



National Review of Statutory Habitat Compensation Associated with Flood and Coastal Risk Management Activity

Progress Report

January 2018

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Acting to reduce the impacts of a changing climate on people and wildlife is at the heart of everything we do.

We reduce the risks to people, properties and businesses from flooding and coastal erosion.

We protect and improve the quality of water, making sure there is enough for people, businesses, agriculture and the environment. Our work helps to ensure people can enjoy the water environment through angling and navigation.

We look after land quality, promote sustainable land management and help protect and enhance wildlife habitats. And we work closely with businesses to help them comply with environmental regulations.

We can't do this alone. We work with government, local councils, businesses, civil society groups and communities to make our environment a better place for people and wildlife.

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1. Introduction

England has a diverse range of internationally important habitats, particularly wetlands, which have been - or may in future be - affected by work to protect people and property from flooding or erosion. The issue of future habitat loss arising from this activity is largely experienced at the coast. Coasts are dynamic, and this dynamism is part of what makes the coastal environment diverse and attractive. However, the complex demands society makes on our coasts means this natural dynamism is often interrupted, reversed or modified. Coupled with the pressures of sea level change, this can over time lead to habitat loss both on and behind the shoreline.

The natural change that occurs along our shores can play out at many scales, from decades of shoreline evolution to overnight losses of land through flooding or erosion. Coastal habitats can expand or retreat, a pattern that can be seen at both a regional scale and within an individual estuary. All this can make the impacts of flood and coastal erosion risk management and natural coastal evolution difficult to disentangle, especially when predicting the long term future.

Many of our coastal habitat areas are internationally protected under European Law. Under this protection, loss or damage to the habitat must be avoided unless the damaging activity is in the over-riding public interest. In such cases - which includes many flood and erosion risk management interventions - the loss or damage must be compensated in advance, in order to maintain the ecological integrity of this special network of sites.

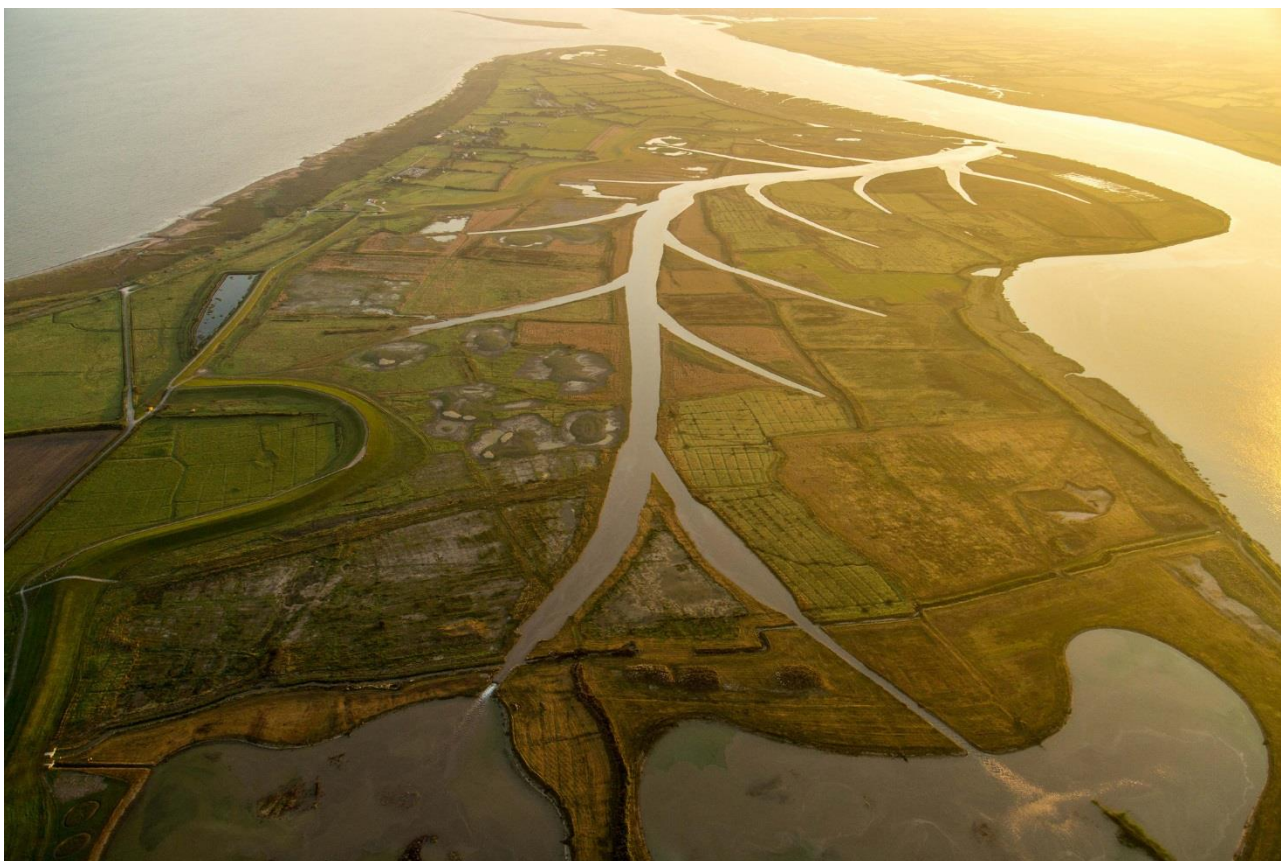


Fig.1 Steart Habitat Compensation Scheme, Severn Estuary

The Environment Agency has been working to both restore historic habitat loss and address anticipated losses at important protected areas for many years. We aim to achieve this cost-effectively to the taxpayer through economies of scale, optimum site choice and being flexible and responsive to changing priorities and opportunities. We also seek to use our habitat compensation work to raise awareness of the benefits to people living and working locally. These benefits are usually a combination of improved flood protection and an improved coastal environment, both of which can help stimulate the local economy and improve health and wellbeing.

Although primarily reporting on legal compliance, the information below also describes the outcome of many years fostering close partnership and communication, expert scientific and operational techniques, and careful project management. Whilst they essentially maintain a 'status quo' in terms of internationally protected area, some of the compensation sites below have given the coastal environment important profile, developed industry understanding and practice, improved the lives of local communities and have become international models of habitat creation.

We are currently achieving - and in some places temporarily exceeding - our ambition to maintain habitat area in the face of ongoing losses in most parts of the country. However current evidence suggests we will generally need to maintain or increase the pace of habitat compensation in the next ten years or so. The new information on the impacts of climate change on sea level and storm surge in the UK Climate Projections 2018 have yet to be considered in our analyses of future change. Equally, an increasing body of monitoring data suggests the rate of habitat loss may not be as high as was once thought at some parts of the coast. Our challenge will be to balance the strategic approach we take to creating habitat with the need to adapt our programme of work to changing evidence, whilst working with others to create more great places for people and wildlife.

2. This Report

2.1 What this report is about

This report is an update to the *National Annual Review of Habitat Creation Programmes* (Environment Agency, March 2013), and reports progress towards creating compensatory habitat for loss of internationally protected wildlife sitesⁱ resulting from flood and coastal risk management (FCRM) activity to December 2017. It therefore demonstrates how we are complying with UK legislation that protects our most important wildlife habitats. This legislation transposes the EU Habitats and Birds Directives (referred to as the Nature Directives) and the UK's commitments under the Ramsar Conventionⁱ.

We approve all coastal FCRM schemes in large-scale plans and more localised strategies, and ensure that the necessary legal obligations associated with this approval are carried out. These plans and strategies look long term and set the direction of travel for FCRM investment: potential risks to protected areas associated with plan or strategy delivery are identified, addressed and communicated - via this report - early.

2.2 Why this report is needed

FCRM Risk Management Authorities (RMAs)ⁱⁱ, their partners and stakeholders, the Government and the public should have confidence that our activity to better protect people and communities from flooding is not adversely affecting the Natura 2000 site network.

We have agreed with Defra and Natural England that we will provide updates on compliance every two years. The information within this report is a snapshot in time, particularly in relation to the current understanding of future habitat compensation needs and the potential opportunities to address them identified around England. This understanding is constantly evolving with new evidence from monitoring and modelling, and with potential schemes progressing or being abandoned or revised.

2.3 The scope of the report

This report catalogues habitat compensation arising from Article 6(4) of the Habitats Directive:

1. direct losses of designated habitat arising from FCRM activityⁱⁱⁱ;
2. losses arising from the reduced ability of coastal habitats to evolve naturally over time due to FCRM activity, commonly referred to as coastal squeeze;

However, important areas of replacement habitat pertaining to site deterioration under Article 6(2) of the Habitats Directive or under other legislation are also discussed. The primary focus of this report is on 2. above. Losses and compensation projects detailed in this report include all RMAs, not just the Environment Agency.

The report does not include those areas of habitat we create as part of, or associated with, work to manage flood risk which is not explicitly designed to compensate for losses of internationally protected habitat elsewhere. For example, we may create, restore or otherwise modify 'natural' features for flood or erosion risk management purposes, and we frequently seek to dovetail the broader work of the Environment Agency with habitat compensation measures to get the best outcomes for people and wildlife.

2.3.2 Habitat area and habitat quality

This document focuses on the *area* of habitat created in response to compensatory requirements (the habitat account assessment). However, the Nature Directives require us to maintain Favourable Conservation Status of both the habitats and the species assemblages using them, for which the sites have been designated. Compensation sites must demonstrate this status prior to losses of the original protected area.

Behind the summary figures shown in section 4 there is, therefore, a body of work to ensure the *quality* of habitat created is such that target species use it in stable or increasing numbers relative to the site of loss. The quality of habitat compensation sites is not the focus of this report, but is an important part of our work and has been the subject of a recent review by Natural England^{iv}. More focus will be given to this quality element in future reports.

2.3.3 Historic damage to the coastal environment

As well as commitments towards compensating in advance towards projected habitat loss, we have committed to creating habitat to address estimated historic losses from coastal squeeze across coastal protected areas. The nominal reference point for looking at historic losses to Natura 2000 sites is 1994^v, notwithstanding that much coastal habitat had already been lost by this date. Nationally protected habitats extend beyond the European Natura 2000 network, potentially requiring further remedial measures, and in practice such reference points are only a broad guide to the work required to achieve a healthy coastal environment.

Separate targets were established in 2007 for each estuary complex that were considered the minimum needed to begin site recovery to this reference point. Further work may be required to complete that recovery in a way that is sustainable into the future. Compensating for the future losses highlighted in this report will then maintain that ecological value.

The figures presented in this report are adjusted to reflect these previous commitments. For example, the Steart managed re-alignment project in the Severn Estuary created 277ha of inter-tidal habitat in total, but 237ha is reported here as compensation for predicted losses in the Severn Estuary Strategy, as 40ha have already been apportioned to addressing historic losses. We are currently discussing with Natural England the scale of any further work required to complete site recovery in each estuary complex. Once agreed in light of the latest evidence surrounding historic losses, any further requirements will be reflected in our next report.

3. The Habitat Compensation Programmes

3.1 Background

Our Habitat Compensation Programmes are led by experienced operational staff, in close co-operation with Natural England and a range of organisations interested in being part of their delivery. The Programmes operate to discrete geographical areas that best reflect both our administrative structure and sensible ecological units. For example, the South Wessex programme focusses upon the Poole and Wareham Strategy area, and the Severn, Thames and Humber each have a discrete Programme to match their respective FCRM Strategies. Other Programmes are driven by the requirements set out in the Habitats Regulations Assessments of Shoreline Management Plans (SMPs) - from which most of our current habitat compensation needs originally arose.



Fig.2 Developing inter-tidal habitat at Medmerry managed realignment, West Sussex

Using this scale means we can look strategically both at the likely evolution of wetlands and shorelines, and at the suite of opportunities to create habitat cost-effectively. This proactive approach may involve anticipatory land acquisition by us in advance of loss, to ensure we can accommodate the potentially long lead-in times for ecologically functional compensatory habitat to be established.

Our approach is supported by Government policy (*Managed Re-alignment: Purchase, Compensation and Payment for Alternative Beneficial Land Use*, Defra 2003), and has been praised by the European Commission. We also explore alternative approaches to secure land such as long term leasing or acquiring rights for habitat creation on third party land.

A summary of the Habitat Compensation Programme boundaries is provided in Appendix 1. In each Habitat Compensation Programme area, we maintain a consistent data base to record and report progress, and compensation sites are now being digitised on a GIS that will contain site-level information on size, features, drivers for site creation and conservation status.

3.2 Funding

The work of the Programmes is primarily funded as part of the FCRM capital investment programme approved by Regional Flood and Coastal Committees (RFCCs). As with other elements of the investment programme, funding of new sites may be done in partnership, where other parties 'buy in' to our Programmes to achieve economies of scale. Other funds (such as Heritage Lottery Fund) may be sought to create habitat, and we may similarly seek to 'buy in' to third party schemes, such as our purchase of an 18.4ha interest in the DP World port compensation scheme at Saltfleet Flats on the Thames Estuary.

3.3 Accountability

Environment Agency FCRM Partnership and Strategic Overview (PSO) teams maintain an understanding of requirements and progress in their respective Areas, although the choice of staff to lead delivery in a given Habitat Compensation Programme will remain flexible depending upon local resources and expertise.

Environment Agency Area FCRM Managers will be accountable for ensuring FCRM activity in their Area is compliant with the Habitats Regulations.

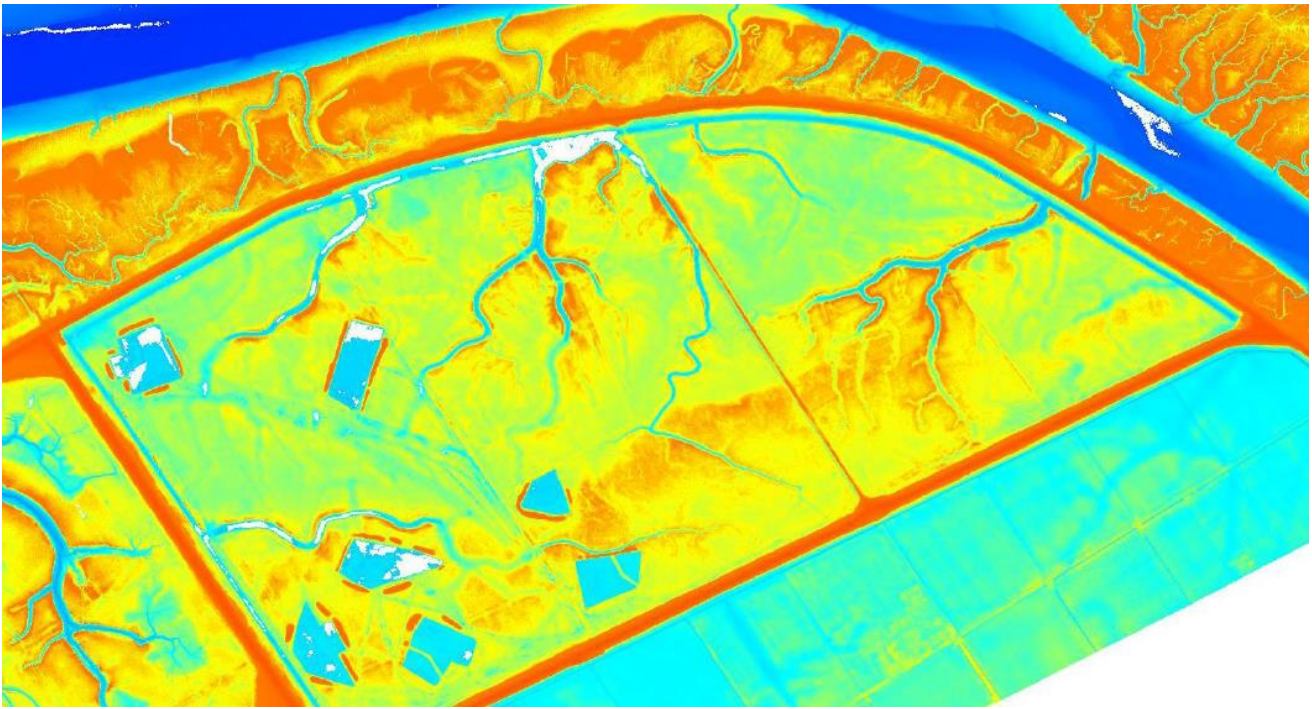


Fig 3 Light Detection and Ranging (LIDAR) assessment of new Hesketh Out Marsh East managed re-alignment site, Lancashire

4. Habitat Account Assessment

4.1 Background to the figures

The summary assessment in Table 1 below, and the more detailed analyses in Appendix 2 provide a snapshot, by Habitat Compensation Programme (HCP) area, of our current understanding of progress towards compensating for projected Natura 2000 habitat loss in England. Figures have been provided by local HCP leads and supported by analysis of the Environment Agency Conservation Projects Database and Project Performance Management Tool.

4.1.1 Projections of habitat change

The projected area of habitat loss associated with FCRM activity at the coast (**'Within-Epoch Change'**) is usually found in the documents associated with the Habitats Regulations Assessment (HRA) of Shoreline Management Plans and/or coastal and estuary FCRM Strategies. The SMPs and Strategies that give rise to a habitat compensation need in a given HCP area are listed in the second column of Tables A1-A10, although their individual requirements are not provided here, as these may overlap or otherwise inter-relate in ways that are too complex for the purposes of this summary report.

Instead, the total projected habitat change for each broad **'Habitat Type'** resulting from all of these SMPs and Strategies combined within a HCP area is shown. This change is set out for each of the three planning horizons, or 'epochs', typically considered by SMPs and FCRM Strategies at the coast. These epochs are denoted by the dates 2025 (epoch 1), 2050 (epoch 2) and 2100 (epoch 3), but they must be considered to be approximate guides rather than fixed dates due to the uncertainty surrounding projections of habitat loss (and coastal management policy), especially beyond epoch 2.

Our report in 2013 did not consider beyond epoch 1, but acknowledged that given the long lead-in times for creating habitat and the need for a more strategic understanding of the task ahead, figures beyond epoch 1 should be considered. This report addresses that recommendation, with the caveat that and all figures for habitat change so far in advance must be considered highly conjectural and subject to potentially significant change.

In many areas fresh analysis of habitat change is being done and in some areas such as the Humber, no estimates of habitat change have been attempted beyond epoch 2. The Environment Agency and Natural England are in the process of commissioning a general review of where projections may be based upon calculations that are too simplistic in their assumptions, which may revise the need for habitat creation up or down in various places.

It is important to note that in some areas there is an overall projected *increase* in the amount of habitat, due to the processes of natural accretion of sediment for example. The figures of 'Within-Epoch Change' are therefore given a + or - to denote the discrete estimates of gain or loss in habitat area within each epoch.

4.1.2 Reporting habitat compensation

Our past and current compensation work ('**Habitat Compensation**') is monitored by local HCP leads. We have been creating compensatory habitat to address projected losses associated with SMPs and FCRM Strategies for some years, in some areas before the most recent iteration of a strategic plan was adopted. We are also progressing habitat creation schemes now, with a high degree of confidence in their completion. Work done, or being done with high confidence, is denoted '**H**'. In some cases, some uncertainty remains about completion date and the precise area of different habitat types that will be created - this is denoted '**M**', medium confidence.

4.1.3 Habitat account balance and potential future work

The '**Cumulative Balance**' is the difference between the projected loss and the habitat compensation done or underway - i.e. what the habitat account balance would progressively look like if we completed all current 'H' and 'M' work but did nothing more between now and c.2100.

In each HCP area there is a pipeline of potential habitat compensation sites that may address any deficit. The total area of sites identified within this pipeline is provided under '**P**'. Beneath 'P' lies a broad spectrum of delivery confidence, ranging from defined areas where landowner discussions are already underway, partnerships are being established and permissions or purchase sought, to a greater body of sites where we are exploring potential or reserving for future negotiation depending upon the actual scale of need over time.

These figures reflect discussions with HCP Leads. However, because in many cases the site locations or the negotiations surrounding them can be sensitive in nature, this report does not generally detail the location of pipeline sites.

4.1.4 Further detail

Clearly, the figures presented in Table 1 and even the more detailed Appendix 2 are summary reflections of a complex picture that is being continuously refined - even, in some cases, as this report is being written. For each HCP area, some further detail is provided with these tables. Any discrepancies between the figures used in this report and our report from 2013 are explained.

The nature of habitat compensation schemes is such that we should not expect an exact 'match' between loss and gain. In most cases, unless otherwise stated, the expectation from Natural England is that strategic compensation in advance of losses of Natura 2000 sites due to coastal squeeze is provided at a ratio of 1:1. Our minimum requirement is therefore to create at least as much habitat as has been lost, unless Natural England specifically agrees a lower amount is acceptable due to, for example, the enhanced ecological characteristics of the compensation site.

However, extra habitat may be 'incidentally' created either because the land parcel purchased or leased enables it, or the topography/hydrology favours it. This extra delivery may help deliver our other environmental objectives, provide a 'buffer' for the compensatory habitat or otherwise enhance its ecological functionality, or attract funding from external parties wishing to buy into or co-deliver the scheme. Where extra habitat is created as part of a Natura 2000 compensation site, this is also reflected in the details in Appendix 2 below.

Table 1: Summary of progress towards compensation by FCRM Risk Management Authorities for ongoing and future losses of coastal habitats in England to December 2017. Figures in (brackets) are conjectural: some HCP areas have not calculated epoch 2-3 habitat loss.

HCP area	Habitat Type	Within Epoch Change			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
North West HCP	Saltmarsh/Mudflat	-162	-	-	162	-	162	(0)	(0)	(0)	-
Severn Estuary HCP	Saltmarsh/Mudflat	-300	-318	-765	288	0	288	-12	-330	-1095	1697
Devon & Cornwall HCP	Saltmarsh/Mudflat	-25	0	0	0	44	44	+19	+19	+19	26
	Grazing Marsh	-13	0	0	0	45	45	+32	+32	+32	0
South Wessex HCP	Saltmarsh/Mudflat	-37	-86	-313	0	0	0	-37	-123	-436	92
	Grazing Marsh	-2	-3	-4	0	0	0	-2	-5	-9	12
	Other	-21	-11	-30	0	0	0	-21	-32	-62	62
Solent & South Downs HCP	Saltmarsh/Mudflat	-80	-88	-207	104	0	104	+24	-64	-271	240
	Grazing Marsh	0	-70	-6	69	0	69	+69	-1	-7	-45
	Other	0	-4	0	10	0	10	+10	+6	+6	0
South East HCP	Saltmarsh/Mudflat	-64	-97	-148	16	0	16	-48	-145	-293	(TBC)
	Grazing marsh	0	-4	0	164	0	164	+164	+160	+160	-160
	Other	-16	-	-	0	6	6	-10	(-10)	(-10)	0

HCP area	Habitat Type	Within Epoch Change			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Thames HCP	Saltmarsh/Mudflat	-58	-105	-615	18	56	74	+16	-89	-704	976
	Grazing Marsh	0	0	0	0	0	0	0	0	0	-779
East Anglia HCP	Saltmarsh	-21	-	-	21	0	21	0	(0)	(0)	50
	Grazing Marsh	-91	-	-	150	20	170	+79	(+79)	(+79)	100
	Other	-212	-32	-	216	35	251	+39	+7	(+7)	32
Humber HCP	Saltmarsh/Mudflat	-254	-159	-	272	314	586	+332	+173	(+173)	516
	Other	-25	-	-	6	19	25	0	(0)	(0)	
North East HCP	Saltmarsh/Mudflat	-20	-	-	22	-	22	+2	(+2)	(+2)	-

HCP area	Habitat Type	Within Epoch Change			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
ALL COMBINED	Saltmarsh/Mudflat	-1021	(-853)	(-2048)	903	414	1317	+296	(-557)	(-2605)	3577
	Grazing Marsh	-106	(-77)	(-10)	383	65	448	+342	(+265)	(+255)	-872
	Other	-274	(-47)	(-30)	232	60	292	+18	(-29)	(-59)	94

5. Assessment of progress

5.1 Inter-tidal habitats

Total epoch 1 predicted balance (Σ cumulative balance, epoch 1 Table 1) in England: **+296ha**.

5.1.1 Key considerations

Clearly, large schemes such as Steart, Wallasea and Medmerry have been instrumental in meeting our statutory requirements, but much of this positive balance is provided by the Humber Estuary, which benefits from a series of large historic and ongoing managed re-alignment schemes, including Alkborough Flats in the heavily accreting inner estuary. Elsewhere in the Humber, and elsewhere in the country, there is a closer alignment between projected loss and expected compensation. In some areas such as the Severn, there is a minor shortfall to be addressed as we prepare for epoch 2. Such minor under- or (more commonly) over- delivery should be expected given the unpredictable parcels of opportunity to be found through the HCP, and the uncertainty surrounding compensation need. However, we adopt a precautionary principle in line with the guidance associated with the Nature Directives, so will seek to address shortfalls as we transition to epoch 2.

This +296ha balance is a work in progress. Ongoing work at the Humber, principally Donna Nook Phase 2 and Skeffling, and the Exe and Tamar in Devon is to be completed. Not included in the figure is the 92ha scheme at Arne Moors, as it is in early stages. The balance is, however, to some extent dependent upon further analysis and subsequent agreement with Natural England regarding our intended use of Wallasea Island for compensation in the Thames, and of Great Bells Farm for grazing marsh compensation enabling a realignment in the Medway and Swale Strategy.

5.1.2 Saltmarsh and mudflat

The interplay between mudflat and saltmarsh is also complex, and experience has shown that tight management of their relative extent is difficult to realise, despite appreciation of the different niches they provide in the coastal ecosystem. On the south and south-east coasts, the two habitats have been explicitly separated with an attempt to account for each discretely. Poole and Wareham in particular will require a focus on mudflat alongside saltmarsh compensation over time, whilst elsewhere mudflat is either naturally accreting through sediment deposition (as in some parts of the Humber) or otherwise extending through saltmarsh lowering (e.g. in the Medway and Swale).

5.1.3 Confidence in current projections

Beyond epoch 1, the evolution of inter-tidal habitats across England's estuaries is unpredictable, and our understanding of it is constantly evolving. This makes projections beyond the first planning horizon to approximately 2025 provisional and, in some cases such as the Thames, highly uncertain and likely to change. Even current assessments of annual saltmarsh loss vary: estimates in Essex and South Suffolk associated with the SMP were in the order of 44ha per year, but these were revised down in a subsequent analysis to less than 1ha/year. Such margins of error threaten to undermine confidence in our delivery model: in turn this can clearly have significant implications for maintaining the quality and resilience of the Natura 2000 network, the demands upon the FCRM investment programme, and its environmental performance well into the future.

This highlights the importance of monitoring inter-tidal habitat extent (as a minimum) to a consistent methodology aligned to the baseline information in the 2010 Environment Agency Saltmarsh Survey, to supply a more robust evidence base on which to make decisions. This is especially important in locations such as Essex and South Suffolk where no working predictions for potential requirements beyond epoch 1 exist. Tables A1-10 suggest there is potentially significant work to do to establish compensatory inter-tidal habitats for the longer term, for which preparation should start soon.

5.2 Grazing Marsh

Total epoch 1 predicted balance (Σ cumulative balance, epoch 1 Table 1) in England: **+342ha**.

5.2.1 Key considerations

The compensatory requirement for freshwater habitat, especially coastal floodplain grazing marsh (broadly defined), is in most cases directly dependent upon the management decisions relating to the adjacent inter-tidal area. The Ouse Washes grazing marsh habitats have not been included in the account balance figures in this report, on the basis that they constitute replacement habitat for deterioration in quality of the SPA rather than compensation for loss under Article 6(4) of the Habitats Directive - although these reports will increasingly seek to reflect this type of work and a paragraph detailing progress has been included under Table A8.

5.2.2 Managed realignment over grazing marsh

In particular, grazing marsh requirements are strongly influenced by the site of managed re-alignment schemes, which may create compensatory inter-tidal habitat in place of the existing Natura 2000 grazing marsh - which will, in turn, need to be compensated for if the integrity of our Natura 2000 sites is to be maintained. In Tables A1-A10, any grazing marsh already lost and compensated for in this way has been incorporated to provide a 'net' balance.

Where the direct grazing marsh 'cost' of *potential* pipeline managed realignment sites is known, such as in the Thames and the Solent & South Downs, this is expressed as a negative figure under column 'P'.

The Severn has a high number of potential managed re-alignment sites in column 'P' but they have a high degree of uncertainty attached, and the grazing marsh cost has not been calculated. In East Anglia, most potential pipeline sites have yet to be defined more closely and are not included in the analysis, but many are likely to involve loss of grazing marsh leading to significant future compensation needs not quantified in Table A8 but totalling hundreds of hectares. Equally, this area is currently well-provisioned for grazing marsh, as the Frampton Marsh site (94ha) was not required for compensation it was originally intended for: it now therefore anticipates the likely need in epoch 2.

In the Medway and Swale, 160ha of grazing Marsh at Great Bells Farm has essentially been allocated as compensation for a potential managed re-alignment scheme, but this has yet to be agreed with Natural England and so currently forms part of our positive balance. Similarly, the 69ha so far created in the Solent and South Downs anticipates greater losses in epoch 2, so in summary the current positive balance of grazing marsh should be considered a temporary surplus prior to a future spike in need.

5.3 Reedbed

Total epoch 1 predicted balance (cumulative balance, epoch 1 Table A8) in England: **+39ha**

East Anglia is the focus for reedbed habitat losses, most of which are already being experienced behind the natural shoreline barriers of Suffolk and Norfolk. Progress towards compensating for these losses has been strong since our 2013 report, with 251ha now created or in progress close to the sites of loss.

5.4 Other habitats

Despite the focus on compensation for loss of inter-tidal and freshwater marsh within the HCP, other habitat both at the coast and inland is also identified, some of which presents unique challenges for re-creation elsewhere. Saline lagoons and shingle features can be especially difficult to reproduce artificially elsewhere without the specific conditions that nurtured them at the site of loss. Scrub and open freshwater features are easier but may still have specific management needs relative to the features of interest, so location is still important.

35ha of potential saline lagoon habitat has been found as part of the Poole and Wareham Strategy. A maximum of 10km of vegetated shingle being lost as part of the Folkstone to Cliff End Strategy is yet to be re-created. Further losses of shingle habitat supporting

specific bird species such as little tern are being lost to coastal squeeze around the country, such as in the Dee, Solent, Hamford Water and the Humber, which are now being quantified and will be addressed in our next report. Losses to other habitat types within England's Natura 2000 network resulting from FCRM activity are small.

Note that in our 2013 report, we highlighted 450ha of other habitat types being created, most of which was not strictly speaking compensatory habitat for Natura 2000 sites and is consequently not included in this analysis.

6. Conclusion and priorities

The Environment Agency is on track to deliver its epoch 1 statutory obligations towards compensating ecologically functional habitat in advance of loss across the Natura 2000 network arising from the strategic FCRM plans and strategies we approve. Current shortfalls in specific areas are generally minor, have been recognised and are expected to be addressed prior to loss at the existing designated sites.

Further work:

Agree scale of remaining commitment required to address historic losses to nationally and internationally designated sites with Natural England.

This assessment is subject to further exploration with Natural England as to the evidence base relating to historic habitat loss that has driven the suite of SSSIs into Unfavourable condition in the past, and any further remedial measures associated with that historic loss prior to compensation for losses anticipated in the future (see section 2.3.3 of this report).

Use SMP and Coastal Strategy reviews to incorporate the latest research and monitoring into projections of habitat loss associated with long term FCRM management policies.

Significant uncertainty surrounds the scale of the task in epoch 2 to maintain network integrity. Some HCPs have working projections for epoch 2 and even epoch 3 losses, but a stronger monitoring base coupled with R&D outputs such as from Natural England's Improvement Programme for England's Natura 2000 Sites (IPENS) should, over the next five years or so, refine our understanding with an evidence base that can be better used to justify development of future habitat compensation schemes. Every HCP area has a short and long list of potential pipeline schemes, which can be mobilised according to the evidence base for future need.

Develop focus upon auditing the quality of compensation sites and setting out our delivery in the context of other RMAs and our wider environmental metrics.

This report represents a step forward in our understanding of the status of our delivery of habitat quantity against statutory obligations. It has focussed upon the habitat account balance, with little or no content on the quality of compensation sites and the extent to which they are successfully replacing the various features for which the original sites were designated. As we better capture this fuller picture of Natura 2000 compensation we can also set out this statutory delivery in the context of our wider environmental work within FCRM, which we now report to Defra using the FCRM Outcome Measure system.

We constantly seek to improve how we operate the HCP, to ensure fairness and transparency, and to avoid double counting or omission. With a strong history of partnership working in the previous RHCP, we will explore how the Partnership Funding model can be applied to habitat scheme delivery, and where partnership working can ensure compensation schemes can be integrated into our other environmental work. We will aspire to reflect this in future reports.

Specific priorities associated with different HCPs are as follows, many of which are already being addressed locally:

Severn Estuary HCP:

- 1) Agree the contribution of Welsh Government to compensation efforts on the Severn through loss/benefits apportionment, in order to finalise the SMP Strategy and associated HRA;
- 2) Review the potential for managed realignment in the Severn Estuary and test scenarios associated with potential need arising from tidal lagoon power developments.

Devon & Cornwall HCP:

- 1) Resolve funding barriers to take forward identified managed realignment sites;
- 2) Quantify Natura 2000 habitat losses in the Cornwall & Isles of Scilly SMP in order to justify any necessary compensation schemes.

South Wessex HCP:

- 1) Progress the Arne Moors partnership project.

Solent & South Downs HCP:

- 1) Agree with Natural England any remaining work to be done to address historic losses of inter-tidal habitat affecting site condition;
- 2) Identify potential grazing marsh compensation >50ha to accommodate potential losses arising from future realignments.

South East HCP:

- 1) Complete the Medway Estuary & Swale and Folkstone to Cliff End strategies that will refine understanding of the scale of losses and potential measures to address them.

Thames HCP:

- 1) Agree with Natural England any remaining work to be done to address historic losses of inter-tidal habitat affecting site condition, and provisional projected losses of inter-tidal habitat in the Thames Estuary, considering new analysis associated with TE2100;
- 2) Depending on the outcome of 1), identify major grazing marsh creation sites to compensate for losses associated with potential realignments in the Thames Estuary, and agree the potential for Great Bells Farm in meeting this need.

East Anglia HCP:

- 1) Agree with Natural England any remaining work to be done to address historic losses of inter-tidal habitat affecting site condition;
- 2) Quantify projected losses of inter-tidal habitat in epoch 2 in order to justify any necessary compensation schemes.
- 3) Depending on the outcome of 2), identify major grazing marsh creation sites to compensate for losses associated with potential realignments in East Anglia.
- 4) Monitor the habitat replacement requirements of the Ouse Washes with reference to the Ouse Washes Habitat Creation Project.

Humber HCP:

- 1) Complete the Donna Nook phase 2 and Skeffling managed realignment schemes.

List of abbreviations

Defra	Department for the Environment, Food and Rural Affairs
EMS	European Marine Site
FCRM	Flood & Coastal Erosion Risk Management
FoCES	Folkstone to Cliff End Strategy
HCP	Habitat Compensation Programme (revised version of the old RHCP)
HRA	Habitats Regulations Assessment
IPENS	Improvement Programme for England's Natura 2000 Sites
IROPI	Imperative Reason of Over-riding Public Interest (in relation to HRA)
MEASS	Medway Estuary & Swale Strategy
OWHCP	Ouse Washes Habitat Creation Project
PSO	Partnership & Strategic Overview (Environment Agency Area teams with oversight of HCP delivery)
RFCC	Regional Flood and Coastal Committee
RHCP	Regional Habitat Creation Programme (old region-based version of the new HCP)
RMA	(FCRM) Risk Management Authority
RSPB	Royal Society for the Protection of Birds
SMP	Shoreline Management Plan
TE2100	Thames Estuary 2100 project

Appendix 1: Boundaries of Habitat Compensation Programmes

NORTH WEST HCP: English component of the North West and North Wales SMP, incorporates Environment Agency Cumbria & Lancashire (CLA) and Greater Manchester, Merseyside & Cheshire (GMMC) Areas.

SEVERN ESTUARY HCP: English coastline covered by the current Severn Estuary Strategy (to Hurlstone Point, nr Bossington, Somerset)

DEVON AND CORNWALL HCP: Incorporates Environment Agency Devon, Cornwall and Isles of Scilly (DCS) Area.

SOUTH WESSEX HCP: Coastline and inland area of Environment Agency Wessex (WSX) Area.

SOLENT & SOUTH DOWNS HCP: Incorporates Environment Agency Solent & South Downs (SSD) Area, which includes the Isle of Wight.

SOUTH EAST HCP: Incorporates Environment Agency Kent, South London and East Sussex (KSL) Area to the boundary of the TE2100 Strategy.

THAMES HCP: Area covered by the TE2100 Strategy.

EAST ANGLIA HCP: Incorporates the Environment Agency East Anglia (EAN) and Lincolnshire & Northamptonshire (LNA) Areas to the boundary of the Humber Strategy.

HUMBER HCP: Area covered by the Humber Strategy.

NORTH EAST HCP: Incorporates Environment Agency North East (NEA) and Yorkshire (YOR) Areas to the boundary of the Humber Strategy.

Appendix 2: Habitat account assessment by Habitat Compensation Programme area

Table A1: Habitat compensation to compensate for projected losses: North West area HCP

Relevant Plans/ Strategies in HCP area	Habitat Type	Within Epoch Change since SMP approval (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Morecambe Bay Strategy	Saltmarsh	-162	-	-	162	-	162	-	-	-	-

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Hesketh Outmarsh West: 7 ha (apportioned) inter-tidal saltmarsh and mud

Hesketh Outmarsh East: 154ha inter-tidal saltmarsh and mud

East Lytham: 1ha inter-tidal saltmarsh and mud

The North West and North Wales SMP does not identify any compensatory requirements arising from FCRM activity, so whilst habitat creation in relation to 'natural flood management' and other drivers continues, there are no statutory drivers relating to the Habitats Regulations. This is in part because the coast in the North West is generally accreting sediment, reducing issues of inter-tidal habitat loss. There are no outstanding commitments to address historic habitat losses in this area.

Anticipated changes in inter-tidal habitat extent:

The Cumbria Coastal Strategy is in development and when completed (c.2019) further information on coastal habitat behaviour may cause the HCP in the North West to evolve. In the meantime a small scheme at East Lytham will create 1.2ha of inter-tidal habitat by 2019 to address small losses identified in the area.

In 2005 we contributed towards the RSPB managed re-alignment project at Hesketh Outmarsh West, Lancashire, to address the likely 7ha loss of sand flat associated with sea defence upgrades within the Morcambe Bay SPA. Further work by Lancaster City Council in the SPA has led to the eastern area of the site also being breached in the autumn of 2017. This is expected to create 154ha of inter-tidal habitat.

Table A2: Habitat compensation to compensate for projected losses: Severn Estuary area HCP

Relevant Plans/ Strategies in HCP area	Habitat Type	Within Epoch Change since SMP approval (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Severn Estuary Strategy, Parrett Estuary Strategy	Saltmarsh/Mudflat	-300	-318	-765	288	0	288	-12	-330	-1095	1697

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Stear: 237ha inter-tidal saltmarsh and mud

Congresbury: 11.5ha inter-tidal saltmarsh and mud

Alvington-Plusterwine: 39.5ha inter-tidal saltmarsh and mud

The Severn Estuary European Marine Site (EMS) comprises the Natura 2000 designations and Ramsar site. It is affected by the FCRM activity set out in the Severn Estuary Flood Risk Management Strategy which is at the stage of “working draft” after a second consultation in 2013: in fact most actions in the Strategy are already underway or completed. The current figures for habitat loss due to coastal squeeze are therefore taken from the HRA of this draft Strategy. These figures have reduced from those calculated in the SMPs that underpin the strategy (note the geographic coverage of the Severn SMP and Strategy is not the same). The SMPs will be updated with new evidence from the Strategy once it has been approved.

The habitat losses identified in this HRA are all inter-tidal saltmarsh and mudflat, which are combined for the purposes of compensation needs due to the uncertainty around relative proportions of each habitat as the estuary develops. The extent to which some habitat loss, especially in the outer estuary, is caused by FCRM activity is also uncertain: natural estuary dynamics cause the loss, gain and movement of mudflats in particular, and the effects of historic or new defences can be difficult to disentangle. Using the 50 percentile range estimate for sea level rise, approximately 300ha of habitat is predicted to be lost in epoch 1 (note in the Severn Plans and Strategies this is taken to lead up to 2030), although this could rise to approximately 500ha under the 95 percentile range estimate. These figures may be revised over time, in particular with the release of revised UK Climate Projections in 2018. Note the 300ha includes 7ha of future inter-tidal losses within the Severn Estuary Natura 2000 site identified in the Parrett Strategy.

Historic losses of inter-tidal habitat (not included in Table A2):

A commitment by us to create 40ha of inter-tidal habitat to start to address historic losses in the Severn has been addressed through the managed re-alignment on the Steart Peninsula (see below).

Anticipated changes in inter-tidal habitat extent:

Of the 300ha required for epoch 1, 288ha has been delivered, largely at the Steart Peninsula (237ha) in Bridgewater Bay, Somerset, which has also created freshwater grazing marsh and other habitats not forming Natura 2000 compensation (and therefore not included in Table A2). Steart, over 400ha in size, is now being managed by the Wildfowl and Wetlands Trust. Schemes at Congresbury (11.5ha) near Weston-Super-Mare, Somerset, and Plusterwine/ Alvington (39.5ha) near Lydney, Gloucestershire, have also contributed. This leaves a 12ha deficit, which we are looking either to deliver through revisions to the existing FCRM capital investment programme, or through a bespoke scheme, or as part of future work in epoch 2, depending on the opportunities that arise.

Because the Severn Estuary EMS borders our Midlands Area and Wales as well as Wessex Area, habitat creation is being co-ordinated with Natural Resources Wales to understand respective responsibilities and future contributions. The HRA of the draft Strategy identified a shortlist of candidate sites for future habitat creation, with a long list developed locally to supplement this ('P' in Table A2 represents their total projected area). This long list originally contained 57 sites - 12 in Wales, 21 in Midlands and 24 in Wessex. However, all of these potential sites are currently under review and their feasibility being tested against various scenarios of estuary evolution and management.

A key element of strategic habitat creation in the Severn will be the possible evolution of tidal lagoon power and the potential for a large and more immediate compensation need arising, potentially competing for many of the pipeline sites currently in the HCP. Given the finite reserve of potential compensation sites along the Severn, this may entail more detailed work to assess options further afield, subject to the tests within the Habitats Regulations being met and agreement with Natural England.

Table A3: Habitat compensation to compensate for projected losses: Devon and Cornwall HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change since SMP approval (+/-)			Habitat Creation			Cumulative Balance			P
Cornwall & Is of Scilly SMP, South Devon & Dorset SMP (part), Exe Estuary Strategy	Saltmarsh/Mudflat	-25	0	0	0	44	44	+19	+19	+19	26
	Grazing Marsh	-13	0	0	0	45	45	+32	+32	+32	0

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Otter/Tamar Estuary sites: [44ha inter-tidal saltmarsh and mud, 45ha freshwater grazing marsh]

The requirement for compensatory habitat in Devon and Cornwall is considered to be low. The main requirements arise from the South Devon and Dorset SMP which includes the Tamar and Exe estuaries. There are no outstanding commitments to address historic habitat losses in this area.

Anticipated changes in inter-tidal and grazing marsh habitat extent:

The potential need for 38ha arising from the Exe Estuary Strategy highlighted in our 2013 report has since been revised down to 15ha, as much of the cause of projected saltmarsh loss is uncertain. A managed re-alignment scheme in the Otter Estuary near Budleigh Salterton, Devon will meet this need (and provide c.35ha of brackish and fresh water habitat), once funding allocation is resolved. Recent analysis of predicted losses within the Tamar estuary in the first epoch indicate losses of 13.5 ha of grazing marsh and reedbed in the upper estuary, and 10 ha of intertidal habitat important for SPA features. Two potential sites for managed realignment are being investigated, and one has been included in the FCRM investment programme.

The Cornwall and Isles of Scilly SMP identified coastal squeeze losses within the Fal/ Helford estuary; these have not been quantified but three potential managed realignment sites have been identified.

Table A4: Habitat compensation to compensate for projected losses: South Wessex HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change since SMP approval (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Poole & Wareham Strategy	Saltmarsh	+7	-9	-234	0	0	0	+7	-2	-236	} 92
	Mudflat	-44	-77	-79	0	0	0	-44	-121	-200	
	Grazing Marsh	-2	-3	-4	0	0	0	-2	-5	-9	12
	Freshwater & Woodland-Scrub	-6	-11	-30	0	0	0	-6	-17	-47	27
	Saline lagoon	-15	0	0	0	0	0	-15	-15	-15	35

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

None currently.

Anticipated changes in inter-tidal and other habitat extent:

The Poole and Wareham Strategy is the main driver for compensatory habitat in South Wessex. Potential sites have been identified with a relatively high degree of confidence in delivery, although they have not yet started so are included under 'P' in Table A4. The Environment Agency, RSPB and Natural England are working together on the appraisal stage of a landscape scale partnership project on the Arne Moors, near Wareham, Dorset. Delivery is planned c.2023 and may comprise up to 92ha of intertidal mudflats and saltmarsh, with 35ha of additional saline lagoons, of which 15ha will be compensatory habitat and 20ha as mitigation for onsite impacts on the RAMSAR bird interest features. There is potential for 12ha of grazing marsh creation at East Stoke, and the Forestry Commission has committed to creating 27ha of new heathland, *Molinia* meadows and woodland scrub as it clears existing plantations at Rempstone. Through partnership working and contributing to these initiatives we will be able to meet our statutory requirements associated with the Strategy. There are no outstanding commitments to address historic habitat losses in this area.

Note that the epochs worked to in the Poole and Wareham Strategy run to 2030, 2060 and 2110.

Table A5: Habitat compensation to compensate for projected losses: Solent and South Downs HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change since SMP approval (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Poole & Christchurch Bays SMP (part), North Solent SMP, South Downs SMP (part)	Saltmarsh	-124	-148	-145	104	0	104	-20	-168	-313	194
	Mudflat	+44	+60	-62	0	0	0	+44	+104	+42	46
	Grazing Marsh	0	-70	-6	69	0	69	+69	-1	-7	-45
	Freshwater	0	-4	0	10	0	10	+10	+6	+6	0

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Medmerry: 104ha inter-tidal saltmarsh and mud

Manor House: 69ha freshwater grazing marsh, 10ha other freshwater habitat

Our Solent and South Downs Area incorporates a dynamic and varied coast which experiences an overall accretion of mudflat and erosion of saltmarsh area.

Historic loss of inter-tidal habitat (not included in Table A5):

In 2007, we agreed with Defra and Natural England to create a minimum of 100ha of inter-tidal habitat to begin to address historic losses of inter-tidal habitat (mainly saltmarsh) there, and further work may be required to bring the protected areas in the Solent into a healthy state that can serve as a suitable baseline for future. The managed re-alignment at Medmerry, near Chichester, West Sussex has been instrumental in creating space for compensatory inter-tidal habitat, in total approximately 25ha of mudflat and 158ha of saltmarsh - of which 79ha is apportioned to meeting commitments to address historic losses (hence 0ha and 104ha respectively shown in Table A5). The habitat at Medmerry may not all be ecologically functional until epoch 2, but it has become a showcase site for managed re-alignment on an open coast. Inter-tidal habitat created through the Lymington Water Level Management Plan addresses the remaining commitment to addressing historic loss.

Anticipated changes in inter-tidal and other habitat extent:

A range of sites have been identified that might address future saltmarsh loss during epoch 2. Although the mudflat area is not under threat overall, much of the inter-tidal habitat creation (under 'P' in Table A5) is expected to include an element of mudflat as well.

The amount and location of grazing marsh in the area is related to managed re-alignment activity. The schemes currently proposed to compensate for saltmarsh in epoch 2 involve realigning over grazing marsh in the hinterland to a total of 45ha. This needs to be considered in addition to the existing 'baseline' loss from current SMP policies of 76ha mainly in epoch 2, making the identification of further grazing marsh creation sites a priority for this HCP despite the 69ha grazing marsh (plus c.10ha other freshwater) creation at Manor House. Although not included in Table A5, there is a possible loss of c.14ha saline lagoon involved in one proposed epoch 1 managed realignment, with small gains for this habitat associated with others.

Table A6: Habitat compensation to compensate for projected losses: South East HCP

Relevant Plans/ Strategies in HCP area	Habitat Type	Within Epoch Change (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Folkstone to Cliff End Strategy, Medway Estuary & Swale Strategy	Saltmarsh	-82	-148	-308	14	0	14	-68	-216	-524	(TBC)
	Mudflat	+18	+51	+160	2	0	2	+20	+71	+231	
	Vegetated shingle	-16 /10km	-	-	6	0	6	-10	-	-	
	Freshwater/grazing marsh	0	-4	0	164	0	164	+164	+160	+160	-160

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Rye Harbour Farm: 6ha vegetated shingle, 16ha inter-tidal saltmarsh and mud, 4ha freshwater

Great Bells Farm: 160ha freshwater grazing marsh and other habitat

Since our 2013 report we have split out the Solent and South Downs HCP from the South East, which leads to some differences in how the figures are presented. However, except for in the Medway and Swale, there has been no change to estimations of habitat change in real terms across this area. There has, however, been significant discussion since 2013 about the use of habitat loss figures in the Medway and Swale SMP, which do not provide inter-tidal coastal squeeze figures. More recent studies associated with the Medway Estuary and Swale Strategy, whilst subject to final agreement with Natural England, are the most likely trajectory to inform our habitat creation goals and are used here.

There are no outstanding commitments to address historic habitat losses in this area.

Anticipated changes in inter-tidal and other habitat extent:

The Medway and Swale is expected to lose saltmarsh and gain mudflat (through lowering of saltmarsh) over the next 100 years, although the former will outpace the latter roughly threefold such that the overall inter-tidal balance will be -59ha, -89ha and -148ha in epochs 1, 2 and 3 respectively. There are considerable opportunities to create inter-tidal habitat in the Medway and Swale, but many options carry

consequential losses of freshwater grazing marsh. However, the scheme at Great Bells provides a potential 160ha 'head start' on addressing any such losses associated with realignments that proceed in epoch 1 as a common understanding of estuary development develops.

The Folkestone to Cliff End Strategy (FoCES), which lies within the South Foreland-Beachy Head SMP, has stated an expected loss of inter-tidal saltmarsh (4ha) and mud (1ha) in epoch 1, and 10.4km loss of annually vegetated drift lines and 10ha loss of perennially vegetated stony banks (grouped as 'vegetated shingle' above). As we develop options further in FoCES, we will gain a clearer understanding of the amount and timing of losses. For now, the 10.4km and 10ha is expected to be a maximum, and some of it may be replacement of deteriorating habitat rather than Article 6(4) compensation for loss.

6ha of shingle habitat has already been created at Rye Harbour Farm to compensate for losses due to recycling operations from Nook Point for the Pett tidal flood defence scheme. Rye Harbour Farm managed re-alignment (2010) is also providing an approximately 2ha of inter-tidal mud and 14ha saltmarsh plus 4ha freshwater, which addresses losses of inter-tidal habitat identified in FoCES and within other local schemes (total 8ha inter-tidal and 4ha freshwater, both included here in epoch 2 as the timing of loss is uncertain) such as Broomhill Sands coastal defence scheme.

The areas of the South Downs SMP, Isle of Grain to South Foreland SMP and TE2100 sitting within the South East HCP require no compensation.

Table A7: Habitat compensation to compensate for projected losses: Thames HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
TE2100, Isle of Grain to South Foreland SMP	Saltmarsh	-18	-65	-185	6	12	18	0	-65	-250	} 976
	Mudflat	-40	-40	-430	12	44	56	+16	-24	-454	
	Grazing Marsh	0	0	0	0	0	0	0	0	0	-779

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Salt Fleet Flats: 18ha inter-tidal saltmarsh and mud

Wallasea: [56ha inter-tidal saltmarsh and mud]

As with the Severn Estuary, the projected habitat change in the Thames is complex and uncertain, and will depend upon sea level rise scenarios being tested in the TE2100 Strategy. In addition, habitat change to date has been the subject of a review currently being discussed by the Environment Agency and Natural England, which indicates that projections of future loss of inter-tidal habitat may be substantial over-estimates, at least in the short to medium term. Notwithstanding the precautionary approach of the HCP, habitat creation for Natura 2000 compensation will clearly need to be responsive to monitoring, although managed realignment may still occur where it is considered to lead to a more sustainable FCRM approach for the estuary.

Historic loss of inter-tidal habitat (not included in Table A7):

In 2007, we agreed with Defra and Natural England to create a minimum of 20ha of inter-tidal habitat to begin to address historic losses of inter-tidal habitat (mainly saltmarsh) there, and further work may be required to bring the protected areas in the Thames into a healthy state that can serve as a suitable baseline for future. This commitment and any further work is currently under review using more recent evidence about both historic and anticipated losses of inter-tidal habitat in this area.

Anticipated changes in inter-tidal and grazing marsh habitat extent:

The Statement of Case for the assessment of Imperative Reasons of Over-riding Public Interest (IROPI) within the current HRA of TE2100 serves as the source for the current projected habitat change in Table A7. Two SPAs - the Thames Estuary and Benfleet-Southend Marshes - are affected. Note that any habitat loss (of saltmarsh or grazing marsh) described in the Statement of Case resulting from planned managed re-alignment schemes has been incorporated as a net figure within column 'P' denoting the future habitat creation pipeline, to ensure 'within epoch change' represents the baseline estimate of habitat loss due to coastal squeeze. Note the saltmarsh figures for coastal squeeze are also corrected for predictions that at Holehaven and Easthaven Creeks (Canvey, Essex), sea level change will result in inundation and saltmarsh development totalling c.17ha over epochs 1 and 2. The habitat change figures shown in Table A7 also correct an error within our 2013 report which gave epoch 1 inter-tidal loss as 314ha.

Compensation for intertidal loss in the Thames has been addressed in part by our purchase of an 18ha interest in the port company DP World's managed re-alignment at Saltfleet Flats, near Cliffe, Kent. Compensation for the remaining intertidal habitat has provisionally been provided by 56ha of the Wallasea Island managed realignment in Essex - however, this requires further discussion with Natural England. As such, we only have medium confidence that the mudflat losses in the Thames have been addressed at the time of writing. The interplay between uncertainty of delivery and uncertainty of habitat loss figures is therefore a current focus of effort in the Thames HCP.

As with the Severn and the Medway and Swale, a significant number of potential habitat creation sites exist in the Thames, although all are likely to be expensive to deliver compared, for example, with schemes in Essex, Suffolk and Norfolk (see Appendix 1 of our 2013 report for a review of relative scheme costs). The key inter-tidal creation sites outlined in the Statement of Case are St. Mary's Marsh, Grain Marsh and Allhallows Marsh, complemented by a range of smaller sites, to be delivered within and beyond epoch 1. However, for the reasons set out above, we are approaching habitat creation cautiously in the Thames, especially where creating inter-tidal habitat will involve substantial losses of internationally designated grazing marsh - 779ha in total associated with the potential realignments at Grain and Allhallows proposed for epochs 2 and 3 respectively.

Table A8: Habitat compensation to compensate for projected losses: East Anglia HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change since SMP approval (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
North Norfolk SMP, Suffolk SMP, Essex & South Suffolk SMP, Ouse Washes HCP	Saltmarsh	-21	-	-	21	0	21	0	-	-	50
	Grazing Marsh	-91	-	-	150	20	170	+79	-	-	100
	Reedbed	-212	-32	-	216	35	251	+39	+7	-	32

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Brandy Hole: 3ha inter-tidal saltmarsh and mud

Wallasea: 18ha inter-tidal saltmarsh and mud

Snape: 38ha freshwater grazing marsh, 44ha reedbed

Lady Fen phase one: 18ha freshwater grazing marsh

Lady Fen phase two: [20ha freshwater grazing marsh]

Frampton Marsh: 94ha freshwater grazing marsh

Hilgay: 65ha reedbed

Methwold: 22ha reedbed

Hickling Broad (Bishops Marsh): 20ha reedbed

Hickling Broad (Potter Heigham): [35ha reedbed]

Ouse Fen: 65ha reedbed

Saltmarsh loss in East Anglia to c.2025, primarily within the Essex and South Suffolk SMP, has been compensated for at the RSPB Wallasea Island site on the Crouch Estuary in Essex, which provides a total of 155ha of compensatory inter-tidal habitat in which we have purchased an interest.

Historic losses of inter-tidal habitat (not included in Table A8):

In 2007 we agreed to create 100ha of inter-tidal habitat in the complex of protected areas on the Essex coast comprising Foulness, River Crouch Marshes, Dengie, and the Blackwater and Colne Estuaries to begin to address historic losses experienced there. We also agreed to create pockets of habitat in the Suffolk estuaries - 50ha in the Hamford Water/Stour and Orwell Estuaries, and 20ha each in the Blyth, Alde-Ore and Deben Estuaries. However, the HRA for the Essex and South Suffolk SMP approved in 2011 identifies only 112ha of habitat creation required to compensate for the international designations between the Blyth and Foulness.

75ha of Wallasea has been 'apportioned' to meeting historic losses, and further sites at Devereux Farm near Hamford Water, Essex (15ha) and Fingringhoe, also on the Colne (22ha) - 112ha in total - have also been allocated for this purpose. Whilst meeting the requirements of the SMP assessment, this focusses all of our efforts on historic losses within Essex. We have agreed with Natural England that unmanaged breaches at Blythburgh (creating 29ha of inter-tidal habitat) and Hazelwood Marshes (approximately 76ha inter-tidal) on the Alde, resulting from the storm surge of 2013, can be considered as remediation of historic losses also.

These new areas of inter-tidal habitat meet the requirements of the SMP's historic loss assessment, and the overall targets for addressing coastal squeeze agreed previously for Essex and Suffolk. However, future effort may be required in the Deben, Stour, Orwell and Foulness areas to bring these protected areas into a healthy state that can serve as a suitable baseline for future. This is now the subject of discussion based upon available evidence on estuary behaviour: for example, research by ABPMer in the Stour & Orwell associated with port development has noted saltmarsh accretion rather than loss. Clearly the need for further habitat creation will, as in the Thames and the Severn, need careful monitoring and the HCP must be agile enough to respond to new evidence by maintaining a portfolio of options. Note that 6ha at Wallasea has also been apportioned to Southend Borough Council to compensate for recent losses due to FCRM activity in the Foulness SPA.

Note that the loss of habitat in the The Wash and North Norfolk Coast Natura 2000 sites arising from the RSPB Titchwell Coastal Change Project in Norfolk was addressed by the RSPB at the Freiston and Frampton Shore sites in Lincolnshire.

Future losses of inter-tidal habitat:

The HRA for the Essex and South Suffolk SMP, and subsequent reviews of habitat loss experienced in the area, suggest that the requirement in Essex for inter-tidal (mainly saltmarsh) compensation in epoch 1 is low, at 21ha (note that a further 9ha highlighted in our 2013 report arising from the Boston Waterways Link scheme is no longer required, further to analysis related to the HRA of that scheme). Currently, 18ha of Wallasea's saltmarsh has been 'allocated' within the HCP to addressing this epoch 1 requirement. On the basis that further (currently unquantified) saltmarsh loss in the Essex estuaries is expected beyond 2025, a potential site at Brightlingsea on the Colne Estuary, Essex, is also being explored that would provide approximately 50ha of saltmarsh. The SMP HRA specifically guarded against presenting estimates of habitat change beyond epoch 1 due to the lack of confidence in them.

A further 56ha of Wallasea is currently apportioned to inter-tidal compensation in the Thames estuary (see Table A7 above), although this is subject to agreement with Natural England.

3ha of saltmarsh was provided at Brandy Hole on the Crouch in 2003 to address losses due to the Hullbridge tidal flood defence scheme.

Future losses of freshwater habitat:

Habitat change across the Essex, Suffolk and Norfolk coasts incorporates more impacts upon freshwater elements of Natura 2000 sites than many other HCP areas. Significant amounts of grazing marsh and reedbed are at risk throughout East Anglia as sea level rise places pressure upon foreshore features, such as the shingle ridge at Walberswick, that currently protect them. Decisions are required on a case by case basis as to how to balance encouraging dynamic coastal processes that maintain ecological interest with protecting the features of lost freshwater sites within the wider Natura 2000 network. In epoch 1 it is the coastal reedbed habitat that is most at risk, largely in Suffolk from Benacre through Easton Broad to Minsmere, although 40ha at Cley in Norfolk is also affected. As such, this has been the focus of our habitat compensation efforts, with sites at Hilgay, Methwold and Hickling Broad in Norfolk, and Ouse Fen and Snape in Suffolk all complete or nearing completion totalling 251ha of reedbed. A further 41ha of reedbed creation is now progressing at RSPB land at the large (over 700ha) Ouse Fen site at Needingworth, Cambridgeshire, with approvals in place and legal agreements being finalised: depending on future requirements for reedbed compensation this presents additional potential resource, although projected reedbed loss in epoch 2 has recently been revised down.

In epoch 2, the focus of risk is on coastal grazing marsh, particularly at Blakeney Freshes in Norfolk, but also at various sites on the Stour and Orwell, and the Crouch and Roach estuaries, totalling well over 400ha. Broad estimates suggest even higher figures could be lost in epoch 3. However, these figures are not included in Table A8 as they are significantly contingent on managed re-alignment over grazing marsh going ahead, and our understanding of the scale of the need for this work is evolving. Completed schemes at Snape in Suffolk and Lady Fen in Norfolk, as well as the older Frampton Marsh site, contribute 170ha towards addressing grazing marsh losses in epoch 1 at Hen Reedbed (23ha), the Stour & Orwell (20ha), Minsmere (28ha) and the Middle Level Barrier Banks (20ha). Further potential exists at Hadleigh Marshes in Essex (60ha), Hillhouse Farm in Suffolk (20ha) and at Hickling, Norfolk (20ha), and there is a general openness towards creating grazing marsh in East Anglia among landowners. Together, the work done to date provides a useful 'buffer' for the as yet unknown requirements of future epochs.

The Ouse Washes:

East Anglia HCP also oversees the Ouse Washes Habitat Creation Project (OWHCP). The Ouse Washes is one of the largest areas of lowland wet grassland in the UK and is designated as SPA and Ramsar site. In recent decades the populations of certain bird species have declined due to the changing flooding regime, hence the need for replacement habitat. A minimum of 500ha of grazing marsh creation was previously agreed as a success criteria for this project but increasing land prices since the start of the project in 2007, combined with a protracted acquisition process and higher habitat creation costs means less habitat is being created than originally planned. With the agreement of Defra and Natural England we have completed 92ha of new wet grassland at Coveney, with a further 83ha anticipated to be secured within the next year. A second site at Sutton is also planned, which is anticipated to provide approximately 130ha of habitat within the next five years. Therefore in total the OWHCP will create around 300ha of replacement wet grassland habitat.

Figures for the Ouse Washes have not been included in Table A8, as they relate to replacement habitat based upon maintaining bird populations under the provisions of the 'Birds' Directive 1979 rather than direct compensation under the 'Habitats' Directive, and the scale of the requirement for replacement will evolve with the monitoring of bird populations at the Ouse Washes and associated sites.

Table A9: Habitat compensation to compensate for projected losses: Humber HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Humber Strategy	Saltmarsh/Mudflat	-254	-159	-	272	314	586	+332	+173	-	516
	Saline lagoon	-25	-		6	19	19	0	-		
Inner Estuary	Saltmarsh/Mudflat	+89	+153	-	171	0	171	+260	+413	-	20
Middle Estuary	Saltmarsh/Mudflat	-263	-257	-	80	225	305	+42	-215	-	335.5
Outer North	Saltmarsh/Mudflat	+13	+22	-	0	0	0	+13	+35	-	160.5
Outer South	Saltmarsh/Mudflat	-93	-77	-	21	89	110	+17	-60	-	0

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Alkborough: 171ha inter-tidal saltmarsh and mud

Paul Holme Strays: 80ha inter-tidal saltmarsh and mud

Skeffling: [231ha inter-tidal saltmarsh and mud]

Donna Nook phase 1: 21ha inter-tidal saltmarsh and mud

Donna Nook phase 2: [89ha inter-tidal saltmarsh and mud]

The Humber Estuary Strategy has taken a detailed overview of inter-tidal habitat change over the next 50 years to c.2056, with modelled estuary dynamics giving precise projections of habitat change in this dynamic and complex environment. These projections have been reviewed since 2015, and underlying loss rates are also being re-examined within the Humber Strategy Comprehensive Review. The inner, middle and outer portions of the estuary experience different rates of sedimentation and loss of mudflat and saltmarsh, so as with our 2013 report, figures for each portion are shown separately in Table A9 in addition to the total although note that estimates have evolved slightly. Note that port-related compensation schemes at Welwick and Chowder Ness are not included in this analysis. Also note the Within Epoch Change figures in Table A9 reflect small amounts of habitat compensation required at a 3:1 ratio for direct loss.

There are no outstanding commitments to address historic habitat losses in this area, further work may be required to bring the protected areas in the Humber into a healthy state that can serve as a suitable baseline for future.

Inner estuary:

The inner estuary is accreting sediment at the fastest rate of any section of the Humber, and also benefits from the 171ha Alkborough tidal flats scheme, which is perhaps the only managed re-alignment in England to date where the habitat itself performs a defined tidal storage function as well as contributing towards the habitat balance of the estuary. Work at South Ferriby may add a small amount (20ha) of further inter-tidal habitat in this area.

Middle estuary:

The middle estuary is losing habitat but, thanks to the large habitat creation scheme identified for Skeffling (225ha) - which will add to the well-established 80ha site at Paull Holme Strays - this area should not experience net habitat loss until epoch 2. Note that the benefits of the Skeffling site, which in fact lies in the outer north portion of the estuary, are being used for the middle estuary compensation. As well as the saltmarsh and mudflat areas, phase one of work at Kilnsea Wetlands has created areas of wetland and supporting habitat over 44ha, including 6ha of extreme high tide roost for key wader species lost from 25ha of eroding saline lagoons at Easington Lagoons SPA. A further 19ha of such roosting habitat will be provided by the Skeffling project in addition to the inter-tidal areas, alongside a further 56ha of mainly freshwater habitat not currently allocated for Natura 2000 compensation (and hence not included in Table A9).

Outer Estuary:

The outer south portion is also losing habitat, and is dependent upon the second (89ha) phase of the Donna Nook scheme progressing.

As with the other major estuaries, habitat management on the Humber will need to respond to evidence gleaned from monitoring data. Large potential sites such as Goxhill have the potential to address further losses in the middle and outer estuary, and this is currently under review.

The Humber Estuary Strategy is about to embark on a comprehensive review, which will re-examine coastal squeeze losses, renew the HRA and steer the HCP in this area. The new Strategy boundary may incorporate further Natura 2000 sites associated with estuary tributaries, which may further affect the statistics for this HCP in future.

Table A10: Habitat compensation to compensate for projected losses: North East area HCP

Relevant Plans /Strategies in HCP area	Habitat Type	Within Epoch Change (+/-)			Habitat Creation			Cumulative Balance			P
		c.2025	c.2050	c.2100	H	M	Total	c.2025	c.2050	c.2100	
Tees Tidal Strategy	Saltmarsh/Mudflat	-20	-	-	22	-	22	+2	-	-	-

SITE/AREA ADDRESSING STRATEGIC COASTAL SQUEEZE LOSSES CAUSED BY FCRM ACTIVITY:

Greatham North: 22ha inter-tidal saltmarsh and mud

As with the North West of England, little habitat compensation need has been identified in the North East. The main driver has been the Tees Tidal Strategy, published in 2009 and setting out the need for 20ha of inter-tidal habitat. This has been supplied at the Greatham North site near Hartlepool, alongside extra areas of grazing marsh and freshwater habitat totalling 15ha. There are no outstanding commitments to address historic habitat losses in this area.

ENDNOTES

ⁱ Sites protected under the European Commission Council's Directives on the conservation of wild birds (2009/147/EC - the 'Birds' Directive) as Special Protection Areas (SPAs) and on the conservation of natural habitats and of wild fauna and flora (79/409/EEC - the 'Habitats' Directive) as Special Areas for Conservation (SACs), and proposed SPAs (pSPA) and candidate SACs (cSAC), and sites designated under the Ramsar Convention on wetlands of international importance.

The Birds and Habitats Directives (the 'Nature Directives') are transposed in UK law through the Wildlife & Countryside Act (WCA) 1981 (as amended) and the Conservation of Habitats and Species Regulations 2010 (the 'Habitats Regulations'). The 2010 regulations update and consolidate amendments made since the original transposition into UK law of the Habitats Directive in 1994. The Ramsar Convention was adopted in the UK in 1976 and sites designated using the mechanism of Sites of Special Scientific Interest. The Ramsar Sites are therefore given legal protection under the WCA 1981 (as amended), and Government policy since has afforded them the same level of protection in practice as those designated under the Habitats Regulations, with which there is considerable overlap of boundaries

ⁱⁱ As defined in [Part 1, Art.1 s6 (13)-(14) of the Floods and Water Management Act 2010]

ⁱⁱⁱ For the purposes of this report, 'FCRM' activity mean that activity which is funded primarily for FCRM purposes using capital Grant in Aid allocated by the Environment Agency, maintenance works by FCRM RMAs, interventions funded by Regional Flood & Coastal Committee levies, and other third party activity requiring FCRM interventions, such as port, harbour or other infrastructure development. The habitat compensation projects listed in Appendix 2 of this report are therefore limited to those with an FCRM-related driver, and do not include managed re-alignments undertaken to compensate for direct losses caused by non-FCRM activity, such as channel/harbour dredge. For a full list of English cases involving Article 6(4) reports to the European Commission since 1994, see Annex 3 of Environment Agency/Defra R&D report (2016) WC1076 *Review of the Effectiveness of Natura 2000 Sites Compensation Measures in Coastal Sites*.

^{iv} Environment Agency/Defra R&D report (2016) WC1076 *Review of the Effectiveness of Natura 2000 Sites Compensation Measures in Coastal Sites*.

^v The year in which the Habitats Regulations entered onto the UK statute books.