Medmerry Managed Realignment - Monitoring Update: Summer 2016

Report – ENVIMSE100291

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Foreword

With the Environment Agency's controlled breach of the old sea defence in September 2013, the Medmerry Managed Realignment Scheme became the largest realignment of the open coast in the UK.

Understanding how the physical environment, habitats and wildlife are responding to the changes is an important gauge of whether Medmerry is working as planned, but can also inform the development of other schemes across the country and beyond.

This report summarises the survey work undertaken over the first two and a half years (to May 2016). It is anticipated that Medmerry will keep changing for several years, but it is in these early years that some of the most profound changes are likely to occur.

The monitoring work has been a collaboration of teams from the Environment Agency, RSPB, University of Brighton, Channel Coastal Observatory, IFCA, Chichester District Archaeology Society and Chichester Natural History Society. This continues the theme of close cooperation that has been such a hallmark of the Medmerry Scheme.

Executive summary

Medmerry is the largest managed realignment project on the open coast ever undertaken in Europe.

Since the breach, the Environment Agency and its partners have conducted wide-ranging environmental monitoring to see how Medmerry has developed. This monitoring will help provide the necessary evidence as to whether Medmerry is suitable for nature conservation designation. The monitoring data will also be used to help better understand the impact of managed realignment in an open coast environment, and to inform the design of future similar projects.

A report was produced in March 2015 looking at the first 18 months of environmental data. This report now brings the findings up to date.

Changes to the physical environment: Monitoring of changes to the beach and breach area by the Channel Coastal Observatory (CCO) has charted radical changes to their layout, driven by tides and storms. These changes have been in line with expectation, but have perhaps happened quicker than predicted, in part due to the severity of storms.

Studies of inter-tidal processes are ongoing but have already confirming how newly created inter-tidal sites are extremely dynamic in the initial few years after breach. This work, by the University of Brighton, has demonstrated that the initial evolution of the intertidal landscape is strongly influenced not only by physical locality but also by the pre-breach land use and landscaping along with the prevailing weather and tidal conditions. The monitoring has also demonstrated the power of a managed realignment site to absorb the tidal energy.

Changes to habitats: The site is undergoing enormous change and many common saltmarsh plants are colonising the new intertidal areas, which is encouraging. The nutrient-rich ex-arable fields have been colonised much more fully than the excavated borrow pits (with very low nutrients). This is to be expected and creates a level of variation across the site which is beneficial to a wide range of wildlife.

Changes to wildlife: At a county level, Medmerry has already developed important breeding populations of Avocet and Little Ringed Plover and has retained its important populations of Lapwing, Redshank, Corn Bunting. A pair of Black-winged Stilts bred successfully in 2014, only the third ever in the UK.

There have been encouraging increases in wintering wetland bird populations, and the signals are that these will continue to rise, at least for the next few years, as the intertidal and surrounding habitats at Medmerry become firmly established.

Medmerry has developed a fish 'index of diversity' comparable to long-established sites, despite being less than three years old, showing how quickly a managed realignment site can develop a healthy population of fish and become an important nursery for marine species. The arrival of a large shoal of Smooth-hound Sharks was possibly unprecedented on the south coast.

Water Voles have colonised large areas of new receptor channel within two years of the breach. The evidence also implies that the translocation and/or passive displacement of Water Voles from within the inundation zone into receptor habitats was successful. Populations of reptiles, another species for which mitigation work was undertaken, also appear to be thriving.

Archaeology: During the construction of Medmerry much significant archaeology was uncovered. The fieldwork to record this was completed before the breach, and the process of analysis and writing up the finds is well under way. Post breach the site continues to be monitored, and the continued erosion of the beach is revealing yet more finds, all contributing to our overall understanding of the environmental and human history of Medmerry.

Conclusion: Nearly three years on from the breach and Medmerry is going from strength to strength in meeting all three of the project's key objectives; sustainable flood risk management, habitat creation and community involvement. As a case study, Medmerry is providing invaluable insight into the development of an open coast managed realignment.

Contents

1. Background

Medmerry is the largest managed realignment project on the open coast ever undertaken in Europe.

Figure 1.1: Aerial photo of Medmerry looking south, 19 September 2013 (Environment Agency)

Located between Selsey and Bracklesham in West Sussex, this frontage was until 2013 a narrow shingle embankment ('barrier beach'). This acted as the flood defence protecting low-lying farmland behind it plus a significant number of residential properties in Selsey, the B2145 Chichester to Selsey road, the main wastewater treatment works of the area, and holiday chalets and associated infrastructure.

The frontage was considered to be the one most at risk in South East England of flooding from the sea, with a predicted level of risk of '1 in 1' (ie it was predicted that the sea would be likely to breach the barrier beach every year if remedial action wasn't taken). The barrier beach was artificially maintained, with a significant amount of public money spent each year (mainly in winter), recycling and re-profiling it with a fleet of diggers. In 2008, the defences breached during a storm which led to widespread flooding inland, showing how vulnerable the coast was at Medmerry.

Following detailed planning and public consultation, as part of the development of the Pagham to East Head Coastal Defence Strategy (2008), it was concluded that the best flood risk management solution for the Medmerry frontage would be managed realignment. In 2010 the Environment Agency secured planning permission for the scheme, and during 2011-2013, to a very detailed and modelled design (including predictions of the expected habitats that would result, see Fig. 1.2), constructed 7km of inland banks to a height of 5.6m Above Ordnance Datum (AOD). The clay to build the banks was extracted from shallow 'borrow pits' within the site, and two rock revetments (eastern and western rock armours) were created to strengthen the bank where it meets the coast. The rock armours were constructed to a height of 6.6m AOD.

Table 1.1: Medmerry timeline

Date	Activity
2008	Pagham to East Head Coastal Defence Strategy recommends Managed Realignment
2009	Business case approved by the Environment Agency for Medmerry Managed Realignment
2010	Planning permission consented by Chichester District Council
2011-13	Construction of Medmerry
September 2013	Managed breach. RSPB takes over day to day management
Winter 2013/14	Medmerry immediately faces severe winter storms, and performs as intended, safeguarding homes and property
2016 TBC	Completion of final land negotiation

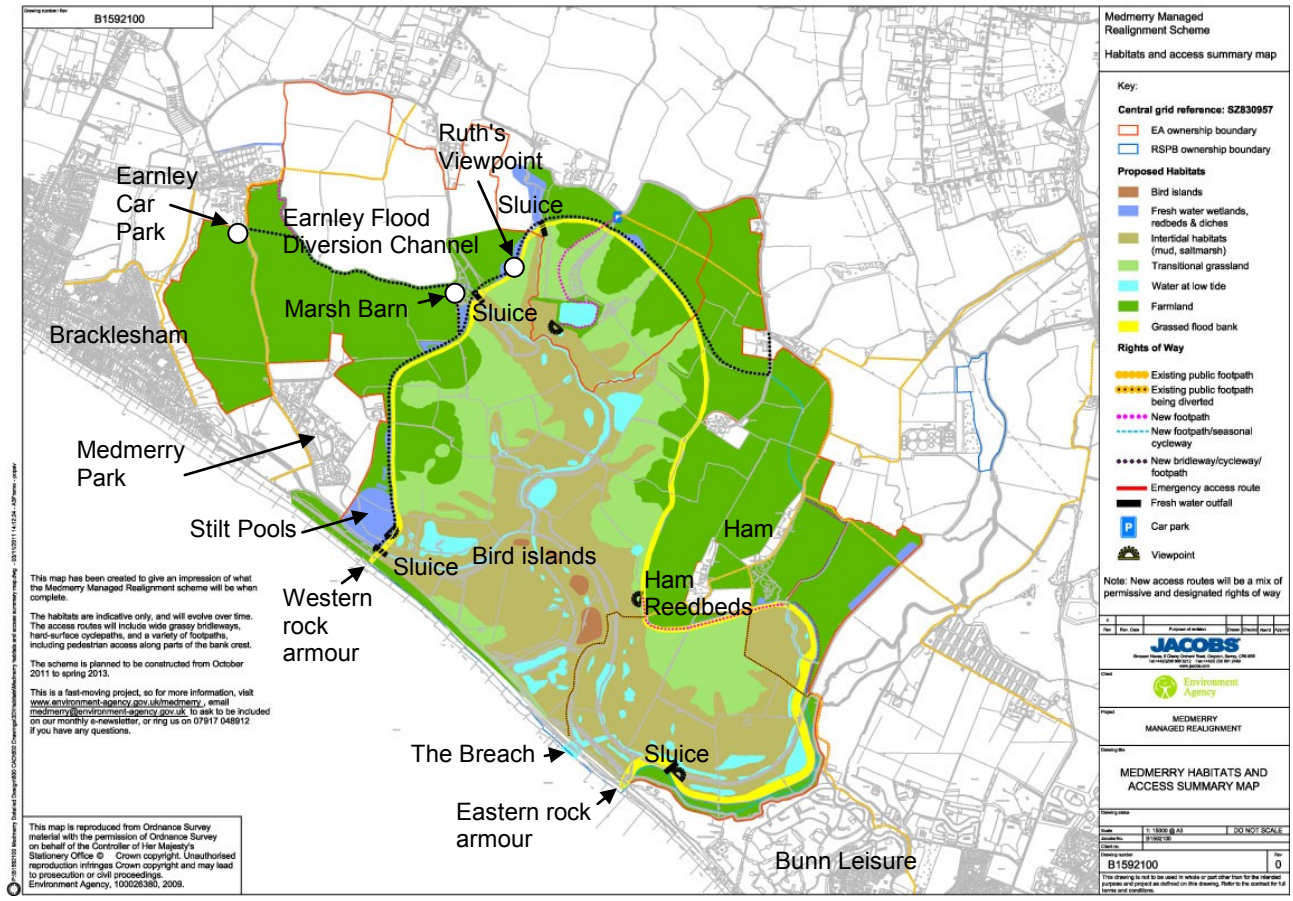
In addition to the creation of the sea defences, large-scale engineering work was undertaken to maintain the freshwater drainage landward of the defences. Four sluices were put in to continue to allow the drainage of freshwater from the Manhood Peninsula out to sea; two freshwater storage basins were created inland of the Earnley Sluice and the Easton Rife Sluice to temporarily hold excess freshwater during periods when the sluices were 'tide-locked'; and the Earnley Diversion Channel was constructed to divert freshwater flows away from the Earnley Rife and into Medmerry, and

The new defence allowed the barrier beach to be artificially breached on 9 September 2013 (a 110m long section was removed), and the sea flowed into the network of channels and borrow pits. The power of the waves is dissipated as it pushes up these channels, in striking contrast to the original barrier beach which took the full force of the sea. As saltmarsh habitats develop in the new intertidal areas, these will naturally further reduce the storm impact on the coast. The scheme has reduced the flood risk of the bank breaching in any one year to a current day 0.1% (0.33% in 100 years time), giving 1000 times better protection to the communities at risk.

The process will also create approximately 184 hectares of new intertidal habitat. This is providing compensatory habitat under the Conservation of Habitats and Species Regulations 2010 for predicted losses of saltmarsh and mudflat in The Solent over the next 20 years. These losses will occur as a result of coastal squeeze against existing or new coastal flood defences within the Solent.

The establishment of habitat at Medmerry, and its anticipated future designation as Special Protection Area (SPA) and Special Area of Conservation (SAC), means that there is now the legal right for existing flood defences in the Solent to be maintained even if the SPA and SAC habitats there are 'squeezed' as a result.

Figure 1.2: Predicted map of Medmerry habitats post breach, drawn in 2011



Post breach environmental and ecological surveys

Since the breach, the Environment Agency and its partners have conducted wide-ranging environmental surveys and monitoring to see how Medmerry has developed. This monitoring will help provide the necessary evidence as to whether Medmerry is suitable for designation as SSSI, SPA and SAC. The monitoring data will also be used to help better understand the impact of managed realignment in an open coast environment, and to inform the design of future similar projects.

A report was produced in March 2015 looking at the first 18 months of environmental data. This report now brings the findings up to date.

Note that this report is solely about the environmental changes at Medmerry and not about the engineering of the site or flood risk management.

2. Changes to the physical environment

2.1. Introduction

Before Medmerry was breached, the shingle barrier beach between Bunn Leisure and Bracklesham was maintained by bulldozer as a high bank, steep-sided on both the seaward and landward sides (Fig 2.1). The shingle included imported material to bolster the bank, and there was evidence that there was a rudimentary 'hoggin' (a mix of clay, gravel and granite dust or sand) within the bank that historically would have been used to try and bind it together. There was also a series of wooden groynes embedded within the bank and projecting either side to slow the littoral drift of shingle towards Bracklesham.

Figure 2.1: Medmerry beach looking SE, 3 August 2009 (Adrian Thomas)

Following the construction of the new inner sea defence banks, the 1km of shingle beach between the two new rock armours no longer fulfils a flood defence function. The intention from the start of the Medmerry Scheme was that, post breach, this length of beach would not be maintained, as there is no longer a flood defence reason to do so. The beach east and west of the breach can now be allowed to develop in a natural way.

The Environment Agency removed some of the wooden groynes in 2014-15 as they no longer were needed to arrest the movement of shingle along this section of coast; also, those that had been exposed and shattered by the sea as the beach rolled back posed a hazard to beach users and windsurfers.

Modelling by ABPMer prior to the scheme suggested that, over time, the sea would flatten the eastern and western beaches spreading the shingle inland and hence creating a much wider expanse of shingle. In times of high seas or storms, it was predicted that waves would then wash over the shingle.

2.2. Changes to the beach and breach

The Channel Coastal Observatory (CCO) was commissioned by the Environment Agency to conduct monitoring of Medmerry between August 2013 and April 2016 to see if the beach and breach were developing as expected.

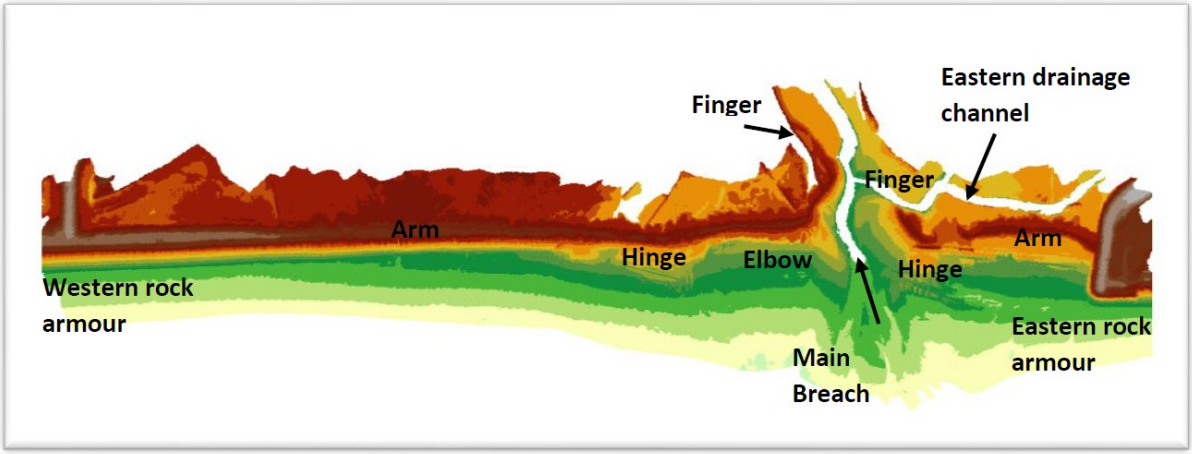
The monitoring was to cover:

- topography (detailed mapping of the surface features of land)
- bathymetry (the study of underwater depth of lake or ocean floors; effectively underwater topography)
- and hydrodynamics (the forces exerted by water flowing in and out of Medmerry)

The full survey report is available in the Appendices.

The following is a non-technical summary.

Figure 2.2: The main terminology used in the study regarding the western and eastern beaches.



Topography

Surveys were carried out using a combination of terrestrial laser scanner (for dry land) and Global Positioning System receivers (RTK GPS) (for recording through water). Each has an accuracy of +/- 20mm horizontally and 30mm vertically. To date, 20 surveys have been undertaken.

A pre-breach full baseline topographic survey was completed in August 2013, covering a 3km stretch between the undefended section east of Bunn Leisure's defences, Selsey, and the western rock armour, Bracklesham, with repeat surveys in March 2014 and October 2015.

Lidar data (which measures distance by illuminating a target with a laser light from an aeroplane), was collected in June 2012, and then combined with the datasets to provide pre-breach topographic detail landward of the barrier beach.

Topographic surveys conducted between August 2013 and January 2016 covered approximately 500m either side of the breach channel, and from the landward extent of the barrier beach to the Mean Low Water contour. Following the 2013/14 storms which caused major morphological changes, the western boundary of the survey area was extended to the western rock armour.

Bathymetric surveys

Three single beam hydrographic surveys have been completed, in January and June 2014 and July 2015, in order to assess elevation changes in the inter-tidal and sub-tidal areas just offshore of the breach site. Survey lines extended 300m offshore along a 1km stretch of frontage spanning either side of the breach. Some bathymetry within the main breach channel itself has also been captured.

Hydrodynamics

An Acoustic Doppler Current Profiler (ADCP) was deployed in the main breach channel, close to the confluence of the drainage channels, in order to measure water current flows through the breach.

Headline results

Figures 2.3 to 2.6 show the development of the beach and breach. The heights are indicated by a spectrum of colour, running from grey as the highest ground through reds, yellows and dark greens, and with pale greens as the lowest levels. The entire series of maps are in the full report.

- The studies have shown in great detail how, in response to wave and storm conditions, the eastern and western beaches have been lowered and flattened.
- The shingle beach has rolled back up to 100m into Medmerry either side of the breach, significantly realigning the shoreline. (see Figs.2.7 and 2.8)
- The erosion has exposed a compacted mud foreshore and, in places, the former land surface, historic groynes, field boundaries and former defence structures.
- 'Overwash fans' of shingle continue to be created on the landward side of the western arm.
- The hinge of the western arm had receded westwards by approximately 710m by April 2016.
- The eastern beach rolled back, initially constrained by a ditch, but once it had moved over this it continued to roll-back until reaching the eastern drainage channel, altering the position and flow of this channel and its confluence with the main breach channel.
- The tides formed two fingers of shingle moving into Medmerry, one on either side of the breach; by April 2016, the tip of the eastern finger was 124m northeast of the original beach position; the tip of the western finger was 300m northwest.

Figure 2.3: Medmerry pre-breach. 27 August 2013

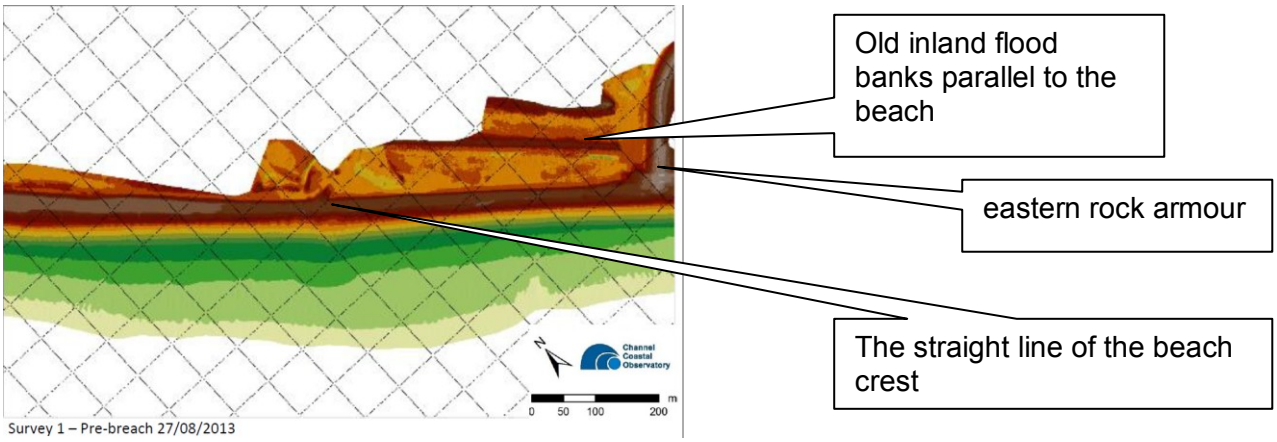
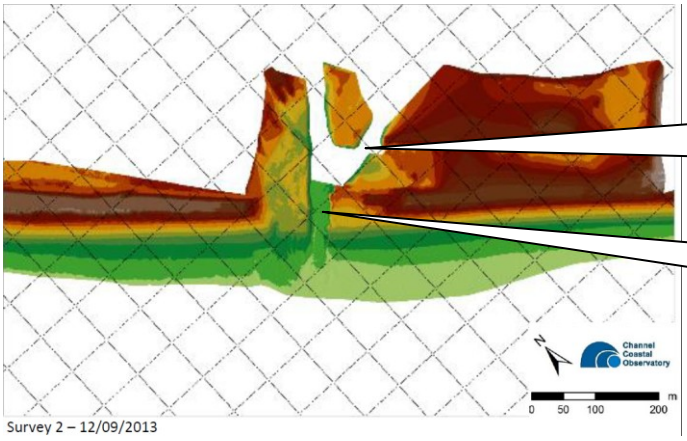


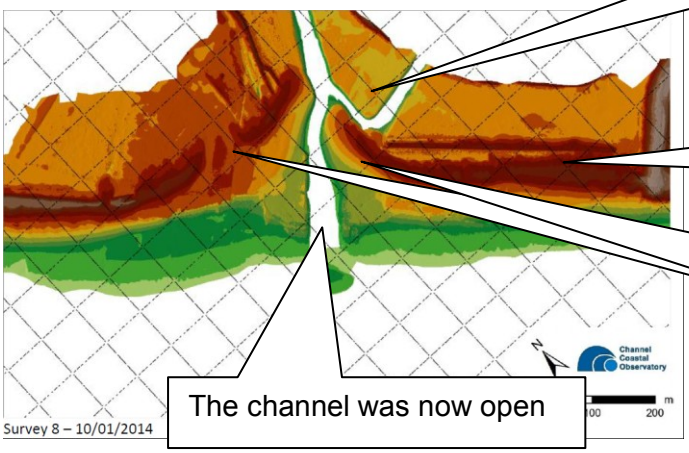
Figure 2.4: Post breach. 12 September 2013



Two new channels (western and eastern) had been dug to convey the tide into the site

The final excavation of the breach had yet to be made.

Figure 2.5: 10 January 2014.



The eastern channel had doubled back on itself and was flowing north (on an outgoing tide) to join the western channel flowing south

The eastern beach had rolled back over one of the former inner flood banks and was approaching the second.

The western and eastern shingle fingers were now pushing into Medmerry, with fans of shingle on the inland face especially noticeable on the western side.

The channel was now open

Figure 2.6. 12 April 2016

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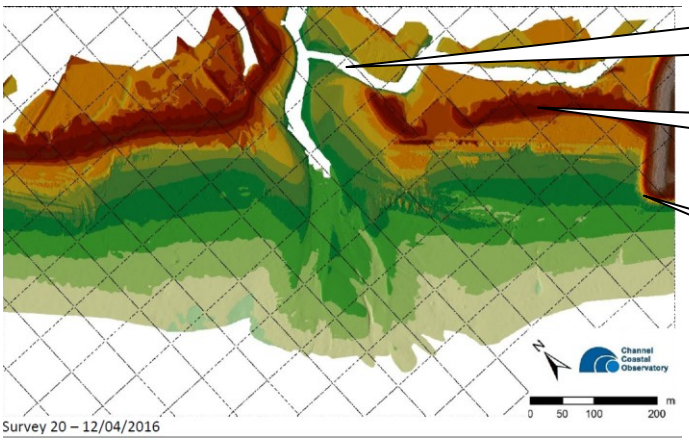


The eastern channel was once more flowing NW, having cut through the eastern finger.

The western and eastern beaches had rolled back further into Medmerry.

The eastern rock armour now stood out into the sea

Figures 2.7 & 2.8: East Beach from the same vantage point looking NW, July 2014 & Feb 2016

Much of the original movement of shingle took place in the repeated storms of winter 2013/14, but spring tides and storm conditions continue to remodel the shingle, in a way that was predicted but perhaps at a pace quicker than originally anticipated. It is also expected that there are several more years of considerable 'rolling back' before Medmerry's beach achieves some kind stability.

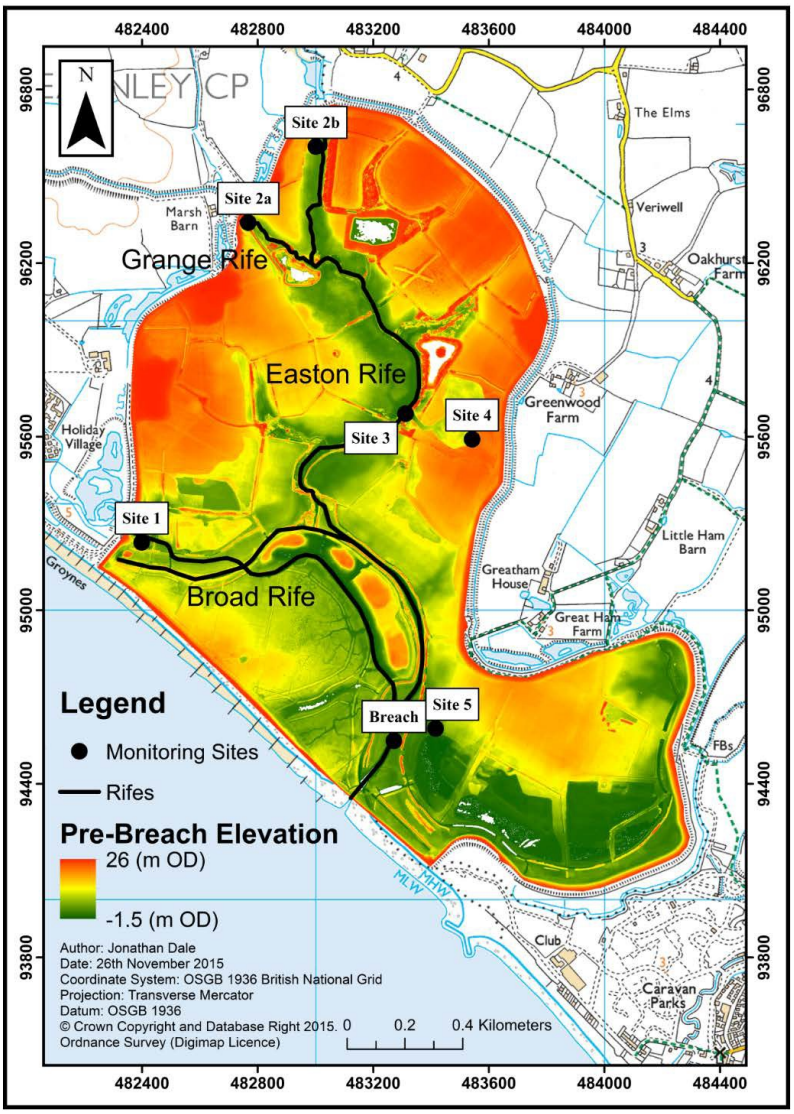
For the first time in probably centuries, the beach at Medmerry is now very much developing through natural processes. As was commented by a local observer who has watched the developments at Medmerry for over 10 years, "You get the sense that Nature has been wanting to do this for years - now she has free rein, she is getting on with the job".

2.3. Changes to intertidal processes

The University of Brighton is assessing how the tides and freshwater flow have influenced the changing intertidal landscape, in particular where and how sediment is being eroded and deposited within the Medmerry site and if there is an export or import of fine sediment to or from the sea.

In order to do this a number of water parameters have been monitored at various sites around Medmerry (see Figure 2.9) including suspended sediment concentration (SSC), water depth, temperature and salinity. These have been assessed in relation to weather, tides and changes in the elevation of the bed of the new intertidal areas,.

Figure 2.9: Position of University of Brighton's monitoring sites at Medmerry



Results
There is still much analysis to be done and data collection will be ongoing until November 2016. Funding is also being sought to extend the duration of the monitoring project to inform not only the development and management of Medmerry but also to help with the planning and constructions of other future managed realignment sites. A summary of some of the initial results includes the following:

- **Salinity**: On average, the water has 30% higher levels of salinity in summer. Spring tides tend to be 15% more saline than neap tides. Salinity levels reduce landwards, this longitudinal gradient is dependent on tidal and freshwater conditions.
- **Suspended sediment concentration (SSC)**: On average, SSC tends to be more than 21% higher in winter than in summer. Levels tend to be greater on neap tides in winter and on spring tides in summer.
- **Tidal variation**: A detailed study was conducted of tidal range (the height difference between high tide and low tide) on 30 September 2015. Site 2b (at the Easton Sluice, the furthest tidal point in Medmerry from the breach) had a tidal range of 1.1m. However, Site 3 in the centre of the site and about 1km downstream from 2b had a tidal range of 1.9m. The high tide time at 3 was 1.25 hours earlier than at 2b, showing how long it takes the tidal process to reach the inland parts of the site, and hence revealing the power of a managed realignment site to reduce the sea's impact.
- **Sedimentation**: The sites monitored show that some areas of Medmerry's intertidal habitat are accreting (sediment is accumulating, decreasing the depth of water) whereas others are eroding. For example:
    - At Site 3, 2.7cm of sediment accumulated over a 12 month period.
    - At Site 5 in one of the main borrow pits, 15.2cm of sediment accreted over 12 months, thought to be due to eroding banks nearby.
    - The pattern of accretion is dependent upon the position of the site within Medmerry. This along with the pattern of SSC, demonstrates that sediment is not only being redistributed within the Medmerry intertidal area but is also being imported from the sea and settling within Medmerry.

2.2.2 Published Paper

The following paper was produced in 2016: Burgess, H., Kilkie, P. and Callaway, T. (2016), *Understanding the Physical Processes Occurring Within a New Coastal Managed Realignment Site, Medmerry, Sussex, UK*. In Baptiste, A. (Ed), ICE Coastal Management, Changing coast, changing climate, changing minds, Amsterdam, 8-9 September 2015, (pp. 263-273). ICE publishing, London

One of the key conclusions of the paper is that, when managed realignment schemes include the creation of new channels to carry the tidal flows, then if the constructed angle of the bank slope of these channels is reduced, it is likely to reduce initial slumping of the banks. It may also aiding in the drainage of the surrounding land and allow quicker formation of natural intertidal channels (cf. Cornu and Sadro, 2002). In areas higher in the tidal elevation, reduced bank slopes would provide a greater area of transition for flora and fauna. Drainage could be further improved by increasing the length and the sinuosity of constructed channels, in line with natural marsh creeks.

An abstract was also produced for a verbal presentation at the International Conference on Cohesive Sediment Transport Processes, Leuven, Belgium, September 2015. The abstract is titled *Spatial and temporal variations of in-situ erosion shear strength of newly inundated inter-tidal sediment*, and is by Jonathan Dale, Paul Kilkie and Heidi Burgess.

2.2.3 Other reports

There have been two student projects, reports from which can be found in the Appendices:

- The Geo-Physical and Chemical Properties of Newly Inundated Managed Realignment Site, by Fabio Paiva da Silva.
- The Geochemical Properties of Medmerry Managed Realignment Site, by Ivana F. Galvao.

3. Visitors

The public access routes around Medmerry were devised in large part through a collaborative process working with the Medmerry Stakeholders Advisory Group. The routes chosen were a balance between wanting to help local people and visitors enjoy the new habitats and landscape, while respecting the privacy of local residents, and recognising the restrictions of the local minor road network and the pressures on the main B-roads in the area.

The public access design means that visitors to Medmerry are able to access the site on foot/bike from Bunn Leisure or Chainbridge Sluice, from Ham Lane, from the 15-place car park at Earnley opened in 2013, or on foot from Bracklesham Beach. Horse riders' best access is from Earnley car park.

Visitors then have the choice of several kilometres of hardcore tracks and grass verges (the latter designed for equestrian users) around most of the perimeter of the site. Visitors also have access along the beach.

There are four elevated viewpoints and several benches but no covered structures.

As of spring 2016, the Environment Agency has not concluded its negotiation with a private landowner to secure the public rights of way for the final linking section of perimeter path linking the east and west sides of Medmerry. Until then, it is not possible to formally open the Easton Lane car park.

An RSPB volunteer undertook 23 surveys, each an hour long, spread over a range of times and days, at three locations around Medmerry. In these surveys, 207 visitors were counted. The relative proportions of broad user-groups were:

- People out for a stroll 34%
- Dogwalkers 31%
- Cyclists 18%
- Horse Riders 0%
- Wildlife Enthusiasts 14%
- Workers 3%

From this, the annual estimate of the number of people visiting Medmerry in 2015 was approximately 22,000.

Conclusion

Medmerry remains a 'quiet enjoyment' site, a place where you can get away from the crowds in peaceful surroundings. It will be interesting to see if the anticipated opening up of the final linking stretch of path, the increased promotion of the site by the RSPB once this happens, and in due course the opening of a more direct permissive path from Pagham Harbour Visitor Centre will increase visitor numbers. Medmerry has been designed to have the capacity to cope with such an increase and in doing so help give recreational space to the local community and support the local green tourism economy.

4. Changes to habitats

The RSPB surveyed the vegetation seaward of the new defences on 4 & 5 August and 13 December 2014 in order to map the vegetation communities that had formed during the first year after the breach. (The area that is still under third-party ownership was excluded from the study).

Much of the site was still in a state of change: many areas were covered by the remains of plants killed by sea water, but halophytes (salt-loving plants) had not yet colonised, and it is predicted that the disturbed areas from arable land and construction work will change rapidly over the next few years as the annuals are replaced by other species.

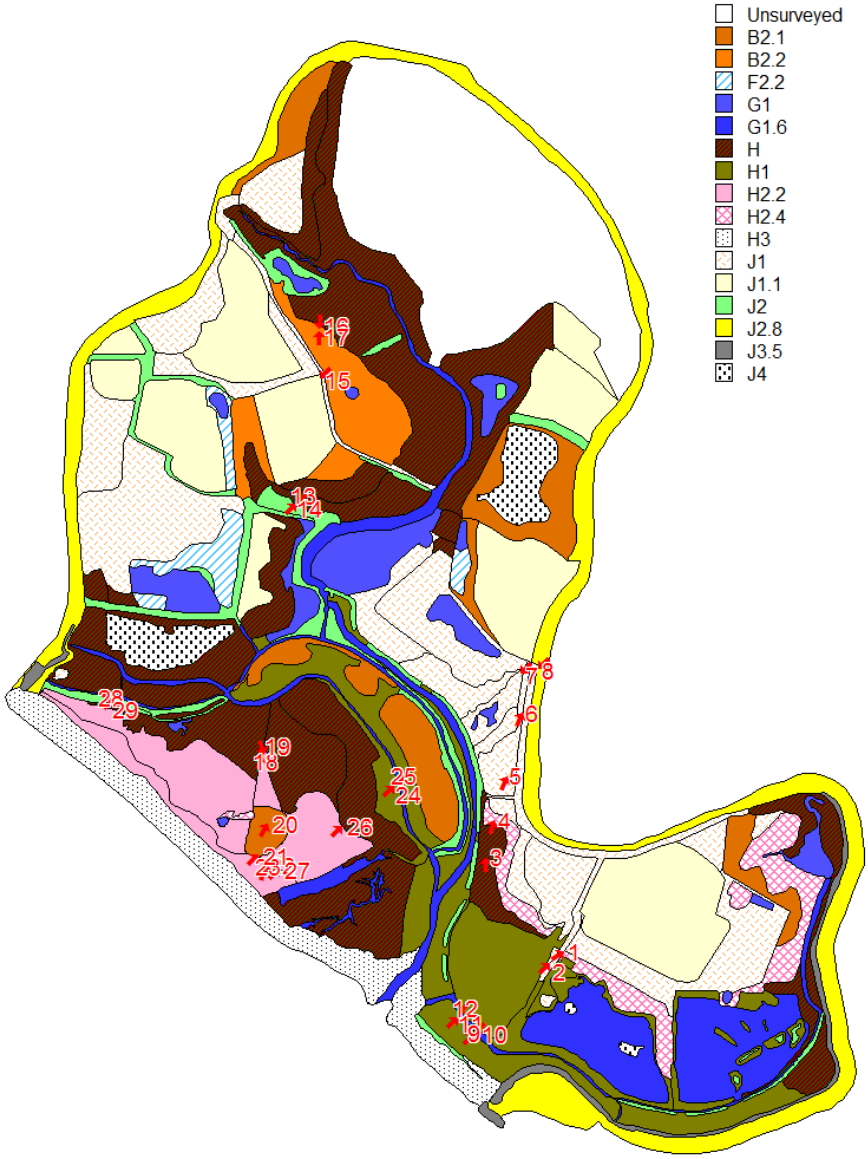
The vegetation communities were mapped from aerial photographs from July 2014 supplied by the Environment Agency (Fig 4.1) and the areas estimated (Table 4.1).

The RSPB will repeat the habitat mapping later in 2016, using the latest data from the EA Geomatics team who flew over and photographed the site in summer 2016.

Table 4.1: Area (ha) of Phase 1 habitats, 2014

	Habitat	Area
B2.1	Unimproved neutral grassland	13.9
B2.2	Semi-improved neutral grassland	7.0
F2.2	Inundation vegetation	3.4
G1	Standing water	10.0
G1.6	Standing brackish water	20.6
H	Coastal (mud and plant litter)	54.1
H1	Intertidal	23.6
H2.2	Continuous saltmarsh	11.7
H2.4	Scattered saltmarsh	6.7
H3	Shingle above high tide	10.4
J1	Cultivated and disturbed land	41.3
J1.1	Arable	35.0
J2	Boundaries (including hedges and grass banks)	10.3
J2.8	Earth banks (the new sea wall)	24.0
J3.5	Sea wall (boulders in the sea wall)	2.5
J4	Bare ground (new scrapes)	5.7

Figure 4.2: Map of Phase 1 habitats at Medmerry, 2014.



Key:

B2.1 Unimproved neutral grassland

B2.2 Semi-improved neutral grassland

F2.2 Inundation vegetation

G1 Standing water

G1.6 Standing brackish water

H Coastal

H1 Intertidal

H2.2 Continuous saltmarsh

H2.4 Scattered saltmarsh

H3 Shingle above high tide

J1 Cultivated and disturbed land

J1.1 Arable

J2 Boundaries

J2.8 Earth bank

J3.5 Sea wall

J.4 Bare ground

Conclusion

The site is undergoing enormous change and many common saltmarsh plants (e.g. Annual Sea-blite *Sueda maritima*, Glasswort *Salicornia europaea* and Orache *Atriplex* spp.) are colonising the new intertidal areas, with considerable developments from year to year (see Figs. 4.3 and 4.4). This is likely to continue as the site changes further, and the old vegetation continues to disappear. The precise boundaries of the saltmarsh and nearby grasslands in particular are evolving in response to the changes to the former barrier beach.

The old arable fields (with high levels of nutrients) have been colonised much more fully than the excavated borrow pits (with very low nutrients) (Figs. 4.5 and 4.6). This is to be expected and creates a level of variation across the site which is beneficial to a wide range of wildlife.

Figure 4.3: Developing saltmarsh, 18 November 2014 (Pete Hughes)

Figure 4.4: Developing saltmarsh eight months later, 18 September 2015 (Pete Hughes)

Figure 4.5: Developing saltmarsh on former arable field 27 September 2015 (Pete Hughes)

Figure 4.6: Developing vegetation, borrow pit 6, 27 September 2015

5. Changes to wildlife populations

5.1 Birds

5.1.1 Breeding birds

Table 5.1 shows the estimates of the breeding populations of all bird species at Medmerry, as recorded within the area hatched in red on Fig.5.1. The national (UK) conservation status of each species is shown by colour: those highlighted in red are species of High Conservation Concern (typically species which, nationally, have declined by 50% or more in the last 25 years); those highlighted in amber are of Medium Conservation Concern (typically having declined by 25% or more).

Breeding and wintering bird counts are carried out on the land seaward of the seawall and the freshwater areas immediately adjacent to it.

Figure 5.1: Bird recording area

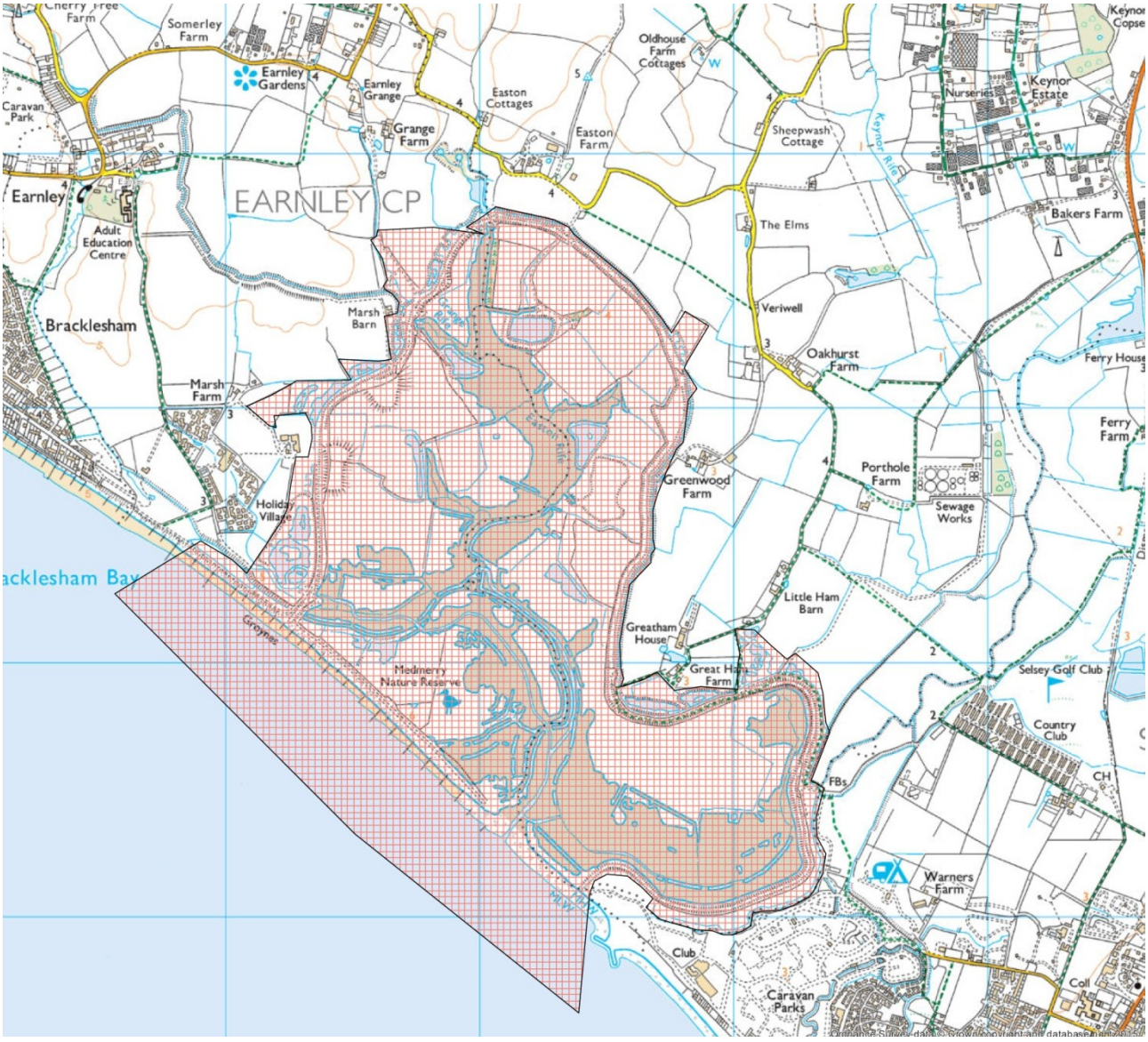


Table 5.1: Breeding bird counts, 2014 and 2015

[2016 breeding data only available for wading birds at time of press]

Species	Count unit	2014	2015	2016	Comments
Little Grebe	Pair	3	5		
Mute Swan	Pair	2	1		
Canada Goose	Pair	1	2		
Shelduck	Pair	4	6		This is 10% or more of the entire Sussex breeding population,
Gadwall	Pair	4	2		Only 40-80 birds are thought to summer in Sussex
Mallard	Pair	14	15		
Tufted Duck	Pair	6	8		
Red-legged Partridge	Pair	3	2		
Grey Partridge	Pair	0	1		
Pheasant	Pair	Present	Present		
Moorhen	Pair	Present	Present		
Coot	Pair	7	7		
Oystercatcher	Pair	3	3	3	There are only c. 60 pairs in Sussex, so this represents 5% of the population
Avocet	Pair	8	16	23	There are less than 100 breeding pairs in 2015 Sussex so this represents a sizable proportion of the county population
Black-winged Stilt	Pair	1	0		Only the third successful breeding in UK records.
Little ringed plover	Pair	5	6	8	There are usually less than 20 pairs in Sussex, so this represents over 25% of the county population
Ringed Plover	Pair	5	6	5	There may be only 70 pairs in Sussex, so this represents over 8% of the county population.
Lapwing	Pair	16	16	16	
Redshank	Pair	9	7	9	
Black-headed Gull	apparently occupied nests	0	4		
Stock Dove	Pair	3	2		
Woodpigeon	Pair	Present	Present		
Cuckoo	Singing/displaying male	2	2		
Barn Owl	Apparently occupied territory	1	1		

Green Woodpecker	Pair	1	1	
Skylark	Pair	16	26	
Meadow Pipit	Pair	8	7	
Pied Wagtail	Pair	3	2	
Wren	Pair	Present	Present	
Dunnock	Pair	Present	Present	
Robin	Pair	Present	Present	
Blackbird	Pair	Present	Present	
Song Thrush	Pair	3	2	
Cetti's warbler	Singing/displaying male	4	4	
Sedge Warbler	Pair	8	7	
Reed Warbler	Pair	18	20	
Lesser Whitethroat	Pair	0	1	
Whitethroat	Pair	15	16	
Chiffchaff	Pair	2	2	
Willow Warbler	Pair	1	2	
Long-tailed Tit	Pair	1	0	
Blue Tit	Pair	Present	Present	
Great Tit	Pair	Present	Present	
Magpie	Pair	2	2	
Carrion Crow	Pair	2	3	
Chaffinch	Pair	3	3	
Greenfinch	Pair	3	0	
Goldfinch	Pair	6	4	
Linnet	Pair	14	16	
Yellowhammer	Pair	6	8	
Reed Bunting	Pair	12	14	
Corn Bunting	Pair	9	10	There are thought to be less than 350 pairs in Sussex, most of these on the South Downs, so this represents a very important and unusual population on the coastal plain.

5.1.2 Wintering birds

Table 5.2 shows the changing populations of a select suite of key wetland birds at Medmerry, as recorded on Wetland Bird Surveys (WeBS) winter counts.

Table 5.2: WeBS counts of key species, 2014-2016

	2014						2015						2016		
	J	F	M	O	N	D	J	F	M	O	N	D	J	F	M
Brent Goose	1025	55	8	2	1850	1983	506	382	133	0	323	713	89	59	95
Shelduck	14	24	15	0	18	19	16	30	40	8	9	21	32	24	25
Wigeon	490	0	0	15	198	147	250	145	17	199	247	92	119	151	94
Teal	505	247	77	220	396	236	380	370	89	280	817	553	378	307	230
Little Egret	3	2	7	12	9	19	12	8	6	11	7	15	12	11	15
Oystercatcher	2	3	2	5	8	3	7	2	13	21	8	14	9	14	36
Ringed Plover	5	2	4	29	18	24	26	64	25	44	30	41	42	30	21
Grey Plover	15	120	28	55	43	11	50	16	5	22	20	6	92	55	35
Golden Plover	225	0	0	40	85	75	25	0	242	0	25	17	0	30	0
Lapwing	1555	105	0	173	216	150	140	14	57	61	234	110	110	52	97
Dunlin	12	0	0	42	46	101	48	11	33	18	25	53	140	110	220
Redshank	0	0	0	5	10	12	3	6	5	6	11	20	7	6	9
Curlew	0	25	0	10	16	13	7	13	9	20	16	20	20	8	71

Selected analyses of key species

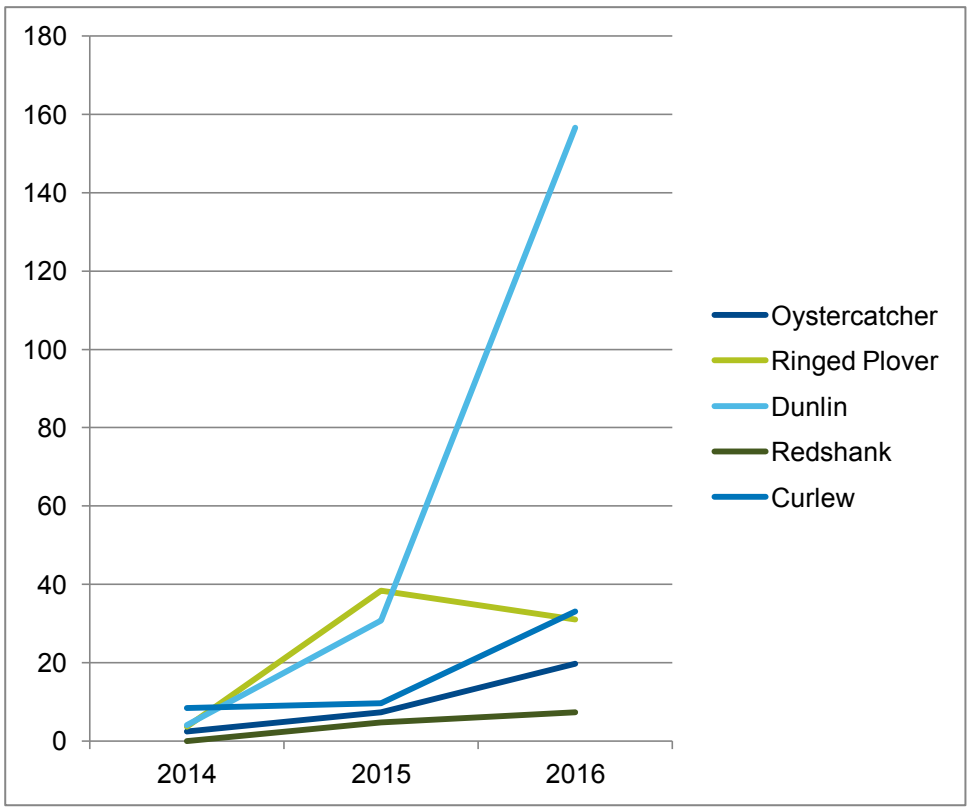
Brent Goose: This is one of the key species for which the Special Protection Area is designated at nearby Pagham Harbour, and is likely to be an important species in the future designation of Medmerry. The widely varying counts are no surprise for a species that roves around the Pagham Harbour to Chichester Harbour area in a small number of large flocks; it is a matter of luck whether a count day at Medmerry coincides with one of the flocks visiting the site. Nevertheless, it is very encouraging that very large numbers are visiting on occasions (a count of 1983 in December 2014 represents about 16% of the Sussex population). Importantly, in winter 2015/16, Brent Geese flocks were observed regularly using cattle grazed pasture and saltmarsh at Medmerry, indicating the management of the site is producing favourable conditions for them.

Teal: Initial high counts soon after breach in 2013 were attributed to the incoming tides flushing of lots of seeds on what was previously dry land. However, the continuing high numbers are very encouraging: the count of 817 in November 2015 represents over 12% of the Sussex wintering population.

Wading birds of estuary muds: During the creation of Medmerry it was anticipated that it would take a number of years for populations of small crustaceans and molluscs in the mudflats and saltmarsh areas to colonise and flourish, and hence provide food for wading birds. The growth in the average numbers of in particular Dunlin but also Curlew, Oystercatcher and Redshank has been encouraging (Fig. 5.2). The Ringed Plover counts are impressive in a county context, approaching 8% of the county total. The counts for other species are, as of yet, just a small

proportion of county figures, with eg Oystercatcher numbers <1% of the county total, and Dunlin and Redshank <0.5%.

Figure 5.2: Average WeBS counts, Jan-Mar, for five key wading birds of coastal muds



Pre-breach, very small numbers of these species were recorded at Medmerry, as the habitat was not favourable for them. The few waders that used the site roosted primarily on cultivated fields or fed on the small areas of old grassland and freshwater rifes. Post-breach, the large areas of tidal mud, saltmarsh and islands have provided good feeding and roosting opportunities for a much larger range of wetland birds.

5.1.3 Other birds

Of course, a range of bird species other than those that breed or are recorded in the Wetland Bird Survey are recorded at Medmerry each year. These include migrant species that either stop off or flyover the reserve, plus a range of non-breeding birds in both summer and winter.

The highlights in the first three years at Medmerry include:

– Regular winter records of small numbers of Black Redstarts using the rock armour areas
– During the winter of 2014/15, three Spoonbills (occasionally four) were regularly seen feeding in the lagoons and creeks, and roosting on the islands.
– Black-winged Stilt - 1 pair bred in 2014, raising three young, the first successful breeding attempt by this species in the UK since 1987
– During the Aug-Oct of 2015, at least one Osprey was seen fishing regularly over the lagoons and creeks.
– Large areas of tussocky grassland on the new seawall and the new saltmarsh has been popular with wintering Short-eared Owls: up to five were seen during the winter of 2014/15, and up to three in 2015/16. One Short-eared Owl remained into the summer of 2016, a very

unusual record for southern England. Peregrines and Merlins are often seen in winter hunting over the saltmarsh and beach.

- Little, Common and Sandwich Terns have been seen fishing over the intertidal creeks and lagoons every summer since the breach.
- Unusual sightings included several Little Gulls visiting the Stilt Pools in late winter/early spring of 2016, a Long-tailed Skua which stayed for a few days in autumn of 2014, and a long-staying Great Northern Diver in autumn 2014.
- Passage waders - the new wetlands have provided good re-fuelling stops for a range of waders heading either north or south on long migrations, including Sanderling, Little Stint, Wood Sandpiper, Curlew Sandpiper, Whimbrel, Bar-tailed Godwit and Green Sandpiper.
- Black-headed Gull: four pairs bred in 2015, fledging four young; 19 pairs bred in 2016 fledging one young.
- Kingfishers - frequently seen in autumn and winter, on smaller creeks and near drainage outfalls.
- Great Grey Shrike - 1 spent a few days near Ham ponds during autumn of 2015.
- Hobby - 2 or 3 were hunting dragonflies over Ham Ponds during spring of 2015.
- Wryneck, near Marsh Barn, September 2015.
- Two wintering Dartford Warblers in gorse on the seawall in 2015/16.
- Hoopoe near Marsh Barn, April 2015.
- Black tern on the Stilt Pools, May 2015

5.1.4 Conclusion

A total of 52 breeding bird species was recorded at Medmerry in 2014 and 2015. At a county level this includes very important breeding populations of Avocet, Lapwing, Redshank, Little Ringed Plover and Corn Bunting. It is anticipated that the important populations of Ringed Plover and Oystercatcher may continue to grow, and the regime of mixed, wildlife-friendly farming may allow the retention of a population of Grey Partridges.

We might expect populations of 'pioneer species' of new wetland habitats, such as Avocets and Little Ringed Plovers, to wane in future years as vegetation establishes (they prefer the openness and bare substrates when wetlands have just been created), whereas the small numbers of Black-headed Gulls may increase, and may also include colonisation by Mediterranean Gulls and terns.

It seems likely that the increases in wintering wetland birds will be sustained, at least for the next few years, as the intertidal and surrounding habitats at Medmerry and the invertebrate and other foodstuffs they contain become firmly established. The introduction of a well-managed cattle grazing regime around the transitional grasslands and developing saltmarsh should allow sustained increases in the average counts of, in particular, Brent Goose, Lapwing, curlew and Wigeon.

5.2. Fish

5.2.1 **IFCA small fish surveys at Medmerry**

Introduction

Saline channels and pools are important nursery sites for a range of seafish and also provide a permanent home for some inshore species.

Surveys have been undertaken at Medmerry by Sussex Inshore Fisheries and Conservation Authority (IFCA) assisted by the EA Fisheries, Biodiversity and Geomorphology (FBG) team to determine which species have colonised Medmerry post-breach, entering the site from the open sea through the breach. The surveys have involved 20 staff from 10 organisations, a great collaborative effort.

Sampling in Medmerry furthers our knowledge of the colonisation and use of managed realignment sites and helps inform the role of fish as part of the wider ecosystem.

Methods

Surveys were carried out twice in 2014 (July and October) and three times in 2015 (June, July and Sept) using Seine nets (which are drag nets with weights along their lower edge) (Figs. 5.3 and 5.4) and Fyke nets (which are cone-shaped nets that sit underwater allowing fish to swim into them), plus some hand netting of fish fry in the 2015 surveys.

Figure 5.3: Seine netting, 14 October 2014

Figure 5.4: Fyke netting at Medmerry (IFCA)

Results: Summary

- In total in 2014 and 2015, there have been 27 species.
- Sand Goby was the most abundant (32% of total abundance, n = 1223).
- Sand Smelt was the second most abundant (23%) followed by Bass (17%) (see Fig.5.5).
- 63% of Bass were less than 70mm long, considered to be group 0 age class. 26% of Bass were 90-139mm considered to be group 1.
- The Simpson's Index of Diversity was higher in 2014 (0.76) than in 2015 (0.57), as in 2015, the catch was dominated by Sand Smelt (51% of the total abundance).
- Bass, Flounder, Sand Goby, Herring and Sand Smelt were the only species to have been found on every sampling occasion.
- The variety of intertidal and subtidal habitats provided food and shelter for a diversity of species.

The average index of diversity was 0.70. This index can have values between 0 and 1, with 0 indicating no diversity and 1 indicating infinite diversity. The fish are a prey species for several of Medmerry's bird species, and hence form an integral part of the ecosystem.

We also found some European Eels and juveniles of Black Seabream which are a conservation feature of nearby Kingmere Marine Conservation Zone, another example of Medmerry's importance as fish habitat.

Smooth-hounds

After an initial record of two on 18-19th June 2015, on 15 July 2015 over 75 Smooth-hounds (a small shark species) swam into a tidal area on the eastern part of the site (Borrow Pit 8). They feed on crustaceans and are known to hunt in packs. They dispersed after about one hour. The next day, 20-30 Smooth-hounds were observed in the same borrow pit on the rising tide, as well as in the channel outside the borrow pit. It is likely there were exploiting an abundance of crabs in the newly created tidal areas. Such an event is thought to be highly unusual in a national context.

Figure 5.5: Sea Bass, Medmerry, 22 September 2015 (Gareth Williams)

Non-fish species

The most abundant non-fish species observed was Common Shore Crab. Also observed were: Sea Gooseberries (a jellyfish-like ctenophore), Greater Pipefish, Sea Chervil (a seaweed-like bryozoan), sea spiders (*Macropodia*), cockles, ragworms, shrimps, and juveniles of cuttlefish and squid.

Conclusion

During 2014 and 2015 Medmerry had a fish 'index of diversity' comparable to Chichester Harbour, Pagham Harbour and Rye Harbour, despite being less than three years old. Although there is probably some way to go for Medmerry to reach its natural balance, it shows how quickly a managed realignment site can develop a healthy population of fish and become an important nursery for marine species. It is notable that juveniles of a number of important commercial species are being found in Medmerry, particularly Sea Bass but also Plaice, Flounder, Dover Sole, and mullet spp.

For the full report, see the Appendices.

An MSc study was undertaken by Cayce Harburg on behalf of IFCA in order to help develop monitoring methodology that can be used in future managed realignment sites

5.3 Water Voles

The freshwater ditches at Medmerry, prior to the breach, held an important population of Water Voles, part of one of just three key populations left in Sussex. Estimating the numbers of Water Voles within a population is difficult as there is considerable mortality during British winters and

then an explosion in numbers during the breeding season. However, the pre-construction surveys showed that Medmerry population occupied much of the extensive ditch network.

The breaching of the shingle beach and the inundation by intertidal waters of up to 184ha of farmland was inevitably going to have a major impact on the population.

To mitigate for these impacts:

– a series of replacement freshwater habitats was created on the landward side of the new flood embankment, including 5.8 km of new wetland channel, 1.9 ha of reedbed and 7.3 ha of freshwater wetland (known as 'the receptor channel').
– More than 100 Water Voles weighing more than 80g were translocated from within the inundation zone. Fifty-five of these were released into suitable habitat established on the receptor channel prior to the coastal defence breach in September 2013. (The remaining individuals were taken into temporary captivity but sadly were found to have the *Yersinia enterocolitica* infection at the holding facilities and could not be released).

It was expected that any remaining Water Voles would move of their own accord into new habitats when the breach occurred.

The studies by Brighton University set out to monitor whether all these actions to safeguard the population had been successful.

Methods

The population was monitored by:

– capturing individual voles, all of which were PIT tagged (Passive Integrated Transponder) in which a tiny microchip is injected under the skin, and a few were fitted with a radio collar and then radio tracked. If PIT tagged animals are retrapped, it is possible to see how far they have moved from their initial capture site.
– capture-mark-recapture (CMR) techniques to determine the response and survival of water voles found inside the inundation zone during, and subsequent to, the tidal breach in September 2013.
– looking for field sign surveys to monitor the colonisation of Water Voles on the newly created receptor channel.
– using genetic monitoring to evaluate the genetic diversity of the populations.

Results

Water Voles have colonised large areas of new receptor channel within two years of the breach, with field sign surveys indicating presence along 70% of the 4 km of surveyed channel (Fig. 5.6).

However, the failure to capture individuals and low records of Water Vole field sign in surveys carried out in spring 2014 around the freshwater perimeter ditch suggest that the 55 individuals translocated the previous spring may have dispersed from the release sites.

None of the radio-collared or PIT tagged individuals that were displaced by the tidal inundation were recaptured along the receptor or control channel.

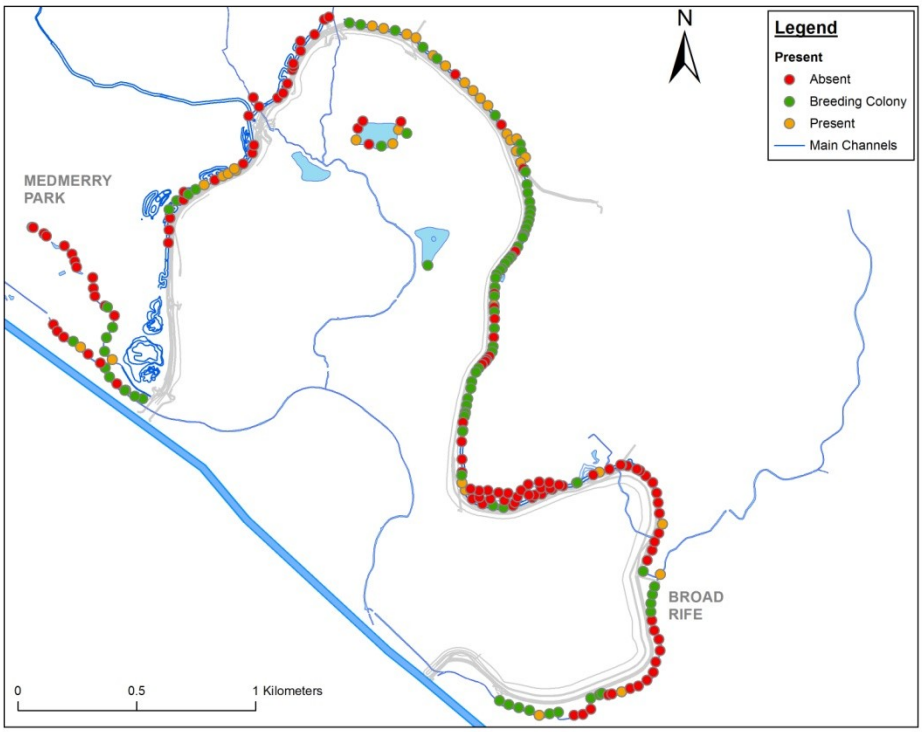
The genetics study showed that genetic variation, prior to the breach, was highest inside of the inundation zone, where, despite four years of construction and the removal of over 100 water voles for translocation, populations had remained well connected and genetically diverse.

The population that established on the receptor channel suffered a temporary loss in genetic diversity, but two years after the tidal breach, the diversity was comparable to the levels observed within the control population.

The results suggest that the receptor channel was colonised by individuals that formerly occupied, or were well connected to, the inundation zone. This implies that the translocation and/or passive

displacement of Water Voles from within the inundation zone into the receptor habitat was likely to have been successful.

Figure 5.6: Water Vole sampling results, April 2015



5.4 Other wildlife

5.4.1 Reptiles

The wet grassland and ditch banks of Medmerry, prior to the Breach, were known to contain populations of four reptile species: Grass Snake, Adder, Slow-worm and Common Lizard.

As part of the mitigation for the breaching and inundation of Medmerry, an area of c.3ha of 'receptor' habitat was created in 2011 landward of the new embankments, comprising rough grassland, log piles and scattered scrub,.

Prior to construction work taking place, reptile fencing was erected which allowed any reptiles in construction areas to be caught and moved to the receptor habitat. A total of 1663 reptiles were moved during this work, the vast majority being Common Lizards and Slow-worms.

Any other reptiles that remained in the area due to be inundated would be able to relocate to higher ground when the sea inundated Medmerry (breaching was undertaken on neap tides, so water levels inside Medmerry would have risen sequentially over a number of weeks.)

The RSPB has been monitoring the receptor habitat. Visual inspections are made on and under six metal corrugated sheets within the receptor area. The key aim is to check whether populations of all four reptile species are still present within the habitat, and if possible to determine whether they are breeding.

A short series of monitoring visits in late summer and autumn 2014 found small numbers of each of the four species present, with maximum counts of one each of Grass Snake and Adder and two each of Slow-worm and Common Lizard.

A more extensive series of 27 visits between 10 March and 28 October 2015 found all four species, with peak counts of two Grass Snakes (see Fig. 5.5), four Adders, seven Slow-worms and

one Common Lizard. Juveniles of all four species were recorded in 2015, indicating that they have bred within the receptor area.

By 1 May 2016, surveys had found peak counts of 1 Grass Snake, 6 male and 4 female Adders, 15 male and 2 female Slow-worms and 1 Common Lizard.

Such counts are likely to be only a proportion of those within the receptor site, and within Medmerry as a whole, but confirm that populations of all four species still exist, and it is likely that populations of all four species will colonise the new seawall and surrounding habitats, if they have not already done so.

Figure 5.5: Grass Snake, Medmerry, 15 September 2015 (Pete Hughes)

5.4.2 Dragonflies

Dragonfly and damselfly surveys have been undertaken by Chichester Natural History Society along a section of the new perimeter ditch along the western side of Medmerry on the landward side of the bank.

Surveys on 4 July and 1 August 2014, less than two years after the ditches were created and planted, revealed four damselfly species (Common Blue, Blue-tailed, Azure and Small Red-eyed) and five dragonfly species (Emperor, Four-spotted Chaser, Black-tailed Skimmer, Common Darter and Ruddy Darter), with healthy populations of most species. Broad-bodied Chasers, Southern Hawkers and Hairy Dragonflies were also recorded during 2015.

5.4.3 Great Crested Newts

A population of Great Crested Newt exists in a pond at Easton, adjacent to Medmerry, and one individual was found within the construction footprint at Medmerry prior to construction. As a result,

the scheme was deemed to be within the Great Crested Newt impact zone and two new newt ponds were dug as mitigation.

A requirement of the Great Crested Newt licence issued by Natural England for the Medmerry Scheme is that the two new ponds should be monitored in years 3 and 5 post breach (ie 2016 and 2018).

The results of the first four surveys in April/May 2016 revealed peak counts of 57 Smooth Newts and seven Palmate Newts but no Great Crested Newts. However, a Great Crested Newt was found on a nearby road and put into the mitigation ponds for its own safety.

The mitigation ponds are functioning well, are retaining water, and contain good levels of vegetation.

5.4.4 Brown Hares

It is difficult to accurately assess numbers, but up to ten individuals were encountered across Medmerry on surveys during 2015. They are found on pasture, saltmarsh and arable (and occasionally on the beach!), suggesting the mix of habitats suits them very well.

6. Archaeology

The Sussex coastline has changed enormously over the last million years. During low sea level stands the area of the present English Channel was land, and a major river system (the Channel River) flowed along it, east to west. At other times there were icebergs in The Channel which carried exotic rocks to the shoreline. They are commonly seen today.

In the postglacial period, (the Holocene), the islands of Southsea, Hayling, Thorney, Medmerry and Selsey extended further south, protected by an offshore shingle barrier: the Anglo-Saxon place-name suffixes (-sea, -sey, -ey and -y) indicate an island. They have subsequently been truncated by marine erosion. Most have a core of relatively solid geology.

The Palaeogene sediments underlying the beach at Medmerry are of the Bracklesham Group, mid Eocene, comprising glauconitic silty sands, silts and sands but they have been weathered in periglacial conditions and are dissected by Pleistocene and Holocene palaeochannels.

Excavations were undertaken by Archaeology South East (ASE) in the Managed Realignment area, and they also defined a former lagoon landwards of the modern beach by auger survey. Since the beach and modern shingle ridges are no longer maintained artificially the beach level is lowering and the shingle ridges are moving inland, exposing archaeological sites, which are being recorded by volunteers from the Chichester and District Archaeology Society (CDAS). Digital 3D images of some of the beach structures are available on our website: www.cdas.info/. Other local observers have kindly reported finds to us.

The sequence exposed is as follows.

1. **The earliest remains** on the beach comprise the roots of an oak tree, which penetrates the Palaeogene sediments, (a former land surface), pre-dating the known archaeology, as well as an organic basal sediment, best called a saltmarsh peat. The tree itself is older than these basal sediments. Basal saltmarsh peats from the ASE excavations date to 4330-4050 and 4260-3990 cal BC.

2. **Bronze Age burnt mounds**. A linear string of these sites, comprising spreads of heat-shattered flint, extends along the shore on both sides of the breach. Some are in situ, resting on Palaeogene deposits. Others are spills within intertidal sediments. The shoreline sites have not been dated by radiocarbon, but six samples from the excavations by ASE fall within the overall date range 1740-

1490 cal BC. There have been no artefactual finds from the beach sites, but a left humerus of the Great Northern Diver (*Gavia immer*) has been found. Sites of this type are very widespread across the UK and were used to produce hot water. What use was made of the hot water is unknown, but the sites may have been used most likely for bathing (including a steam bath), though cooking or malting/brewing have also been suggested.

3. **An Iron Age skeleton** was found by Mrs Cathy Dennis and lifted by the police who did not have the time to consult archaeologists. Lifting was done very rapidly, on a rising tide, and so the only record of context is a single photograph. The police obtained a radiocarbon determination calibrated to 760-410 cal BC – just in case it had been modern. The skeleton is of a male, aged 25+, probably middle aged, with arthritis of the spine, cribra orbitalia in his orbits, (indicating a poor diet), tooth wear and pre-mortem loss, calculus and periodontal disease. He was not a healthy or affluent man. The grey coloration of the surrounding sediment, in the photograph we have, indicates a Holocene intertidal creek fill in this location and also shows dark stripes around the head which are degraded remains of wooden planks, indicating that the skeleton lay over a planked structure – a platform or even perhaps a boat. The skeleton might represent an accidental drowning in a creek or could be a 'placed' deposition (a "bog body"): placing bodies in wet places was a common Iron Age practice.

4. **Late Saxon and medieval wooden structures**. A wattle fence cuts across one of the burnt mounds and is probably a continuation of similar structures in the ASE excavations, dating to the Late Saxon to 14th-15th centuries. A fish basket or the base of an eel trap has also been recovered, dated to 1449-1635 cal AD. Two large braced linear timber structures with associated wickerwork have also been planned and recorded. They are probably fish traps. 14C dates are awaited.

Figure 6.1: Probable medieval fish trap

5. **18th century leather slow match pouch**. This was found by Mr Darren Screech, and has been donated to the Portsmouth Museum of the Royal Navy for conservation and display. It provided a safe means of igniting grenades and other munitions aboard Royal Navy ships. It might have come from the wreck of the HMS Hazardous prize in Bracklesham Bay (1706). Ship nails from that wreck, or another one, litter the shore.

6. **19th century structures** - Thorney Farm. In January to April 2016 flint and brick walls of part of this farm were exposed and then destroyed by erosion, leaving scant time for recording. The farm was certainly there by 1810, appearing on a map of that date. A map regression shows that it survived until the late 19th century and then was over-ridden by the shingle bank moving inland. By 1914 the only buildings left were "two dilapidated huts inhabited by four or five men who made

a hundred tons of wonderful hay … " (Heron 2015). There was no sign at all of 19th century ceramics or glass bottles, implying that the part of the farm exposed on the shore in 2016, was a farmyard area, not domestic (Fig. 6.2). A chalk-lined well and another well of brick and timber construction were also recorded (Fig. 6.3). Other parts of the farm, and perhaps a predecessor to it, are expected to be exposed in future. Marshland drainage ditches of 19th century date are becoming increasingly well-exposed on the beach. These will best be planned from aerial photography.

Figure 6.2: Flint and brick walls of Thorney Farm, visible just in front of wooden groyne

7. **The 20th century**. Concrete anti-tank blocks and beach scaffolding, part of the 'coastal crust' defences from 1940, are visible on the beach. The survival of the scaffolding (originally strung with barbed wire) is unusual: in more accessible places it has been removed and recycled. Expended (and occasionally unexploded) munitions related to the air-to-ground gunnery range (1943-1954) are also common. An early modern or modern French-pattern shrimp/prawn trap, weighted with interwoven flints has also been lifted. It is probably of 20th century date, though it is of a traditional form, dating back to the 19th century.

Figure 6.3: Remains of chalk lined well at Thorney Farm

Future monitoring

CDAS will continue to monitor this beach for the indefinite future. The sites are being publicised through an organised walk for the RSPB and a presentation will be given at the CITiZAN (Coastal and Intertidal Archaeology Network, Museum of London Archaeology) conference in Bristol in October 2016. A full archaeological report, properly accredited, will be submitted for publication in Sussex Archaeological Collections.

For the report with full references, footnotes and acknowledgements, see the Appendices.

7. Appendices

Please contact Charlotte Devaney at the Environment Agency if you would like to request full copies of any of these reports by email. charlotte.devaney@environment-agency.gov.uk

A. Summary of Monitoring August 2013-April 2016 (Channel Coastal Observatory)

B. Annual Intertidal Processes Report Year Two, 2015 (University of Brighton)

C. Monitoring of the UK's first fully coastal managed realignment with implications for future sites. Cayce L. Harburg

D. Medmerry vegetation report 2014

E. Medmerry Fish Survey 2014-15

F. Water Vole Molecular Monitoring Report (University of Brighton).

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