

# Soft Engineering Case Study: Wallasea Island

By the British Geographer

## Situation

Wallasea Island is on the south side of the Crouch Estuary in Essex and also linked to the Roach Estuary. These estuaries feed into the North Sea.



Figure 1

In the past, the area was protected by a sea wall, and the land behind the wall was drained by Dutch engineers and used for farming. However, due to lack of maintenance the wall on the north shore was in poor condition and by 2004 had begun to collapse in several places. There was a high risk that the walls would fail resulting in flooding the island and causing damage to the estuary.

The threat of coastal flooding on Wallasea Island puts a wide range of assets in the coastal floodplain at risk, including 2,700 properties, 9,500 hectares of high-grade farmland, 168km of flood defenses and a variety of natural habitats. Large areas of land are several metres lower than the normal high water in the estuary. As sea levels raise intertidal wetlands and salt marshes in front of sea defenses - internationally important wildlife habitats – become eroded. This process is known as coastal squeeze.

## The Wallasea Island Project

The Wallasea Island Project is an example of a new approach to the management of floods. The more traditional approach of building hard defenses such as sea walls is being replaced where appropriate by managing the land in a more sustainable way:

- **Hard engineering** strategies are usually costly to build and maintain and can have a visual impact on the landscape

- **Soft engineering** strategies such as beach nourishment and managed realignment have less impact on the environment, are more sustainable and need less maintenance.

Managed realignment has a number of benefits:

- Reduces the cost of hard defenses by shortening the overall length of defenses to be maintained
- Recreates river, estuary or coastal habitats and uses them to absorb wave energy and store water in times of flood
- Creates natural habitats or replaces habitats lost elsewhere

The project was designed to create the UK's largest man-made marine wetland. It uses realignment involving the construction of a new sea wall along the length of the north bank of the island; then allowing the land in front to be inundated by the sea. This widens the area of intertidal habitat, which is good for wildlife and recreation as well as helping to manage flood risk.

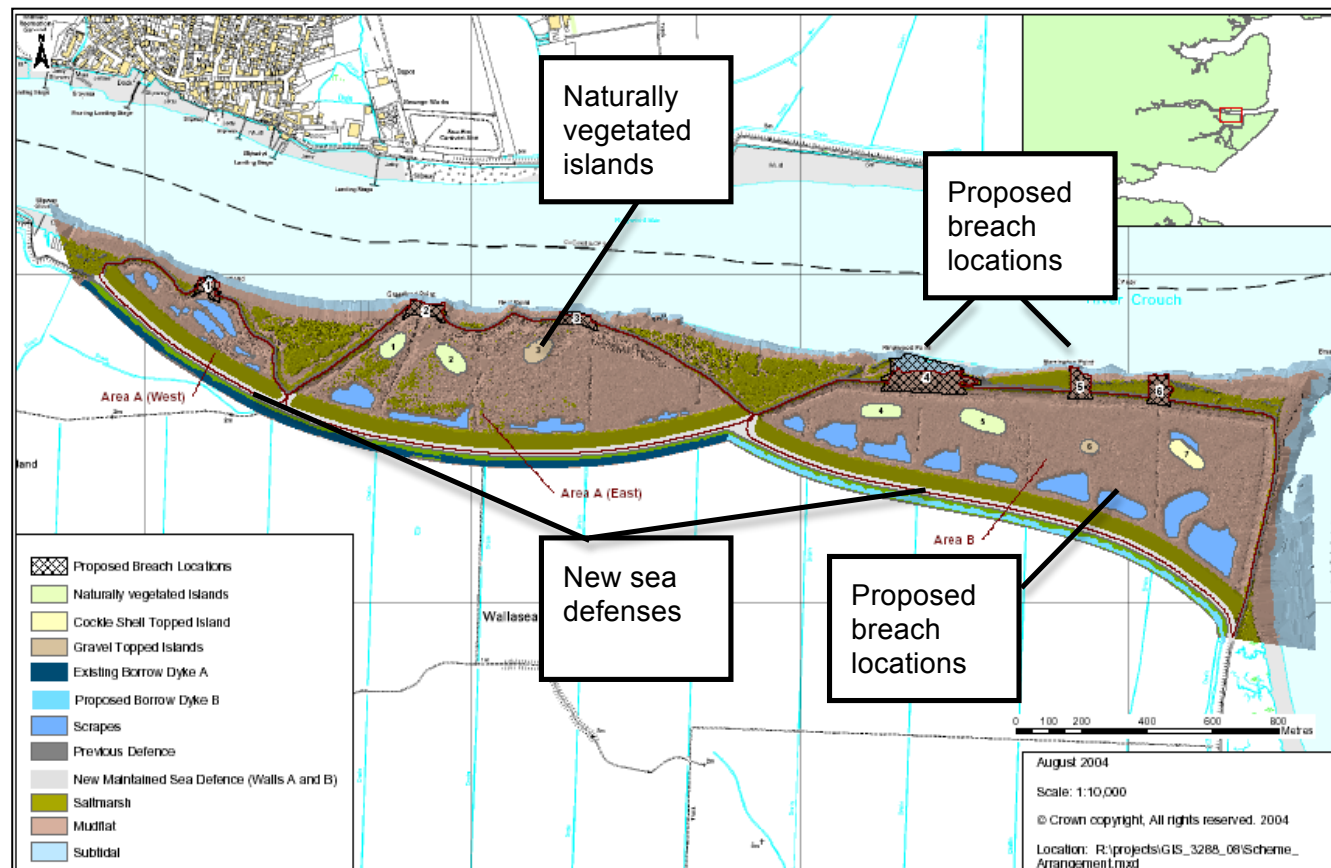
In the past, high flood tides and surges were absorbed by salt marshes along the coast. These areas were reclaimed for farmland, such as the wheat fields on Wallasea Island. Since the Second World War there has been a food surplus in the UK, which means this farmland is no longer so important. The managed realignment project on Wallasea Island would give more space for water by working with natural processes: the new wetland would increase storm protection as storm waves would lose their energy as they flowed over the site.

Realignment was chosen at Wallasea for the following reasons:

- A sufficiently large site to attract vast numbers of birds, including those that had used other wetland sites
- Little chance of the surrounding estuary being damaged
- No adverse effect on those using the area
- Remote estuary location
- The site was not protected for its conservation interest and there was limited public interest in the area
- No opposition as Wallasea Farms, the existing landowner, was concerned about the poor state of the old sea defenses and offered full support for the project

The Environment Agency investigated the tidal and environmental impact of managed re-alignment. The main area of concern was to make sure that there was no negative impact on the River Crouch and the people, businesses, fisheries and boats that use it. The EA took measurements to work out how the tides in the Crouch and Roach estuaries behave, then compared these with models of what would happen after the wetland was created. Surveys were undertaken of existing wildlife on the site to ensure maximum protection was possible for creatures such as reptiles, water voles, insects and ground nesting birds.

Development of 110 hectares of new wetland at the site began in May 2005 and went through three stages. The project cost £8 million. Although this programme is an example of managed realignment of the coastline, some engineering work was still needed. This can be seen in figure 2.



**Figure 2**

### Stage 1: Completed November 2005

1. A new stronger sea wall was built at the back of the site on the landward side (white line)
2. A new freshwater 'borrow dyke' was built (turquoise). This formed a freshwater marsh for nesting avocet, redshank and water voles. In front of the wall there is a salt marsh, formed by pumping mud into the area.
3. A robust retaining bund wall was built to hold the imported mud for the salt marsh and to ensure that no silt was swept back into the Crouch. The saline lagoons and a number of artificial islands were created.
4. A new beach was developed inside in the North East corner of the site.

## Stage 2

Over 700,000 tonnes of mud was pumped ashore to build the new salt marsh. This material was dredged up at Harwich: it would have been otherwise dumped at sea. The dredger *Medway Two* worked 24 hours a day, seven days a week, placing up to 40,000 tonnes a week. Only clean pollutant-free material was used; it was pumped into a pipeline that ran along the top of the sea wall and into the retaining bund, where it settled out.

## Stage 3

In May 2006 the final landscaping of the wetland took place 'in the dry'. Finally, the old sea walls were breached in several places to allow the tide to flood in and the wetland to start forming.

The project was completed at a cost of £8 million on 4th July 2006 when a 300 metre section of the old sea wall was bulldozed to allow the sea to flood the area at high tide. You can see a video clip of the breach by clicking on the link below. The wetlands area covers about 115 hectares. The volume of water entering the site on each tide ranges from 790,000 cubic metres on a neap tide to 1,700,000 cubic metres on a spring tide. It is expected that by 2011, the area will have naturally evolved into a wetland, lagoons and mudflats. Figure 3 shows the staged inundation.



Figure 3

Eastern Side of Allfleet's Marsh (Area B) during the first tidal inundation in July 2006

## RSPB Wild Coast Project

The Wallasea Island Wild Coast Project aims to extend the work of the Defra funded Wallasea Island wetland restoration project, by creating a series of mudflats, salt marshes and lagoons to the south of the original project. RSPB's (The Royal Society for the Protection of Birds) vision for Wallasea Island is to turn this area of arable farmland, which is in danger of unmanaged flooding, back to its historical condition as a rich mosaic of mudflats and salt

marsh habitat, with approximately 133ha of mudflats, 276ha of salt marsh and 56ha of shallow saline lagoons. A habitat adaption zone of 48ha will support further new salt marsh as sea level continues to rise.

A six-phased approach will be adopted to enable adequate time to research and model potential designs and impacts on tidal currents. A range of licenses and consents need to be attained. The new plans will be phased in over a 10-year period. Through a partnership with Crossrail, clean recovered materials will be transported by ship. The mapped plan can be seen in figure 4. Phase 1 is due for completion in 2015.



Figure 4.

Figure 4 shows a series of distinct salt marshes separated by boundary zone or adaptation zones. Which can be seen as light green strips. There are a series of lagoons and salt marshes with drainage creeks.

Once completed, it will be a landscape used by people as well as wildlife, enjoyed by local communities and those from farther afield. Visitors will be able to come to Wallasea Island for relaxation and enjoyment, whether for bird watching, walking, cycling, painting or photography.

Wherever possible, public access will allow visitors and wildlife to happily coexist. The current access along the north (Defra) seawall will be unaffected by construction works and we will provide more than 15 kilometres of new and



improved access routes, and a range of visitor facilities after the habitat is created.

## **Conclusions**

The success of the original wetland restoration at Wallasea Island is clear to see. Restoration has been successful in developing salt marsh, saline lagoons and mudflats. The cost was mainly incurred on new sea wall defenses. The project has had enormous environmental benefit and abundances of wader birds and overwintering waters birds have all shown and increase. For overwintering waterbirds the observed increase was from 7024 in 2006/07 to 16,574 in 2010/11. Although these figures do not take into account natural variation in bird abundance, they do show a promising trend of growth. In addition the project has provided an area 115ha of natural flood defense that wasn't previously available.

In addition the RSPB's Wild Coast Project promises to offer in excess of 500 additional ha of restoration. It must be stated that this is an enormous project for the RSPB and will require additional private investment. However, through partnership with Crossrail there is the expectation that phase 1 will be in place by 2015 so the future looks promising. This project will not only offer great flood defense for the Crouch and Roach Estuaries but the materials provided would reduce the volume of seawater entering on each tide and prevent adverse effects on navigation, shellfisheries and on other sea defenses in the estuary. The new bank towards the western end of the project will ensure that the RSPB's project does not increase flood risk to properties and businesses on the rest of the island.

In the context of climate change and future sea level rise, joint private and civic funded restoration projects like the Wild Coast Project offer the UK a vital contribution toward the adaptation required for future coastal management and which may become a model for future schemes. Local authorities and agencies on restricted budgets will need to look at how management schemes can achieve dual functionality to justify their cost. In the case of Wallasea Island we can see real evidence of smart spending. The two projects provide for flood defense and improved biodiversity. In addition through the creation of a visitors centre and recreation opportunities they have ensured a future income stream.