

Coastal Erosion at St Bees 1864 - 2006

This investigation was triggered by Chris Robson, who had acquired a pair of 1946 aerial photographs of St Bees and, knowing my interest in local maps, asked if it would be possible to carry out a comparison to determine the extent of coastal erosion on the cliffs bordering the Golf Course between the Seacote Hotel at one end and Sea Mill at the other.

The available sources of local map information only go back as far as 1864, because the cliffs were not included on the 1815 Enclosures Map or the 1838 Tithe Map of the village, but are as follows :-

1864 OS Map : 1st Edition - 1:10,560 (6" = 1 mile) Scale and 1:2500 Scale - surveyed in 1861 - 63 and reproduced in 1999 for the Millennium celebrations.

1900 OS Map : 2nd Edition - 1:10,560 Scale - based on the 1861 survey, but with revisions in 1898.

1926 OS Map : 1:10,560 Scale - Cumberland Sheet LXXII NW - survey revised in 1922 - 23.

1946 Aerial Photograph (from Chris Robson)

1967 OS Map : 1:10,560 Scale Sheet NX91 SE - surveyed in 1961

1990s OS Material at 1:2500 scale used to produce the 2000 Millennium Map - survey date unknown

Satellite image extracted from "Windows Local Live", taken in about 2000.

Satellite image extracted from "Google Earth", taken in about 2006.

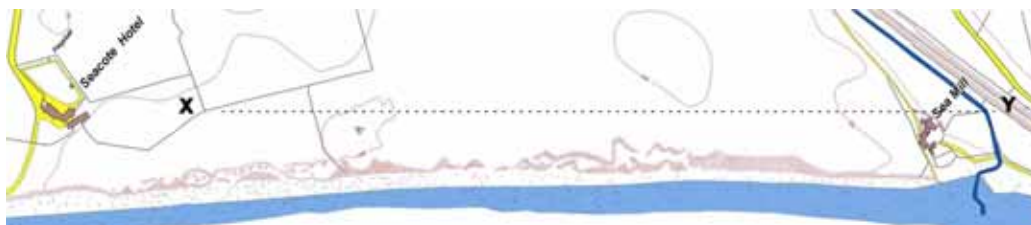
2008 Digital Mapping data from OS - survey date unknown (pre-Fairladies Development)

These sources were all used in this investigation, to give a reasonable spread over the time period. By taking a scanned image of each of the data and comparing them in the computer, it should then be possible to compare the position of the cliffs at different dates. That's when the fun started !

EXAMINATION of the MAPPED INFORMATION

1864 Map

Note the difference in mapping styles compared to the rest. It looks as though only the cliff faces are mapped and not the slopes.



1900 Map

Slopes and cliff faces now appear to be mapped.



1926 Map

Apparently little change from the previous map, although the golf course is now fenced off.



1967 Map

Fence has gone, and slopes just right of centre now amalgamated.



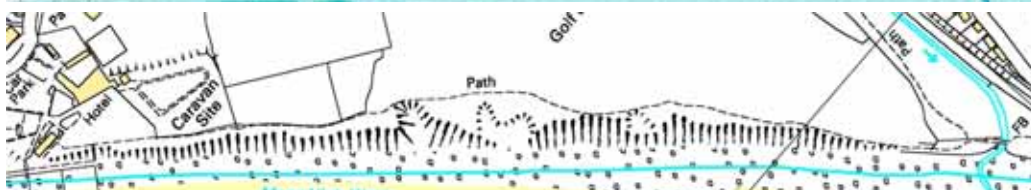
2000 Map

Cliffs and slopes now shown as "coastal slopes", but does not show any major changes in shape from the previous maps.

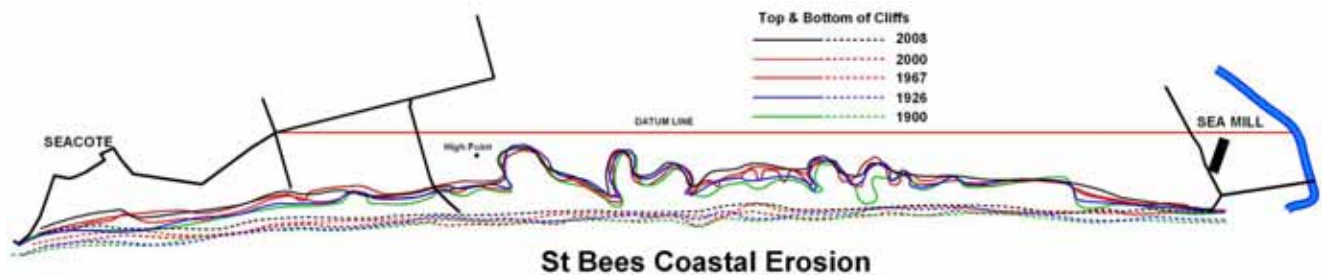


2008 Map

Little or no change from 1967 in the shape of the cliffs/slopes.

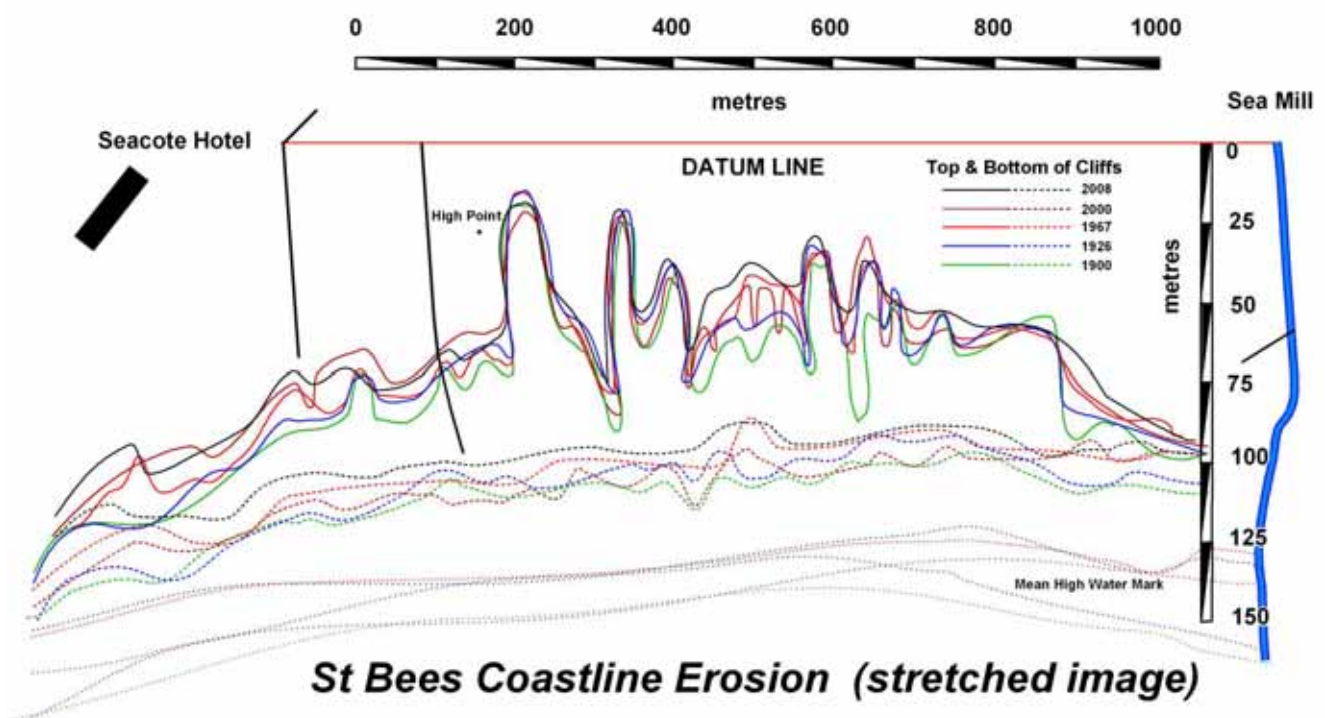


Looking at the maps individually, there does not appear to be much change, but using the OCAD Mapping Program to superimpose all the maps on top of each other - with a common datum line (marked as "X-Y" on the first map), adjusting them to the same scale and plotting the top and bottom of the cliffs, some differences show up.



For this part of the investigation, the 1864 map is of little use, because it only appears to have the cliff faces mapped, rather than the top of the cliff - and the High Water Mark (HWM) applies to the Spring tides, rather than the ordinary tides on the later maps.

By expanding the vertical scale of the map, whilst retaining the same horizontal scale - another useful option in the OCAD program - the differences become more apparent.



Examining this plot in detail yields the following information -

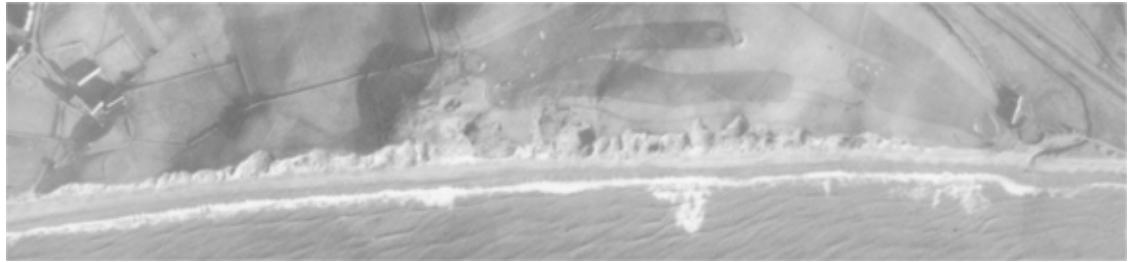
- the cliff top in the centre of the area close to the high point has changed little (not unexpected, because it is a well established grassy slope), although the base of the cliff has moved inland by about 15-20m during the ~100 year period that these maps cover. The HWM has also moved by about the same amount, although the main change is between 1900 and 1926.
- at the Seacote end, the inland movement of both the top and bottom of the cliffs in the same time period has been 20 - 25m, with the HWM moving by a larger distance
- at the Sea Mill end, the top of the cliff has moved about 5m and the bottom by 10-15m, with the HWM moving about 25m.

Whilst there are some anomalies in the individual plots (most likely due to interpretation errors - on my part, or the part of the OS), the overall conclusion is that erosion is taking place at a steady rate and as this occurs, the cliff faces are getting steeper, particularly in the centre of the area below the high point.

EXAMINATION of the PHOTOGRAPHIC EVIDENCE

For this part of the investigation, the 1946 photograph of the coastal cliffs was examined alongside the 2000 & 2006 satellite images as follows :-

1946
Photograph
from Chris
Robson



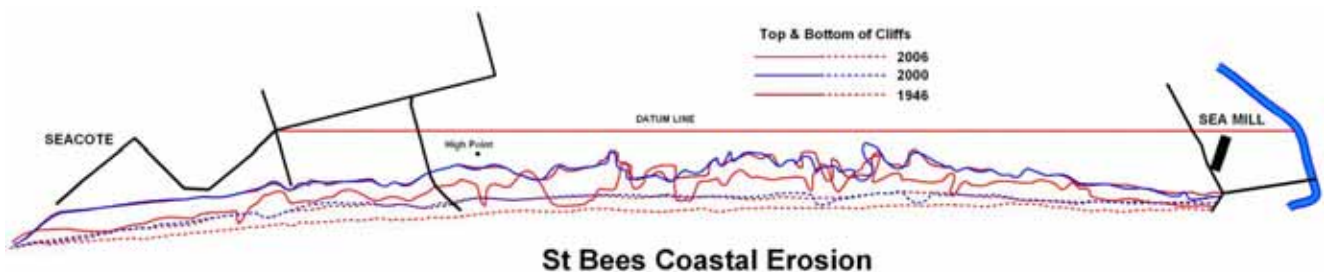
2000
Satellite
Image
(Windows
Local Live)



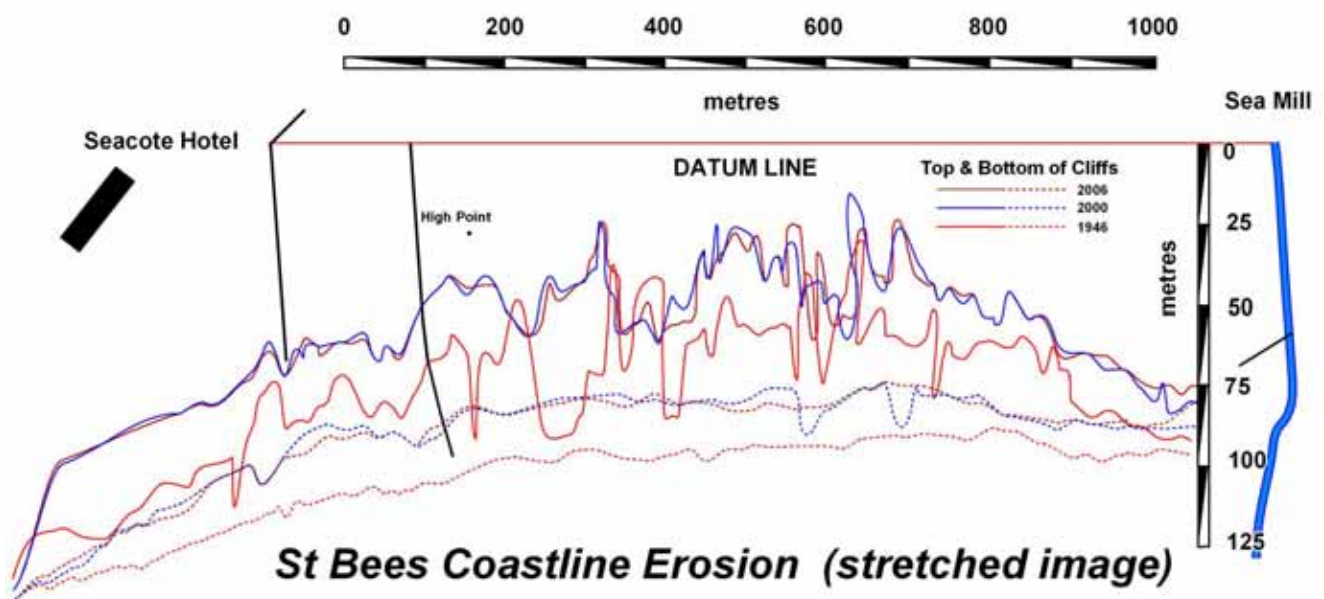
2006
Satellite
Image
(Google
Earth)



It was immediately clear that it would not be possible to identify the true cliff top, but that the sandstone faces of the cliff were reasonably distinguishable from the grassy slopes. Using the same comparison system that was used for the maps gave the following results :

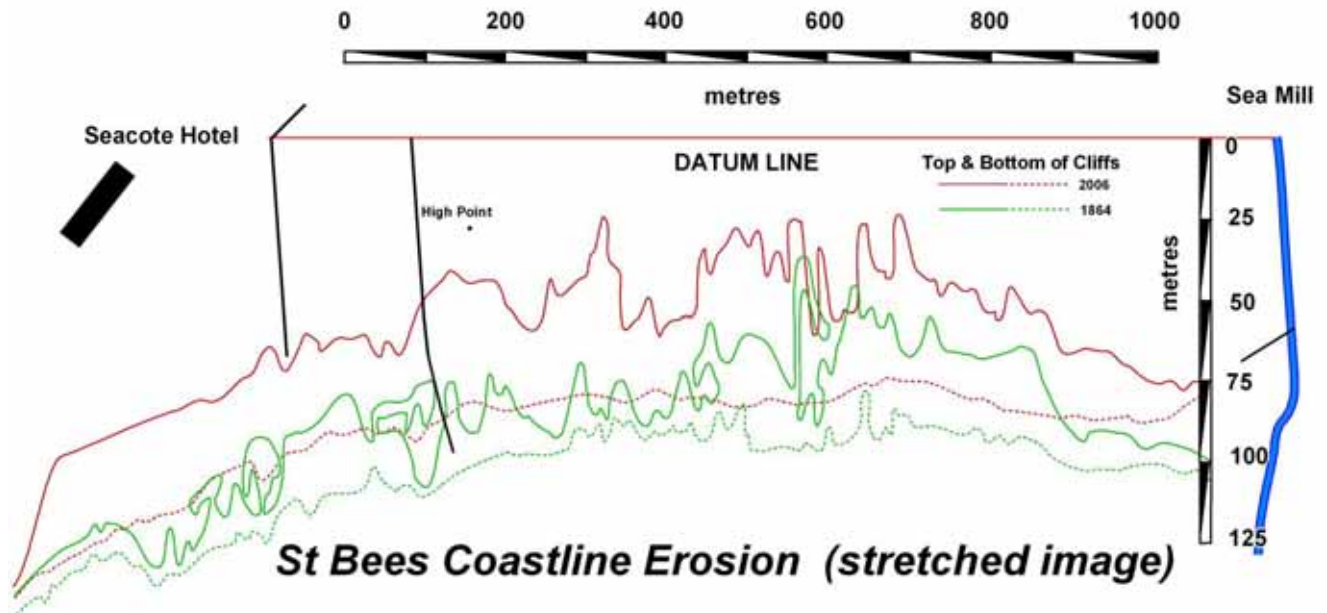


Expanding the vertical scale shows up the differences between the images more clearly :-



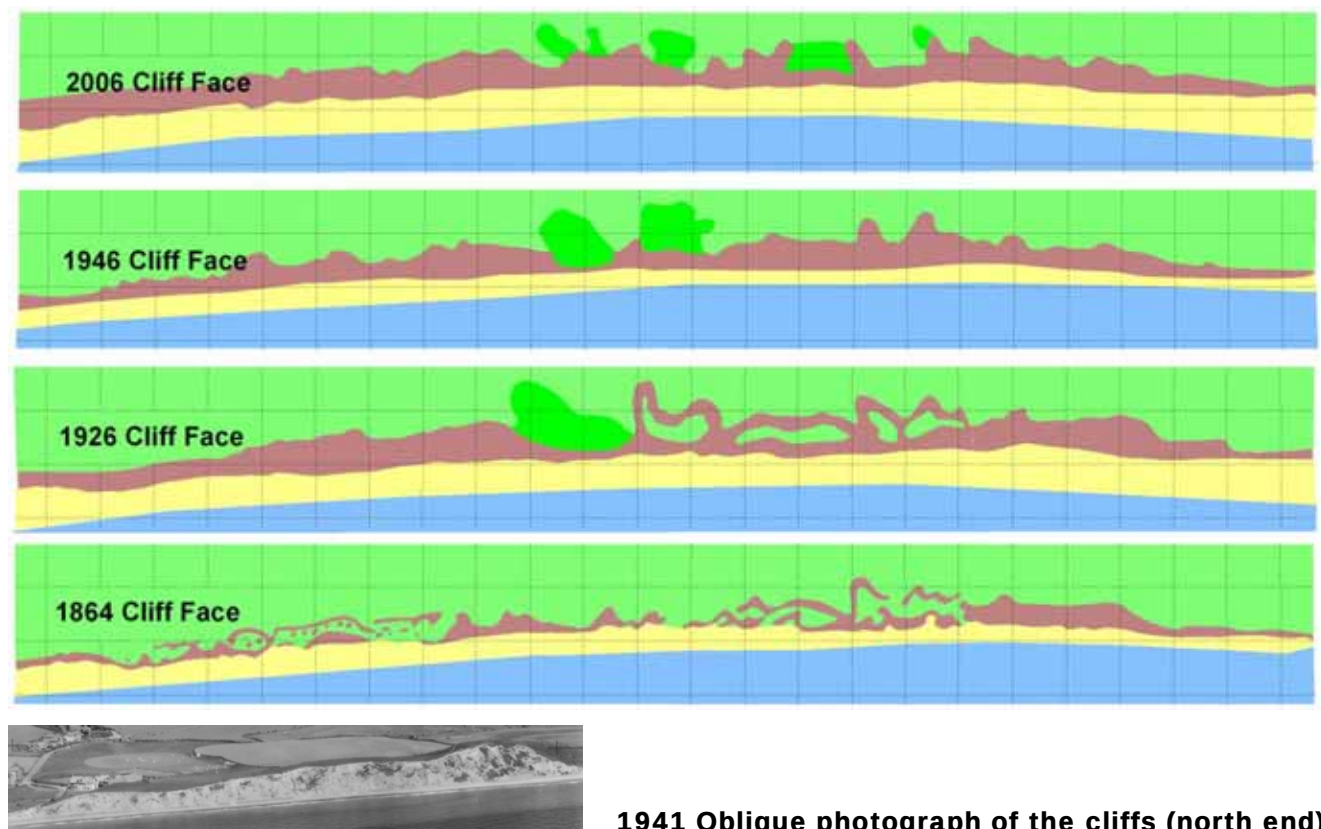
Examining the plots in detail shows little difference between the 2000 and 2006 plots - most are likely to be due to interpretation errors - but between 1946 and 2006 the bottom of the cliff face has moved inland by about 20m, and there have been similar changes to the top of the cliff faces, with quite a significant loss of material in the centre of the area, just to the right of the high point.

Finally, the 1864 map may have mapped just the cliff faces of the time, so comparing that map with the 2006 satellite image gives the following :-

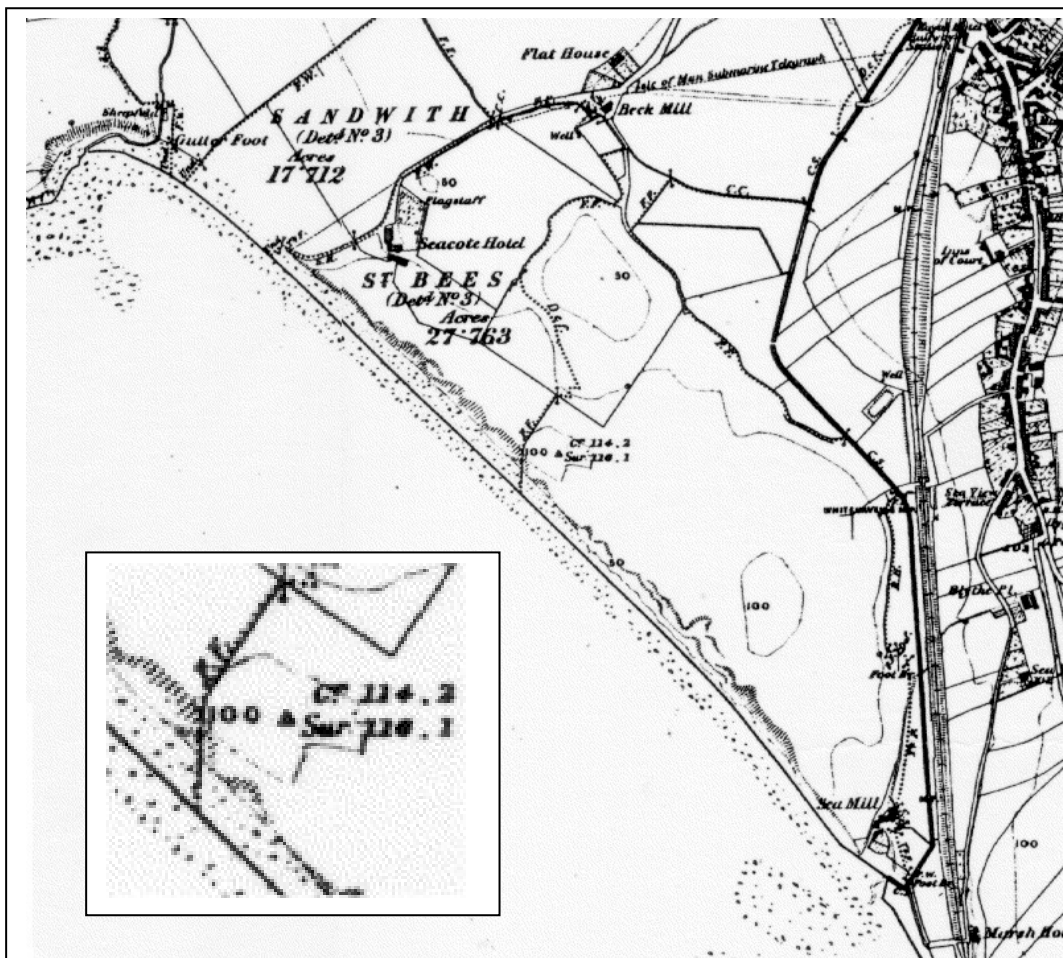


The cliffs were certainly a lot smaller in 1864 and the tops were considerably further out to sea.

An alternative way of displaying this information was attempted as shown below :-

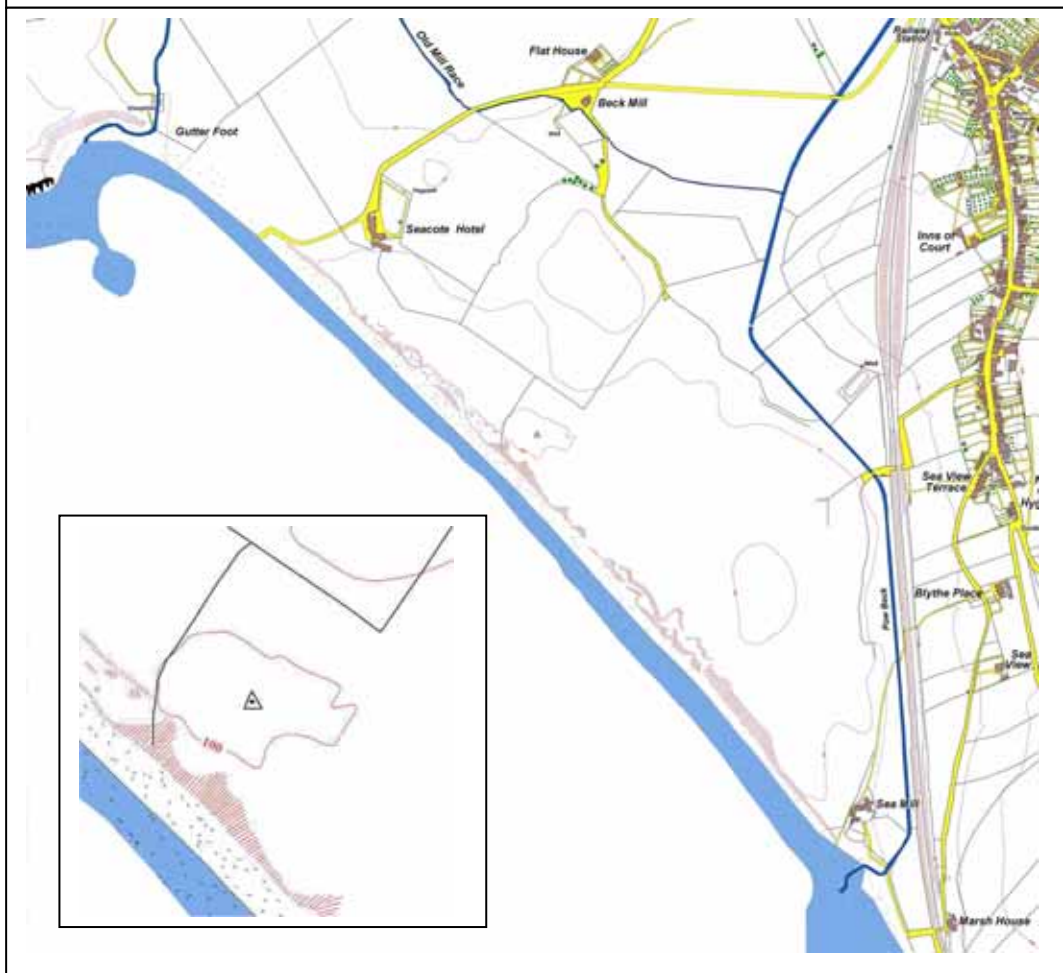


So the OVERALL CONCLUSION, it is clear that there has been ongoing coastal erosion taking place. In the 1860s the cliffs were a lot lower, the cliff top in the centre of the area close to the high point has changed little, but at both ends of the beach there have been considerable changes.

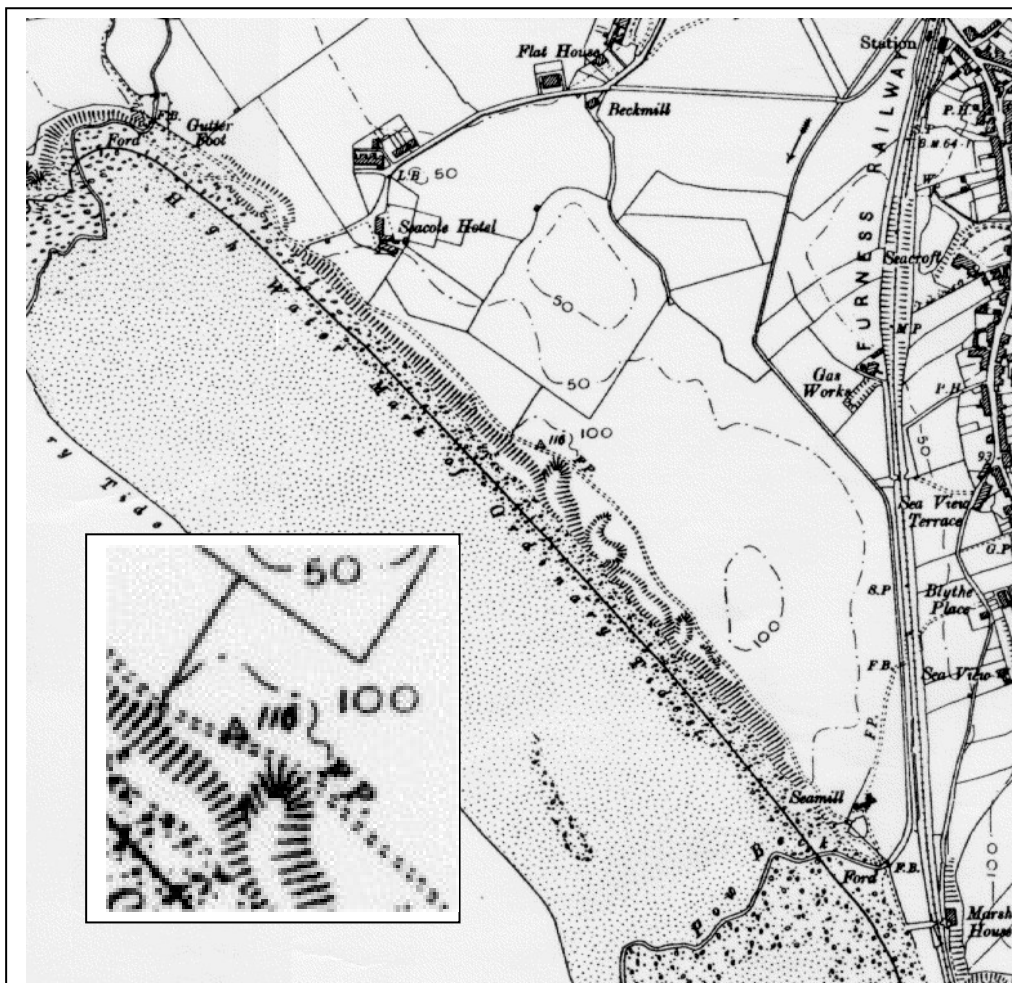


1864 OS MAP

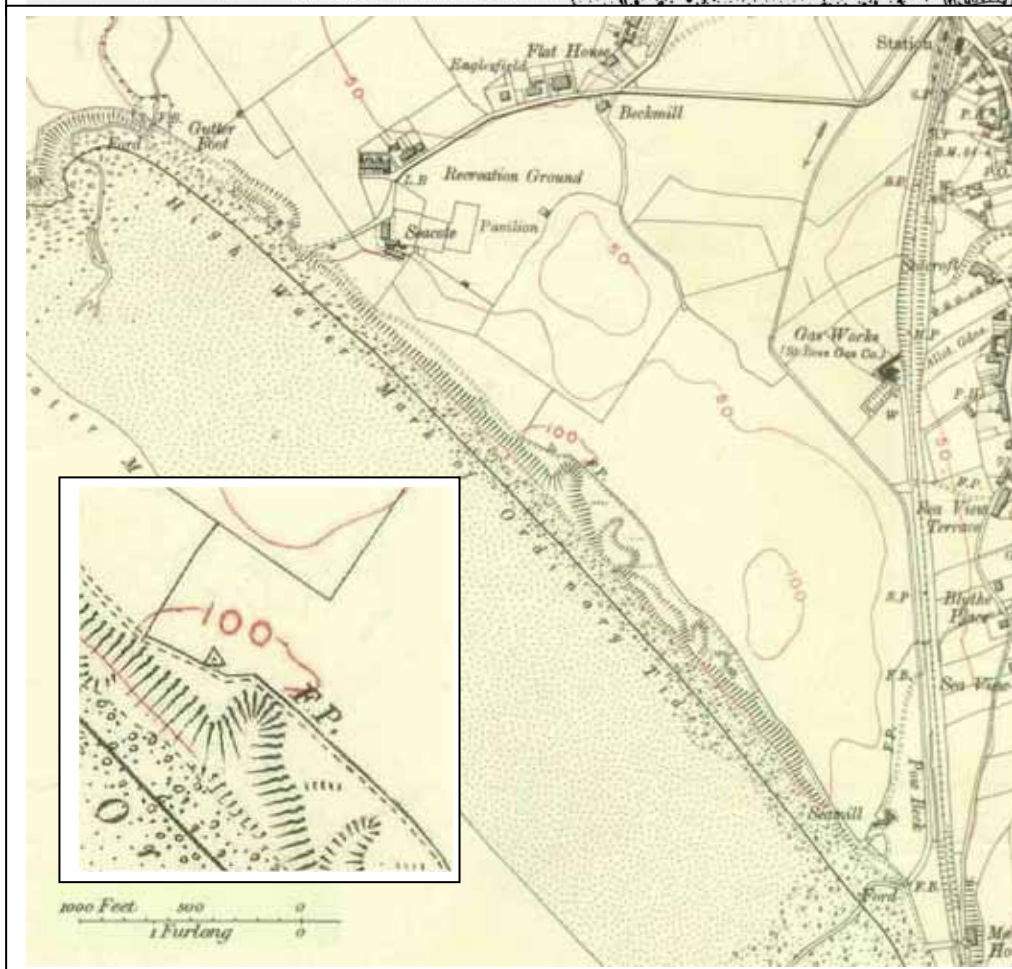
Note distance
between the
Coast and the
Fence Corner



Extract from the
1864
Millennium
Map Set



1900 OS
MAP



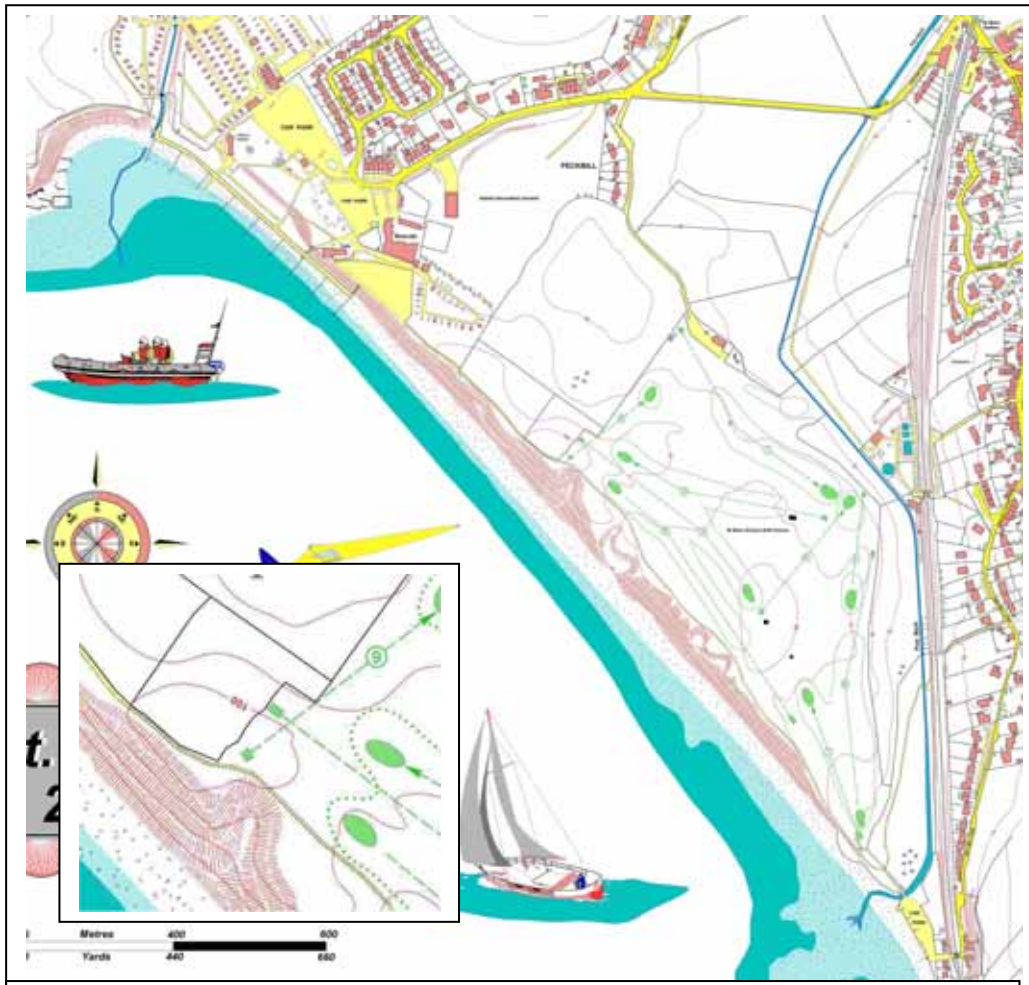
1926 OS
MAP



**1946 RAF
Photograph**
(Supplied by
Chris Robson)



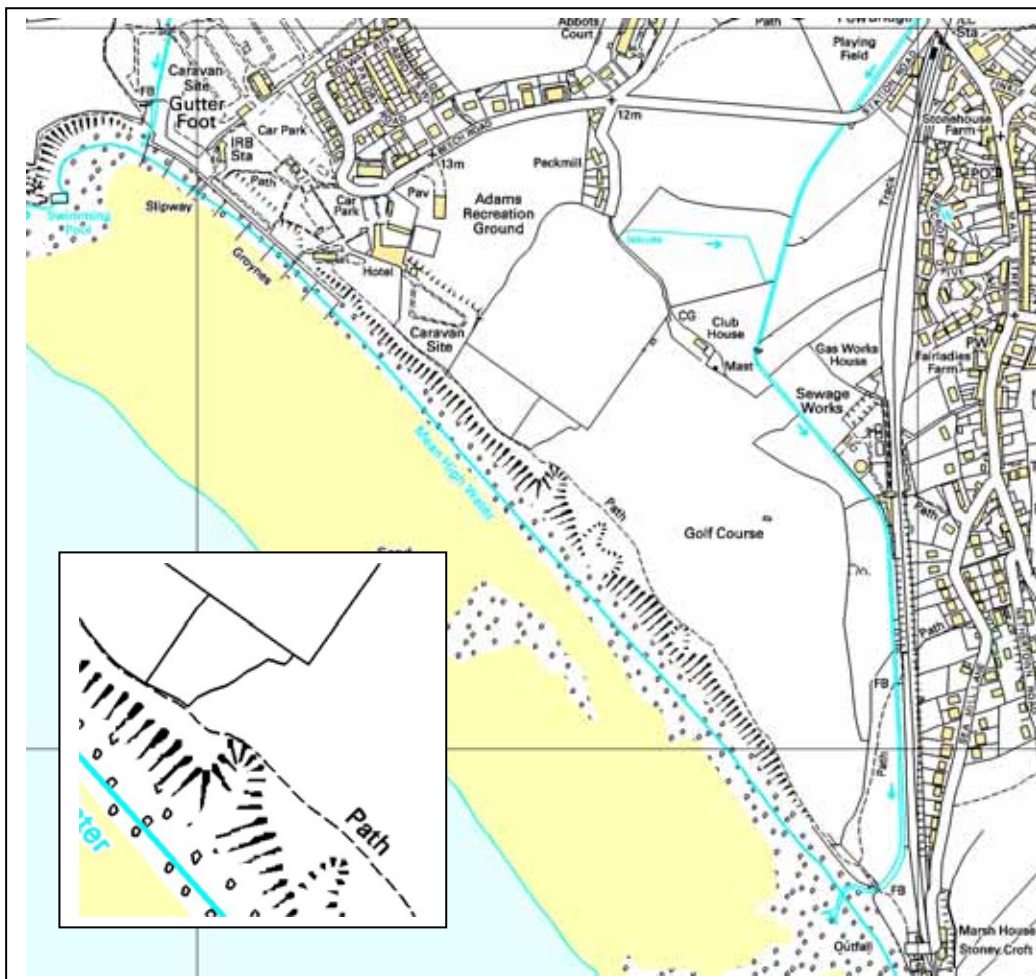
**1961 OS
Map**



**2000
Millennium
Map**
(from 2000 OS Map)
Drawn by Tony
Pennick



**Satellite
Image of
St Bees**
Taken around 2000
(Extracted from
Windows Local Live)



**2006 OS
Map**



**Satellite
Image of St
Bees**

Taken around
2006
(Extracted from
Google Earth)