Wallasea Wetland Monitoring Programme

Monitoring Results (April 2006 to June 2007)

Non-Technical Summary

Project Background

On the 4th July 2006, the final breach was completed on a managed realignment project located on the north bank of Wallasea Island in the Crouch Estuary in Essex. The aim of this Defra-led project was to create new mudflat and saltmarsh habitat in compensation for the loss of similar habitats, and the associated impacts to SPA-designated bird populations, following port developments in the Medway and Orwell estuaries. The realignment was designed to provide suitable habitat for valuable species lost during the port developments as well as providing improved levels of coastal protection to Wallasea Island. This work was pursued with the full support and assistance of the landowner, Wallasea Farms Ltd., who were responsible for the submission of the Planning Application and for the commissioning of the Environmental Impact Assessment (EIA) which accompanied the application.

As part of this project, Defra are funding a detailed 5-year monitoring programme to evaluate the success of the project in meeting stated objectives and to verify whether any changes that may occur in the adjacent Crouch and Roach Estuaries are within the limits predicted during the statutory EIA process. On-site monitoring began in April 2006 (i.e. 2 months prior to the breaching work) and is scheduled to continue through to December 2011.

The Wallasea Monitoring Programme is being managed by Jacobs UK Ltd with a large proportion of the monitoring coordinated, undertaken and interpreted by ABP Marine Environmental Research, supported by a range of specialist surveyors as required.

This report is the first of a series of annual monitoring reports that will provide ongoing feedback on the development of habitats within the Wallasea realignment and will present an evaluation of any changes that may occur in the adjacent waterways. The report sets out the results and findings from the first year of monitoring undertaken between April 2006 and June 2007.

The overall Monitoring Programme is being overseen by a Project Management Group (PMG), which comprises representatives from Defra, Natural England (NE), the Environment Agency (EA), Royal Society for the Protection of Birds (RSPB) and Wallasea Farms Ltd. As of 1 April 2007, the day-to-day site management work and provision of ongoing advice on monitoring measures is being carried out on behalf of Defra by the RSPB. Annual meetings of the PMG will continue throughout the five year monitoring period to review the findings.

Monitoring Approach & Findings

The first year of monitoring (from April 2006 to June 2007) on the Wallasea Managed Realignment comprised the following elements. A summary of activities undertaken during this period can be seen in Table 1.

1) Overwintering bird monitoring

Monitoring methods: A series of six monthly bird surveys were undertaken between October 2006 and March 2007 to describe the abundance, distribution and behaviour of overwintering waterfowl and waders.

Findings: In its first winter, the site was already supporting good populations of many key species and a total of 55 different species were recorded using the area. Over the main winter months species abundances of between 1876 and 5101 were recorded and, of these, the majority (1588 to 4646 birds) were wader and waterfowl species with the most abundant being lapwing and golden plover. Of particular note was the occurrence in October (three months after the final breach) of a passage peak of 733 ringed plover which represents an internationally important count. Wildfowl were also present in good numbers with, for example, peaks of 82 shelduck and 762 teal.

The majority of birds were roosting and loafing rather than feeding within the site and the highest abundances were usually recorded towards high water as birds flocked in from surrounding areas to roost. It was also noted that as the tide flooded in, the birds often first moved onto the unvegetated spoil areas which are higher than the surrounding mudflat (and thus are inundated later) before then moving on to permanently exposed island features and other locations.

Based on a detailed review of bird behaviour and distributions recorded in January 2007, an average of around 2300 birds used the site (with the sum of the peak abundances for each species being 3884). In the same month, the average number of all birds feeding across the site was 612 which represented around 28% of the birds that were present when the mudflats were exposed. These feeding birds included, on one occasion, 458 dunlin foraging on the mudflat as well ringed plover (87), redshank (53), shelduck (150) and brent goose (87) feeding on mudflat, lagoons and tidal waters. Therefore, while feeding levels are expected to increase over time (as the invertebrate prey species become established) it is clear that there were already moderate numbers of some wader and wildfowl species feeding in the first winter. On one occasion in January 2007, over 169 brent geese were seen feeding on algae that was growing within the site. Brent goose is a key interest feature for the Crouch and Roach Estuary SPA and the 169 brent geese recorded in January represents 5% of the abundance criteria cited within the SPA designation. In the same January 2007 survey, the number of all species roosting at high water was 2568 and included lapwing, ringer plover, golden plover, dunlin, redshank and waterfowl species such as shelduck teal and mallard.

The compensation targets for this site, in terms of the numbers of overwintering waterbirds it supports, are 3600 roosting birds (in particular ringed plover, grey plover, dunlin and turnstone) and 2800 feeding birds (in particular shelduck, dunlin and redshank). These targets are five-year peak mean values but it is still valuable (as an indication of the site's initial development) to compare

them against abundances recorded during the first year. To make this comparison, the values quoted above for roosting (2568) and feeding (612) birds in January 2007 represent 71% and 22% of the compensation targets respectively. All the main compensation target indicator species were present although only incidental numbers of turnstone were recorded at this early stage.

2) Spring breeding birds monitoring

Monitoring methods: Two walkover surveys were carried out in May and June 2007 to assess the value to breeding birds of habitats within the realignment site and the mitigation areas created behind the sea wall.

Findings: In total 81 pairs of breeding birds were recorded across the realignment site and the mitigation areas. The individual species were as follows: shelduck (12 pairs), mallard (5 pairs), oystercatcher (8 pairs), ringed plover (4 pairs), redshank (20 pairs), skylark (17 pairs, mainly on the new sea wall), yellow wagtail (3 pairs), meadow pipit (2 pairs), whitethroat (1 pair), linnet (2 pairs on island features), reed bunting (1 pair) and corn bunting (6 pairs). In addition a range of other species were observed on site (often feeding) that were considered to be locally breeding birds but which were nesting outside the realignment site. These species included: little egret, grey heron, greylag & Canada geese, avocet, common tern, stockdove, swift, swallow and starling.

These findings compare favourably with the 2003 pre-realignment observations made in Area A (western half of the site) with the results therefore demonstrating that the created habitats are functioning appropriately both as a location for ground nesting birds and as feeding locations for species that are breeding off-site. It is expected that the value to breeding birds of these mitigation habitats (berm, sea walls, islands and lagoons) will increase as the habitats mature and as appropriate management measures are put in place. In particular, habitat quality is expected to improve over time as the abundance of prey species (algae, aquatic invertebrates and fish) increases.

3) Intertidal/subtidal morphology and fixed-point photographs

Monitoring methods: In June 2006, a 'Light Detection and Ranging' (LiDAR) survey was carried out, which aimed to describe the baseline intertidal morphology of the realignment site as well as the wider outer estuary. In parallel, a topographic survey of the realignment site and adjacent habitats was completed in order to ground-truth the LiDAR data and to provide more detailed and localised land elevation measurements. During this topographic survey, a series of fixed-point photographs were taken across the site, whilst digital aerial photographs of the site were taken during the LiDAR survey that will be used to make visual assessments of the physical development of the site and of the growth of saltmarsh plants across the area. As a baseline subtidal survey was undertaken in 2004 (prior to this monitoring programme), the baseline survey was not repeated during 2006 (the first post-breach subtidal survey will be carried out in summer 2007).

Findings: As outlined above, during this first year of monitoring, a baseline survey of land elevation was undertaken using LiDAR. The survey data has been processed and validated against the ground-truth survey data and the results presented in the form of elevation maps of the new realignment site. In future years, when further identical surveys are undertaken, it will become possible to use these results to identify whether or not there has been any morphological change.

The panoramic views of the realignment area that were taken at each of the fixed-point locations, and a map of these locations can be interrogated online (at www.abpmer.net/wallasea) where the photographs that correspond to each site can be viewed.

4) Saltmarsh vegetation

Monitoring methods: As with the intertidal morphology studies, the assessment of saltmarsh development within the site and of changes to habitat outside the site is being determined through a combination of aerial remote sensing (Compact Airborne Spectral Imaging (CASI) techniques) and annual 'on-the-ground' surveys. The first CASI aerial survey was carried out in June 2006 and provides a baseline image of vegetation within and outside the realignment site against which the results of future airborne and on-the-ground surveys can be compared.

Findings: As described for the LiDAR survey results above, the maps of island vegetation that were undertaken using CASI imaging represent a baseline dataset that will be used in the analysis of any future changes. For the purposes of this first year review therefore the survey data has been processed and presented in the form of broad-scale habitat maps of the realignment site and its immediate environs.

5) Estuary current/flow monitoring:

Monitoring methods: In order to test the hydrodynamic predictions presented in the Environmental Statement (ES), a series of four boat-based flow monitoring surveys were undertaken before and after the realignment (two in April/May 2006 and two in August 2006). These describe the flow speeds upstream and downstream of the realignment site under both neap and spring tidal conditions. The flow monitoring also involved the deployment of static flow meters at Brankfleet Spit (at the eastern extent of the realignment site) and within Breaches 2 and 4.

Findings: The flow monitoring work has shown that, following the final breach in early July 2006, the hydrodynamic conditions within and outside the site are as predicted during the EIA process, which concluded that there would be no discernible change to the flows in the estuary and that any changes are not expected to have any perceptible effect on the estuary or to significantly alter the morphology of the system. It was not possible to detect any changes in the flow speeds within the estuary using the extensive series of boat-based and fixed point flow measurements that were taken. To facilitate further investigation, a revised computer modelling analysis was run as a means of accounting for natural variability in flow speeds and to estimate the theoretical changes that have occurred that would not otherwise be detectable through spot sampling. For this analysis, the models that were used to assess the impacts of the scheme were updated using the new field measurements and were run to describe conditions (in the modelled environment only) before and after the realignment.

The flow monitoring work has shown that, following the breaching work, the hydrodynamic (i.e water flow and water level characteristics) conditions within and outside the realignment site, and the changes arising as a result of the scheme, are similar to those that were predicted within the hydrodynamic modelling work that informed the EIA. An extensive series of boat-based and fixed-point flow measurements were taken which showed that the overall average and peak flow rates in the estuary have not been significantly altered and it was not possible to detect any clear spatial trends in the flow speeds within the estuary that could be intuitively linked to the realignment site.

There were though, some indications in the data of predictable flow pattern changes. For instance, there were some signs that the streamlines within the estuary have been altered such that, on a flooding tide, the flows are drawn more over to the south bank (as the realignment site draws in water) while on ebb tides the flows are pushed away to the north side. Overall, however, the results confirm the findings of the original hydrodynamic modelling work which concluded that there would be no discernible change to the flows in the estuary and that any changes are not expected to have any perceptible effect on the estuary or to significantly alter the morphology of the system. Detecting these predicted small-scale changes was always going to be difficult in the context of natural variability of the tidal regime in the estuary but it was important that this detailed monitoring work was undertaken to confirm that there has been no major change to the flow regime of the estuary.

Although the changes are of a small scale and not clearly detectable in the field, an extra volume of water is now entering and leaving the Crouch as a result of this scheme and it is important to understand as much as possible about how and where the flows may have changed. This was done using computer modelling analysis which makes it possible to address the issue of natural variability because it allows the conditions before and after the breaching to be compared based on an identical tide (within the model) in a way that is not possible in reality. For this analysis, the computer models that were used to design and assess the impacts of the scheme were updated using the new field measurements that were taken for this monitoring and they were run to describe conditions before and after the realignment.

The results of this updated modelling work confirm the findings of the original modelling that informed the EIA process. The original modelling work predicted that for the majority of the tidal cycle, there would be no change in the flow speeds but that during the peak flow periods of spring tides there would be a flow speed increases of around 0.1-0.2 knot (or 0.05-0.1m/s). These were predicted to occur as relatively brief events lasting for around 20 to 30 minutes (and not more than 1 hour). On Neap tides, similarly brief but much smaller scale increases of 0.07 knot (or 0.035m/s) were predicted on peak ebb and flood periods.

The new modelling work undertaken for this report confirms that that there has been little change to water levels in the estuary and that, with respect to flows, the sections of the Crouch downstream of the site experience short-term and small-scale increases in flow during ebbing and flooding periods. These changes are as originally predicted and are not expected to have a perceptible effect on the estuary. However, further studies of the estuary will be carried out including surveys of the shape of the estuary channel and of the shoreline habitats to confirm that there have been no significant adverse effects on the features from the extra volumes of water now entering and leaving the estuary.

In separate studies of the flows though the breaches it has been shown that there were slightly higher speeds than predicted in the original (pre-breach) modelling studies. However, these flows do not exceed 1m/s (2 knot) other than for brief periods when the ebb/flood flows are strongest and they are not considered to be high enough to cause erosion of the breach channels. Once again through, further studies of the alignment of the channels through the breaches as well as

assessments of the stability and width of the breaches will be carried out as part of the ongoing 5-year monitoring programme in order to confirm this conclusion.

The results of this updated modelling confirm the findings of the original modelling that informed the EIA process. In particular, the results confirm that that there have been no changes to water levels in the estuary and that, with respect to flows, the sections of the Crouch downstream of the site experience short-term (20-30 minutes) and minor increases (0.05-0.1ms^{-1} or 0.1 to 0.2 knot) in flow during ebbing and flooding periods. These changes are as originally predicted and are not expected to have a perceptible effect on the estuary. However, notwithstanding the fact that these changes cannot be perceived and that it has not been possible to measure them in the field, it will be important that these modelled changes are considered as part of the planning for future developments and for the ongoing strategic management of the estuary. The monitoring of the flow through the breaches has identified slightly faster currents than predicted in the modelling studies carried out before the breaching work. However, these flows do not exceed 1ms^{-1} (2 knots) and are not considered strong enough to cause erosion of the breach channels.

6) Aquatic and terrestrial invertebrates:

Monitoring methods: A survey was undertaken of the abundance and diversity of aquatic and terrestrial invertebrates within the new sea wall and borrow-dyke habitats. The aim of the survey was to evaluate the quality and value of these new habitats and their success in providing mitigation for equivalent habitats that were lost and changed by the flooding of the realignment area.

Findings: The invertebrate surveys have shown that the borrow-dyke and grassland berm behind the new sea wall support a good abundance and diversity of aquatic and terrestrial species. Across the terrestrial berm habitats, a total of 57 species were identified from the three sites. These included seven rare and important species, with the uncultivated and vegetated edges of the borrow dyke being the most valuable areas. In the borrow dyke, the aquatic fauna were typical of the brackish water conditions that are prevalent here (as was the case under baseline conditions behind the old sea wall). In total, 35 taxa were recorded from the 12 borrow-dyke sampling sites (mean 12 taxa/site) and three of these taxa were saline lagoon specialist species (lagoon cockle, the lagoon mud snail and the lagoon slater). A further aquatic sample taken within the realignment itself found a total of 10 invertebrate taxa as well as three fish species. This confirms observations made by separate fisheries PhD research students on the site (see below), which have also shown rapid colonisation of the realignment scrapes and the presence of several fish species that are using the area as a feeding site.

In summary, the results show that there has been a rapid development of the mitigation habitats and the scrapes in the realignment site. As a consequence, the mitigation areas and especially the borrow-dyke margins already have a high invertebrate nature conservation value. It is recognised that the quality of the new habitats is likely to increase as they mature.

7) Sea wall, clay bund and breach stability and integrity

Monitoring methods: A survey of the condition of the sea wall and clay bund was carried out prior to breaching in May 2006. This was done to provide a baseline description of the conditions against which an evaluation of the results of future annual investigations can be made.

Findings: Site investigations were carried out in May 2006 into the structural integrity of the sea wall and clay bund around the site and have provided an understanding of the baseline condition of these features. Future site investigations will use this baseline to assess the impacts of time and structure pressure on the integrity of the sea wall and clay bund that could be associated with the realignment of the site.

8) Web camera and other research

In an initiative that has been run in parallel to the core monitoring programme, the Environment Agency and Defra have jointly funded the installation, operation and maintenance of a web camera tower on the site. This was installed in June 2006 as part of the European ComCoast project and its core aim is to help communicate the lessons of realignment to stakeholders and the general public. The web-site on which the images can be viewed (www.abpmer.net/wallasea) will continue to be regularly populated with photographs and videos as well as details on the progress being made, the results of individual surveys and any relevant reports that are produced.

In addition to the core monitoring work summarised above, the Wallasea Realignment Project has presented a valuable opportunity for pursuing separate scientific research studies. It is important to ensure that the information provided by such studies is collated and used alongside the main Wallasea Monitoring Programme to assess the progress and implications of the Project and as an additional verification of any impacts that may arise from the scheme. Therefore, each of the seven PhD and MSc students that are known to be conducting such research were contacted and asked to summarise their work to date. These preliminary results show that the site is already acting as a feeding ground for juvenile bass and that high numbers of ragworm are present at certain locations within the realignment. However, it should be noted that most of these studies are in their early stages and validated findings will not emerge until much later in the research process. Further updates on the findings from these studies will be contained in subsequent annual reports.

Conclusions

The 2006/07 monitoring has indicated that the realignment site and the mitigation habitats are already beginning to function well in ecological terms.

In the first winter after breaching, the site has already been supporting good numbers of overwintering waterbirds while the mitigation habitats have abundant and diverse assemblages of aquatic and terrestrial invertebrate populations. In each case, it is recognised that these habitats and assemblages are in the early stages of their development and continued enhancement is expected over the next few years in terms of the invertebrate colonisation of the mudflats, the saltmarsh/vegetation coverage of the recharge area, the maturing of the mitigation areas and, importantly, the numbers of waterbirds and breeding birds that are supported by these habitats and the faunal assemblages that they will support.

In addition to the ecological functioning of the site, the flow monitoring and modelling work has confirmed that the implications of the realignment, in terms of the effects of flow speeds within the Crouch Estuary, are currently as predicted within the EIA process.

Acknowledgements

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Table 1 - Project Progress Table June 2007

'Standard' work or 'Extra' to contract	*Date*	*Project Event*	*Summary Details*	*Images*
Standard	26 April 2006	Long-term current monitoring (before during and after breaching).	*Static Nortek flow meter deployed on the 'Ness'.*	
Standard	27-28 April 2006	Pre-breach estuary flow (spring tide)	*Flow speed (ADCP) monitoring along 'Figure of 8' alignments covering Zones 1 to 4.*	
Standard	7 May 2006	Start-up meeting	*Start-up Meeting held between Mark Dixon (Defra), Colin Scott (ABPmer) and Peter George (Jacobs). Minutes issued by MD*	Meeting
Standard	6-7 May 2006	Pre-breach estuary flow (neap tide)	Flow speed (ADCP) monitoring along 'Figure of 8' alignments covering Zones 1 to 4.	
Standard (aborted)	*8 May 2006*	Abandoned pre-breach topographic survey	Survey started but abandoned due to excessive rain and treacherous conditions.	
Standard	31 May 2006	Sea wall inspection (Jacobs)	*Baseline inspection completed by Chris Powell*	
Standard	31 May and 1 June 2006	Pre-breach topographic fixed point photo survey	*Recorded surface elevations at over 132 sites across the realignment site and took fixed-point panoramic photos from 17 locations on the new sea wall.*	

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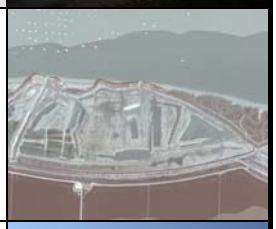
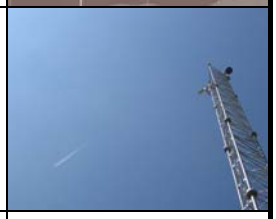
'Standard' work or 'Extra' to contract	*Date*	*Project Event*	*Summary Details*	*Images*
Event	3 June 2006	Breach 1 opened up flooding Area A (west) (Count Area 1*)		
Event	5 June 2006	Breaches 2 and 3 opened up flooding Area A (east) (Count Areas 2 to 5*)		
Standard	16 June 2006	LiDAR/CASI flight by Environment Agency National Centre for Environmental Data and Surveillance	*Environment Agency carried out over fly of site to collect surface elevation, CASI and photographic images (NB survey previously aborted on 31 May due to high cloud cover)*	
Extra	29 June 2006	Web camera tower set up	*Tower set up and 2 web cameras installed as part of Environment Agency and ComCoast stakeholder communication initiative. Part funded by Defra-EWD.*	
Extra	3 July 2006	Website set-up in advance of Defra conference	Website constructed to disseminate information during lifetime of project. Part of the Environment Agency/ComCoast stakeholder communication initiative.	
Event	4 July 2006	Breaches 4 to 6 opened up flooding Area B (Count Areas 6 to 9*)		
Event	5-6 July 2006	Defra Flood Defence Conference in York. Paper presented on lessons learned from Wallasea regime modelling and website publicised.		

'Standard' work or 'Extra' to contract	*Date*	*Project Event*	*Summary Details*	*Images*
Standard	3-5 August 2006	Post breach estuary flow (neap tide) and deployment of static meters in breaches	*Flow speed (ADCP) monitoring along 'Figure of 8' alignments covering Zones 1 to 4. Also deployment of Nortek (flow meter) and OBS (suspended sediment meter) in Breaches 2 and 4.*	
Extra Sampling	9 August 2006	Fish sampling as part of ComCoast PhD study.	Hand trawling in Count Area 2 and in adjacent mature saltmarsh to collect samples of bass for gut analysis. (Samples contain abundant crustacea – prawns shrimps crabs)	
Standard	13-14 August 2006	Post breach estuary flow (spring tide) and retrieval of all static meters (in breaches and at Ness)	*Completed*	
Standard	Sept 2006	Trial bird survey	Counts to be taken on hourly basis on key habitats in nine count sections. Data mapped to give spatial information.	
Event	23 September 2006	WEM magazine article	Article prepared on Wallasea for CIWEM magazine	
Standard	Monthly Oct-Mar 2006	Monthly bird surveys	First visit (12th October) completed by CJT Ecology. In summary 6 targets achieved for roosting birds were achieved.	
Standard	9 November 2006	PMG meeting		Meeting

'Standard' work or 'Extra' to contract	Date	Project Event	Summary Details	Images
Event	20 Nov 2006	CIWEM Wetland Award submission	Submission prepared for Wetland Award with Faber Maunsell	
Event	26 January 2006	Hydrologic/CIWEM Conference coastal management	Paper prepared and presentation given at CIWEM conference.	
Extra	1 February 2007	Wetlands Conference	Paper prepared and presentation given at CIWEM conference.	
Standard	2 May 2007	Breeding bird survey	First of two annual breeding bird survey undertaken	
Standard	16 June 2007	Breeding bird survey	Second of two annual breeding bird survey undertaken	
Standard	June 2007	Aquatic and terrestrial invertebrate survey	Survey work undertaken with sampling mainly in borrow dyke (aquatic) and along new sea wall (terrestrial).	