

OPTIONS FOR MANAGEMENT INCLUDING RETAINING WALLS AND MANAGED REALIGNMENT

Background on studies and reports over the last 15 years.

1. Since the 1990's there have been a number of reports in varying formats which have looked at the possibilities for managing the Alde and Ore Estuary. The most well known of these are the Posford Duvivier Report (Suffolk Estuary Strategies) started around 1999, the Black and Veatch report of 2005, and the Alde and Ore Futures Consultation Document of 2011. In addition there have been several plans dealing with the shoreline, Coastal Habitat Management Plans, and Shoreline Management Plans I and II plus an EA study known as ACES. Also the Alde and Ore Association engaged Professor Pye for further professional and expert advice on those plans.

2. Further, a number of locations have been considered for managed realignment (MR) in the past and discussions between landowners and statutory bodies have taken place, including involvement of the EA Regional Habitat Creation Programme. These discussions highlighted that there are challenges in implementing MR within this estuary complex as many of the flood cells are large and low-lying presenting issues for both local and estuary-wide hydrodynamics, as well as **not necessarily creating the habitat required as the land is too low in the tidal regime**. Costs for building cross banks can make schemes prohibitively expensive at a number of locations and therefore MR at a number of locations has not been deemed economically or environmentally viable, that said the 1999 report set out where the most viable locations were thought to be.

3. The current AOEP estuary plan follows on from the Alde and Ore Futures project (2011) which was supported by monitoring and modelling studies by Black and Veatch. This follows on from the Suffolk Estuaries Strategies (1999) which was underpinned by studies by ABP MER in 1996 who collected and collated physical data from the estuaries. These two previous pieces of work undertook estuary modelling and economic and environmental appraisals of the options presented at the time.

4. These previous projects considered the effects of holding the existing defences in place as it is a requirement of the appraisal process alongside 'Do Nothing' and 'Managed Realignment'. As such the projects set out the likely impacts of retaining estuary walls *in situ* which is the policy option the AOEP is keen to employ for most of the estuary defence frontages. Economic calculations for these projects will have altered in terms of present day costs, but much of this modelling information on the impacts of holding defences or re-aligning defences is still relevant. Following the December 2013 surge there have been some changes to estuary hydrodynamics as a result of breaches at Hazlewood and on Orford Ness and changes in management at Havergate. However these can be viewed in the context of the modelling reports that already exist as these locations were recommended for managed realignment in the previous project reports.

Analysis of options

5. To help appraisal and inform the public consultation, this annex will summarise the main findings on options in the key 1999 report, together with a brief description of the nature of each flood cell in each zone, taken from findings from the Futures project and subsequent consultation and research, and the proposed AOEP plan.

The 1999 Suffolk Estuaries Strategy report

6. The 1999 report was underpinned by significant monitoring and modelling work by HR Wallingford which was interpreted by Posfords in terms of likely significant effect. It considered:

i. the various flood defence policy options for the estuary in the context of their potential impacts on other aspects of the area but for the purposes of this summary – most notably- estuary hydrodynamics and the intertidal environment.

ii. the strategic impacts of flood defence policy but then also looked at each flood compartment and considered the ramifications of holding the defence, allowing it to fail or undertaking managed realignment.

iii. in addition to each flood cell the 1999 report considered stretches or reaches of the estuary to look at wider impacts of changing flood defence policy on local hydrodynamics and flood risk. While it can be assumed that if there are increased flows there will be increased erosion rates of remaining saltmarsh and intertidal areas.

This would, in principle, be offset by managed or unmanaged realignment but some sites would not generate intertidal habitat for many years if they are very low lying. A similar case locally would be the Bulcamp and Angel marshes on the Blyth. It is therefore not a straightforward trade off.

7. This paper focusses on the constraints assessed from a hydrodynamic perspective and likely effects on the intertidal areas and remaining defences of implementing the recommended policies in each plan. It does not include any economic assessments which may well have changed.

8. The flood cells in the 1999 report do not directly correspond to those adopted by Environment Agency in the Futures project with its nomenclature of Flood Cells 1 -13 and which was subsequently adopted by the AOEP for its estuary plan. This paper therefore translates the locations by name with the approximate flood cell references.

Flood cell /zone analysis, taking in the 1999 report, the Futures and AOEP updated information

9. Overall, looking at the estuary on a flood cell basis, several types of issues arise. Some flood cells contain substantial residential areas, i.e. Flood Cell 4 Orford, Flood Cells 6 and 7 Snape village and Maltings and Flood Cell 10 south Aldeburgh. All of these have long stretches of river walls but withdrawing to protect smaller areas and allowing for river incursion in the remaining areas would involve costly construction of new walls. Also some of the areas that might be left unprotected contain valuable resources such as freshwater bore supplies. As the international designations for habitats and species cover the whole estuary, the impact of changes in any one flood cell would need to be considered.

10. As the AOEP plan is to take the area forward to 2050, monitoring of the state of the estuary in relation to sea level rise will be undertaken regularly and plans may need to be reviewed. At this stage at the start of a 35 year period it is not possible to predict what changes, where they might be needed or what natural events may dictate or require a review of the policy.

Zone 1 Snape /Flood Cells 6 and 7

Current position FC6 and 7, Snape to Langham Bridge, contains a significant number of residential homes and a very important business and cultural centre. The area is the tidal end of the estuary and subject to all the special designations of SPA, SAC and RAMSAR. There are several nature reserves and extensive reed beds. Environment Agency are currently developing plans with a range of options to see how best to sustain the area.

The 1999 report recommended that these two compartments (Snape Maltings and Village) could be treated separately in terms of the tidal flood risk. However, following the 2013 surge it became apparent that there is a need to treat the 2 areas as a single unit due to freshwater flood risk and social and economic impacts that were not considered in 1999. That said, the 1999 report recommended HTL policies for both frontages but included the potential for MR on the Snape marshes due to a slight economic benefit of the MR approach (on the basis of economic assessments at that time) and no detrimental impacts of MR in this area on the rest of the estuary. The 1999 report then deferred the decision to a local level stating that whilst MR may lead to a more sustainable outcome in the longer term, it would need to have full local consultation.

The AOEP plan is treating the two flood cells together following the consultations for Alde and Ore Futures and further endorsed by the impact of the 2013 surge. The policy option for this frontage is currently being investigated by a more detailed appraisal by EA. The results of this will be consulted upon.

Zone 2 Long Reach / Flood Cells 5, 8 and 9

Current position FC 5, Iken Marshes, has internationally designated habitat in front of the river defences. The defences also currently protect the Stanny Farm reserve which over the last 20 years has built up special habitats encouraging many species such as bearded tits, nesting avocets and many winter and spring migrating birds. There are around 30 residential properties. Professor Pye estimated that a permanently flooded FC 5 would increase volumes of water in the river by 20% or more which could have a damaging impact on the defences lower down the river. There are also freshwater abstraction points for upland irrigation. Any changes would need to take account of these. There are no easy options for changes in the river wall structure.

FC8, Ham Creek, has a relatively short frontage to a long river tail back. The walls were repaired immediately after the December 2013 surge and protect at least two freshwater abstraction points.

FC9, Hazlewood Marshes, was originally thought to be worth retaining for a while because of the freshwater marsh habitat but the walls breached in the December 2013 surge. There was no environmental, river flow or economic case for substantial repairs to restore the walls so the cell now provides the basis to build up and enhance intertidal habitats.

The 1999 report said that in this zone the flood cells could be treated independently of one another. Ham Creek (Friston, Flood Cell8) was considered to be too small to have any significant effects on coastal squeeze and in situ retained valuable freshwater habitats. Hazlewood was recommended for unmanaged realignment and as such this has happened in 2013. Iken was recommended for unmanaged realignment on economic grounds with the recognition that this could create new intertidal marshes. However this report highlighted ‘repercussions’ for the rest of the estuary as the area was excellent freshwater marsh and the size of the site would increase tidal flows. As a result the recommended strategic options included holding Ham Creek and Iken with realignment at Hazlewood.

The AOEP report reflects the policy option recommended in the 1999 report. Hazlewood has realigned and the plan proposes holding the line in Ham Creek, FC 8, and Iken, FC5, bearing in mind the in-combination effects of further realignment at Iken or Ham Creek would have hydrodynamic impacts downstream in the estuary as well as the impact on habitats and property.

Zone 3 Barbers Point to Home Reach/ parts of Flood Cell 5, all FC 10s and the northern parts of FC 4 and 11

Current position FC4 is an extremely large flood cell stretching almost 12 miles with a varying width of around 2 miles. As well as containing Orford settlement, it has several important bore holes for upland irrigation. Partial retreat could only be managed by construction of new walls which would be costly but save little in overall maintenance and limited security for new habitats.

FC10s, Aldeburgh Marshes and Aldeburgh town frontage to Slaughden, has 3.8 km of river wall protecting Aldeburgh Marshes which is well below sea level, and containing a river channel suitable for moorings, safe sailing and edged in many places by saltings. If flooded, the marshes would become an extensive area of mudflats and might not fully empty each tide becoming more like the Blythburgh Estuary. Research would be needed to consider any impact on the rest of the river as well as Aldeburgh town and the adjacent coastline. The Futures consultation suggested retreating the line to Aldeburgh Town but that would involve costly new wall construction but the government would only provide a part of the funding.

FC10n, Thorpeness, would be connected to FC10s if there was extensive flooding of FC10s. Otherwise the main threat to the area comes from future coastal erosion.

The 1999 report This is a complex zone. The 1999 modelling and appraisal included options for Slaughden which will not be discussed here as the Alde and Ore Futures work and AOEP plan process have established a short term policy for this frontage and longer term solutions are under consideration.

The 1999 report concluded that loss of defences in this section could increase tidal volume by 50% throughout the zone and increase tidal volumes elsewhere in the estuary by 20%. This would clearly have a major influence on estuary regime and have consequences for the shingle ridge particularly at the mouth. The report suggested that holding the line was sensible throughout this section with the exception of the peninsula at the northern tip of Sudbourne.

The report also recommended a managed realignment policy for Aldeburgh town marshes to better defend the town at the rear of the marshes and create new intertidal areas to compensate for coastal squeeze in the future. This together with the northern tip of Sudbourne were considered hydro-dynamically viable in terms of wider estuary impacts. The report also suggested that if Aldeburgh Town Marsh is HTL along with the area between Iken and the tip of Sudbourne then a realignment on the tip of Sudbourne peninsula would be good for alleviating hydrodynamic pressure with minimum effect on the estuary. The 1999 report however concluded that MR was

the best economic option at Aldeburgh but stated that there would be increases in flows and a loss of freshwater habitat.

The AOEP plan for resilience is based on the Futures consultation conclusion that the estuary needs to be considered **as a whole**. The community's view that the criteria used by government to assess economic benefit, in terms of property and lives, overlooked the importance of the estuary's conformation which provides the economic activities of the area, special landscape and habitats. This was one of the key reasons for the Partnership being set up in order to have a management programme which balances all economic, environmental, cultural considerations, as well as costs, and looks at the estuary as a whole. Further, building new walls to protect Aldeburgh would be hugely more expensive at the back of the flood cell rather than the hold the line resilience approach for the coming 35 years.

The AOEP will however bear in mind possible options for managed realignment consistent with its policy to seek to manage coastal squeeze but would clearly seek to identify options which would deliver new habitat most effectively, affect the economics of the area less substantially and also produce the most beneficial adjustments to hydrodynamics of the estuary as a whole. Any changes would need to be discussed and agreed with the landowners but at this stage of the plan no options are being progressed.

Zone 4 Sudbourne marshes to Orford/ Flood Cells 4 and 11, both their, northern and central parts

Current position FC4 is an extremely large flood cell stretching almost 12 miles with a varying width of around 2 miles. As well as containing Orford settlement, it has several important freshwater abstraction points for upland irrigation. Partial retreat could only be managed by construction of new walls which would be costly but save little in overall maintenance and limited security for new habitats

FC11, Kings and Lantern Marsh, contains saltmarsh, intertidal flats, dry habitat along an extensive partly compartmented flood cell as well as buildings and telecommunications masts in the northern half.

The 1999 report noted the scale and impact that such a large defended area of floodplain presents to the hydrodynamics of the estuary. Holding the defence line in Sudbourne and Orford formed the basis of the strategy options for this zone because they are so strategically important to the estuary regime. At Lantern Marshes North there was a realignment in place from 1999. The report considered further realignment on Orford Ness of Lantern Marsh South and Kings Marshes and recognised that it was problematic. The areas were recognised for their environmental sensitivity and options were left open in the appraisal. It concluded that if Sudbourne was held then realignment along the Orford Ness Marshes would offer habitat enhancement to offset losses elsewhere.

The AOEP plan originally assumed the current defence line was in good repair and would remain for many years having been relatively recently repaired. The December 2013 surge however caused damage to some of the walls. Whilst the National Trust is responsible for much of Flood Cell 11, the Orford Ness marshes part are now in new ownership. The two owners are currently considering what repairs might be done post the 2013 Surge. The AOEP are maintaining dialogue with both landowners regarding their management of these areas as possible options could affect both habitats and flood relief and so the AOEP plan itself.

Zone 5 Upper Butley /Flood Cells 2 and 3 and the northern part of Flood Cell 1

Current position Flood Cell 1 contains an area now owned by RSPB which might one day, subject to the necessary permissions, including diverting public footpaths, scientific assessment on the impact on the estuary and funding, be converted to intertidal habitat or at least more regular inundation. Further up the Ore, the walls have already been returned to satisfactory levels in terms of what the AOEP proposes.

FC 2 has some of the best graduated saltmarshes in the estuary and this needs to be sustained. Elsewhere Environment Agency consider that raising the walls would offer a greater standard of protection for the community.

FC3 contains internationally designated intertidal habitat in front of the walls. While the number of houses requiring protection is small the flood cell extends deeply into the area, so that managed retreat might lose not just the special habitat but an extensive area of land and affect significantly volumes of water in the river.

The 1999 report concludes that 'pressure on the defences in the Butley River are not significant'. Saltmarshes in this area are acting as a natural buffer to the walls. HTL was the recommended policy option locally with a view that MR in the north of Boyton at Stonebridge Marshes or at Chillesford Lodge would be helpful if compensatory habitat were required.

The AOEP plan recognises that Butley defences are under less pressure due to presence of marshes and the importance therefore of maintaining the marshes in situ for as long as possible. The AOEP has been informed by the RSPB, which recently became owner of the southern area on FC1, that at some point in the future managed realignment or a flood relief structure might be considered. This could lead to the creating of more intertidal habitat and possibly salt marsh but is not under consideration in the short term. If and when the land owner wishes to take this forward there will need to be full consultation, more hydro dynamic and habitat research as well as permissions sought under several regulations including planning law. The AOEP is aware that some time ago the land owners at Stonebridge were approached about MR but declined at that time.

Zone 6 / Flood Cells 12, 13 and the southern part of Flood Cells 1 and 4.

Current position Flood Cell 1 contains an area now owned by RSPB which might one day, subject to the necessary permissions, including diverted public footpaths, scientific assessment on the impact on the estuary and funding, be converted to intertidal habitat or at least more regular inundation.

FC4 is an extremely large flood cell stretching almost 12 miles with a varying width of around 2 miles. As well as containing Orford settlement, it has several important freshwater abstraction points for upland irrigation. Partial retreat could only be managed by construction of new walls which would be costly but save little in overall maintenance and limited security for new habitats

FC 12 and 13 are owned by the RSPB, and are already nature reserves. After the 2013 surge the river walls were repaired and redesigned to cope with more frequent but less damaging overtopping which has beneficial impacts for the habitats which are being maintained and developed there.

The 1999 report stated that, economics aside the unmanaged realignment of Gedgrave, Havergate and Boyton lead to a massive increase in tidal volume which would have the effect of weakening the shingle ridge resulting in substantial disruption of shingle drift in the open coast zone. This would lead to increase of potential for erosion and flood risk to the south at Hollesley. The report stated that Gedgrave would be best managed in situ as HTL. Havergate could be realigned and in doing so compensatory habitat would be required potentially at Kings Marsh or Lantern Marsh (south). The report recommends Boyton for MR.

The AOEP plan notes (see Appendix 4) that the new owner of part of Boyton may consider at some point in the future a different defence approach, possibly retreating the line or having a managed seasonal inundation over a sill. The AOEP plan takes account of the fact that following the tidal surge in 2013 Havergate defences (FC 12 and 13) were modified to allow for overtopping and therefore an adaptation approach has been employed which was not considered in the 1999 study.

CONCLUSION

11. There is much in common between the 1999 report recommendations for management of the estuary and the AOEP plan with similar conclusions in all but two zones. Also the 1999 report considered raising defences while the AOEP plan proposes a resilience approach. The differences, which mainly centre around the river near Aldeburgh in Zone 3, reflect in part a different approach. The AOEP plan includes monitoring the impact of sea level rise and recognises that over time there may need to be changes to deal with intertidal habitat and saltmarsh loss but the amount, when and where will need to be decided taking account of quality of habitat and balancing the interests throughout the estuary to secure the best outcome for the estuary as a whole. In the case of Zone 4, plans for the future are still under discussion, given the impact of the December 2013 surge and new ownership. Ideas in the 1999 report are not necessarily ruled out.

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