

## CRITIQUE OF DEFRA'S COASTAL POLICY AND THE ENVIRONMENT AGENCY'S BLYTH ESTUARY STRATEGY: BLYTH ESTUARY GROUP

### Summary

The abandonment of all seven Natura 2000 sites<sup>1</sup> in the 20Km Kessingland to Minsmere SMP2 (November 2010) marks the beginning of Defra's £2.6billion<sup>2</sup> 'cost saving' scheme to relocate the UK's entire reserve of 32,000ha of coastal designated habitat to new sites inland and to manage realign 8,800ha<sup>3</sup> to create 4,400ha of saltmarsh (Defra Report FD2017/TR. 2006<sup>4</sup>). The questionable evidence and EC law interpretation used by the EA and Defra to achieve this objective is the subject of this critique.

Defra policy for the rest of the UK's embanked estuary farmland is abandonment by 'withdrawal of maintenance' where the EA's assessed 'benefit cost ratios' (BCRs) fall below Defra's 5:1 guideline. In the Humber, for example, some 13,000ha, protected by 65Km of clay seawall is under threat. All the EA's BCRs are based on Defra's outdated 1m sea level rise guidance, so unless this is revised it is likely that £130M of productive Humber farmland could soon be abandoned with significant implications for the UK's food security as this strategy is applied to other estuaries (Appendix 2 & 14).

EA/Defra bases its 'withdrawal of maintenance' BCR policy on a combination of accelerating sea level rise (15mm/yr by 2085), low estuary sedimentation (3mm/yr or less), increasing tidal prism, increasing river velocity, increasing storm surges and sea level rise induced 'coastal squeeze'. These ideas, none of which are supported by 'independent' peer-reviewed data, are used by the EA to label defences as 'unsustainable' or 'uneconomic'. In contrast, justification for the policy of 'managed realignment' is the creation of saltmarsh, however, this requires very high sedimentation (over 20mm/yr for 100 years) – unlikely in any UK estuary and twice the known rate for the Blyth (9.7mm/yr, Pye Report, Table 3) and the Blackwater (9.6mm/yr, Defra Report FD1922/TR page 75).

These two strands of policy are mutually incompatible - 'withdrawal of maintenance' based on Defra's sea level rise guidance outpacing estuary sedimentation and saltmarsh creation requiring the opposite – estuary sedimentation outpacing the guidance – an unlikely event before the start of the next ice age.

The policy is self-evidently intrinsically flawed.

If sea level rise accelerates at the rate predicted by Defra (a fivefold increase over 95 years from 1990 to 2085), we (and the rest of the world) will need all our resources to move people to higher ground and find new land for food production.

In the absence of acceleration evidence (See Appendix 2), we should be protecting what we have for as long as we are able. Abandoning tens of thousands of hectares of productive farmland and spending a substantial part of the coastal defence budget on habitat relocation and managed realignment without this evidence, is unacceptable. A more sensible, sustainable and cost effective approach would be to part fund landowners to take over the responsibility from the EA to raise and maintain the defences themselves (as they have been doing for centuries). For example, in the Blyth, a £1M to £2M materials grant could save UK taxpayer £5.3M in unnecessary habitat relocation and the Suffolk ratepayer £5.7M in building unnecessary and unwanted secondary defences [Blyth Estuary Strategy StAR Report, June 2009 Page 45].

1. *The Kessingland to Minsmere IROPI, October 2010 contains details of seven Natura 2000 sites planned for relocation - Benacre Broad, Covehithe Broad and Easton Broad, (288ha, £14.7M), Tinkers and Delacroix Marshes and the Hen Reedbeds (103ha, £5.3M), Walberswick to Dunwich Marshes (190ha, £9.7M) and Minsmere Marshes (218ha, £11.1M). Total relocation cost £40.8M based on £51.5K/ha Blyth Estuary Strategy StAR Report June 2009 page 45.*

2. *£2.6 billion comprises £1.6 billion for relocating 32,000ha of designated coastal habitat at £51K/ha (Blyth Estuary Strategy StAR Report, June 2009 Page 45, £5.25M for relocating 103ha of Natura 2000 habitat at Tinkers and Delacroix Marshes and the Hen Reedbeds) and £1 billion for 8,800ha of managed realignment for saltmarsh creation (Defra Report FD2017/TR 2006, Page 27).*

3. *The Environment Bank states the Government target for intertidal habitat creation (saltmarsh creation through managed realignment and withdrawal of maintenance) is an additional 3,600ha by 2015 (www.environmentbank.com/targetsg.html).*

4. *FD2017/TR 2006 [http://randd.defra.gov.uk/Document.aspx?Document=FD2017\\_5200\\_TRP.pdf](http://randd.defra.gov.uk/Document.aspx?Document=FD2017_5200_TRP.pdf)*

## **Defra Coastal Policy**

In the late 90s and in response to the assessed cost of protecting 192 coastal designated habitat sites from a predicted acceleration in sea level rise and an increase in storm surges, Defra environmental strategists conceived a policy 'Making Space for Water' 2000. Subsequent papers include '*Uneconomic sea defence abandonment*'<sup>1</sup> (Sarah Nason, Defra 2004), '*habitat relocation*' and '*managed realignment*' (Defra Report FD2017/TR 2006).

<sup>1</sup> <http://archive.defra.gov.uk/environment/flooding/documents/policy/guidance/seadefence.pdf>

In the belief that designated habitat relocation is both lawful and cheaper than site protection, the EA have been removing £12M/yr since 2005 from our coastal defence budget to fund the *Regional Habitat Creation Programme* to provide 'habitat relocation' and 'managed realignment'. However, in the EA's first example of habitat relocation (*Benacre Broad, Covehithe Broad, Easton Broad, Delacroix/Tinkers Marsh and the Hen Reedbeds, IROPI October 2010*), the £20M relocation cost would pay for the entire protection of the eroding coast between Southwold and Kessingland for 100 years (about £6M. Appendix 12) and the maintenance of the Blyth clay defences for 50 years (about £2M).

Defra hopes that the EU Commissioners will find '*state cost saving*' an acceptable IROPI ('*Imperative Reason of Overriding Public Interest*') for the abandonment of protected habitat. However, the *EC Habitats Directive IROPI Guidance Document 2007* makes clear that derogation is only permitted where a site is required for the purposes of overriding '*public interest*'. Listed examples of acceptable legitimate public interest are a **motorway, harbour, factory extension, railway, coal mine and reservoir**.

Clearly there is no public interest (or cost saving) in the abandonment of these sites and it seems unlikely that the that the Commissioners would sanction the relocation of a Member State's entire reserve of designated habitat to help a State minimise its coastal defence costs - particularly as the EU offer '*co-financing*' to those who find designated site maintenance a financial burden.

## **Blyth Strategy Summary**

New evidence found in 2009 raises serious questions regarding the EA's technical judgement that, after providing 400 years of protection through 1.4m of sea level rise, our clay defences are now considered 'unsustainable' beyond 20 years. The Blyth Estuary Group believes this judgement is wrong and the EA's Strategy is flawed and unlawful and will waste £11M of public money over the next ten years.

Black & Veatch (B&V), the EA's consultants, assessed the potential flood damage in the Blyth at £85M should the defences fail. This gives an upper limit of £17M for seawall repair and maintenance (Defra 5:1 BCR guidance). However, whilst this sum is more than adequate for the long term maintenance of the existing river walls, this option was eliminated at the short-listing stage in 2004 by a computer modelled assessment – now found to be wrong – that the Blyth had an increasing tidal prism and that the predicted increase in tidal flow made the existing defences unsustainable. Protecting the estuary, B&V claimed, could now only be achieved by building heavily engineered new walls behind the old ones at an unaffordable cost of £43M (FRM/SEA Report Sept 07 p7)

In January 2009 Prof K Pye's 'Blyth Sedimentation Report', commissioned by County and District Councils, the Blyth Estuary Group and the EA, was published. This demonstrated that rather than increasing by 63% as B&V's modelling had predicted, the tidal prism and river velocity will actually fall by 25% over the next 100 years. However, whilst the EA claimed the report "*improves understanding*" the EA continue to maintain that our 400 year old clay walls are unsustainable beyond 20 years. Despite numerous requests since February 2009 no verifiable evidence or reasoning for this claim has been forthcoming and no '*independent*' peer-review has been provided.

<sup>1</sup> Prof Ken Pye is a respected independent Geomorphologist and Sedimentologist.

## **Key points:**

- There has been no discernable acceleration in 20<sup>th</sup> century Sea Level Rise (SLR) Houston & Dean 2011, [www.jcronline.org/doi/pdf/10.2112/JCOASTRES-D-10-00157.1](http://www.jcronline.org/doi/pdf/10.2112/JCOASTRES-D-10-00157.1) (*Appendix 2*).
- Ancient embanked Blyth marsh levels demonstrate Mean High Water Springs (MHWS) SLR has remained constant at about 3.4mm/yr over the last 400 years (*Appendix 2*).
- Defra's UKCP09 'Low' projected SLR from 1990 to 2100 is 41cm – only about 4cm more than our current MHWS SLR and less than half Defra's current guidance of 1m (*Appendix 14*).
- Storm surges have reduced in frequency and severity since 1964 (*Appendix 1*).
- UKCP09 North Sea average 'wave height' is projected to fall over the next 100 years (*Appendix 1*).
- The Pye Report demonstrates Blyth river velocity will fall by 25% over the next 100 years (*Appendix 3*).
- Properly maintained clay walls have no 'end of life'.
- Blyth saltmarsh increased by 16.1% between 1971 and 1998 (J French).
- EA/EDI Blyth river bed transects show significant accretion.
- The rebuilding of our existing clay defences have never been costed by the EA as the EA's '*maintenance and consulting engineers*' have judged them all to be '*unsustainable*'. Despite many requests no substantive reasoning for this judgement has been forthcoming.

## **Background**

Black & Veatch, the EA's consultants, concluded in 2003 that net sedimentation in the Blyth Estuary was zero and - if their sedimentation assessment was correct – the tidal prism and river tidal flow would increase by 63% (with 0.6m SLR by 2100). The increased river flow, they concluded, would result in the loss through erosion of all the estuary clay walls. At the short-listing stage, this conclusion eliminated the low cost option to 'Hold the Existing Line of Defence'. As a result, **no** costing for the raising and repair of the existing river walls was ever prepared or considered.

In 2009 the Pye Sedimentation Report – part funded by the EA – demonstrated that B&V's sedimentation assessment was wrong and that current average sedimentation is in fact 9.7mm/yr and not zero. If this level of sedimentation were to continue – and no evidence has been produced that it will not – the river tidal flow will fall by 25% over the next 100 years. A 25% decrease in river flow will produce a reduction in river cross sectional area of about 18% halting overall channel erosion and maintaining the potential sustainability of all the estuary walls well into the next century.

B&V's flawed estuary modelling was reviewed and approved by Dr Jon French (University College London), Greg Guthrie (Royal Haskoning), Dr Roger Morris (Natural England), and Karen Thomas (Environment Agency). (*Appendix 9*)

## **EU Designated Sites**

Defra, the Environment Agency (EA) and Natural England (NE) have a duty under European Union legislation to protect and prevent deterioration of EU designated habitat sites. In the case of Tinker's and Delacroix Natura 2000 site, the defence height had been allowed to deteriorate over many years, to a point 0.5m below the EA's own 1 in 10 year storm surge 'Defence Level' of 2.3mOD and on November 9th 2007 a '1 in 10 year' storm surge (*the fifth since 1964. Appendix 1*) resulted in defence failure and inundation. The clay wall was overtopped by 0.3 to 0.5m and breached by 110m in 10 places inundating 64ha of the Natura 2000 site and 51ha of an adjoining marsh with over 1 million cubic metres of sea water.

A few weeks later the EA's Area Manager wrote to the landowner stating that repairs could not be justified due to "*a finite financial resource*" - thus making Tinker's and Delacroix Marshes the first Natura 2000 site in Europe to be abandoned on the grounds of cost (**Note 1**).

The 'Habitats Directive' states that where site protection is a financial burden on a member state, they may apply to the EU for co-financing. To our knowledge no such application has ever been made. There is NO provision in the legislation for a site to be abandoned on the grounds of cost. There is, however, provision where the site is required for a particular beneficial national purpose (*reasons of overriding public interest*) e.g. Motorway, railway, harbour, reservoir, coal mine and factory extension etc, providing that replacement habitat is in place first and has been raised to a similar conservation standard. This is not the case here. There is absolutely no public interest served by this abandonment. Furthermore, the taxpayer will be seriously disadvantaged by this strategy with £5.3M wasted in the next 5 years unnecessarily and unlawfully relocating the designated habitat some 20 miles down the coast to Snape - a site that is also protected by similar clay defences and subject to the same sea level rise, storm surges. And then, in year ten, a further £5.7M will be wasted from the 'local levy' building unnecessary secondary banks to protect property following the EA's withdrawal of maintenance from our estuary defences.

The EA maintain that this abandonment is valid and lawful as their *'experienced maintenance and consulting engineers'* have advised that, despite the Pye Report sedimentation findings in 2009, our existing defences remain *'unsustainable'* and will not last beyond twenty years. However, despite numerous requests the EA have declined to disclose the evidence and reasoning that was used in arriving at their conclusion. Our EA Area Manager told us at the StAR Report meeting in November 2009, *"You have your opinion, we have ours and we will never agree"*. Certainly without their evidence and reasoning being made public this will continue to remain true and, likewise, the EA's contravention of Article 6.15 in the Treasury 'Green Book' that clearly states *"Ensure that people are told the results and reasons for decisions taken"* CONSULTATION p40.

It is the opinion of the BEG that an *'independent'* assessment of the 1995 to 2009 EDI river-bed transects, the UKCP09 2100 predicted sea level rise (5mm/yr) and the 2009 Pye Report sedimentation rate (9.7mm/yr), would **not** support the judgement of the EA's maintenance and consulting engineers.

Clearly if their judgement was unsound, £5.3M of 'Habitat Creation' would be unjustified and the 'Withdrawal of Maintenance' notice issued to Blois Farms for Tinker's Marsh Natura 2000 site in 2007 would be unlawful.

If at some point in the future estuary sedimentation **was** outpaced by sea level rise, it is unlikely that the country would choose to spend its money on 'Habitat Creation'. Every last penny would be needed to relocate people to higher ground and import food to replace that lost by the inundation of low lying farmland in Norfolk, Suffolk, Essex, Kent and the Fens. Unfortunately, importing food would become increasingly difficult as the rest of the world would be facing a similar problem.

**Note 1:** The breaches were subsequently repaired by local volunteers, landowners and Natural England staff at a cost of about £7000.

### **David Collins**

The pivotal figure in Flood Management is David Collins. After 10 years in Defra's Flood Management Division as a Senior Advisor on Flood Management Policy he left in April 2008 to become Environment Director specialising in habitat creation at ELM Environment and Planning Ltd. He is now a consultant implementing the policies he wrote, delivering the Suffolk and Essex Estuary Strategies for EA/Defra and creating the habitat required by the strategies under contract to WS Atkins who are contracted to deliver EA/Defra's £1.6 billion *Regional Habitat Creation Programme*. This appears to us to be a serious conflict of interest.

ELM Environment and Planning Ltd. <http://elmtwo.com/curriculum-vitae>

Extracts from David Collins website, conference presentations, communications and published papers:-

1. Wrote Defra's main policy document *'Making Space for Water'* FCDPAG5 *'Procedural Guide for Operating Authorities'* advocating managed realignment and habitat replacement (March 2000).

2. Was Senior Advisor to Sarah Nason, Head of Defra Flood Management when she produced the 'Withdrawal of Maintenance' policy document entitled 'Maintenance of Uneconomic Sea Flood Defences' (April 2004).  
<http://archive.defra.gov.uk/environment/flooding/documents/policy/guidance/seadefence.pdf>
3. Advises Ministers on Flood Management Policy.
4. At the 'Coastal Futures' CMS Conference in 2004 he states in 'Slide 20' of his Defra Flood Management presentation 'SMP: The Next Steps' "*Extend period under consideration to 100 years*". A 100 year period was introduced by EA/Defra for both SMP's and estuary strategies in 2005.
5. At the 'Dynamic Coasts' CMS Conference in 2004 in 'Slide 26' of his Defra Flood Management presentation 'Towards Sustainable Coastal Defence' on 'Habitat Creation' he states "*Defra and Environment Agency must commit funds (for Habitat Creation) – hearts and minds issue? - Don't let legislation and bureaucracy get in the way of common sense*". A reference, we presume, to funding uncertainty and the legality of the proposed abandonment of EU designated sites. Early in 2005 EA/Defra sets up and funds the *Regional Habitat Creation Programme* with £12M/yr, contracting WS Atkins Plc to run the programme.
6. From July 2005 he oversees the delivery of the Blyth Strategy for EA/Defra.
7. At the Hague CoastNET Conference in January 2006 he states in 'Section 2' of his Defra Flood Management presentation 'Challenges to reduce flood risk' "*We should err on the side of caution – i.e. It is better to overestimate the pace of future change, and the UK Government supports this approach*". In October 2006 Defra increased the predicted 100 year sea level rise from 0.6m to 1m in publication FCDPAG3 Supplementary Note. This Supplementary Note remains in force today (2011) despite the release in July 2009 of Defra's UKCP09 Marine Projections showing a reduction to 41cm.
8. November 2006 takes over direct control of the Suffolk and Essex Estuary Strategies from Paul Miller EA who becomes Habitat Creation Manager for the *Regional Habitat Creation Programme*.
9. Following a request by BEG in Oct 2006 questioning the evidence for 'zero net estuary sedimentation' and asking for a sediment survey to resolve the issue, David Collins replies in a letter to BEG dated 10<sup>th</sup> Nov 2006, "*We have faith in the peer-reviewed research that our consultants (B&V) have undertaken and see no benefit in undertaking further (sedimentation) investigation*" and adding, without explanation, "*we do not believe a higher estimate of sediment deposition rates would change the outcome of the strategy*".
10. Leaves Defra in April 2008 and joins ELM Environment & Planning Ltd, a partnership specialising in 'Habitat Creation' and is contracted by WS Atkins Plc to provide services to the *Regional Habitat Creation Programme* with Paul Miller (EA) Habitat Creation Manager.

### **The Problem**

On 23rd February 2009 the Blyth Estuary Group asked the EA and David Collins, in the light of the Pye Report, to disclose the science, factual evidence and reasoning that had "*satisfied*" the EA's *National Review Group* that our river defences were 'unsustainable' beyond 20 years. Despite many requests no substantive reply has ever been received.

In a response sent to the BEG on 4<sup>th</sup> November 2009 the EA stated that the defence life assessments were based on the advice of the EA's own "*experienced maintenance and consulting engineers*". Following an FOI request, the EA stated that no copy of this advice exists but said in a subsequent email that the matter was the subject of "*numerous discussions*", but again we were told no record or minutes of these discussions exist. They did, however, add the following rather less than enlightening statement that could apply to any estuary clay wall in Suffolk. "*They (EA engineers) both felt that in terms of sustainability of walls, sedimentation rates were just one aspect. Other important factors to*

consider included the current poor condition of the walls, current erosion pressures on the walls, rising sea levels and storm events”.

### Our response to the four points mentioned

1. **Current poor wall condition.** We agree. After forty years of lack of maintenance many of our estuary walls are 0.4m too low.
2. **Current erosion pressures on the walls.** Apart from 50m at Oyster Point and 80m at Reydon where the piling has failed, there is **no** direct ‘pressure’ on any of our river walls. With estuary sedimentation at 9.7mm/yr (Pye Report) and the river being in cross-sectional equilibrium (B&V), the tidal flow and ‘pressure’ will reduce by 25% over the next 100 years (*Appendix 3*).
3. **Rising sea levels.** The UKCP09 ‘Low’ SLR acceleration projection is 41cm – only about 4cm more by 2100 than our current MHWS SLR. Raising clay walls by 41cm is no problem for modern machinery and a good wall access track.
4. **Storm Events.** Providing the walls are maintained to the traditional height above saltings of 1.7m upstream and 1.8m downstream of the Bailey Bridge, we will be protected from 1 in 10 year storm surges – the only ones that we have had since 1964 (*Appendix 1*). With the walls maintained level, the likelihood of breaches will be reduced. However, if they were to breach, the wall access track – part of BEG’s planning application - will provide rapid access above mean sea level for repair plant and materials.

### Reasoned refutation

- On the basis of B&V’s argument, we agree that if we had ‘*zero net sedimentation*’ it would be the beginning of the end for the estuary defences. River velocity would increase by 0.63%/yr, all saltmarsh vegetation would rapidly become inundated and die and with no protective vegetation the river walls would become eroded by wave action and increasing tidal flow. Under these conditions a defence ‘residual life’ of 20 years would be fully justified and the Final Strategy conclusions would be valid. **However, as the Pye Report has found, current sedimentation is 9.7mm/yr and is outpacing sea level rise by 2.9 times and will outpace all Defra’s UKCP09 sea level rise projections well into the next century.**
- On the basis of the BEG’s argument, whilst sedimentation outpaces sea level rise, saltmarsh level will rise with MHWS SLR and vegetation will thrive preventing wall erosion. The Pye Report has found current Blyth mudflat sedimentation to be 9.7mm/yr and with the current MHWS sea level rise at 3.4mm/yr, estuary water speeds are reducing by about 0.4%/yr, reducing or halting saltings erosion and in some areas producing saltings growth (*Appendix 3*). Over the next 100 years, the lowered water speeds will reduce the river bed cross-sectional area by about 18%, maintaining by accretion its current state of equilibrium (*Estuary Model ‘Final Report’ Jan 2006 p43*). The river transects conducted by EDI Ltd in 2009 have confirmed river-bed accretion and little or no channel width increase. In the canalised section of Tinker’s Marsh bank, there is a potential for a further 1.4m increase in channel width over the next 100 years. This is a legacy from the inundation in 1945 of 170ha of marshes upstream. We expect the saltings to slowly erode by 1.4m until width equilibrium is reached at a cliff height (the vertical distance from the top of the saltings to the top edge of the river bed) of about 0.3m. This will leave a secure average of 8m of saltmarsh in front of Tinker’s wall (*Calculated from the Tinker’s Marsh transect river bed slope of 1 in 2 and an average measured saltings cliff height of 1m*).
- With the UKCP09 ‘Low’ SLR prediction showing only a 4cm increase above our current MHWS SLR by 2100 and with decreasing estuary water speeds there is no reason why our 400 year old walls, with care and minimal expense, will not last a further 100 years (*Appendix 8*).

## **Background information from the BEG Planning Application**

The 2006 Draft Blyth Strategy outlined the abandonment of the estuary walls and the loss of Southwold Harbour over 20 years. The reason given for the abandonment was an assessment by Black & Veatch (The EA's consultants) that the estuary process that had deposited more than fourteen metres of sediment over the last 6800 years had now ceased (Brew 1992).

Over the next 100 years with a predicted sea level rise of 0.6m, and 'zero net sedimentation' B&V calculated that the tidal prism and river velocity will increase by 63%, making the existing river walls unsustainable. To protect our walls from the increased flow, the EA stated in a letter to J Gummer MP in 2005, they would need £100 million to sheet-pile the entire length of the river from Wolsey Creek to the sea – about 8km in total. This figure was later reduced to a less unaffordable £43 million for a revised, unwanted and unnecessary scheme ('Hold a retreated Line' Option 3) based on 8Km of new river walls built behind the existing walls.

We became increasingly concerned by the absence of any corroborative evidence to support B&V's assessment of 'zero net sedimentation' and with the cooperation of our County and District Councils and the EA; a comprehensive survey of estuary mudflat deposition was commissioned. Under the direction of Kenneth Pye Associates Ltd, EDI Surveys measured sediment deposition over 170ha of mudflats at 170 selected points and concluded that over 1 million cubic metres had been deposited in the estuary over the last 65 years. The survey evidence demonstrated that at the current average sedimentation rate of 9.7mm/yr and with a predicted sea level rise of 6.0mm/yr (2006), rather than increasing by 63% as B&V believed, the tidal prism and river velocity will actually fall by 25% over the next 100 years (*Appendix 3*).

Despite the new evidence of a falling river velocity, the EA maintain that the existing defences remain unsustainable beyond the next 20 years. The main reasons given to the BEG were that although they accept that the river velocity and channel erosion may be falling, they believe that '*channel erosion remains significant*' and '*the walls are likely to collapse if raised*' (*David Collins via email*).

To quantify channel erosion with greater accuracy we agreed with the EA in March 2009 to commission EDI Surveys Ltd to resurvey the EA's four river-bed transects and compare them with those conducted in 1995, 2002 and 2006. The results showed significant river-bed accretion and little or no channel width increase over the last 14 years and certainly none that would threaten the walls within 20 years - thus confirming B&V's statement '*the estuary is not restricted by width and depth of the channel and the channel cross-sectional area is at equilibrium*' Blyth Model Report (January 2006) p43. The survey was funded by the EA.

We have found no evidence to support the suggestion that raised walls with intact saltings have collapsed in the Blyth. There are, however, six examples of raised walls that have not collapsed (*Appendix 7*).

To conclude, the important new evidence found clearly invalidates B&V's theoretical model and the Blyth Strategy conclusions upon which they rely. The assessment that our 400 year old river walls '*have reached the end of their useful life and are unsustainable beyond 20 years*' is without corroborative evidence and is clearly unsound.

With the river at equilibrium, a falling tidal prism, falling river velocity, little or no channel-width increase, no accelerating sea-level rise, no increase in frequency or severity of storm-surges, no coastal squeeze and no evidence of wall collapse, all our existing river walls are potentially sustainable and all at an affordable cost of less than £2 million.

With probably less than six years before a '1 in 10 year' storm-surge arrives we must act now to reinstate our river walls.

If we **'do nothing'** in the short term (0 to 10 years) Tinker's Marsh wall will breach again leading to the loss of a Natura 2000 site and a 22% increase in tidal prism and river velocity. The increased river velocity would have a very serious and detrimental effect on the infrastructure and safety of navigation in Southwold Harbour – a Haven Port since 1489.

If we continue to **'do nothing'** through to the medium term (10 to 50 years) it will lead to the breaching of all river walls, a 290% increase in tidal prism, the loss of 523ha of grazing marsh, 3 Ramsar sites, 4 SSSI's, 2 SPA's, 16Km of footpaths, loss of property at Blythburgh and Wenhaston and the destruction of Southwold Harbour. The eventual loss of the harbour training arms would lead to the loss of Southwold South Beach and Denes, Walberswick Beach and the loss of properties at Ferry Road, Blackshore, and the Walberswick flats.

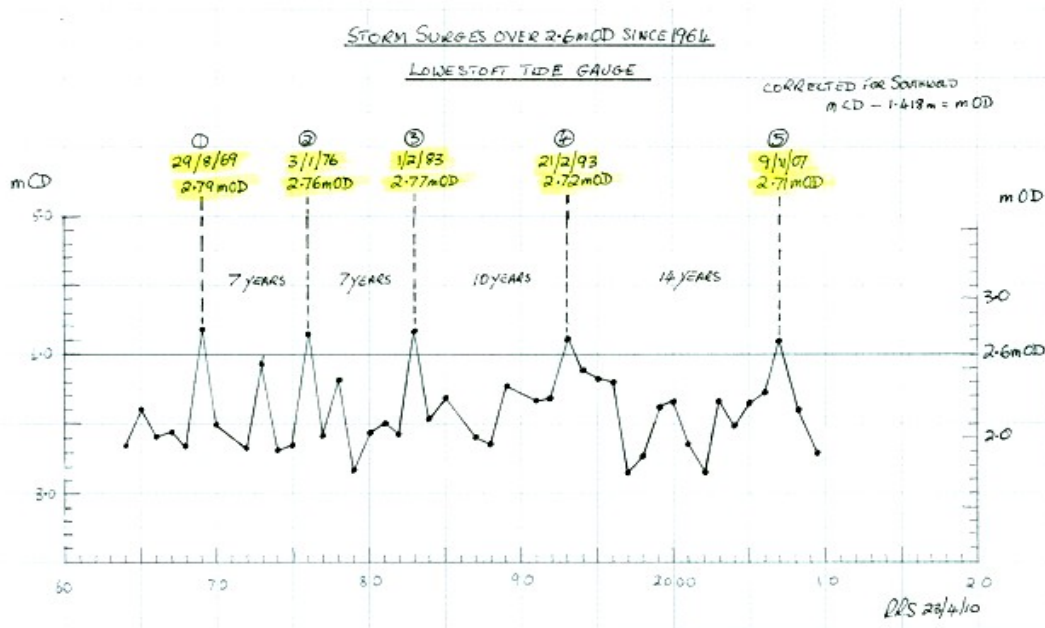
*In September 2009 the Blyth Estuary Group received planning permission to raise 8Km of river wall using 'waste soil' disposal charges to part fund the construction. The wall will be raised using marsh clay from the excavation of a new soke dyke and the 'waste soil' will be used to infill the old soke dyke and build a new 12m wide wall access track behind the existing seawall to the same elevation as the estuary saltings (i.e. MHWS level currently 1mOD).*

*The access track will provide additional wall support, access above mean sea level for maintenance and repair plant and the raised wall will provide protection to our estuary and harbour for the next 50 years from 1 in 10 year storm surges. The expected cost will be less than £2M over six years.*

## **APPENDIX**

### **1. Storm Surges**

The following figures and graph show the five highest storm surges since 1964 extracted from BODC Lowestoft Tide Gauge data. The Chart Datum (CD) to Ordnance Datum Newlyn (OD) correction figure of -1.42m used below is calculated from the Lowestoft Tide Gauge peak surge height on 9<sup>th</sup> November 2007 of 4.132mCD and the surge debris line of 2.714mOD measured at Cliff Field Car Park, Walberswick by BEG on December 1<sup>st</sup> 2007 using Leica GPS/RTK equipment ( $2.714 - 4.132 = -1.42\text{m}$ ).

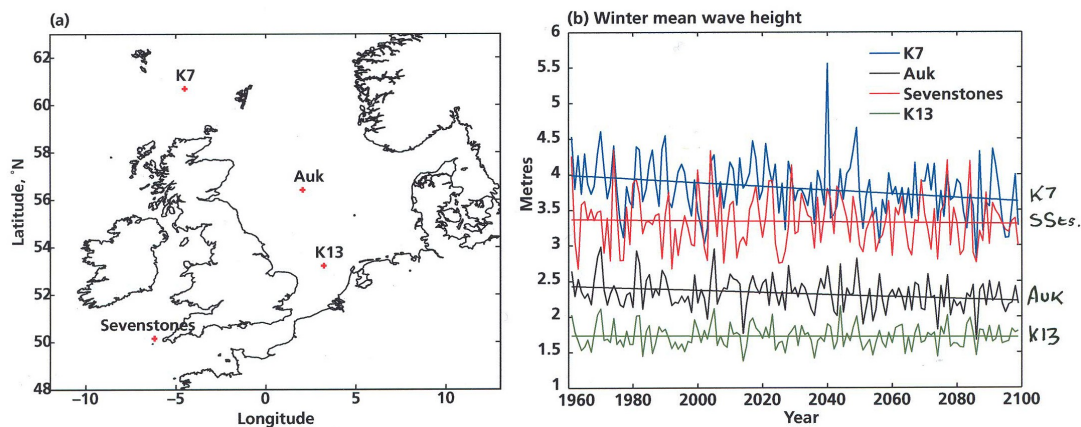


**Figure 1** BODC Lowestoft tide gauge data showing a reduction in storm surge frequency and severity over the last 46 years. Listed below are the Southwold 'open sea' storm surges above 2.60mOD since



1964. The average 'return period' is 1 in 10 years with a level that has remained remarkably consistent at 2.75mOD +/- 4cm.

(1) 2.79mOD, 29/09/1969. (2) 2.76mOD, 03/01/1976. (3) 2.77mOD, 01/02/1983.  
 (4) 2.72mOD, 21/02/1993. (5) 2.71mOD, 09/11/2007.



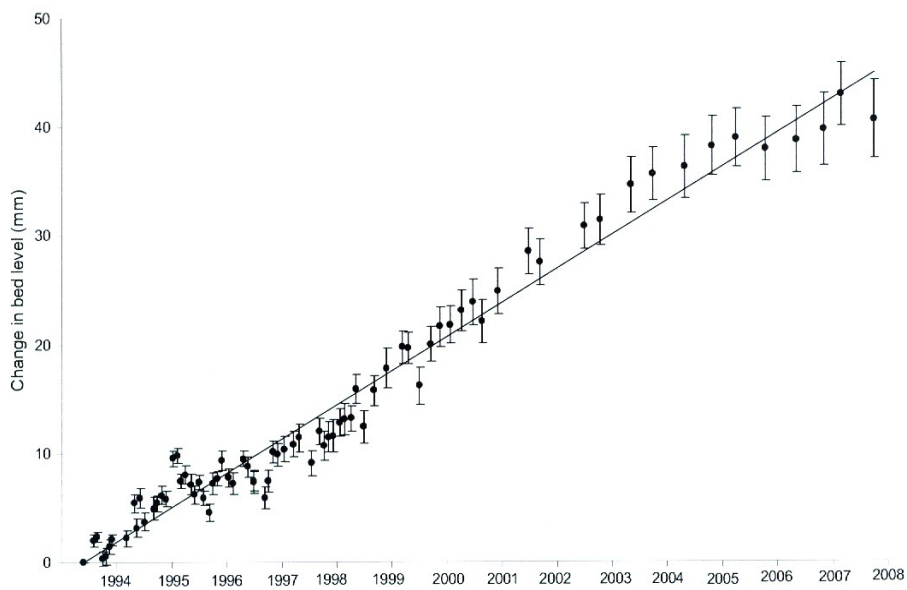
**Figure 2** Defra's UKCP09 'wave height' projections from 1960 to 2100. Of particular note is the wave height reduction at K7 - the main formation area for East Coast storm surges.

## 2. Sea Level Rise

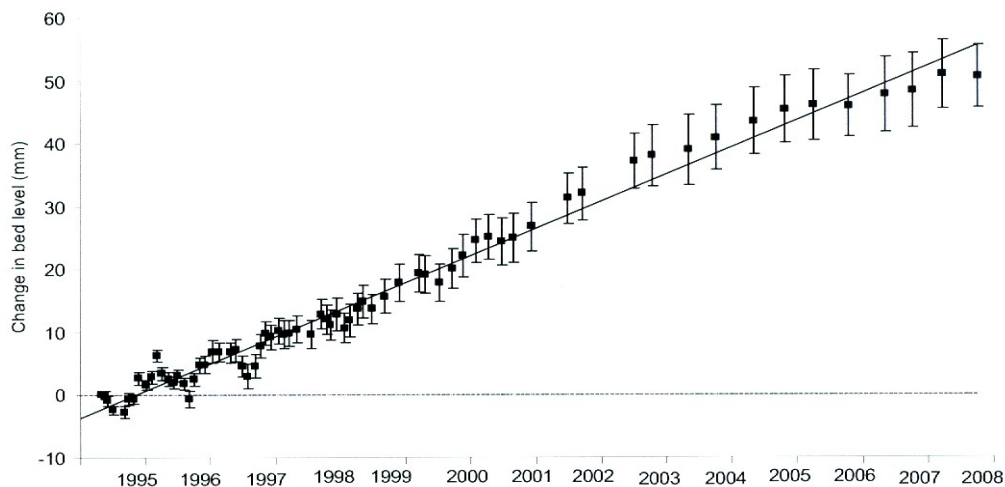
The latest sea level research paper from J R Houston & R G Dean 2011 concludes "Our analyses do not indicate acceleration in sea level in U.S. tide gauge records during the 20<sup>th</sup> century. Instead for each time period we consider, the records show small decelerations that are consistent with a number of earlier studies of worldwide-gauge records". <http://www.jcronline.org/doi/pdf/10.2112/JCOASTRES-D-10-00157.1>

Black & Veatch calculate Lowestoft Relative Mean Sea Level Rise to be 2.8mm/yr (**Figure 4**) (1.3mm/yr UK Absolute SLR plus 1.5mm/yr East Coast isostatic, 'Defra Land Level Report' FD2319/TR p104 April 2007). However, more importantly for the Blyth is Mean High Water Springs Sea Level Rise (MHWS SLR), for it is this level that equals and determines the elevation of all the vegetated saltings throughout the Blyth Estuary (currently 1mOD) and it is the height above this level that determines the 'Return Period' for the defences.

BEG postulate that the North Sea high water tidal range is increasing by about 0.6mm/yr at Lowestoft, giving an average MHWS SLR for this area of 3.4mm/yr ( $2.8 + 0.6 = 3.4\text{mm/yr}$ ) and that this rate of rise has remained constant for the last 370 years. This notion is based on the 1250mm level difference between today's saltings and the level of Southwold Town Marshes embanked on the saltings in 1630 ( $1250\text{mm} / 370\text{yrs} = 3.38\text{mm/yr}$ ). (Note: The Town Marsh has a highly resilient top layer of 5 metres of sea-born clay sediment and a slowly rising water table). The concept of an increasing tidal range is consistent with tidal range increases found by Van Cauwenberghe's 2000 'Relative Sea Level Rise along the Belgian Coast' and the level of 3.4mm/yr is consistent with data found by 'best fit' Lidar analysis of the James Walker 1840 Blyth Marsh Survey levels and the average saltings level increase of 3.65mm/yr ( $(3.1 + 4.2) / 2 = 3.65\text{mm/yr}$ ) over the last 14 years at two saltmarsh sites Old Hall and Tollesbury, Blackwater Estuary, Essex (Defra publication FD1922/TR p66 See Figures 2.2 and 2.3).



**Figure 2.2** Mean sedimentation (n=12) for the Old Hall salt marshes between May 1993 and October 2007 with best fit line. Mean rate is  $3.1\text{mm year}^{-1}$  (regression equation:  $y = -1.136 + 0.008529 \text{ day}$ ;  $r^2=97.1\%$ ,  $p<0.001$ ).



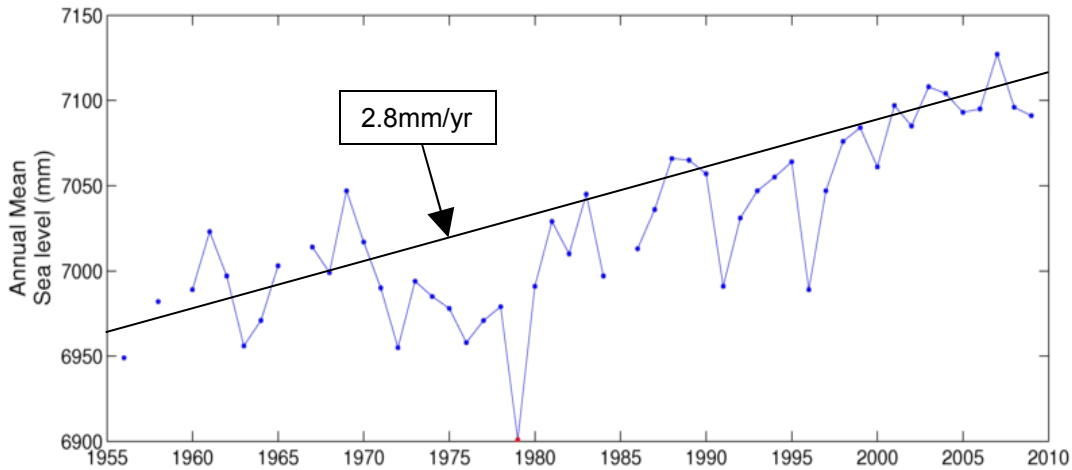
**Figure 2.3** Mean sedimentation (n=16) for the Tollesbury salt marshes between April 1994 and October 2007 with best fit line. Mean rate is  $4.2\text{mm year}^{-1}$  (regression equation:  $y = -7.505 + 0.01162 \text{ day}$ ;  $r^2=97.9\%$ ,  $p<0.001$ ).

**Figure 3** Old Hall and Tollesbury 'saltmarsh sedimentation' showing vertical accretion tracking East Coast MHWs SLR (Average  $3.65\text{mm/yr}$ ) between 1995 and 2008. Shows no discernable acceleration.

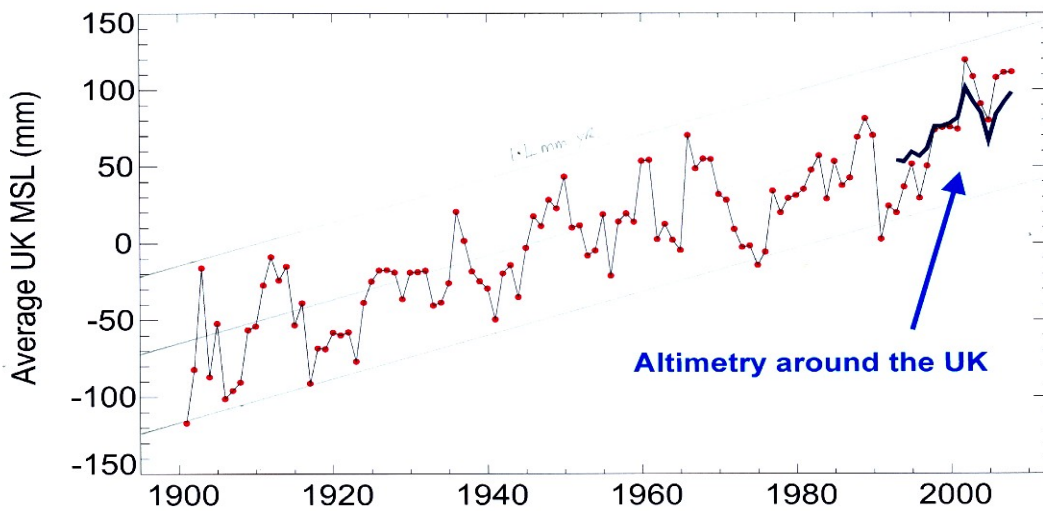
UK Tide Gauge Plots: -

- Lowestoft (-1.47mm/yr) [www.psmsl.org/data/obtaining/rlr.annual.plots/754\\_high.png](http://www.psmsl.org/data/obtaining/rlr.annual.plots/754_high.png)
- Sheerness (-1.09mm/yr) [www.psmsl.org/data/obtaining/rlr.annual.plots/3\\_high.png](http://www.psmsl.org/data/obtaining/rlr.annual.plots/3_high.png)
- N. Shields (-0.48mm/yr) [www.psmsl.org/data/obtaining/rlr.annual.plots/95\\_high.png](http://www.psmsl.org/data/obtaining/rlr.annual.plots/95_high.png)
- Newlyn (-0.46mm/yr) [www.psmsl.org/data/obtaining/rlr.annual.plots/202\\_high.png](http://www.psmsl.org/data/obtaining/rlr.annual.plots/202_high.png)

The bracketed figures are the isostatic corrections from 'Defra Land Level Report' FD2319/TR p104 April 2007. When corrected, the mean 20<sup>th</sup> century SLR for the UK is about 1.3mm/yr with no discernable signs of acceleration.

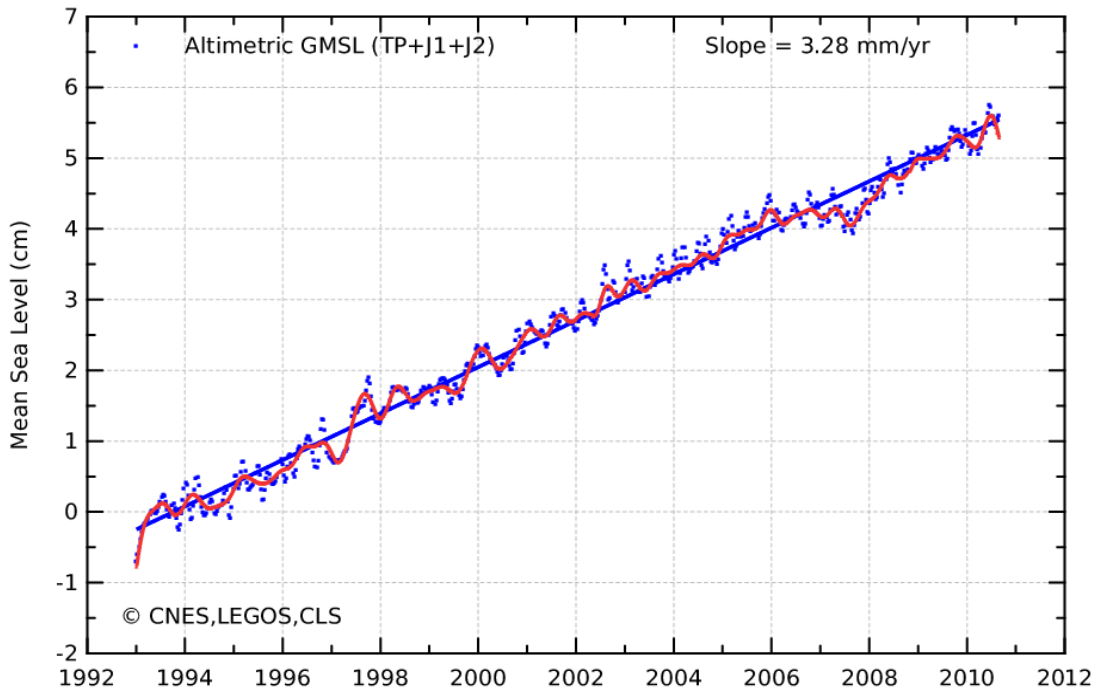


**Figure 4** Lowestoft Tide Gauge 2.8mm/yr Mean Sea Level Rise 1956 to 2009 (Note: - MHWs SLR is 0.6mm/yr higher at 3.4mm/yr). Shows no discernable acceleration.



**Average UK Mean Sea Level Change  
1.4 mm/year for the 20th century**

**Figure 5** The above plot from Prof Philip Woodworth (Proudman Oceanographic Laboratory) shows the latest satellite altimetry superimposed on the average UK 20<sup>th</sup> century sea level rise. The drawn lines are all 1.4mm/yr - the rate Prof Woodworth calculates to be the 20<sup>th</sup> century average (before isostatic correction). The plot shows no discernable acceleration departing from historic values.



**Figure 6.** Global Satellite Altimetry. (Topex, Jason 1 and Jason 2). Global Mean Sea Level Rise 3.28mm/yr 1993 to 2010. Shows no discernable acceleration.

### 3. Tidal Prism

*(The estuary 'spring' tidal volume from mean low tide to mean high tide)*

Black & Veatch state that with all the existing walls retained and a predicted SLR of 0.6m, the Blyth tidal prism (mean spring tidal volume) and river velocity will increase by 63% over the next 100 years (A rise of 1.58 million cubic metres from  $2.49 \times 10^6$  to  $4.07 \times 10^6$  'Blyth Strategy Technical Report' p12). A prism increase of this magnitude is only possible if it is assumed that for the next 100 years there will be 'zero net sedimentation' over the entire Blyth intertidal area of 263ha of saltmarsh, mudflat and river.

$$263\text{ha} \times 10^4 \times 0.6\text{m} = 1.58\text{m}^3 \times 10^6$$

Prof K Pye's Blyth Sedimentation Survey Report shows this to be wrong and that the current average sedimentation rate on 170 hectares of breached marsh mudflats is 9.7mm/yr (Table 3. Pye Survey). Assuming MHWS SLR to be 3.4mm/yr and sedimentation in the rest of the estuary keeps pace with and equals SLR then the tidal prism is currently reducing at the rate of 0.43%/yr.

$$170\text{ha} \times 10^4 \times (9.7 - 3.4\text{mm/yr}) \times 10^{-3} \times 100 / 2.49\text{m}^3 \times 10^6 = -0.43\%/yr.$$

The tidal prism reduction over the next 100 years with a predicted SLR of 0.6m is 25%

$$170\text{ha} \times 10^4 \times (9.7 - 6.0\text{mm/yr}) \times 10^{-3} \times 100\text{yrs} \times 100 / 2.49\text{m}^3 \times 10^6 = -25\%/100\text{yrs}$$

The net import of sea-born clay sediment required to deposit 9.7mm/yr on 170ha and keep pace with MHWS SLR (3.4mm/yr) in the rest of the estuary (93ha) is about 31Kt/yr.

$$(170\text{ha} \times 10^4 \times 9.7\text{mm/yr} \times 10^{-3}) + (93\text{ha} \times 10^4 \times 3.4\text{mm/yr} \times 10^{-3}) = 19.6\text{Km}^3/\text{yr} \text{ or } 19.6\text{Km}^3/\text{yr} \times 1.6\text{sg} = 31\text{Kt/yr.}$$

At 9.7mm/yr, Blyth sedimentation outpaces all UKCP09 SLR acceleration projections. Under these projections the tidal prism will fall by 'High' 25%, 'Medium' 28% and 'Low' 31% by 2095

**As long as sedimentation outpaces sea level rise – and it has for millennia - the tidal prism and river velocities will continue to fall, saltmarsh vegetation will grow and rise with MHWS SLR.**

#### **4. Sediment sources**

The main sediment sources for Blyth mudflat accretion are coastal erosion at:-

- **Benacre and Covehithe** (4.5m/yr) 3.4Km cliffs with average height of 7m and 5.2Km of shore sand/clay deposits eroding down to -10m. 341,000m<sup>3</sup>/yr.
- **Easton Bavents** (2.6m/yr) 1.8Km cliffs with average height of 7m and 1.8Km of shore sand/clay deposits eroding down to -10m. 80,000m<sup>3</sup>/yr.
- **Dunwich Bay** (1m/yr). 3.4Km clay/sand/peat deposits eroding down to -5m. 17,000m<sup>3</sup>/yr.

Total eroded clay, based on 33% clay content, is about 146,000m<sup>3</sup>/yr or 234,000t/yr. About 13% of this is deposited in the Blyth each year. Should SLR accelerate, coastal erosion is also likely to accelerate leading to an increase in estuary sediment supply and an increased deposition rate. The (m/yr) figures are the average erosional losses since 1891.

#### **5. River wall sustainability**

Black & Veatch claim that the cross sectional area of the Blyth is in equilibrium (*B&V 'Blyth Estuary Model Final Report' p 43*). Apart from one area close to the 1960's river widening scheme at Tinker's Marsh, the four river transects at Blackshore, The Bailey Bridge, Reydon Wind Pump and Reydon Quay show little or no channel width increase over 14 years (1995-2009).

**With the river in equilibrium and a reducing tidal prism, all our existing river walls are potentially sustainable. Whilst the walls are maintained and the saltings protected, our 400 year old clay defences will have no 'end of life'.**

#### **6. Coastal Squeeze (Saltmarsh Loss)**

Vegetated saltmarsh in East Coast estuaries is essentially flat (+/- 100mm) and, while estuary sedimentation exceeds SLR (9.7mm/yr sedimentation and MHWS SLR 3.4mm/yr), saltmarsh will continue to grow vertically, tracking and equalling the Mean High Water Springs SLR. Whilst this remains the case – and no evidence has been produced that it will not – SLR will not be the cause of saltmarsh loss. A more likely cause, where saltmarsh loss is found, is long fetch wave erosion and interestingly - as a recent investigation at Waldringfield on the Deben has revealed - significant saltmarsh burrowing and erosion by Shore Crabs (*Carcinus maenas*) at a rate of about 14mm/yr by excavating horizontal runs 0.3m into creek edges and up to 140mm/yr by burrowing and collapse at river edges. It is possible that Shore Crabs and Rag Worms (believed to be their main food source) may turn out be one of the more significant factors in East Coast saltmarsh loss.

Dr N Cooper's report for the EA "*Saltmarsh change within the Suffolk estuaries between 1971, 1986 and 1998*" p24 claims a 7.9% saltmarsh loss over 27 years for the Blyth, and Dr J French's paper "*Tidal marsh sedimentation versus sea level rise*" p11 claims a 16.1% **increase** in the same period. BEG have good reason to believe that the latter gives a more reliable picture.

**Note.** In the case of 'Managed Realignment', for every century of embankment it will take a minimum of 54 years of full sedimentation for half the ancient saltmarsh to accrete to the level at which new saltmarsh could be created. (100yr x 3.4mm MHWS SLR / 9.7mm/yr sedimentation rate – 3.4mm/yr MHWS SLR = 54yr). As most of our embanked land is more than 300 years old this process will take a minimum of 150 years – and longer if the tidal prism is halved by the installation of a sill or restricted by the width and depth of a breach. However, should SLR accelerate at the rate expected by Defra (15mm/yr by 2085) saltmarsh creation will not be possible until the start of the next iceage.

## 7. Blyth walls raised since 1958

- 0.5Km, 4.5mOD to protect Walberswick Village c1958.
- 1.2Km, 3.1mOD to protect Southwold Town Marsh c1958.
- 0.4Km, 2.8mOD to protect Bulcamp House c1958.
- 0.2Km, 3.0mOD to protect property at Blythburgh c1958
- 0.5Km, 2.5mOD (raised by 1.5m with a 3m crest width) Palmers Lane 'Sea Defence' built in 2008.
- 2.6Km, 2.5mOD (part raised by 0.6m) to protect the Hen Reedbeds and Reydon Marsh in 2008.

**All walls remain in good condition and none show signs of collapse.**

## 8. Permissive Powers and the Coast Protection Act 1949

The EA claim '*permissive powers*' from the following clause of the Coast Protection Act 1949.

4. (1) *A coast protection authority shall have power to carry out such coast protection work, whether within or outside their area, as may appear to them to be necessary or expedient for the protection of any land in their area.*

This is currently interpreted by EA/Defra as "**Save for the specific requirements of the Habitats Directive, there is no general obligation to build or maintain defences either at all, or to a particular standard**". Arguably, not quite what the original drafters had in mind.

Other relevant clauses: -

29. (1) *If complaint is made to the Minister that a coast protection authority have failed to take sufficient measures for the protection of any land in their area, or he is of the opinion that an investigation should be made into the need for any such measures or the sufficiency of any measures so taken, he may cause a local inquiry to be held into the matter.*

29. (2) *If after a local inquiry has been held under this section the Minister is satisfied that there has been such a failure on the part of a coast protection authority, he may make an order declaring them to be in default and directing them to exercise such of their powers under this Act as may be specified in the order in such manner and within such time as may be so specified.*

20. (4) *The council of a county may pay such contributions as they think fit towards any expenses incurred by any person in respect of coast protection work appearing to the council to be work for the protection of any land in the county.*

20. (5) *The council may if they think fit defray, or contribute towards, the cost of carrying out any coast protection work which appears to the council to be necessary or expedient for the protection of any land in their area.*

20. (6) *A coast protection authority may defray, or contribute towards, the cost of carrying out any coast protection work which appears to the authority to be necessary or expedient for the protection of any land in their area.*

(BEG Emphasis)

**NOTE:** The Flood and Water Management Act 2010 formalises the 2008 delegation of all coast protection complaints from the Minister to the Environment Agency.

## 9. Independent Peer-review

Defra require strategies to be independently peer-reviewed. However, none of the reviewers for the Blyth Estuary Strategy could be considered independent. Apart from the reviewers from the EA and NE (hardly independent) the reviewer from a second consultancy (Haskoning) was at the same time also contracted to deliver the Blyth SMP, and the reviewer from UCL had produced the original flawed computer modelling upon which the B&V modelling was based. The 2010 SMP2 and the 2010 IROPI have received no peer-review.

The following communication on the subject of independent reviews was received by BEG from Prof Ken Pye Sept 2<sup>nd</sup> 2010

*My opinion is that the Suffolk Estuaries Strategies, like all strategies should be underpinned by a sound scientific evidence base which has (a) been made generally available for scrutiny in the public domain, and (b) been subject to a commissioned independent review. By 'independent' I mean review by a group of specialists with appropriate geomorphological, ecological and engineering personnel (recognizing that there are also important socio-economic interests) who have not been involved in the development of the strategy itself, and have been employed to provide internal peer review by the EA or the consultants involved in development of the strategies.*

*The evidence base which has so far been made available, mainly in the form of consultants' reports accessed via the EA website, is inadequate to support the policies of large-scale sea wall abandonment in the Blyth or other estuaries in Suffolk. The results of our own sedimentological study of the Blyth, completed in early 2009, indicated that there has been average vertical sedimentation of up to 9.7 mm/yr over the past 60 – 70 years, and found no evidence to support previous suggestions that the tidal prism has been increasing, or that the estuary has exported sediment in the recent past. In my opinion, it is highly unlikely that the tidal prism would increase by 63% over the next 100 years, even allowing for the highest projected rates of sea level rise, because there are no grounds to believe that the supply of sediment in North Sea waters will diminish – rather the opposite is more likely, since rising sea level and higher rates of open coast erosion are likely to release more sediment into the marine system and increase the landward transport into the estuaries.*

*I am not aware of any independent reviews of the evidence base underlying the Suffolk estuary strategies, or the targets set for large-scale habitat recreation in the area. There is a clear need that such independent reviews should be undertaken.*

#### **10. Maintenance v Improvement? EA Protocol**

The EA protocol for the 'maintenance' of existing clay defences specifically precludes landowners from raising their walls above the highest point of their existing walls – raising walls above this point is considered 'improvement' requiring planning permission. The protocol completely ignores the fact that for four centuries landowners have maintained their defences by raising them at least 0.8m/century to compensate for sea level rise and natural slumping. The protocol, as currently drafted, can only result in eventual defence failure.

We suggest that the walls should be maintained to an agreed storm surge 'return period' (say 1 in 10 years) plus an allowance for sea level rise, natural slumping over the maintenance period and an allowance for wave freeboard.

On the Blyth (and perhaps other sheltered estuaries) the wall height that provides this level of protection is about 1.7m above the saltings - roughly eye-level.

The European Federation of National Maintenance Societies defines maintenance as:-  
*"All actions which have the objective of retaining or restoring an item in or to a state in which it can perform its required function. The actions include the combination of all technical and corresponding administrative, managerial and supervision actions".*

#### **11. Groynes.**

For over 400 years the only proven protection for soft eroding coasts are groynes. Where these are neglected (e.g. Happisberg, Hopton, Corton, East Lane, Felixstowe and Holland-on Sea) undermining of sea walls and the erosion of the cliffs they were built to protect quickly follows.

This was graphically demonstrated by Peter Frew (North Norfolk DC) and Karen Thomas (EA) in their recent animated presentations showing how beaches are lowered and seawalls are undermined after

groyne protection is lost. However, not explained was the rationale behind the neglect of groynes that protect these expensive assets.

The 11 groynes built to protect Southwold c1920 were 76m long and spaced at about 107m. They protected the beach from longshore drift above MLWS and gave about 24m of dry sand above MHWS. The beach profile was maintained over 80 years by wave action moving sand from near-shore deposits into the groyne field. The new groynes built in 2004 are 20m shorter and now there is very little dry sand above the MHWS line near the pier.

## 12. Coastal erosion between Southwold and Kessingland

Erosion here is currently removing 2 to 5m/yr and over the next 100 years 19 houses, 2 farms and outbuildings, Covehithe Church, 1 historic 'nuclear hardened' GPO cable bunker, the EA's Hundred River pumping station at Kessingland (£2M replacement value), 200ha of prime arable land and 100ha of reed bed will be lost (total about £15M). Added to this is the cost of relocating 288ha of EU protected habitat – *Benacre Broad, Covehithe Broad and Easton Broad* - at £51K/ha (£15M), the cost of outflanking protection for Southwold and removing the Southwold North Sea Wall once Easton Bavents is breached (possibly £10M), the cost of outflanking protection for Kessingland Village (possibly £3M) and the cost of demolishing all the buildings and structures before they fall into the sea (possibly £2M). Total £45M.

Protecting this area of coast (7Km) would require 35 off 76m rock groynes (spaced at 200m<sup>1</sup>) at about £167k<sup>2</sup> each. Total £5.8M – well below Defra's 5:1 BCR limit.

<sup>1</sup> Spacing sufficient to reduce erosion to an acceptable rate (0.2m/yr) whilst protecting the dynamic nature of the designated habitat.

<sup>2</sup> 3m crest height, CSA 20m<sup>2</sup> x 76m = 1520m<sup>3</sup> @ £110/m<sup>3</sup> placed = £5.8M.

The Haskoning/EA maintain in their SMP2/IROPI (October 2010) that groyne protection of the designated habitat between Southwold and Kessingland is not considered *'feasible'* as it has the potential to adversely affect the sediment supply to Southwold beaches. However, no modelling evidence has been provided to support this opinion and it is contrary to a 2002 report by Halcrow (Futurecoast 2002a) which stated *"the additional input of sediment from the erosion of these cliffs is unlikely to have a significant impact on the longshore transport rates, as it is predominantly fine sand, which is likely to be transported offshore"*.

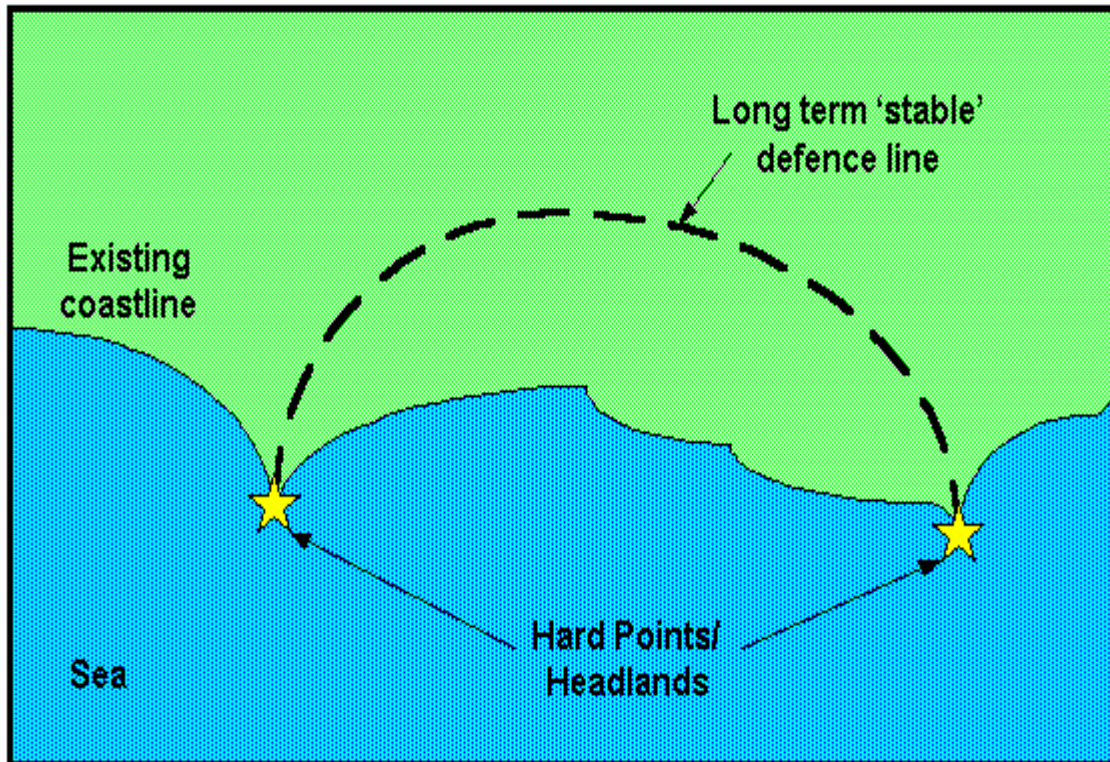
It is worthy of note that almost the entire North Sea coast between Denmark and France is protected by 100m to 200m groynes every 100m to 200m, providing Europeans with over 300Km of sandy beach.

Furthermore, as the former 80 year old groyne field at Southwold clearly demonstrated, providing the groynes are carefully maintained, wave action alone is quite capable of maintaining a good beach profile.



### 13. Defra's 'cusped coast' plan.

In 2003 Defra published their vision of a 'cusped coast' for sparsely populated eroding coastal areas (see below). Following the removal of all low lying EU protected habitats through the SMP's and IROPI's, the only areas protected will be those of high population; all areas in-between will be left to erode to an assumed more 'stable' defence line inland. However, if the recent Sea Palling rock-reef geomorphology gives a modelling insight into a possible future embayment shape, East Anglia can look forward to an ever increasing demand for outflanking protection as the coast erodes inland to a point equalling the distance between the 'hard points'. Should a long term 'stable' line not occur as predicted, and a new and longer and more costly inland defence be required, the unnecessary and irreversible sacrifice by coastal communities, of land property and heritage, will have serious repercussions for the people's trust in a caring Government.



*Defra's Long Term 'stable' defence line? (Defra 'guidance policy document' 2003)*

[www.defra.gov.uk/environment/flooding/policy/guidance/realign.htm](http://www.defra.gov.uk/environment/flooding/policy/guidance/realign.htm)

### 14. UKCP09 projections for East Coast Relative Sea Level Rise

Defra's UKCP09 (2009) projections for 1990 to 2100 (110 years) East Coast Relative Sea Level Rise are: - 'Low' 41cm, 'Medium' 49cm and 'High' 58cm. The UKCP09 SLR rates at 2100 are 'Low' 5mm/yr, 'Medium' 6mm/yr and 'High' 7mm/yr. The current outdated guidance (Defra 2006) for a similar period is 98cm (1990 to 2100) and 15mm/yr by 2085.

The UKCP09 'Low' projection for 2100 is only 4cm more than our historic MHWs SLR for the last 110 years (110 years @ 3.4mm/yr = 37cm).

**Until there is clear and robust evidence to demonstrate that the UKCP09 'Low' SLR acceleration projection has been exceeded, the use by EA/Defra of the highest percentile of the highest SLR projection will lead to a serious and unjustified distortion in benefit/cost ratios (BCR's) and, contrary to the 'precautionary principle', to the irreversible loss of property, heritage and ten of thousands of hectares of productive farmland.**

RRS/BEG 04/08/11