ENVIRONMENT AGENCY

Shoreham & Lancing

Sea Defences

Who We Are

The Environment Agency began work on April 1 1996 and combines the expertise of the National Rivers Authority (NRA), Her Majesty's Inspectorate of Pollution (HMIP) and the County Council Waste Regulation Authorities.

The Agency is one of the most powerful environmental regulators in the world and has many responsibilities to protect land, air and water. One of these responsibilities is flood defence. In this respect it has authority to spend money if a sea defence is in a poor condition and its failure would affect a wide population.

The way the coastline has changed over the centuries

Shoreham

Such a defence is the frontage between Brooklands in Lancing and the Old Fort at Shoreham by Sea. Statutory provisions for the maintenance of this stretch of coastline were first made in 1826 with the establishment of the Shoreham and Lancing Sea Defence Commissioners. In 1996 The Environment Agency inherited this provision from the National Rivers Authority.

Shoreham Beach today

& Lancing

Why Does Shoreham Lancing

Shoreham Beach today - view towards Lancing

Shoreham Beach is a spit of shingle created by a combination of the easterly drift of material along the coast and the flow of the River Adur. The whole coastline from Brooklands in the west, to the harbour arm in the east has changed over the centuries. There has been a continuing process of erosion and siltation with the sea and the River Adur occasionally breaking through the coastline.

A shingle beach is a highly effective way of absorbing the energy generated by waves for it moves backwards and forwards according to the prevailing storm conditions. For example between 1875 and 1891 the beach moved between 20 and 100 metres towards the land. In 1913 a breach over 400m long occurred in front of the Widewater.

Shoreham Beach today - view towards Brighton

And Need A Scheme?

The natural state of the coast before development began consisted of low lying saltmarshes protected by a high mobile shingle barrier bank. The bank would have been built up and drawn down by wave and tidal action. It would have been moved along the coast from west to east by the dominant westerly storms. The long term rise in the sea level resulted in a gradual movement of the shingle bank inland. That natural state no longer exists. The coast has been fixed in position due to the need to protect the properties that have been built adjacent to the shoreline since the First World War.

Two things have happened;

1) Shingle has been lost so the beach cannot absorb the wave energy created by the storms.
2) The beach now has less room to move without creating a breach which may flood properties. The area at risk is shown below.

What Does A Shingle

Sea defences formed by a shingle bank have to serve a number of purposes.

- They have to be high enough to prevent the waves overtopping.

- They have to be big and strong enough not to breach and to withstand the energy released by a storm.

- They have to be dense enough to stop high water percolating through as happened in 1984 at Kings Walk in Shoreham.

- They must not stop the natural drift of shingle otherwise it will cause problems further along the coast. For Shoreham and Lancing this drift is some 15-20,000 cubic metres a year.

Bank Do?

Beach replenishment work

Shoreham Port harbour arm stops this natural drift which is why the Port Authority remove this amount of shingle at Old Fort each year. The shingle is loaded on lorries and carried around the harbour when the beaches to the east need to be replenished.

The Problem

Sea defence engineers have to design a scheme which is sufficiently large to withstand storm attack; is high enough to stop the waves overtopping it and does not interrupt the existing natural drift of 15-20,000 cubic metres per year. At the same time it must not destroy the valued amenity of the beach for residents and visitors alike.

The Shoreham and Lancing frontage has caused concern for some years. The Agency's yearly survey of the beach has shown a continuing deterioration of the amount of shingle. This is despite increasing maintenance costs.

If nothing is done then there could be a loss of over 190 hectares of residential and industrial land and, the severing of the A259.

lew scheme will reduce the steep shingle bank and improve beach access

Emergency renourishment to sea defences

This was dramatically shown during the storm of 1989 and 1990. Then there was an unpredicted loss of beach at the Widewater, Kings Walk and Old Fort areas. Emergency renourishment works were carried out. In February 1991 over 110,000 cubic metres of shingle were recycled from the harbour arm to these three danger areas.

What We Have Done

Church of the Good Shepherd on Shoreham Beach

When the Agency's predecessors took over responsibility for the frontage from the Sea Defence Commission in 1979 a programme of renewal of groynes and breastwork was started. But the events of 1989-90 showed that a complete understanding of how the frontage behaved was required. C H Dobbie & Partners produced an appraisal study. This laid the foundations for a more detailed strategy study started in 1993 by Scott Wilson Kirkpatrick and Partners. This strategy laid down the blueprint for the whole frontage within which more detailed design could be undertaken.

The strategy study considered five basic options ranging from "do nothing" to very expensive construction works. Ground investigations were carried out to find out the types of shingle on the beach and what was underneath. The sea bed contours were mapped offshore and wave and surge climates were modelled on computer. At the same time a detailed condition survey was made of the defences. Public consultation meetings were held in July and August at Lancing Parish Hall and in the Hall of the Church of the Good Shepherd on Kings Walk in 1994.

So Far

The result of all this work showed the standard of protection was considerably less than that recommended by Ministry of Agriculture Fisheries and Food. In some sections it was very low. The study also revealed that the energy released by a combination of certain storms and wind directions could cause very rapid erosion of the beach and the sea could break through the defences. This was checked by the University of Brighton who built a scale model section of the existing and proposed beach profiles and tested these under various storm conditions in their wave tank.

Construction of rock groynes

Work on the Lancing Sea Defences at Brooklands

The area found to be at greatest risk was at Brooklands. As a result emergency work was put in hand during the summer of 1995 to reinforce the defences with 28,000 tonnes of shingle and the construction of three rock groynes to break up the wave energy and hold the beach in place.

The Strategy Plan

By looking at past storms it is possible to estimate their chance of happening. For example a 1 in 200 year storm has a 1 in 200 chance of happening in any one year. The combination of high tides, wave height and wind force gives us the magnitude of this storm and so the conditions for which the sea defences must be designed. The Ministry of Agriculture Fisheries and Food (MAFF) administer flood defence for the Government. The MAFF guidelines for an area such as Shoreham and Lancing is a 1 in 200 year storm. This is called the standard of protection.

Many options have been studied and their costs have been estimated. These have included:

- *Beach Recycling* — shingle is brought from the east and deposited back at the west end of the frontage
  estimated cost — £29.50 million

- *Beach Nourishment* — shingle is imported and used to build up the beach
  estimated cost — £14.45 million

- *Sea Wall and Rock Revetment* — there would be a permanent concrete wall and a rock revetment consisting of large chunks of rock placed at the top of the beach
  estimated cost — £14.53 million

- *Large Strongpoints* — long fish tail shape groynes
  estimated cost — £15.36 million

- *Breakwaters* — offshore rock islands
  estimated cost — £14.58 million

Special Tanks at the University of Brighton where tests on Shoreham sea defences were carried out

The Agency has decided after extensive tests and research to adopt a combined scheme involving rock groynes, timber groynes and beach nourishment. It has been estimated this scheme will cost £14 million.

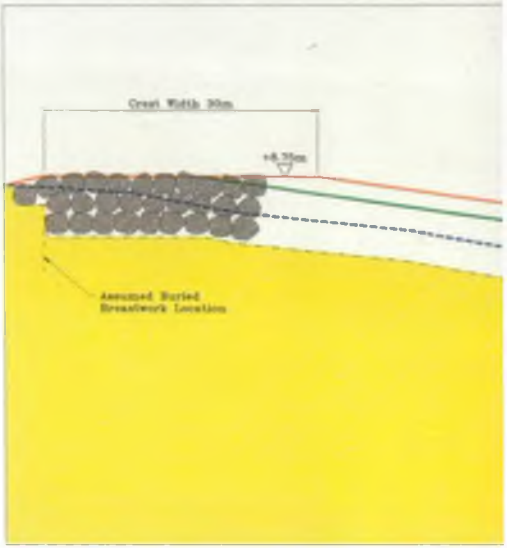
The Strategy is to:

- Construct three rock groynes and recharge the beach at Brooklands.
- Construct eleven rock groynes and recharge the beach at Kings Walk.
- Modify the existing timber groynes between Brooklands and Shoreham Beach to retain a crest height of +6.5m above datum with a minimum crest width of 20m and to achieve an average seaward slope of 1 in 7.
- Construct two rock groynes on the Widewater frontage and place rock armour to protect the existing sea wall.
- Provide approximately 500,000 cubic metres of shingle material along the total frontage to recharge the upper beach within groyne bays.
- Continue maintenance to existing beach structures while capital works are phased in.

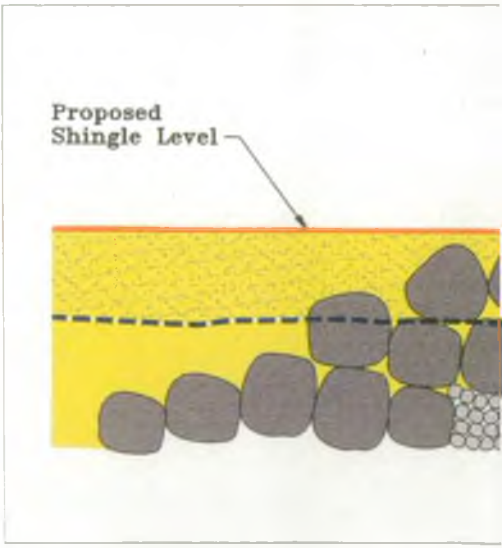
The total scheme is to be constructed over 14 years at an expenditure of approximately £1 million per year.

The scheme has been chosen for the following reasons:

- It is the closest of all the options to the existing defences.
- It is a less risky strategy than relying on completely soft defences.
- It makes best use of existing defences, and targets works to where they are most needed.
- It has the lowest cost.
- The cost is less likely to change during the duration of the work.



Longitudinal section through typical groyne



Cross section through typical groyne

How Much Will It Cost And Who Pays?

The total estimated damage to property which could be caused by the sea defences failing is about £77 million, affecting some 1,200 properties and businesses. Traffic disruption caused by the closure of the A259 would amount to £29.7 million. The cost of strengthening the sea defences from Lancing to Shoreham Beach is estimated to be £14.2 million. Each section of the scheme has to show that the cost of the works is less than the damage which may occur if the sea defences are not strengthened. This financial yardstick is used to ensure that public money is spent wisely.

The scheme will be funded by the Environment Agency (which raises a levy on the Local Authorities in Sussex) and by Government grant-in-aid from MAFF.

TIMETABLE AND COSTS

1995-6	Priority Works - initial works at Brooklands	£0.9 million
1996-7	Completion of overall strategy, modelling and start at Kings Walk	£1.5 million
1997-8	Continue works at Kings Walk	£1.1 million
1998-9	Continue works at Kings Walk	£1.1 million
1999-2000	Complete works at Kings Walk	£1 million
2000-2001	Start works at Widewater	£1 million
2001-2002	Continue works at Widewater	£1 million
2002-2003	Complete works at Widewater	£0.8 million
2003-2004	Start works at Mermaid & Caravan Park frontage	£0.9 million
2004-2005	Continue works at Mermaid & Caravan Park frontage	£0.9 million
2005-2006	Continue works at Mermaid & Caravan Park frontage	£0.9 million
2006-2009	Complete works at Mermaid & Caravan Park frontage	£2.7 million
2007 onwards	Continue monitoring review and management	£0.16 million

If you would like further information, please write to:

Mr Peter Midgley, Sussex Area Manager, The Environment Agency, Rivers House, 3 Liverpool Gardens, Worthing, West Sussex BN11 1TF

The Phase 2 Works

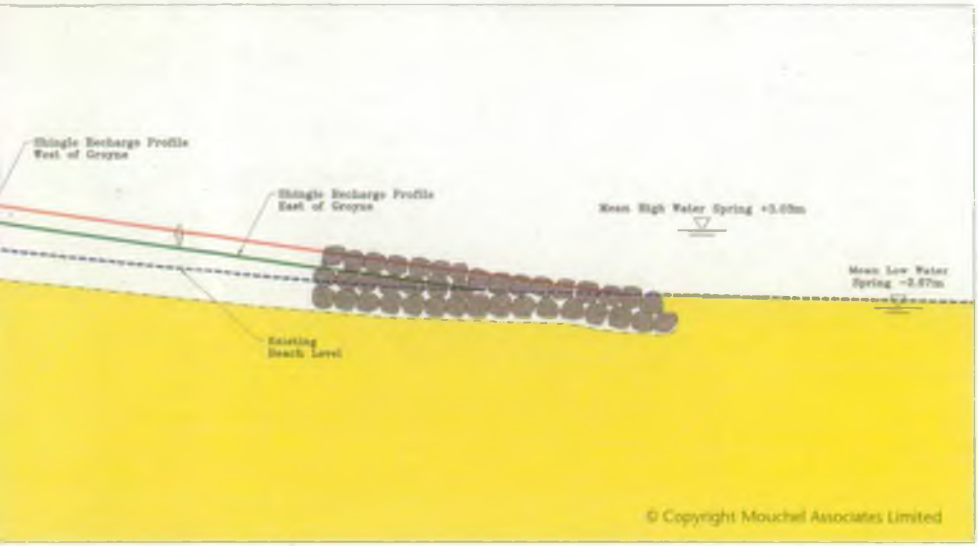
Phase 1 was the construction of the protective works at Brooklands. We are now moving onto the Phase 2 Works at Kings Walk and the scope of the works are to construct eleven rock groynes and to recharge the beach.

The Kings Walk Scheme has been designed by L G Mouchel and Partners Ltd, Consulting Engineers. Scott Wilson & Kirkpatrick are also retained to monitor the overall strategy.

Phase 2 will be constructed in three stages, each lasting approximately 5-6 months. Construction of the first stage is due to start in early autumn.

Local concerns about disruption due to construction and the unsuitability of the local road network to take construction traffic has led to the decision to bring in materials by sea.

The high amenity value of the beach is recognised and the design caters for the recreational activities that take place throughout the year.


Shingle Recharge Profile
West of Groyne
Shingle Recharge Profile
East of Groyne
Mean High Water Spring +5.05m
Mean Low Water
Spring -2.07m
Existing
Beach Level
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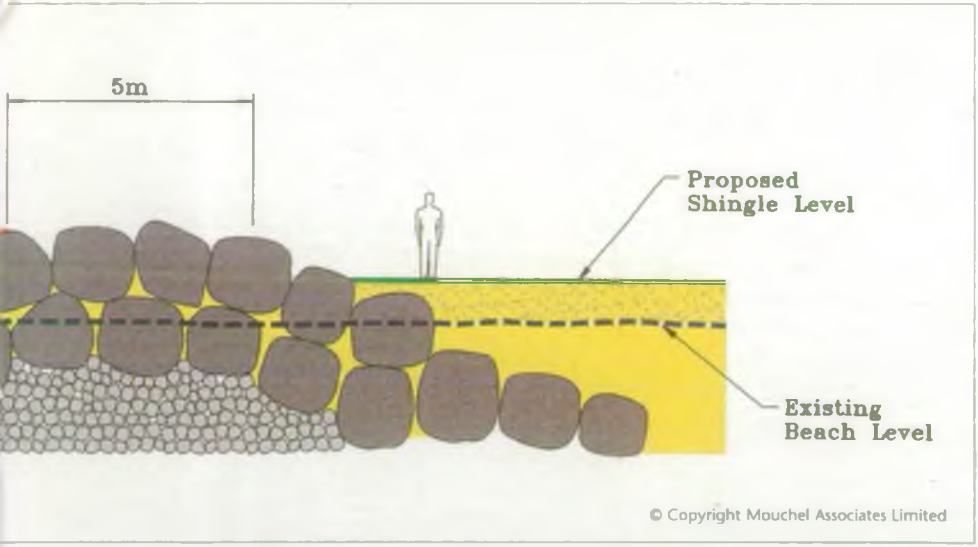
5m
Proposed
Shingle Level
Existing
Beach Level
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