown sand from the beach plain, as well as seed/propagule supply that determine the presence of the habitat. Ammophila arenaria (Marram grass) plants also have a mycorrhizal association. • Annex 1 habitat to be present where relevant sedimentary and wind conditions occur. Target set to restore as some sea defences restricting natural coastal processes, particularly at Crow Point.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Natural England on request.
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the feature are referable to and characterised by the following National Vegetation Classification type (s) SD6 *Ammophila arenaria* mobile dune community.	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring the presence, variety and composition of these vegetation types at this site will help to conserve the typical species composition of the SAC feature at this site at appropriate levels (recognising natural fluctuations). The vegetation type's equivalent to this habitat are generally NVC types SD6 and elements of SD5, but can contain elements of other communities depending on degree of surface stability. The majority falls within SD6: a dynamic vegetation type maintained only by change, which will rapidly change and disappear if stability is imposed. It can vary from stands of pure *Ammophila arenaria* (Marram grass) to more diverse communities, reflecting a range of natural factors. SD10 *Carex arenaria* community may become prominent on areas of dune subject to erosion through disturbance. There is a degree of geographical variation. The species composition of shifting dunes is constrained by the harsh conditions, but the vegetation is by no means uniform. The most marked floristic variation relates to the degree of instability. Where sand accretion is extremely rapid it is possible to find vegetation that consists only of *Ammophila arenaria*. As rates of sand deposition decline the Marram is joined by more species. There are a number of sub-communities and there will be natural fluxes in the transition between the mobile dunes and fixed dunes seaward as sand deposition changes.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Habitat Map. Available from Natural England on request. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP. Available here.
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread; Sea Buckthorn *Hippophae rhamnoides* and Japanese Rose *Rosa rugosa*	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. For this feature, two types of negative species can occur: invasive non-natives, or species indicative of poor or declining condition (e.g. (nettle or creeping thistle). For known or likely invasives, there should be zero tolerance. Invasive non-native species may be an issue, the presence of non-natives and other undesirable species could be an indication of increased stability. Some species are potentially more invasive into areas of bare sand and will require specific management on site. Where sea buckthorn is native this species is not counted as a negative indicator. It has been widely introduced elsewhere and has proved very invasive. The distribution of invasive non-natives is not fully understood or mapped. In some areas of southern England Where sea buckthorn is native species, it is not counted as a negative indicator. However it has been widely introduced elsewhere, including at Braunton Burrows,	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			and can prove very invasive at the expense of the qualifying dune habitats. Restore target selected as Sea Buckthorn *hippophae rhamnoides* and Japanese Rose *rosa rugose* are continually invading with reduction and eradication undertaken yearly.	P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation community transitions**	Maintain the full natural range of vegetation zones associated with the feature and the transitions between them.	Zonations are seen as indicative of good conservation of structure and function. It is essential that the relationship between this habitat and other elements of the sand dune system are recognised. As much of the dune frontage as possible should have intact zonation to the next stage in succession (generally fixed dunes). This target needs to be determined at a site level, as there may be specific factors that naturally limit continuous coverage.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Dune topography**	Maintain a natural topography to the shifting dune feature.	Dune topography may be influenced by the operation of geomorphological processes, which should be allowed to continue in order to maintain the dune system in its naturally dynamic form. Maintaining this zone in a natural form, and as part of the wider dune zonation, will provide optimal conditions for the full range of characteristic flora and fauna. The low shifting dunes on the foreshore provide a vital structural element to any dune system: the varied natural topography provides important means of dune-building and pro-gradation seawards. Key dune-building plants such as *Ammophila arenaria* (Marram grass) is sensitive to salinities over 1.5% so only persists on higher dune ridges.	
Structure and function (including its typical species)	**Presence of un-vegetated surfaces**	Restore the extent of bare sand which typically covers up to 50% of the feature extent, of varying sizes, in a mosaic with the vegetation.	In these developing, dynamic zones, bare sand should be expected. Lack of bare sand would suggest an artificially stabilised system. Blow-throughs are a natural element of this zone. If extent of sand is towards the upper end of the range, it will become important to assess whether recreational pressures are over-riding natural dynamics. Restore target selected as some stability and lack of bare sand occurring.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Key structural, influential and distinctive species**	Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature *Ammophila arenaria, Leymus arenarius and Elytrigia juncea, Senecio jacobaea, xAmmocalamagrostis baltica Festuca rubra, F. ovina, Poa pratensis, Carex arenaria.*	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I habitat feature at a particular site. These species will include; • Structural species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • Influential species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Sea Stock *Matthiola sinuate*, White Horehound *Marrubium vulgare*, Sea Clover *Trifolium squamosum* Shore Dock *Rumex rupestris*, Sea Knotgrass *Polygonum maritimum*	with a significant functional role linked to the habitat) • Site-distinctive species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.	England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Supporting off-site habitat**	Restore where necessary the extent, quality and spatial configuration of land or habitat surrounding or adjacent to the site which is known to support the feature including maintaining	Include only where applicable. The structure and function of the qualifying habitat, including its typical species, may rely upon the continued presence of areas which surround and are outside of the designated site boundary. Changes in surrounding land-use may adversely (directly/indirectly)	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		coastal and marine sediments and patterns which feed the dune system	affect the functioning of the feature and its component species. This supporting habitat may be critical to the typical species of the feature to support their feeding, breeding, roosting, population dynamics ('metapopulations'), pollination or to prevent/reduce/absorb damaging impacts from adjacent land uses e.g. pesticide drift, nutrient enrichment. Target set to restore as some sea defences the Hold the Line policy under the Shoreline Management Plan at Westward Ho! And Skern Saltmarsh to Appledore (west) may have potential effects Braunton Burrows SAC as sand movement is restricted and therefore limits natural processes.	
Structure and function (including its typical species)	**Functional connectivity with wider landscape**	Restore the overall extent, quality and function of any supporting features within the local landscape which provide a critical functional connection with the site	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features, such as habitat patches, hedges, watercourses and verges, outside of the designated site boundary which are either important for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. Target set to restore as some sea defences restricting natural coastal processes, particularly at Crow Point. The Hartland Point to Anchor Head Shoreline Management Plan (SMP2) has a management policy at Braunton Burrows of 'allow natural coastal evolution to continue through no active Intervention' promoting natural processes. However, the Hold the Line policy at Westward Ho! And Skern Saltmarsh to Appledore (west) may have potential effects Braunton	NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Burrows SAC, as continued defence at Westward Ho! limits natural processes. The managed realignment policy at Crow Point and Crow Neck may promote alternative processes that could affect the Braunton Burrows SSSI and SAC, as well as the UNESCO Biosphere Reserve's dunes.	
Structure and function (including its typical species)	**Adaptation and resilience**	Maintain or as necessary restore the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing likelihood of natural habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England, taking into account the sensitivity, fragmentation, topography and management of its habitats (Natural England, 2015). This means that action to address specific issues is likely, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so further site assessment and appropriate monitoring is recommended.	NATURAL ENGLAND (2015). Climate Change Theme Plan and supporting National Biodiversity Climate Change Vulnerability assessments ('NBCCVAs') for SACs and SPAs in England Available at http://publications.naturalengland.org.uk/publication/4954594591375360]. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, to within typical values for the	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		habitat.	therefore affect the ecological structure, function and processes associated with this Annex I feature. This Annex 1 habitat has essentially raw soils with little humus and low nutrient status. The majority of the area is wind-blown sand with some areas stabilised to a certain degree by Marram Grass *Ammophila arenaria.* This is maintained by the natural deposition and erosion of wind and tidal born sand with associated biological material.	
Supporting processes (on which the feature relies)	**Conservation measures**	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to Maintain the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Management should consider the structures on and functions of the site as a whole. Management measures specifically aimed at maintaining and enhancing the features for which they are designated and to address some of the pressures and future threats. Target set to restore as some sea defences restricting natural coastal processes, particularly at Crow Point. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential.	NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Supporting processes (on which the feature relies)	**Air quality**	Maintain the concentrations and deposition of air pollutants within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	This habitat type is considered sensitive to changes in air quality. Exceedance of these critical values for air pollutants may modify the chemical status of its substrate, accelerating or damaging plant growth, altering its vegetation structure and composition and causing the loss of sensitive typical species associated with it. Critical Loads and Levels are recognised thresholds below which such harmful effects on sensitive UK habitats will not occur to a significant level, according to current levels of scientific	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			understanding. There are critical levels for ammonia (NH3), oxides of nitrogen (NOx) and sulphur dioxide (SO2), and critical loads for nutrient nitrogen deposition and acid deposition. There are currently no critical loads or levels for other pollutants such as Halogens, Heavy Metals, POPs, VOCs or Dusts. These should be considered as appropriate on a case-by-case basis. Ground level ozone is regionally important as a toxic air pollutant but flux-based critical levels for the protection of semi-natural habitats are still under development. It is recognised that achieving this target may be subject to the development, availability and effectiveness of abatement technology and measures to tackle diffuse air pollution, within realistic timescales. Maintain selected as current levels not currently exceeding maximum critical loads.	
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table. Through appropriate site management under agri-environment, i.e. no inputs etc. water pollution is minimal.	RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Supporting processes	**Hydrology**	Restore the natural hydrological regime to provide the conditions	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives	RACHAEL BURDEN, ANDREW WILLIAMS AND

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(on which the feature relies)		necessary to sustain the feature within the site	for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table. There is no apparent penetration of seawater beneath the coastal dunes. Hydrology regime is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows. Research is required to investigate the drivers of hydrological change and the impacts on SAC features. This needs to include an investigation of the ecology and drivers of change in humid dune slacks.	JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve. Available on request from Natural England. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Supporting processes (on which the feature relies)	**Aeolian (wind-blow) processes**	Restore the ability of wind-blow processes to transport sand from the beach plain to the fore dune.	Allowing natural wind-blow (or 'aeolian') processes to shape the topography of this habitat feature is important to its long-term conservation. The beach plain needs to be dry to allow sand to be transported by wind inland into the dune system. The Hartland Point to Anchor Head Shoreline Management Plan (SMP2) has a management policy at Braunton Burrows of 'allow natural coastal evolution to continue through no active Intervention' promoting natural processes. However, the Hold the Line policy at Westward Ho! And Skern	HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Saltmarsh to Appledore (west) may have potential effects Braunton Burrows SAC, as continued defence at Westward Ho! limits natural processes. The managed realignment policy at Crow Point and Crow Neck may promote alternative processes that could affect the Braunton Burrows SSSI and SAC, as well as the UNESCO Biosphere Reserve's dunes. Target set to restore as some sea defences restricting natural coastal processes, particularly at Crow Point.	NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Version Control n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 3: Supplementary Advice for Qualifying Features: H2130 Fixed dunes with herbaceous vegetation ('Grey dunes')

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Restore the total extent of the H2130 feature to 658 hectares.	See the notes for this attribute above in Table 2. For this feature if loss (or gain) of area is from natural causes dynamism this is not an unacceptable decline in condition, but any significant loss due to human interference is to be regarded as unfavourable. Increase in area is favourable unless related to coast protection. In a naturally functioning dune system there is likely to be varying proportions of fixed and mobile dune communities over time. Target set to Restore as some areas of fixed dune grassland invaded by native and non-native scrub. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request.
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Restore the distribution and configuration of the H2130 feature, including where applicable its component vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. For this feature it is also important to maintain transitions between fixed/semi-fixed dunes and other dune/terrestrial habitats to seaward or landward. Target set to restore as some areas of fixed dune grassland invaded by native and non-native scrub. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation community composition**	Ensure the component vegetation communities of the H2130 feature are referable to and characterised by the following National Vegetation Classification types: SD7 *Ammophila arenaria – Festuca rubra* semi-fixed dune community, SD8 *Festuca rubra – Galium verum* fixed dune grassland, SD9b *Ammophila arenaria – Arrhenatherum elatius* dune grassland, Geranium sanguineum sub-community, SD11 *Carex arenaria – Cornicularia aculeata* dune community SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland, SD19 *Phleum arenarium - Arenaria serpyllifolia* dune annual community.	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. n the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). Some examples of SD9 dune grassland can also be referable to this habitat type. Inland stands of SD11 dune and SD12 dune grassland are referable to Annex I type H2330 Inland dunes with open *Corynephorus* and *Agrostis* grasslands.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. NATURAL ENGLAND, 2017, Braunton Burrows

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Broad Habitat Map. Available from Natural England on request. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread; *Rosa rugosa., Cirsium arvense, Cirsium vulgare, Urtica dioica, Lolium perenne, Arrhenatherum elatius* (not SD9), *Pteridium aquilinum, Rubus fruticosus, Chamaenerion angustifolium,* sea buckthorn, willow *Salix spp*., privet *Ligustrum vulgare.*	Undesirable non-woody and woody vascular plants species may require active management to avert an unwanted succession to a different and less desirable state. Often they may be indicative of a negative trend relating to another aspect of a site's structure and function. These species will vary depending on the nature of the particular feature, and in some cases these species may be natural/acceptable components or even dominants. For this feature where sea buckthorn is native this species is not counted as a –ve indicator (see H2160 table) It has been widely introduced elsewhere and has proved very invasive. Species such as common nettle *Urtica dioica* and the thistles *Cirsium arvense* and *C. vulgare* species are indicative of poor condition because of enrichment. *Senecio jacobaea* is a natural constituent of dune vegetation and should only to be included as a negative indicator where extensive dense stands of robust plants are present. In some areas of southern England Where sea buckthorn is native species, it is not counted as a negative indicator. However it has been widely introduced elsewhere, including at Braunton Burrows, and can prove very invasive at the expense of the qualifying dune habitats. Restore target selected as Sea Buckthorn *hippophae rhamnoides* and Japanese Rose *Rosa rugosa* are continually invading with reduction and eradication on a yearly basis.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Braunton Burrows is also invaded by native scrub such as willow *Salix spp*., privet *Ligustrum vulgare* and bramble *Rubus fruticosus* agg. Appropriate grazing is critical.	Natural England here. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation community transitions (range and zones)**	Maintain the patterns of natural zonations/transitions associated with the feature, with full zonation from beach inland to fixed dune should be intact over at least 95% of coastal frontage.	Transitions/zonations between adjacent but different vegetation communities are usually related to naturally-occurring changes in soil, aspect or slope. Such 'ecotones' retain characteristics of each bordering community and can add value in often containing species not found in the adjacent communities. Retaining such transitions can provide further diversity to the habitat feature, and support additional flora and fauna. Some dunes are on naturally sediment-deficit coasts: on these there is likely to be less than 95% frontage of strandline and embryo dunes.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Structure and function (including its typical	**Vegetation structure diversity**	Maintain a variation in sward structure, so that typically 30-70% of sward comprises species-rich short turf (between	A varied vegetation structure and a succession of flowers and seeds through the year are important for maintaining the habitat's diversity. Targets for ratio of short to taller vegetation should be set on a site-specific basis.	This attribute will be periodically monitored as part of Natural England's site condition

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
species)		2-10cms tall).	In addition, a proportion of the short turf area should be <5cm tall. The ratio of short to tall vegetation can be lower (but not <30%) in semi-fixed dune grassland (SD7) where *Ammophila arenaria* (Marram grass) is still abundant. Levels and timing of stock grazing should be sufficient to allow adequate seed production. Maintain target selected with scope for improvement through better timing of stock grazing in individual units.	assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Structure and function (including its typical species)	**Dune topography**	Maintain the natural topography of the fixed dune feature.	Characteristic dune topography may be influenced by the operation of geomorphological processes, which should be allowed to continue in order to maintain the dune system in its naturally dynamic form. Fixed dunes occur where the dune stabilises and the organic content of the soil increases. Maintaining this zone in a natural form, and as part of the wider dune zonation, will provide optimal conditions for the full range of characteristic dune flora and fauna.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Structure and function (including its typical species)	**Presence of un-vegetated surfaces**	Restore an appropriate cover of bare ground or sand, which is typically between 5-20% and in patches in a mosaic with vegetated surfaces.	Patches of bare sand are essential for a wide range of typical dune invertebrates and 'dune annual' plants. For semi-fixed/fixed dunes the range of bare ground/sand is typically between 5-20%. Areas of bare sand which are maintained by frequent human disturbance should not increase in extent. Restore through re-creation of early-stage dune succession through scraping.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Structure and function (including its typical species)	**Key structural, influential and distinctive species**	Maintain the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: Toothed Medick *Medicago polymorpha*, Dune Fescue V*ulpia*	See the notes for this attribute above in table 3.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		fasciculata, Least and Sand Soft-brome *Bromus hordaceus ferronii & thominei*, Sticky Stork's-bill *Erodium lebelii*, Clustered Clover *Trifolium glomeratum*, Slender Bird's-foot Trefoil *Lotus angustissimus* and Seaside Pansy *Viola tricolor curtisii.* String-of-sausages lichen *Usnea articulata* Scrambled Egg Lichen *Fulgensia fulgens*		2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. **D.T. HOLYOAK, G.A. HOLYOAK AND M. J. WILLING, 2004, Monitoring of sand-bowl amber snail catinella arenaria populations at Braunton Burrows, North Devon, in 2004. Available from Natural England on request.**A.M. COPPINS AND B. J. COPPINS, 2013, Braunton Burrows SSSI, North Devon, Site

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Dossier of Lichen Interest. Available from Natural England on request. J. R. DOUGLASS AND B. J. COPPINS, 2013, Common Standards Monitoring for Lichens at Braunton Burrows SSSI. Available from Natural England on request. BRYAN EDWARDS DORSET ENVIRONMENTAL RECORDS CENTRE, April 2007, The Current Status of *Fulgensia fulgens* Scrambled-egg Lichen in England. Available from Natural England on request. B.BENFIELD, March 2007. Braunton Burrows Biosphere Reserve, An assessment of the lichen value of dune scrub. Available from Natural England on request. MARY BREEDS, 2005, Survey of Water Germander (Teucrium scordium) at Braunton Burrows SSSI and Northam Burrows SSSI
Structure and	**Functional**	Maintain the overall extent,	See the notes for this attribute above in table 3.	NATURAL ENGLAND.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function (including its typical species)	**connectivity with wider landscape**	quality and function of any supporting features within the local landscape which provide a critical functional connection with the site		2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. D.T. HOLYOAK, G.A. HOLYOAK AND M. J. WILLING, 2004, Monitoring of sand-bowl amber snail catinella arenaria populations at Braunton Burrows, North Devon, in 2004. M. COPPINS AND B. J. COPPINS, 2013, Braunton Burrows SSSI, North Devon, Site Dossier of Lichen Interest. J. R. DOUGLASS AND B. J. COPPINS, 2013,

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Common Standards Monitoring for Lichens at Braunton Burrows SSSI MARY BREEDS, 2005, Survey of Water Germander (Teucrium scordium) at Braunton Burrows SSSI and Northam Burrows SSSI
Structure and function (including its typical species)	**Adaptation and resilience**	Maintain OR Restore as necessary the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change, either within or external to the site	See the notes for this attribute above in table 3.	
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, to within typical values for the habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature.	
Supporting processes (on which the feature relies)	**Conservation measures**	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. For this feature, • Reduce nutrient levels to maintain high numbers of species through the management activities of grazing, burning, mowing, sod-cutting and scrub cutting. The reworking of sand through cultivation or sand-drift may help to conserve the dynamic habitat. Management of succession is a critical aspect of management for this habitat, by a combination of active processes and	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, 2018. European Site Conservation Objectives for Braunton Burrows SAC (UK0012570),

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			grazing/cutting. • A range of invertebrates and plants require bare sand where it is not too frequently disturbed by vehicles or feet. • Where damage initiates a blow-out, this can be a +ve outcome in over- stabilized dunes, where sea defence concerns or critical infrastructure are not comprised. Maintain target selected as site under management through agri-environment. However, parts of the site are currently under grazed or outside of the scope of the grazing units. The habitat requires ongoing cattle or sheep grazing and clearance of native/ non-native scrub. Other interventions such as scraping and notching of stable dunes to restore natural process.	Available from Natural England here. NATURAL ENGLAND, 2014. Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Supporting processes (on which the feature relies)	**Air quality**	Maintain the concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See the notes for this attribute above in table 3. A maintain target is considered appropriate here because the nitrogen and acidity maximum critical loads are currently not exceeded for this feature (see the Air Pollution Information System)	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	**Water quality**	Where the feature is dependent on surface water and/or groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome-shaped water table. This limits the scope for pollution from off site. Management of no inputs through agri-environment limits on site pollution sources.	RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve. Available on request from Natural England.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. For this feature, hydrology can be influenced by dune topography, vegetation, substrate, flow regimes The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table. There is no apparent penetration of seawater beneath the coastal dunes. Hydrology regime is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows. Research is required to investigate the drivers of hydrological change and the impacts on SAC features. This needs to include an investigation of the ecology and drivers of change in humid dune slacks.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				National Nature Reserve. Available on request from Natural England.
Supporting processes (on which the feature relies)	**Aeolian (wind-blow) processes**	Restore the ability of wind-blow processes to transport sand from the beach plain to the fore-dune.	Allowing natural wind-blow (or 'aeolian') processes to shape the topography of this habitat feature is important to its long-term conservation. The beach plain needs to be dry to allow sand to be transported by wind inland into the dune system. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential to reduce dune stability. Restore natural dune windblown processes notching of stable dunes. Assented military use of site has localised severe impacts on dune grassland and dune slacks, by creating and maintaining bare or churned areas. Assent does go some way to resolving problem, but uncertainties remain over extent and degree of impact.	
Version Control: n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 4: Supplementary Advice for Qualifying Features: H2170 Dunes with *Salix repens ssp. argentea* (Salicion arenariae)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Restore the total extent of the H2170 feature to 111 hectares	See the notes for this attribute above in table 3. Dunes with *Salix repens* are part of a broader dune wetland vegetation community. It is characteristic of older, drier dune slacks. In a naturally functioning dune system some dune slacks will, over time, dry out, leading to localised losses of Dunes with Salix repens. However new slacks will be created by sand blow (secondary slacks) or by beach development (primary slacks), some of which in time will develop into Dunes with Salix repens. Therefore, this Annex 1 habitat needs to be assessed in conjunction with the H2190 Humid dune slack feature which represents the wetter and early succession elements of dune wetlands. All elements of the wet-dry and early-late succession spectrums should be represented on the site. Evidence of natural changes to extent should not justify further loss to development. Target set to Restore as some areas of dunes invaded by native and non-native scrub. Further research required to improve the understanding of the site's eco-hydrology.	This attribute will be periodically monitored as part of Natural England's site condition assessments NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Extent and distribution of the feature	**Spatial distribution of the feature**	Restore the distribution and configuration of the feature, including where applicable its	A contraction in the range, or geographic spread, of the feature (and its component vegetation and typical species, plus transitional communities) across the site will reduce its overall	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
	within the site	component vegetation types, across the site	area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. This may also reduce and break up the continuity of a habitat within a site and how well its typical species are able to move around the site to occupy and use habitat. Such fragmentation can impact on their viability and the wider ecological composition of the Annex I habitat. Smaller fragments of habitat can typically support smaller and more isolated populations which are more vulnerable to extinction. These fragments also have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for some of the typical and more specialist species associated with the Annex I habitat feature. In the short term, dune wetland features are fixed in space determined by dune topography and hydrology. However, in a naturally functioning dune system topography can change leading to localised losses and gains in dune wetlands, including Dunes with *Salix repens*. Target set to restore as some areas of fixed dune grassland invaded by native and non-native scrub.	designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Extent and distribution of the feature	**Future extent of habitat within the site and ability to respond to seasonal changes**	Restore the ability to absorb seasonal and periodic fluctuations in the extent of the habitat	This recognises the need to allow for natural fluctuations in the extent and the distribution of this habitat feature, often during particular seasons and usually as a result of natural coastal processes. Dunes with *Salix repens* are buffered from short term natural variations in hydrology including dry seasons. However, artificial drainage or a longer series of dry years with lowered water table will lead to early succession away to non-dune wetland habitat. In the medium term, a degree of dune	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for NATURAL ENGLAND, Braunton

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			dynamics is required to create new dune slacks, some of which over time will develop into *Dunes with Salix repens*. Hydrology regime and ability of feature to respond to seasonal changes is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows impacts features response. Further research required to improve the understanding of the site's eco-hydrology.	Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Dune topography**	Restore a natural dune topography, and allow natural change that is wind-driven.	It is possible that on some sites there are over-riding constraints that will not allow natural dune dynamics to proceed. On these sites it may be necessary to artificially lower ground surface levels in slacks to extend their lives. See also 'Within-site sedimentary processes' component. Dune topography is stabilising. Restore natural dune topography through re-creation of early-stage dune succession through scraping and re-creation of windblown processes through notching of stable dunes. Scrub invasion is also leading to dune stabilisation. A sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime is essential.	NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Presence of un-vegetated surfaces**	Restore patches of bare sand of varying sizes in a mosaic with the vegetation (5%-10% of the feature extent)	Bare sand is less characteristic of Dunes with Salix repens than of Humid dune slacks. Nevertheless some bare sand should be expected even in this late succession community. Its location can change over time in response to localised dune dynamics and rabbit activity. Restore bare sand through re-creation of early-stage dune succession through scraping and re-creation windblown processes through notching of stable dunes to move sand around site. .	This attribute will be periodically monitored as part of Natural England's site condition assessments NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Map. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation community composition**	Maintain the composition of the feature's component vegetation communities and associated transitions, allowing for successional changes in response to natural processes.	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. In the UK these have been categorised by the National Vegetation Classification (NVC). Maintaining or restoring these characteristic and distinctive vegetation types, and the range of types as appropriate, will be important to sustaining the overall habitat feature. This will also help to conserve their typical plant species (i.e. the constant and preferential species of a community), and therefore that of the SAC feature, at appropriate levels (recognising natural fluctuations). The NVC type SD16 *Salix repens - Holcus lanatus* is a characteristic community of this habitat. Although this vegetation type is dominated by creeping willow and can appear uniform, there is natural variation related to dampness and levels of grazing (including rabbits).	This attribute will be periodically monitored as part of Natural England's site condition assessments NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and	**Vegetation**	Restore the cover of this Annex 1	The coastal sand dune ecosystem has a characteristic range of	This attribute will be periodically

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
function (including its typical species)	**structure: zonation of dune vegetation**	habitat to typically comprise between 10-50% of the overall dune wetland resource on the site	natural features, representing different stages of natural succession. The full representation of these stages should be maintained or where appropriate restored. This Annex 1 habitat needs to be considered in combination with Humid dune slacks which represents the wetter and early succession elements of dune wetlands. All elements of the wet-dry and early-late succession spectrums should be represented on the site. Hydrology regime and subsequently vegetation structure is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows having a direct impact on vegetation structure. Restoring/improving the hydrological regime is required to restore natural processes however research is required to investigate the drivers of hydrological change and the impacts on SAC features. This needs to include an investigation of the ecology and drivers of change in humid dune slacks. Restore through re-creation of early-stage dune succession through scraping.	monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation composition: trees and scrub**	Restore the cover of locally native tree and scrub species, excluding creeping willow, to between 5-10% as small scattered groups.	Dense cover of trees and shrubs can smother and shade out smaller and more characteristic vegetation of this habitat feature, and interrupt naturally occurring dune processes. Usually active management is required to reduce or contain its cover across this habitat feature. Apart from sea buckthorn	This attribute will be periodically monitored as part of Natural England's site condition assessments.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			(where it is native), other trees and shrubs would usually indicate an artificially stabilised system. On some sites it may be appropriate to allow natural succession to native woodland to proceed on a small proportion of the Annex 1 habitat. Restore target selected as scrub, both non-native and native, invasion is also leading to dune stabilisation at this SAC. A sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime is essential to ensure the occurrence of natural dune process.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation: undesirable species**	Restore the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread. *Rosa rugosa, Cirsium arvense, Cirsium vulgare, Urtica dioica,*	Two types of negative species can occur: invasive non-natives (eg. Michaelmas daisy), or species indicative of poor habitat condition (eg. nettle or creeping thistle). Senecio jacobaea is a natural constituent of dune vegetation. However, in dune slacks an abundance indicates over-stocking. In some areas of southern England Where sea buckthorn is native species, it is not counted as a negative indicator. However it has been widely introduced elsewhere, including at Braunton Burrows, and can prove very invasive at the expense	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Lolium perenne, Arrhenatherum elatius (not SD9), *Pteridium aquilinum, Rubus fruticosus, Chamaenerion angustifolium,* *Hippophae rhamnoides L*. willow *Salix* spp., privet *Ligustrum vulgare*.]	of the qualifying dune habitats. Restore target selected as Sea Buckthorn *hippophae rhamnoides* and Japanese Rose *rosa rugosaare* continually invading with reduction and eradication undertaken under Countryside Stewardship Higher Tier agreement (2018 start) and further works under Plantlife Dynamic Dunes Project (EU Life/HLF funded) Braunton Burrows is also invaded by native scrub such as willow Salix spp., privet Ligustrum vulgare and bramble Rubus fruticosus agg.	NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, to within typical values for the dunehabitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature. As dune slack vegetation succession progresses, soils develop in structure and nutrient status. The soils under Dunes with *Salix repens* represent some of the more mature natural soils to be found on dunes.	
Structure and function (including its	**Key structural, influential and**	Maintain the abundance of the species listed to enable each of them to be a viable component of	Some plant or animal species (or related groups of such species) make a particularly important contribution to the necessary structure, function and/or quality of an Annex I	This attribute will be periodically monitored as part of Natural England's site condition

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)	**distinctive species**	the Annex I habitat feature: Creeping willow *Salix repens*, Round-headed Club-rush Scirpoides holoschoenus, Round-leaved Wintergreen Pyrola rotundifolia maritima, Sharp Rush Juncus acutus, Water Germander Teucrium scordium, Early and Dune Gentian Gentianella anglica & uliginosa, Early Marsh Orchid Dactylorhiza incarnata coccinea, Variegated Horsetail Equisetum variegatum, Fen Pondweed Potamogeton coloratus and Fen Orchid Liparis loeselii String-of-sausages lichen *Usnea articulate* Scrambled Egg Lichen *Fulgensia fulgens*	habitat feature at a particular site. These species will include; • Structural species which form a key part of the Annex I habitat's structure or help to define that habitat on a particular SAC (see also the attribute for 'vegetation community composition'). • Influential species which are likely to have a key role affecting the structure and function of the habitat (such as bioturbators (mixers of soil/sediment), grazers, surface borers, predators or other species with a significant functional role linked to the habitat) • Site-distinctive species which are considered to be a particularly special and distinguishing component of an Annex I habitat on a particular SAC. There may be natural fluctuations in the frequency and cover of each of these species. The relative contribution made by them to the overall ecological integrity of a site may vary, and Natural England will provide bespoke advice on this as necessary. The list of species given here for this Annex I habitat feature at this SAC is not necessarily exhaustive. The list may evolve, and species may be added or deleted, as new information about this site becomes available.	assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. D.T. HOLYOAK, G.A. HOLYOAK AND M. J. WILLING, 2004, Monitoring of sand-bowl amber snail *Catinella arenaria* populations at Braunton Burrows, North Devon, in 2004. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				A.M. COPPINS AND B. J. COPPINS, 2013, Braunton Burrows SSSI, North Devon, Site Dossier of Lichen Interest. Available from Natural England on request. J. R. DOUGLASS AND B. J. COPPINS, 2013, Common Standards Monitoring for Lichens at Braunton Burrows SSSI. Available from Natural England on request. BRYAN EDWARDS DORSET ENVIRONMENTAL RECORDS CENTRE, April 2007, The Current Status of Fulgensia Fulgens Srambled-egg Lichen in England. Available from Natural England on request. B.BENFIELD, March 2007, Braunton Burrows Biosphere Reserve, An assessment of the lichen value of dune scrub. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation structural diversity**	Maintain a suitable variation in vegetation height across the dune feature	Even for a vegetation community dominated by *Salix repens,* a uniform canopy will not be typical or ideal. A wide range of invertebrates in particular depend on both a varied vegetation structure and a succession of flowers and seeds. Extensive grazing management is essential to deliver a range of vegetation heights.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Supporting processes (on which the feature relies)	**Functional connectivity with wider coastal sedimentary system**	Maintain adequate movement of sediment from all key sediment sources (directly from the beach, indirectly from offshore, eroding cliffs, coastal dunes etc).	This recognises the potential need at this site to maintain or restore the connectivity of the site to its wider landscape in order to meet the conservation objectives. These connections may take the form of landscape features outside of the designated site boundary which are either important for the continuous supply of sediment (such as soft eroding cliffs, dunes, offshore sand banks) or for the migration, dispersal and genetic exchange of those typical species closely associated with qualifying Annex I habitat features of the site. These features may also be important to the operation of the supporting ecological processes on which the designated site and its features may rely. In most cases increasing actual and functional landscape-scale connectivity would be beneficial. Where there is a lack of detailed knowledge of the connectivity requirements of the qualifying feature, Natural England will advise as to whether these are applicable on a case by case basis. Although Dunes with *Salix repens* does not depend in the short term on continued inputs of sand, its medium/long term survival does. Primary slacks can occur on the beach plane with sufficient input of sand.	
Supporting processes (on which the feature relies)	**Aeolian (wind-blow) processes**	Restore the natural movement of sand within the site, resulting from wind blow-outs and blow-throughs.	Allowing natural wind-blow (or 'aeolian') processes to operate and to allow active movement of dry sand is important. Current dune topography, including hollows reaching damp sand where slacks occur, has resulted from past within-site dune	HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			movement. Although Dunes with *Salix repens* do not depend in the short term on new dune mobility, its medium/long term survival does. Secondary slacks are created where overlying sand is blown away down to the water table/wet sand. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential to reduce dune stability. Restore natural dune windblown processes notching of stable dunes. Assented military use of site has localised severe impacts on dune grassland and dune slacks, by creating and maintaining bare or churned areas. Assent does go some way to resolving problem, but uncertainties remain over extent and degree of impact.	Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level as necessary, maintain natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. All dune wetland vegetation communities, including Dunes with Salix repens, are influenced by the water table. Each community reflects a particular past and current hydrological regime. Water table monitoring should be present on all sites with dune wetlands. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table.	This attribute will be periodically monitored as part of Natural England's site condition assessments. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			There is no apparent penetration of seawater beneath the coastal dunes. Hydrology regime is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows. More research required to improve the understanding of the site's eco-hydrology	Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Supporting processes (on which the feature relies)	Air quality	Restore as necessary the concentrations and deposition of air pollutants to within the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	As above in Table 3. A restore as necessary target is considered appropriate here because the nitrogen and acidity maximum critical loads are currently being exceeded for this feature.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk).
Supporting processes (on which the feature relies)	Conservation measures	Maintain the management measures (either within and/or outside the site boundary as appropriate) which are necessary to [Maintain OR Restore] the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. Although 'natural processes' are given a high priority in sustaining site and feature integrity in dunes, active management (including livestock grazing) is sometimes required.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 5: Supplementary Advice for Qualifying Features: H2190 Humid dune slacks

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Extent and distribution of the feature	**Extent of the feature within the site**	Restore the total extent of the H2190 feature to 111 hectares.	See the notes for this attribute above in table 3. For this feature if loss (or gain) of area is from natural physical dynamism this is not a decline in condition, but any significant loss due to human interference (e.g. sand extraction, visitor impacts, ploughing or conversion to improved grassland) is to be regarded as unfavourable. In a naturally functioning dune system some dune slacks will, over time, dry out but new ones will be created by sand blow (secondary slacks) or by beach development (primary slacks). Humid dune slacks represents the wetter and early succession elements of dune wetlands. All elements of the wet-dry and early-late succession spectrums should be represented on the site. Evidence of natural changes to extent should not justify further loss to development. H2170 - Dunes with Salix repens are characteristic of older, drier dune slacks, therefore, this Annex 1 habitat needs to be assessed in combination with it. Target set to Restore as some areas of humid dune slacks invaded by native and non-native scrub and there is evidence to suggest the water table is lowering. Assented military use of site has localised severe impacts on dune grassland and dune slacks, by creating and maintaining bare or churned areas. Assent does go some way to resolving problem, but uncertainties remain over extent and degree of impact. Further research required to improve the understanding of the site's eco-hydrology.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				on request from Natural England) P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request.
Extent and distribution of the feature	**Dune topography**	Restore a natural dune topography, but allow natural change that is wind-driven.	Some naturally occurring change may be necessary to maintain the continuity of slacks. It is possible that on some sites there are over-riding constraints that will not allow natural dune dynamics to proceed. On these sites it may be necessary to artificially lower ground surface levels in slacks to extend their lives. See also 'Within-site sedimentary processes' component. Scrub invasion is also leading to dune stabilisation. A sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime is essential. Restore natural dune topography through re-creation of early-stage dune succession through scraping and re-creation of windblown processes through notching of stable dunes.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England) P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Extent and distribution of the feature	**Spatial distribution of the feature within the site**	Restore the distribution and configuration of the H2190 feature, including where applicable its component vegetation types, across the site	See the notes above in Table 3. In the short term, dune wetland features are fixed in space determined by dune topography and hydrology. However, in a naturally functioning dune system topography can change leading to localised losses and gains in dune wetlands, including Humid dune slacks. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across the site directly impacting the spatial distribution of humid dune slacks across the site. Scrub invasion is also leading to dune stabilisation. A sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime is essential. Restore natural dune topography through re-creation of early-stage dune succession through scraping and re-creation of windblown	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			processes through notching of stable dunes.	England here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England) P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.
Extent and distribution of the feature	**Future extent of habitat within the site and ability to respond to seasonal changes**	Restore the site's ability to absorb seasonal and periodic fluctuations in the extent of the H2190 habitat	This recognises the need to allow for natural fluctuations in the extent and the distribution of this habitat feature, often during particular seasons and usually as a result of natural coastal processes. Humid dune slacks are buffered from short term natural variations in hydrology including dry seasons. However, artificial drainage or a longer series of dry years with lowered water table will lead to early succession away to non-dune wetland habitat. In the medium term, a degree of dune dynamics is required to create new dune slacks.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND,

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			If loss (or gain) of area is due to natural causes, this is not a decline in condition; but any significant loss due to human interference (e.g. sand extraction, visitor impacts) is to be regarded as unfavourable. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across the site directly impacting the spatial distribution of humid dune slacks across the site. Scrub invasion is also leading to dune stabilisation and drying out of the site. A sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime is essential. Restore humid dune slack hydrology by re-creation of early-stage dune succession through scraping to raise water table in the soil. More research required to improve the understanding of the site's eco-hydrology.	European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England) P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Presence of unvegetated surfaces**	Restore an extent of bare ground or sand which is no more than 20% of the total dune slack area.	Patches of bare sand are essential for a wide range of dune invertebrates and colonisation by some bryophytes. Restore unvegetated surfaces through re-creation of early-stage dune succession through scraping and re-creation of windblown processes through notching of stable dunes.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 2017, Braunton Burrows Broad Habitat Map. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Structure and function (including its typical species)	**Vegetation community composition**	Maintain the component vegetation communities and associated transitions of the H2190 feature, allowing for successional changes in response to natural processes.	This habitat feature will comprise a number of associated semi-natural vegetation types and their transitional zones, reflecting the geographical location of the site, altitude, aspect, soil conditions (especially base-status and drainage) and vegetation management. For this feature it is unlikely that all slack communities will be represented in a single slack. It is more usual for individual slacks to be at different stages in vegetation succession, and to have slightly different hydrological regimes. The target relates to the humid dune slack resource across the whole site. There are typically 4 humid dune slack vegetation communities: SD13, SD14, SD15, SD17 and associated sandy-grassland communities at this site. This includes; • Young slack vegetation with pioneer and early stages of vegetation characterised by the SD13 community • Young or moderately old slacks with more mature vegetation which flood to some depth in winter and stay moist in summer by base-rich ground waters as represented by SD14 a scarce community, often species rich includes rarities such as *Liparis loeselii.* • Older, wetter slacks with the SD15 community which are kept wet by prolonged flooding, and where lengthy inundation through the year is essential (high water table) for the development of this kind of vegetation. • The SD17 dune vegetation type is characteristic of damp and wet dune slacks which grades into damp grasslands of fixed dunes (H2130 feature). This comprises closed swards dominated by mixtures of grasses, sedges and herbs with nationally rare species such as *Epipactis dunensis, Carex maritima* and *Teucrium scordium*.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here.
Structure and function (including its typical species)	**Vegetation structure: zonation of dune vegetation**	Restore the succession of dune slack stages (early, middle and later), with all humid slack communities present	The coastal sand dune ecosystem has a characteristic range of natural features, representing different stages of natural succession. The full representation of these stages should be maintained or where appropriate restored. The target relates to the humid dune slack resource across the whole site. The latter end of the dune slack succession which is dry dune slack is covered by H2170 Dunes with Salix repens. There are different types of dune slacks that form of this feature; pioneer, young/moderate and old, and stages within these: dune slack community sub-types: dune slack pools (permanent water bodies); dune slack pioneer swards; dune slack fens (calcareous, occasionally acidic); dune slack grasslands (humid grasslands and rushbeds); dune slack reedbeds, sedgebeds and canebeds. A mosaic of other wetland vegetation communities are frequently present within dunes (swamp/mire/tall herb fen). These are all important elements of the dune system and may have hydrological connectivitiy with the dune slack habitats. Restore target selected as pioneer humid dunes slacks decreasing through a trend towards drying out at the site. Likely impacted through scrub invasion and drainage at Saunton Golf Club and off site on Braunton Marsh. Restore pioneer humid dune slack hydrology by re-creation of early-stage dune succession through scraping to raise water table in the soil. Bare (ideally damp) sand is important at this site for many of the vascular plant assemblage species, for Petalwort and for Sand-bowl Amber Snail. Bare sand is also created by recreation and military activities and by grazing. A shifting pattern of bare sand is desirable and should be	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			spread widely across the site units.	Braunton Burrows National Nature Reserve (Available on request from Natural England) P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request.
Structure and function (including its typical species)	**Vegetation composition: trees and scrub**	Restore the cover of locally native tree and scrub species to between 5-10% as small, scattered groups, with the cover of *Salix repens* not more than 33%.	Dense cover of trees and shrubs can smother and shade out smaller and more characteristic vegetation of this habitat feature, and interrupt naturally occurring dune processes. Usually active management is required to reduce or contain its cover across this habitat feature. Apart from sea buckthorn (where it is native), other trees and shrubs would usually indicate an artificially stabilised system. The 'humid dune slack' community requires soil to be wet enough and not too dominated by creeping willow for a diverse range of forbs and some grasses to be also present. The target relates to the humid dune slack resource across the whole site. Restore target selected as high level of scrub encroachment across the site. Invasives Sea Buckthorn *hippophae rhamnoides* and Japanese Rose *Rosa rugose* are continually invading with a reduction and eradication programme undertaken on a yearly basis.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Structure and function (including its	**Vegetation composition: forb/grass**	Maintain a typically low dune vegetation sward with >30% cover of forbs and <50% cover of	Low swards required by dune species such as fen orchid. Drying and eutrophication of the slack can be indicated by increase in 'grassiness'.	This attribute will be periodically monitored as part of Natural England's site

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
typical species)	**ratio**	grasses, and occasional bryophytes (eg. *Calliergon cuspidatum, Campylium stellatum)*.	Management through grazing essential with lower stocking rates in late spring/summer.	condition assessments.
Structure and function (including its typical species)	**Vegetation: undesirable species**	Maintain the frequency/cover of the following undesirable species to within acceptable levels and prevent changes in surface condition, soils, nutrient levels or hydrology which may encourage their spread. Ragwort *Senecio jacobaea,* Creeping Thistle *Cirsium arvense,* Spear Thistle *C. vulgare*, Common Nettle *Urtica dioica,* Perennial Rye-grass *Lolium perenne,* False Oat-grass *Arrhenatherum elatius.*	Species such as *Urtica dioica, Cirsium arvense and C. vulgare* species are indicative of poor condition. Ragwort *Senecio jacobaea* is a natural constituent of dune vegetation. However, in dune slacks an abundance indicates over-stocking. Perennial rye-grass *Lolium perenne* is indicative of agricultural improvement. If *Salix repens* covers more than 33%, it is potentially indicative of drying out, and this should trigger further investigation to determine why this might be shifting to a different Annex I habitat.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here.
Structure and function (including its typical species)	**Key structural, influential and distinctive species**	Restore as necessary the abundance of the species listed to enable each of them to be a viable component of the Annex I habitat feature: *Sagina nodosa, Centaurium pulchellum, Senecio erucifolius, Rubus caesius, Trifolium fragiferum.* Early Gentian *Gentianella anglica,* Round-headed Club-rush *Scirpoides holoschoenus*, Sharp Rush J*uncus acutus,* Round-leaved Wintergreen	See notes for this attribute above in Table 3. Humid dune slacks are diverse around the coast but may include locally distinctive species - rare and local species such as *Petalopyllum ralfisii, Liparis loeselii, Pyrola rotundifolia* found mainly in this habitat plus *Epipactis dunensis, Carex maritima and Teucrium scordium.*	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
		Pyrola rotundifolia maritima, Early Marsh Orchid *Dactylorhiza incarnata coccinea,* Variegated Horsetail *Equisetum variegatum,* Fen Pondweed *Potamogeton coloratus* Water Germander *Teucrium scordium* (Schedule 8) Scrambled Egg Lichen Fulgensia fulgens String-of-sausage Lichen *Usnea articulata* Sand-bowl Amber Snail *Catinella arenaria* Petalwort *Petalopyllum ralfisii*		Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows D.T. HOLYOAK, G.A. HOLYOAK AND M. J. WILLING, 2004, Monitoring of sand-bowl amber snail catinella arenaria populations at Braunton Burrows, North Devon, in 2004. Available from Natural England on request. A.M. COPPINS AND B. J. COPPINS, 2013, Braunton Burrows SSSI, North Devon, Site Dossier of Lichen Interest. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				J. R. DOUGLASS AND B. J. COPPINS, 2013, Common Standards Monitoring for Lichens at Braunton Burrows SSSI. Available from Natural England on request. BRYAN EDWARDS DORSET ENVIRONMENTAL RECORDS CENTRE, April 2007, The Current Status of Fulgensia Fulgens Scrambled-egg Lichen in England. Available from Natural England on request. B.BENFIELD, March 2007, Braunton Burrows Biosphere Reserve, An assessment of the lichen value of dune scrub. Available from Natural England on request.
Structure and function (including its typical species)	**Soils, substrate and nutrient cycling**	Maintain the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, to within typical values for the dune habitat.	Soil is the foundation of basic ecosystem function and a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with this Annex I feature. As dune slack vegetation succession progresses, soils develop in structure and nutrient status. The soils under Humid dune slacks represent less to moderately-developed natural soils to be found on dunes.	

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature relies)	**Functional connectivity with wider coastal sedimentary system**	Restore adequate movement of sediment from all key sediment sources to the dune feature	Although Humid dune slacks do not depend in the short term on continued inputs of sand, its medium/long term survival does. Sediment supply can occur directly from the beach, indirectly from offshore, eroding cliffs etc. Primary slacks can occur on the beach plane with sufficient input of sand. Target set to restore as natural processes, particularly sediment supply, may be interrupted or prevented by coastal protection or artificial stabilisation (currently groynes at Airy Point (SS457324), rock armouring along Crow Neck to Crow Point (c.SS463321-SS466319). The Hartland Point to Anchor Head Shoreline Management Plan (SMP2) has a management policy at Braunton Burrows of 'allow natural coastal evolution to continue through no active Intervention' promoting natural processes. However, the Hold the Line policy at Westward Ho! And Skern Saltmarsh to Appledore (west) may have potential effects Braunton Burrows SAC, as continued defence at Westward Ho! limits natural processes. The managed realignment policy at Crow Point and Crow Neck may promote alternative processes that could affect the Braunton Burrows SSSI and SAC, as well as the UNESCO Biosphere Reserve's dunes. Accumulation of driftline organic material (seaweed etc.) is essential for trapping sand and initiating dune formation. Mechanical beach cleaning can adversely affect this process.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2)

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				Hartland Point to Anchor Head Summary of Draft Final SMP, Available here.
Supporting processes (on which the feature relies)	**Aeolian (wind-blow) processes**	Restore the natural movement of sand within the site, resulting from wind blow-outs and blow-throughs.	Allowing natural wind-blow (or 'aeolian') processes to operate and to allow active movement of dry sand is important. Current dune topography, including hollows reaching damp sand where slacks occur, has resulted from past within-site dune movement. Although Humid dune slacks does not depend in the short term on new dune mobility, its medium/long term survival does. Secondary slacks are created where overlying sand is blown away down to the water table/wet sand. Sustained control programme for sea buckthorn and other scrub plus appropriate grazing regime essential to reduce dune stability and enable natural windblown processes. Restore natural dune windblown processes notching of stable dunes. Assented military use of site has localised severe impacts on dune grassland and dune slacks, by creating and maintaining bare or churned areas. Assent does go some way to resolving problem, but uncertainties remain over extent and degree of impact.	
Supporting processes (on which the feature relies)	**Hydrology**	At a site, unit and/or catchment level (as necessary, restore natural hydrological processes to provide the conditions necessary to sustain the feature within the site	Defining and maintaining the appropriate hydrological regime is a key step in moving towards achieving the conservation objectives for this site and sustaining this feature. Changes in source, depth, duration, frequency, magnitude and timing of water supply can have significant implications for the assemblage of characteristic plants and animals present. This target is generic and further site-specific investigations may be required to fully inform conservation measures and/or the likelihood of impacts. For this feature; • All dune wetland vegetation communities are influenced by the water table. Each community reflects a particular past and current	RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			hydrological regime. Water table monitoring should be present on all sites with dune wetlands. • Humid dune-slacks are extremely rich and specialised habitats which are very threatened by the lowering of water tables. They require a period of wetting, with inundation to shallow depth in winter and dry in summer. • Permanent pools will sometimes occur in association with dune slacks, and can be hydrologically linked to the humid dune slack feature. There will be a suite of dune slacks within a site, all at different stages in vegetation succession, and although all linked to the same dune aquifer, may have slightly different hydrological regimes due to variations in age, elevation and management. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table. There is no apparent penetration of seawater beneath the coastal dunes. Restore target selected as hydrology regime is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows. Research is required to investigate the drivers of hydrological change and the impacts on SAC features. This needs to include an investigation of the ecology and drivers of change in humid dune slacks.	England)
Supporting processes	**Water quality**	Where the feature is dependent on surface water and/or	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality	RACHAEL BURDEN, ANDREW WILLIAMS AND

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
(on which the feature relies)		groundwater, maintain water quality and quantity to a standard which provides the necessary conditions to support the feature.	and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table. Through appropriate site management under agri-environment, i.e. no inputs etc. water pollution is minimal.	JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Supporting processes (on which the feature relies)	**Air quality**	Restore as necessary the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).	See the notes for this attribute in Table 3 above. Restore target selected as SIP for S1395 Petalwort feature states reduce the impact of atmospheric nitrogen deposition. H2190 Humid dunes slacks are the supporting habitat for Petalwort. Minimum critical load is exceeded but does not reach maximum critical load. A Site Nitrogen Action Plan is required to determine mechanisms for control, reduction and amelioration of atmospheric nitrogen impacts.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Supporting processes (on which the feature relies)	**Conservation measures**	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to restore the structure, functions and supporting processes associated with the feature	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, Site Management Strategies or Plans, the Views about Management Statement for the underpinning SSSI and/or management agreements.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Although 'natural processes' are given a high priority in sustaining site and feature integrity in dunes, active management (including livestock grazing) is sometimes required. • Management includes scrub cutting, mowing, grazing, turf-stripping and re-wetting. Mowing can prolong the younger species-rich stage of slack succession but cannot reverse the process. Reverse the fall in water tables (if anthropogenic) and/or removal of trees and scrub combined with follow-up grazing management. • Management should focus on creating new successional cycles to provide habitat for early successional species and replace that lost by accelerated succession. • Stimulation of germination from the seed bank through management may contribute to the conservation of both characteristic and threatened species typical of dune slacks. • Management practices that remove nutrients (N) from the system can mitigate the effects of N inputs but may damage fragile components. • A range of invertebrates and plants require bare sand, usually naturally created by wind blow, but sometimes where it is infrequently disturbed by vehicles or feet. The site is under appropriate habitat management through agri-environment. However, parts of the site are currently under grazed or outside of the scope of the grazing units. The habitat requires ongoing cattle or sheep grazing and clearance of native/ non-native scrub. The Hartland Point to Anchor Head Shoreline Management Plan (SMP2) has a management policy at Braunton Burrows of 'allow natural coastal evolution to continue through no active Intervention' promoting natural processes. However, the Hold the Line policy at Westward Ho! And Skern	NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. HALCROW, June 2010, North Devon and Somerset Coastal Advisory Group (NDASCAG) Shoreline Management Plan Review (SMP2) Hartland Point to Anchor Head Summary of Draft Final SMP, Available here. RACHAEL BURDEN, ANDREW WILLIAMS AND

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Saltmarsh to Appledore (west) may have potential effects Braunton Burrows SAC, as continued defence at Westward Ho! limits natural processes. The managed realignment policy at Crow Point and Crow Neck may promote alternative processes that could affect the Braunton Burrows SSSI and SAC, as well as the UNESCO Biosphere Reserve's dunes. Hydrology regime at the is impacted due to both scrub invasion following a decline in rabbit numbers in the 1950's and dainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows. Interventions required to supplement natural processes such as scraping in slacks and notching of stable dunes. Therefore target set to restore as natural processes not functioning wholly.	JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				

Table 6: Supplementary Advice for Qualifying Features: S1395 Petalwort, *Petalophyllum ralfsii*

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting processes (on which the feature and/or its supporting habitat relies)	**Conservation measures**	Restore the management measures (either within and/or outside the site boundary as appropriate) which are necessary to maintain the structure, functions and supporting processes associated with the feature and/or its supporting habitats.	Active and ongoing conservation management is needed to protect, maintain or restore this feature at this site. Further details about the necessary conservation measures for this site can be provided by contacting Natural England. This information will typically be found within, where applicable, supporting documents such as Natura 2000 Site Improvement Plan, site management strategies or plans, the Views about Management Statement for the underpinning SSSI and/or management agreements. 2018 Population stable at about 22,000 thalli. Losses from some areas (Doughnut slack and areas near Broadsands car park) but increasing in other parts of the former Broadsands Car Park. The largest Petalwort populations at Braunton Burrows, situated around the slack of the old Broadsands Car Park area remain vulnerable. It had been lost from locations in this area due to enrichment of the ground and growth of rank vegetation. Regular monitoring of the site at a 3-yearly interval is recommended to inform the management plan.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (*Petalophyllum ralfsii*) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (*Petalophyllum ralfsii*) at Braunton Burrows, North Devon. Available from Natural England on request. P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				from Natural England on request. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here.
Supporting habitat: extent and distribution	**Extent of supporting habitat**	Restore the total extent of the open dune slack habitats which support the feature to no less than 60 OS 10m grid squares at the site.	In order to contribute towards the objective of achieving an overall favourable conservation status of the feature at a UK level, it is important to maintain or if appropriate restore the extent of supporting habitats and their range within this SAC. The information available on the extent and distribution of supporting habitat used by the feature may be approximate depending on the nature, age and accuracy of data collection, and may be subject to periodic review in light of improvements in data. Scrapes have been successful at creating natural habit for the plant such as at Doughnut Slack as Broadsands Scrape. It is recommended that scrapes are made again in these former Petalwort areas to ensure the continuity of Petalwort in its more natural habitat. Petalwort grows best where the turf is short (<1cm) and open. Rabbit grazing is essential to maintain this habitat and light trampling also assists. The current recreational use of the site assists in maintain the habitat in part. However, there is an inadvertent risk of damage, where nutrient enrichment by dogs may encourage taller growth of vegetation that can overgrow Petalwort.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here. P. S. GATELEY AND P. STURGESS (JNCC), 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.
Supporting habitat: extent and distribution	**Distribution of supporting habitat**	Restore the distribution and continuity of the feature and its supporting habitat, including where applicable its component vegetation types and associated transitional vegetation types, across the site	A contraction in the range, or geographic spread, of the feature (and its component vegetation) across the site will reduce its overall area, the local diversity and variations in its structure and composition, and may undermine its resilience to adapt to future environmental changes. Contraction may also reduce and break up the continuity of a habitat within a site and how well the species feature is able to occupy and use habitat within the site. Such fragmentation may have a greater amount of open edge habitat which will differ in the amount of light, temperature, wind, and even noise that it receives compared to its interior. These conditions may not be suitable for this feature and this may affect its viability. Scrapes have been successful at creating natural habit for the plant such as at Doughnut Slack as Broadsands Scrape. It is recommended that scrapes are made again in these former Petalwort areas to ensure the continuity of Petalwort in its more natural habitat. Petalwort grows best where the turf is short (<1cm) and open. Rabbit grazing is essential to maintain this habitat and light trampling also assists.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England here. NATURAL ENGLAND, European Site Conservation Objectives for Braunton Burrows SAC (UK0012570), Available from Natural England here. NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			The current recreational use of the site assists in maintain the habitat in part. However, there is an inadvertent risk of damage, where nutrient enrichment by dogs may encourage taller growth of vegetation that can overgrow Petalwort	P. S. GATELEY AND P. STURGESS (JNCC) , 1990, Sand Dune Survey of Great Britain, Site report number 138: Braunton Burrows. Available from Natural England on request. NATURAL ENGLAND, 1986, Braunton Burrows SSSI Citation. Available here. M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.
Supporting processes (on which the feature and/or its supporting habitat relies)	**Adaptation and resilience**	Restore the feature's ability, and that of its supporting habitat, to adapt or evolve to wider environmental change, either within or external to the site	This recognises the increasing likelihood of supporting habitat features to absorb or adapt to wider environmental changes. Resilience may be described as the ability of an ecological system to cope with, and adapt to environmental stress and change whilst retaining the same basic structure and ways of functioning. Such environmental changes may include changes in sea levels, precipitation and temperature for example, which are likely to affect the extent, distribution, composition and functioning of a feature within a site. The vulnerability and response of features to such changes will vary. Using best available information, any necessary or likely adaptation or adjustment by the feature and its management in response to actual or expected climatic change should be allowed for, as far as practicable, in order to ensure the feature's long-term viability.	M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
Supporting habitat: structure/function	**Soils, substrate and nutrient cycling**	Restore the properties of the underlying soil types, including structure, bulk density, total carbon, pH, soil nutrient status and fungal:bacterial ratio, within typical values for the feature's supporting habitat	Soil supports basic ecosystem function and is a vital part of the natural environment. Its properties strongly influence the colonisation, growth and distribution of those plant species which together form vegetation types, and therefore provides a habitat used by a wide range of organisms. Soil biodiversity has a vital role to recycle organic matter. Changes to natural soil properties may therefore affect the ecological structure, function and processes associated with the supporting habitat of this Annex II feature.	M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.
Supporting processes (on which the feature and/or its supporting habitat relies)	**Water quantity/ quality**	Restore water quality and quantity to a standard which provides the necessary conditions to support the feature	For many SAC features which are dependent on wetland habitats supported by surface and/or ground water, maintaining the quality and quantity of water supply will be critical, especially at certain times of year. Poor water quality and inadequate quantities of water can adversely affect the structure and function of this habitat type. Typically, meeting the surface water and groundwater environmental standards set out by the Water Framework Directive (WFD 2000/60/EC) will also be sufficient to support the achievement of SAC Conservation Objectives but in some cases more stringent standards may be needed to reflect the ecological needs of the species feature. Further site-specific investigations may be required to establish appropriate water quality standards for the SAC. The dune system perched on low lying ground acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Percolating waters accumulate over impermeable sub-surface deposits to form a dome shaped water table. There is no apparent penetration of seawater beneath the coastal dunes. Hydrology regime is being impacted due to scrub invasion following a decline in rabbit numbers in the	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request. RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			1950's. Continued management through scrub clearance and grazing is critical. Create scrapes to ensure the continuity of Petalwort in its more natural habitat.	Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Supporting processes (on which the feature and/or its supporting habitat relies)	**Air quality**	Restore as necessary the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for the feature's supporting habitat on the Air Pollution Information System (www.apis.ac.uk).	See the notes above in Table 3 above. Increased nitrogen deposition may accelerate the growth of taller dune vegetation such as grasses that may overgrow and smother this very small liverwort. Restore target selected as SIP for this feature states reduce the impact of atmospheric nitrogen deposition. Minimum critical load is exceeded but does not reach maximum critical load. A Site Nitrogen Action Plan is required to determine mechanisms for control, reduction and amelioration of atmospheric nitrogen impacts.	More information about site-relevant Critical Loads and Levels for this SAC is available by using the 'search by site' tool on the Air Pollution Information System (www.apis.ac.uk). NATURAL ENGLAND, Braunton Burrows SAC IPENS Site Improvement Plan, Available from Natural England here.
Supporting habitat: structure/function	**Bare Ground**	Ensure areas supporting Petalwort contain at least 5% bare ground and the height of overall vegetation structure is predominantly short.	P. ralfsii tolerates only light shading, and most sites supporting the species have persistently very low vegetation that includes many small perennials, which is maintained by low nutrient levels and often by intense grazing by rabbits, plus on some sites light trampling pressure. Most sites also have at least some bare ground, commonly 10-50% bare sandy ground amongst low vegetation, although P. ralfsii can grow in a very thin low cover of grasses and low herbs. Grazing by rabbits is often important in the maintenance of this low structure. If such grazing becomes reduced or is not sufficient, then periodic clearance of tall vegetation and scrub with removal of arisings may be required. Management supported by agri-environment essential to ensure appropriate grazing and enable scrub clearance of both non-native and natives. Recreation of natural processes by scraping to raise the water table required to support structure.	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
				D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.
Supporting habitat: structure/function	**Scrub and tree cover**	Restore the cover of scrub and trees from within habitat supporting Petalwort to less than 5%, and absent from its primary areas	Invasive scrub is very harmful to Petalwort which tolerates only light shading. Scrub species that can be a particular problem in dune slacks include sea buckthorn, bramble and birch, and excessive creeping willow is also undesirable. Continued management through scrub clearance and grazing is critical	This attribute will be periodically monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.
Supporting processes (on which the feature and/or its supporting habitat relies)	**Disturbance from human activity**	Maintain light to moderate levels of trampling to benefit the feature	Petalwort requires firm or compacted substrates and avoids very loose or mobile sand, thus excessive disturbance will be harmful. There is a narrow zone of disturbance intensity that provides the right conditions - too much and the ground remains too unstable for establishment, whilst too little and the ground may become overgrown by a closed turf. There should be no excessive disturbance to dune slacks or other sandy	M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			ground supporting Petalwort, for example caused by excessive trampling or jogging, or the use of vehicles or scrambler motorbikes. The recreational use of the site assists in maintain the habitat in part. However, there is a risk of damage, particularly by the presence of dogs. Assented military use of site has localised severe impacts on dune grassland and dune slacks, by creating and maintaining bare or churned areas. Assent does go some way to resolving problem, but uncertainties remain over extent and degree of impact.	D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.
Supporting habitat: structure/ function	**Hydrological regime**	Restore water levels at sites supporting Petalwort at or to a level sufficient to support the species, in particular water tables should not be lowered and should be allowed to naturally fluctuate. Water tables in dune slack sites should be at or above the ground surface during the majority of the winter months.	Petalwort favours damp sites with the water table at or near the surface. Most sites are dry for parts of a normal summer and wet or flooded during at least some winters. Ponds dug or deepened in dune slacks for conservation purposes for amphibians, in particular Natterjack Toads, should be sited far enough away from petalwort populations to prevent the damage that might be caused directly or e.g. by increasing trampling levels nearby. Hydrology regime is impacted due to scrub invasion following a decline in rabbit numbers in the 1950's. Continued management through scrub clearance and grazing is critical. It is likely that drainage at both Saunton Sands Golf Club and Braunton Burrows leads to a lowering of the water table across Braunton Burrows. Create scrapes to ensure the continuity of Petalwort in its more natural habitat. Research is required to investigate the drivers of hydrological change and the impacts on SAC features. This needs to include an investigation of the ecology and drivers of change in humid dune slacks.	NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Supporting habitat:	**Nutrient status**	Maintain the nutrient status to naturally expected levels,	This feature is particularly sensitive to small-scale changes in its supporting habitat's structure. Raised nutrient levels through	This attribute will be periodically

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
structure/ function		avoiding pollution and activities that increase nutrient levels which promote algal growth in dune slacks, or an increase in species such as common nettle and rye grass.	pollution is likely to be damaging, and increased nutrient levels will promote the growth of other vegetation that will out-compete and shade out the diminutive *P. ralfsii*. Excessive algal growth in dune slacks and an increase in species such as common nettle and rye grass are likely to be indicative of raised nutrient levels. The dune system acts in itself as an isolated catchment, largely dependent on precipitation for groundwater recharge. Maintain target selected as current management restricts water pollution through no inputs.	monitored as part of Natural England's site condition assessments. NATURAL ENGLAND. 2010. Braunton Burrows: Definitions of favourable condition for designated features of interest (draft). Available from Natural England RACHAEL BURDEN, ANDREW WILLIAMS AND JOHN DOWD, 1994, A Hydrological Investigation of Three Devon Sand Dunes Systems – A Detailed Analysis and Discussion of English Nature's Hydrological Data for Braunton Burrows National Nature Reserve (Available on request from Natural England)
Population (of the feature)	**Population abundance (within the SAC)**	Maintain the abundance of the Petalwort population to a level which is consistently above 22,000 thalli across 60 OS 10m grid squares, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.	This will ensure there is a viable population of the feature which is being maintained at or increased to a level that contributes as appropriate to its Favourable Conservation Status across its natural range in the UK. Due to the dynamic nature of population change, the target-value given for the population size or presence of this feature is considered to be the minimum standard for conservation/restoration measures to achieve. This minimum-value may be revised where there is evidence to show that a population's size or presence has significantly changed as a result of natural factors or management measures and has been stable at or above a new level over a considerable period. The values given here may also be updated in future to reflect any strategic objectives which may be set at a national level for this feature.	M. J. STRIBLEY, 2018, Monitoring survey for Petalwort (Petalophyllum ralfsii) at selected sites in Devon and Cornwall 2017/2018. Available from Natural England on request. D. T. HOLYOAK, 2005, Survey and Monitoring of Petalwort (Petalophyllum ralfsii) at Braunton Burrows, North Devon. Available from Natural England on request.

Attributes		Targets	Supporting and Explanatory Notes	Sources of site-based evidence (where available)
			Given the likely fluctuations in numbers over time, any impact-assessments should focus on the current size of the site's population, as derived from the latest known or estimated level established using the best available data. This advice accords with the obligation to avoid deterioration of the site or significant disturbance of the species for which the site is designated, and seeks to avoid plans or projects that may affect the site giving rise to the risk of deterioration. Similarly, where there is evidence to show that a feature has historically been more abundant than the stated minimum target and its current level, the ongoing capacity of the site to accommodate the feature at such higher levels in future should also be taken into account in any assessment. Unless otherwise stated, the population size or presence will be that measured using standard methods, such as peak mean counts or breeding surveys. This value is also provided recognising there will be inherent variability as a result of natural fluctuations and margins of error during data collection. Whilst we will endeavour to keep these values as up to date as possible, local Natural England staff can advise that the figures stated are the best available.	
Version Control Advice last updated: n/a				
Variations from national feature-framework of integrity-guidance: n/a				