Adapting to Climate Change Along England's Southern shore (ACCESS)

Professor Andy Bradbury

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Conclusions

- *Case studies illustrate increased levels of erosion, instability, breaching and flooding over next 100 years*
- *South-east Monitoring Programme is essential for forming an historical database invaluable for understanding long-term change*
- *A more standardised approach to predicting erosion is required on a national, regional and local level*
- *Evolution of fringing barriers, barrier beaches and spits, saltmarshes and sand dunes should be included in future iterations of national and regional assessments of erosion*
- *Requirement for standard approach to economic evaluation of assets at risk to avoid under-valuation*

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Recommendations *the following is recommended at a national level: To avoid future inconsistencies between various projects in terms of rates of coastal erosion and benefit-cost data,*

- ***Establish a national technical working Group to develop national standards for calculation of coastal erosion and instability rates*** *together with* ***improved approaches to identifying the economics of assets at risk****.*

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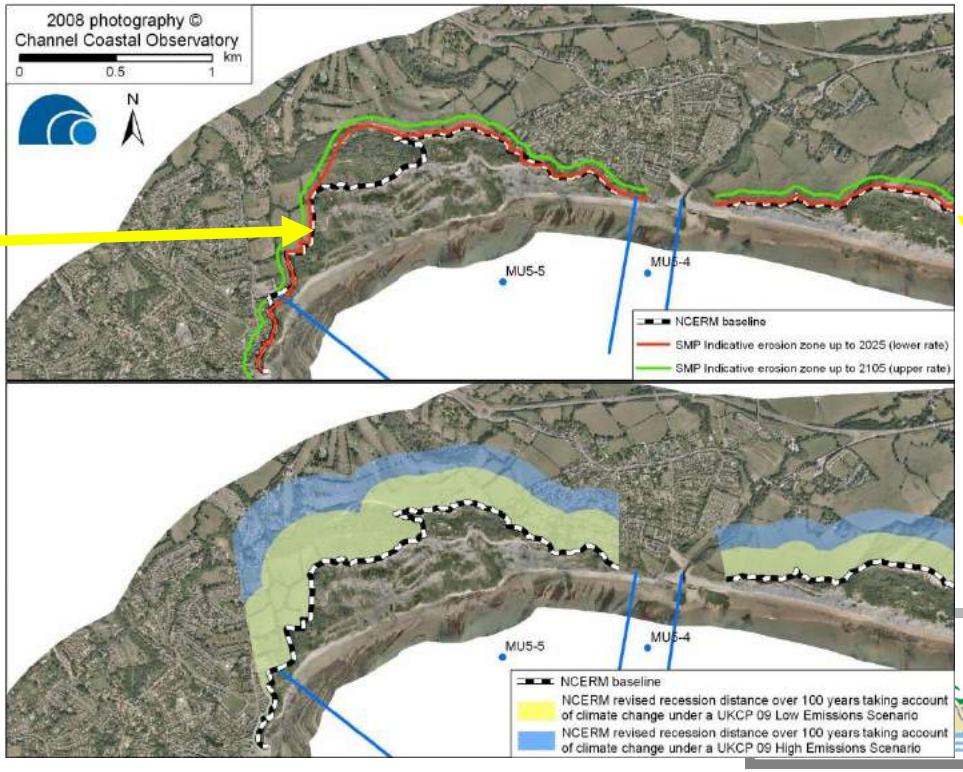
Recommendations ***To avoid future inconsistencies between various projects in terms of rates of coastal erosion and benefit-cost data, the following is recommended at a national level:***

- ***A freely available, centralised database of national baseline, erosion and accretion rates*** *that can be updated as more recent Coastal Monitoring data becomes available covering not only simple and complex cliffs but barrier beaches, spits, sand dunes, eroding and flooding areas and saltmarshes.*

Different baselines



Different rates of erosion

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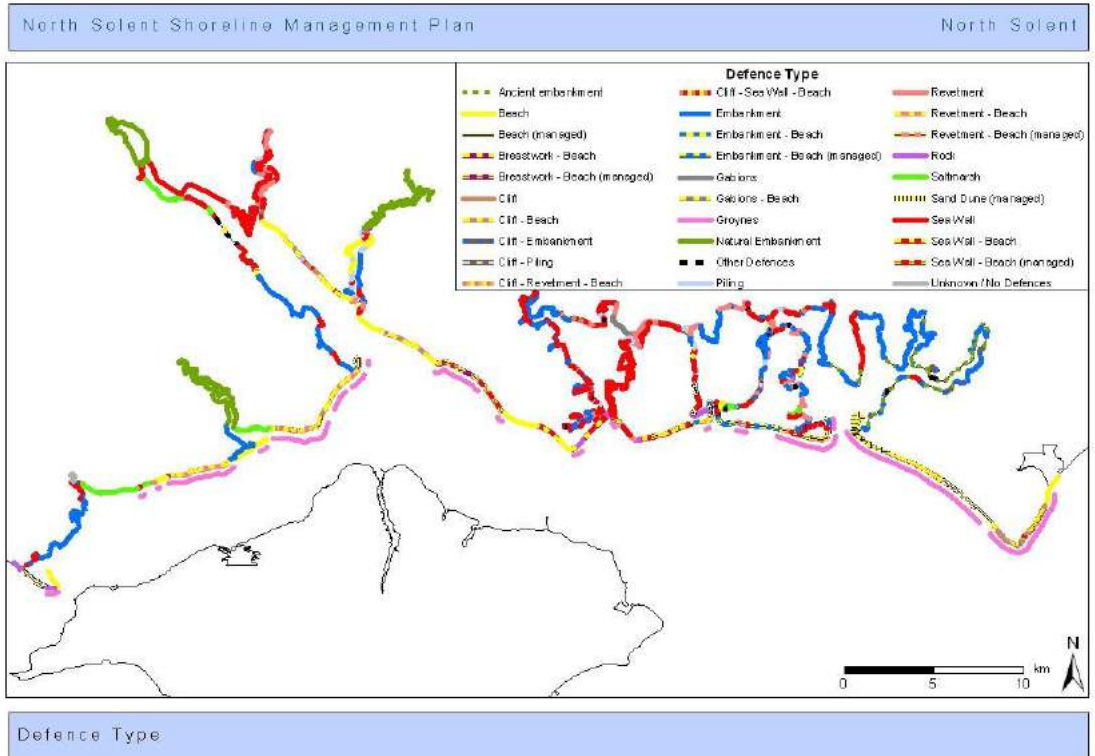
Recommendations *To avoid future inconsistencies between various projects in terms of rates of coastal erosion and benefit-cost data, the following is recommended at a national level:*

- ***A centralised database for flood and coastal defence information,*** *that can be updated and accessed by all agencies and local authorities.* ***To avoid different defence type, residual life, condition and standard of protection data being used at national, regional and local level.***



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Residual Life of existing structures

- Structure elements
  - Structure condition
  - Construction type
  - Age
  - Exposure
- Beach
  - Rate of change
  - Storm response
  - Long term trends
  - Envelope of change
- High level of uncertainty
  - Varied construction data
  - Limited performance data
  - Minimal maintenance data

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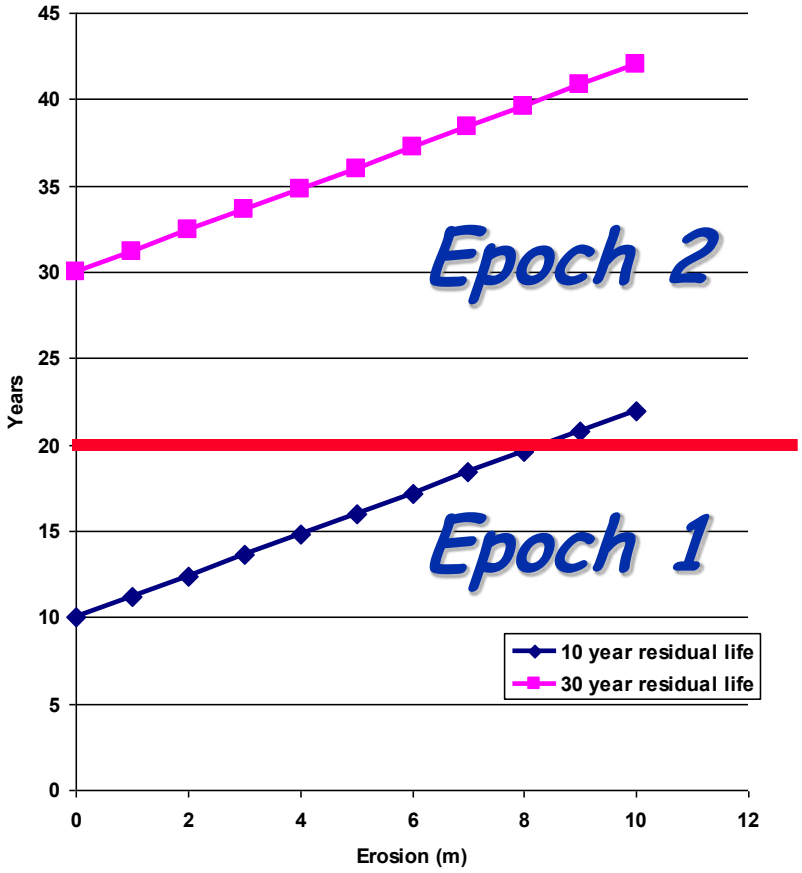
Residual life "error"

- $Y = mX + C$

  mX= Rate erosion

- C = offset to reflect residual life
  - Very variable
  - Can be in error by more than whole management epoch



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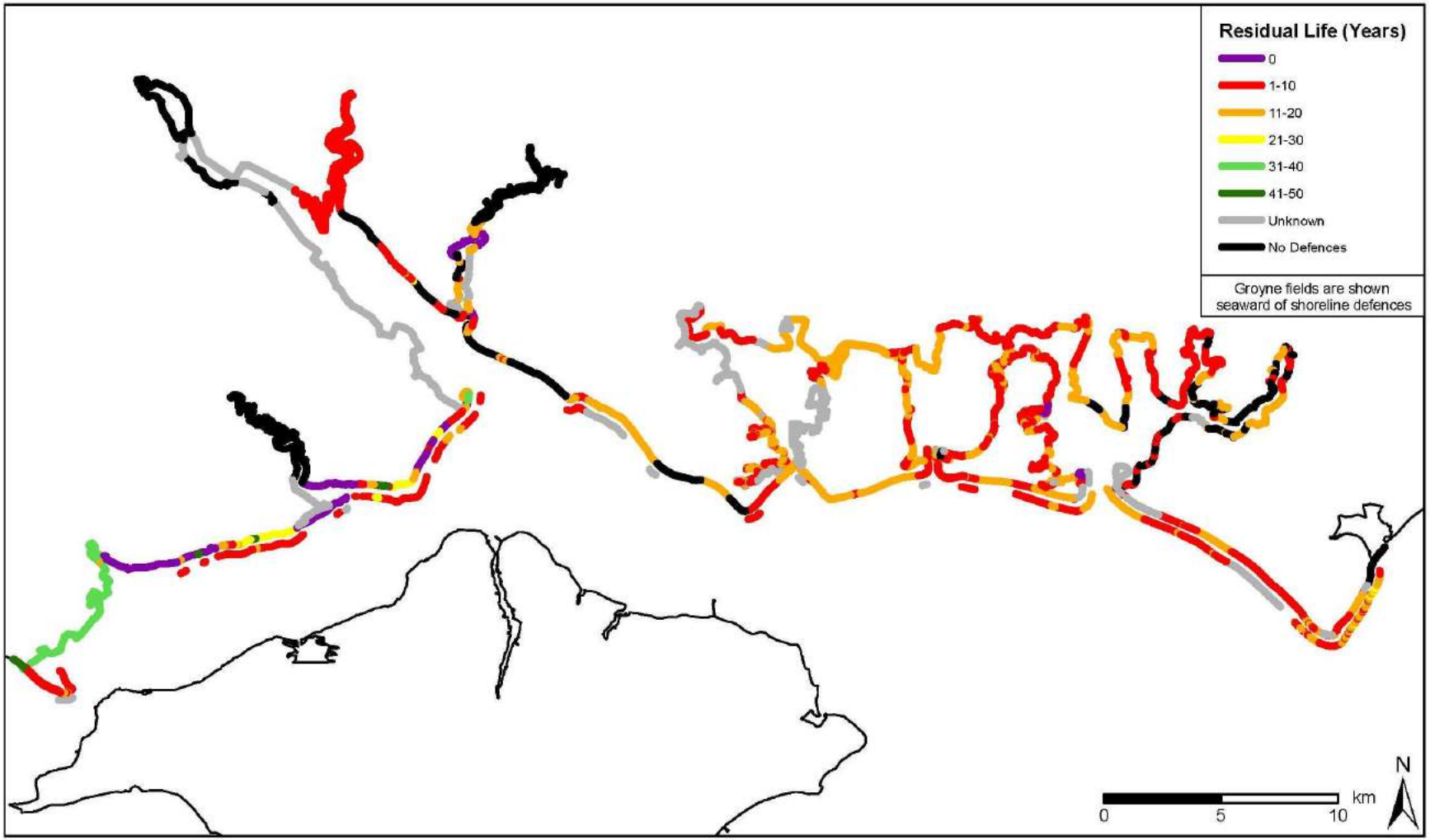

Residual Life of Defences

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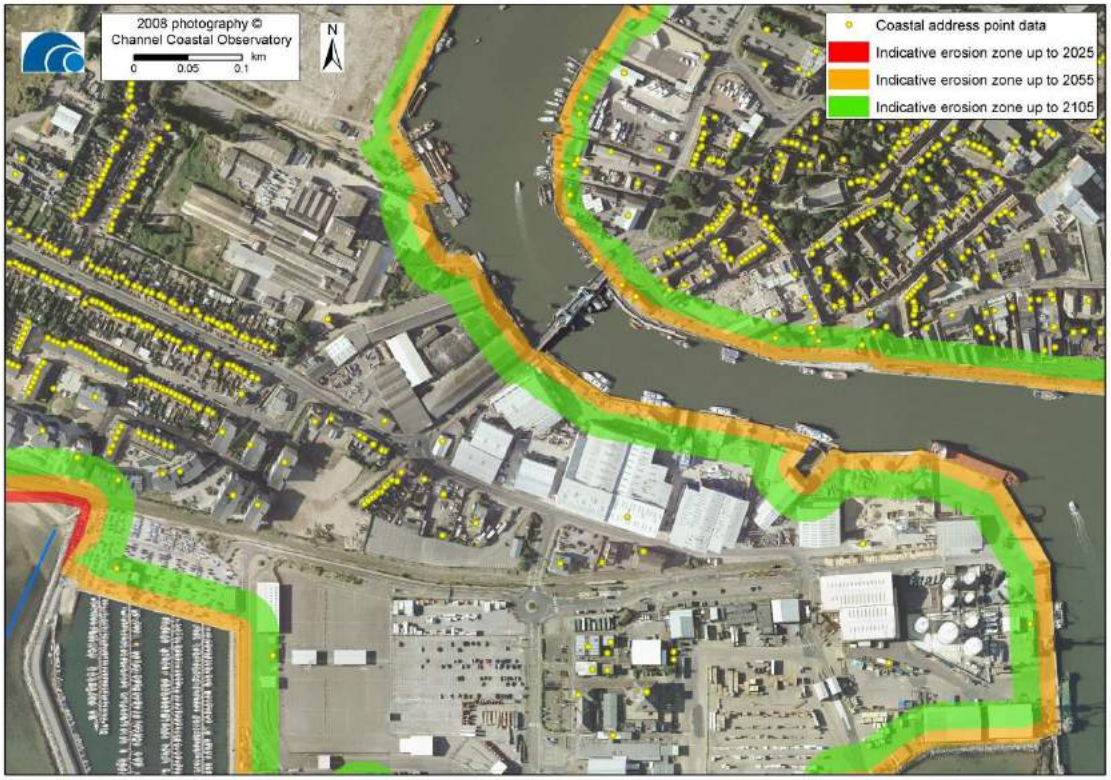
Recommendations *To avoid future inconsistencies between various projects in terms of rates of coastal erosion and benefit-cost data, the following is recommended at a national level:*

A regularly updated uniform, national GIS address-layer, available to all parties and projects, akin to the National Receptor Database to avoid under-estimate of industrial areas. Recommendation: A regularly updated uniform, national GIS address-layer needed,

- *available to all parties and projects,*
- *Similar to the National Receptor Database*
- *Will avoid under-estimate of industrial areas.*
- *Property point not always picked up in GIS assessment.*



Comparison of properties at risk and values applied in the SMP2 and Strategy study at Barton-on-Sea

SMP number of properties	SMP property value (2010 estimates)
324	£84 million (average local authority property value £260,165)
Strategy number of properties	Strategy property value
520	£185 million (average property value for Barton-on-Sea £685,000)

Clarification of assets and valuation procedures needed for overview national economic analysis.

Robust consistent methods needed for future SMPs

SMPs may underestimate property values significantly (55%).

Expected accuracy imagery

- Many variables so considerable uncertainty
- Minimum change reliably detectable (~0.5m) using photogrammetry
  - 4-5 x ground sample distance (pixel)
  - Control and ground model dependant
- Worse for direct digitisation
  - Well controlled orthos.(1-3m)
  - Georectified image (3-10m)

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Evolution lowland features

- Not covered in NCERM
  - Saltmarsh
  - Spits
  - Barrier beaches
  - Nesses
  - Deltas

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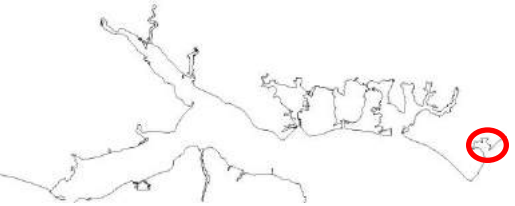


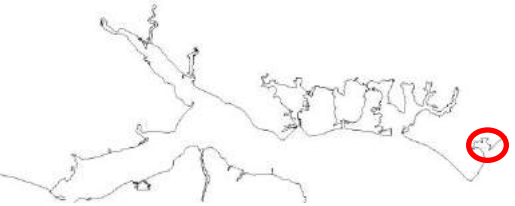
Variable longshore evolution

Pagham Harbour

1946

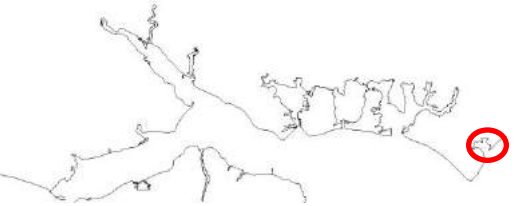
- Coarse resolution
- (1:10000 source)
- Note retouched imagery
- Low water "trimmed"

Aerial photograph 1946 © RAF



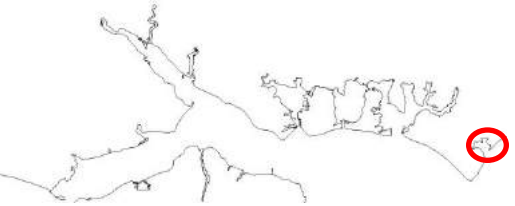
Pagham Harbour
1965

- Coarse resolution



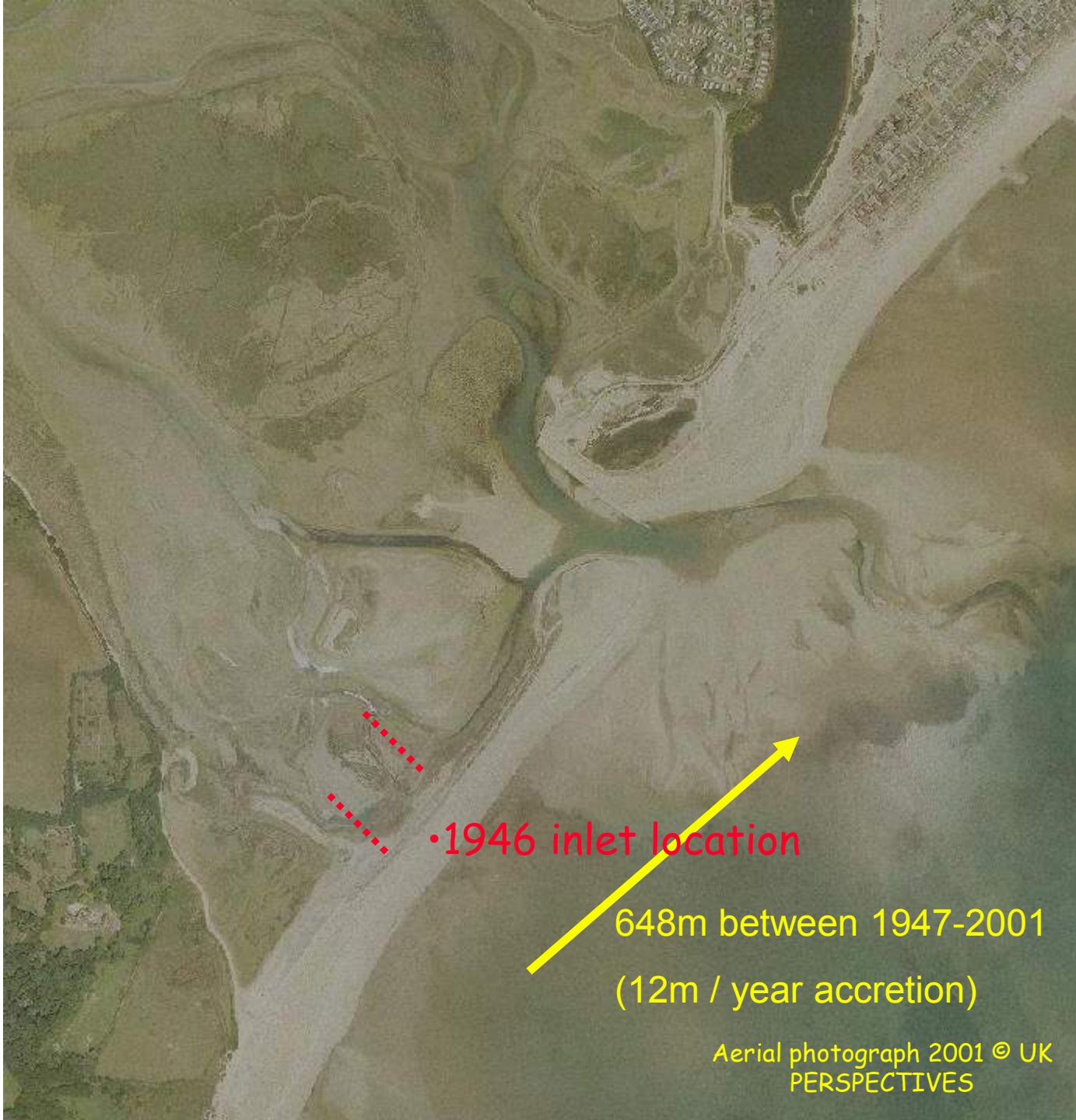
Pagham Harbour
1991

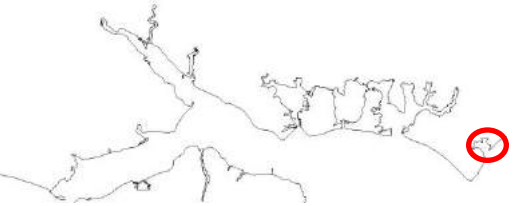
- Mid resolution
- Scans from 1:5000



Pagham Harbour
2001

- Mid resolution





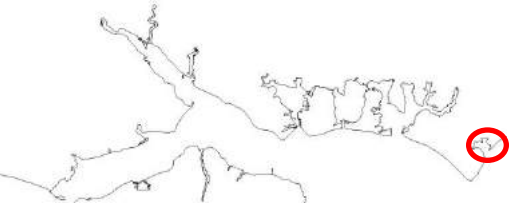
Pagham Harbour
2005

- High resolution
- Commissioned MLWS
- 20cm GSD Digital

Spit accretion seaward and eastward 100m between 2001 – 2005 (25m / yr accretion)

- 1946 inlet location

Aerial photograph 2005 © CCO



Pagham Harbour
2008

- High resolution
- Commissioned MLWS
- 9cm GSD Digital

Spit built eastward by additional 455m between 2005 – 2008 (151m / yr)

- 1946 inlet location

Aerial photograph 2008 © CCO

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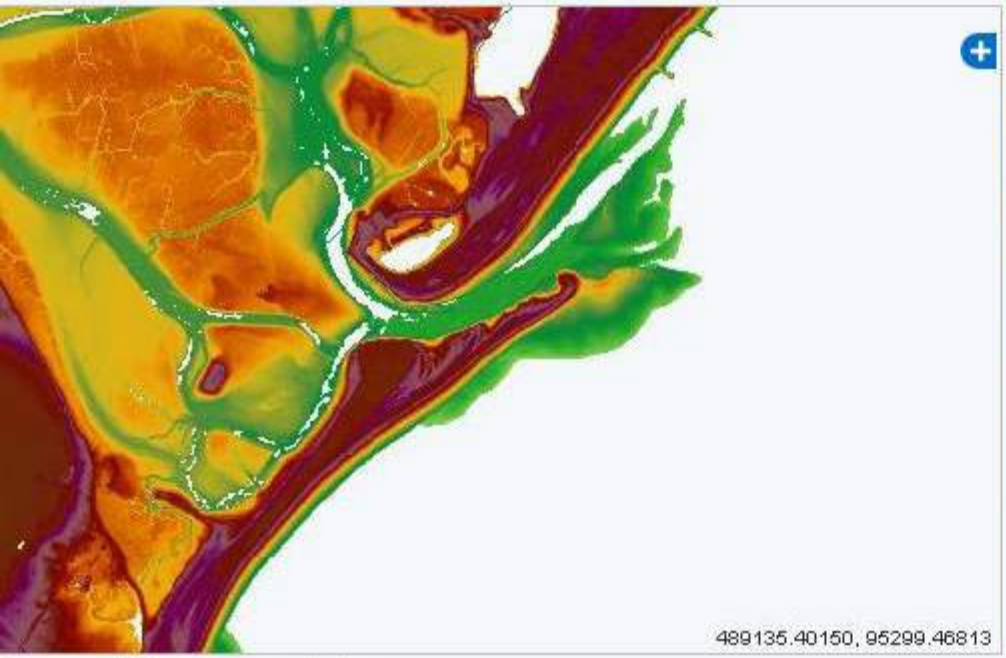
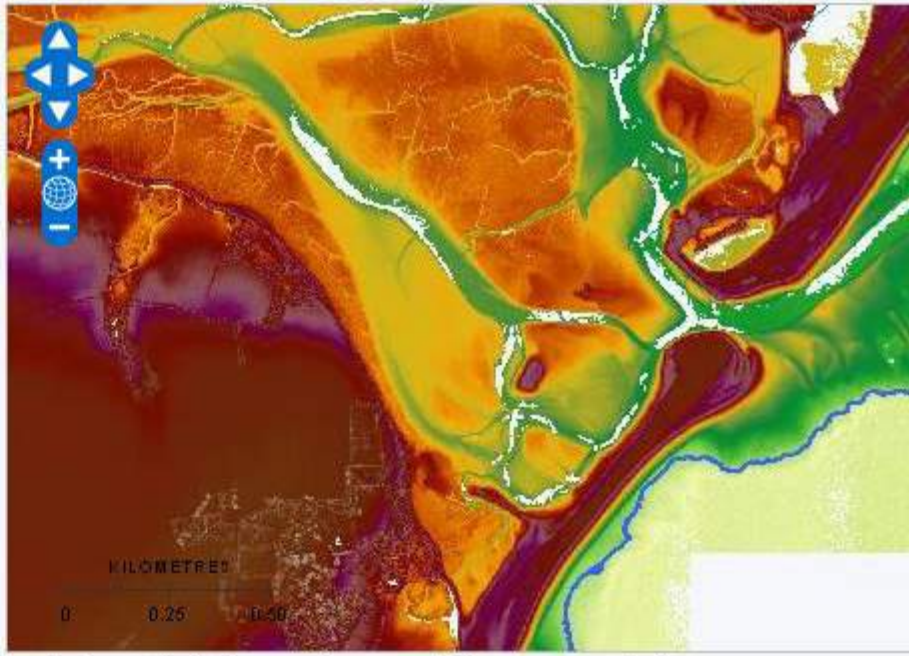
DUAL MAP VIEWER

Zoom to a region





- Photogrammetric data
- Topographic ground model data
- Hydrographic ground model data
- Sediment distribution data
- Beach profile cross section changes
- Real time data
  - *Wave buoys*
  - *Tide gauges*
- Other

- Ortho-rectified photography
- False colour infrared photography
- Non-rectified photography
- Lidar data
  - *2008*
  - *2007*
  - *2006*
  - *2005*
  - *2004*

Elevation (meters OD)

75.0+

- Photogrammetric data
- Topographic ground model data
- Hydrographic ground model data
- Sediment distribution data
- Beach profile cross section changes
- Real time data
  - *Wave buoys*
  - *Tide gauges*
- Other

Suggested approach to NCERM updates

- Use National coastal monitoring data sets as source
  - Update cliff edge
  - Consistent data source and method
- Expansion of coverage to include beaches and wetlands
  - Add MHWS, MLWS, saltmarsh, barrier/spits outline
  - Present lines on most recent aerial survey backdrop
  - Present line of existing defences where present
- Updates approx. 5-yearly
- Present actual positions and dates
  - Application historical monitoring data
    - Long term rates
    - Recent epochs

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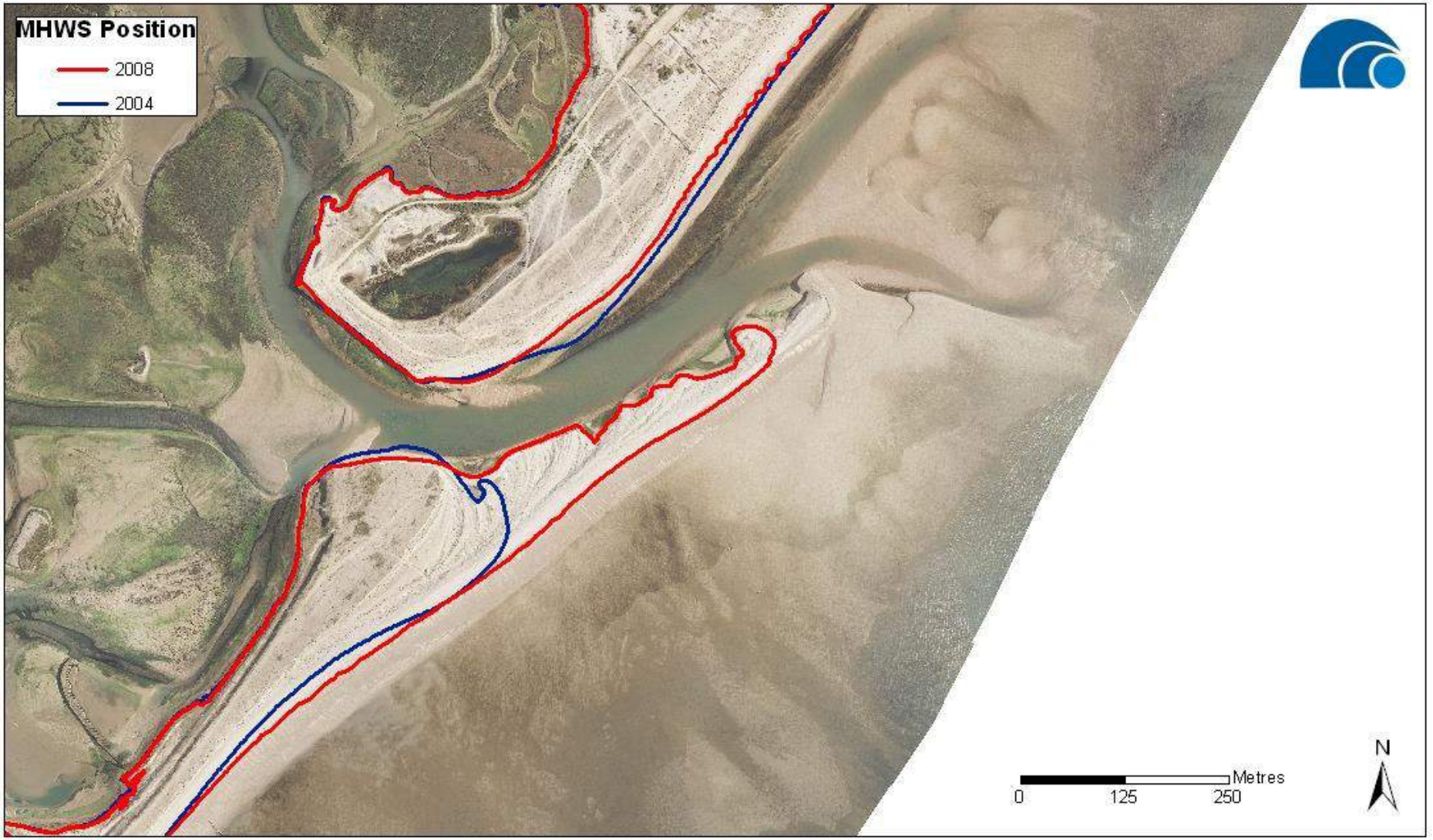
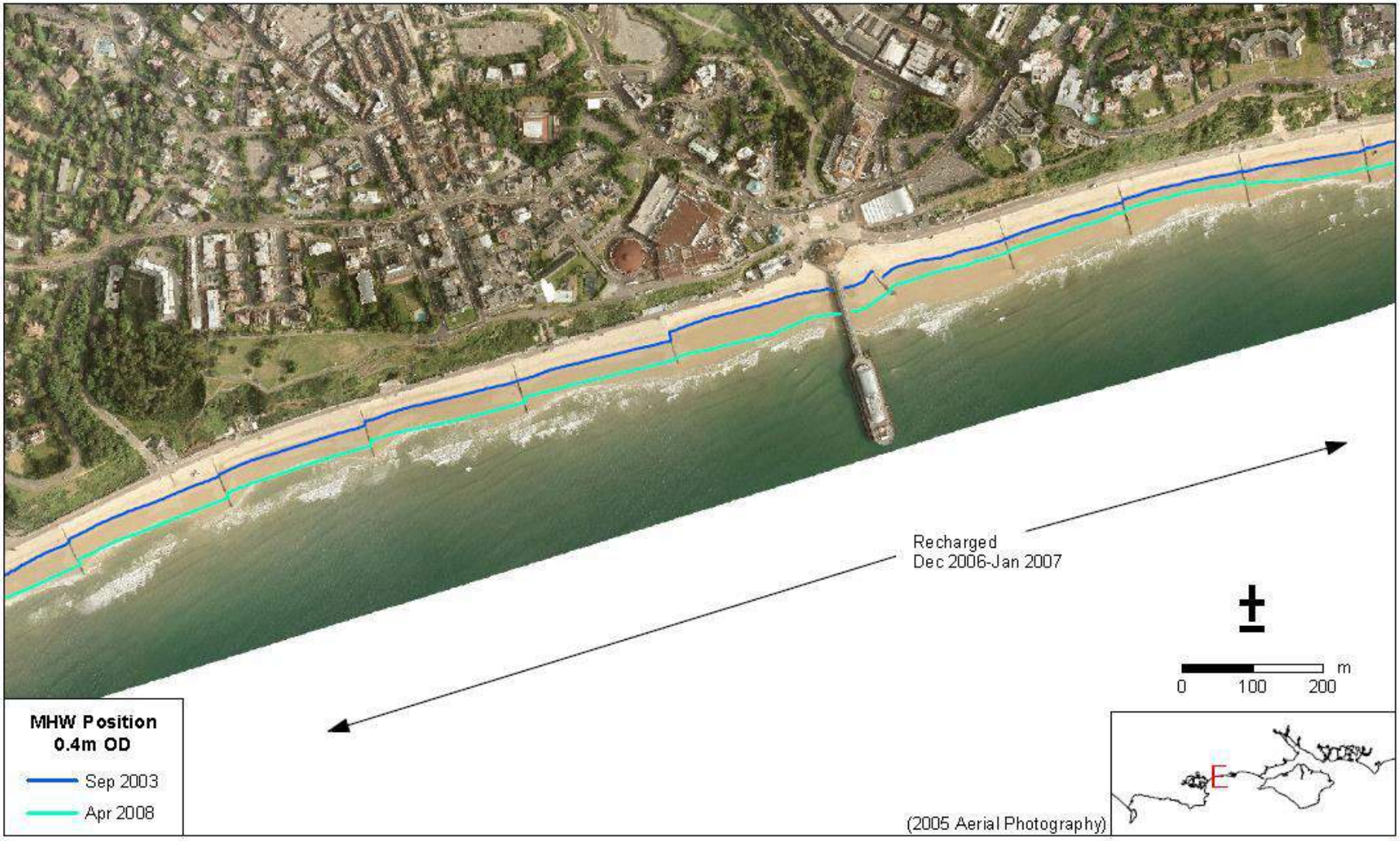
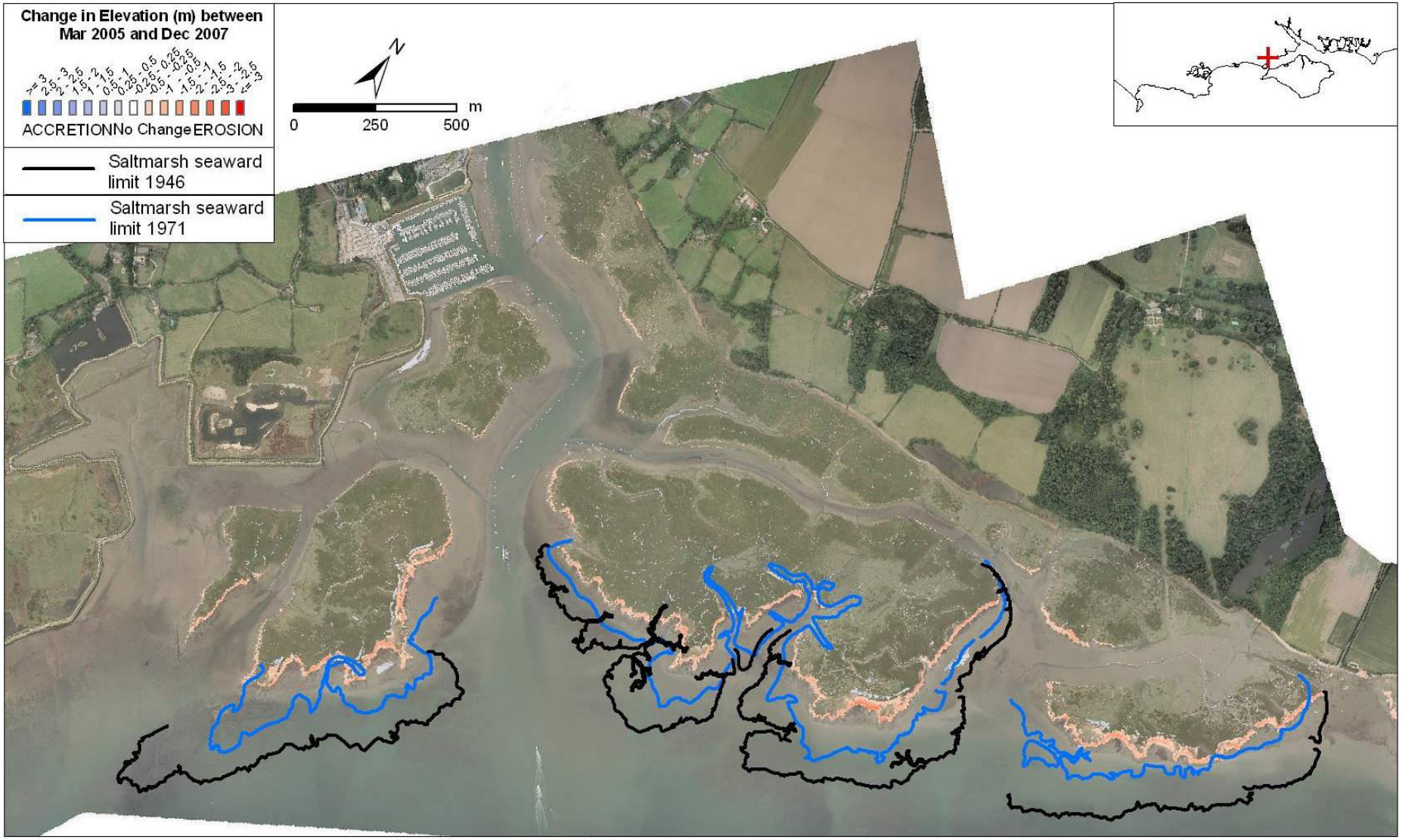


Pagham Harbour - Mean High Water Springs Position (MHWS)





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Naish

Naish Cliff Edge Lines