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EA-South West/



PRESTON BEACH

*Sea
Defences*

PRESTON BEACH



*A joint
project*



ENVIRONMENT AGENCY



WEYMOUTH & PORTLAND
Borough Council



WEYMOUTH AND THE SEA

Weymouth is an important seaside town facing the English Channel in Dorset.



character Venn described the bay at Budmouth-Regis (Weymouth) as "the great salt sheening sea bending into the land like a bow".

But although the sea brought prosperity to Weymouth it has always had the ability to bring misery too.

Tidal flooding has a long history and this booklet describes the construction of a vital sea defence scheme along the Preston Beach, which runs between Weymouth and Overcombe. The scheme is owned and maintained by The Environment Agency.

A series of visits by King George III popularised the area as a health resort and it has remained a major tourist attraction ever since.

Visitors are attracted by the natural beauty of the wide sweeping Weymouth Bay.

Thomas Hardy captured the essence of the spot when he wrote *Return of the Native*. The

A HISTORY OF FLOODS

There is a long history of flooding problems in the area of Preston Beach. Records reveal that attempts were made to outwit the sea over 130 years ago. Between 1855 and 1885, for example, a road that followed the inner part of the beach had to be realigned and set back by at least 60 feet. It was already being overwhelmed again by 1899.

Groynes erected to stop shingle drift had 'wasted away' by 1883 following which many thousands of tons of Portland stone, in the form of large blocks, were placed along the shore to add to the protection.

At the turn of the century, the general view was that the stone blocks were contributing to the severity of the erosion and beach recession. As a result Dorset County Council had the stone blocks removed and used to construct a retaining wall.

Subsequently a series of groynes were built, maintained and improved by the County Council, particularly following a strong gale in 1938. Then shingle completely blocked the Preston Road enforcing one way traffic for a week.

Since the second world war, the defences deteriorated and patchwork solutions were adopted. Frequent overtopping of the sea wall continued, however, blocking the road with shingle and causing widespread traffic congestion elsewhere.

In 1989, during a particularly fierce storm, a section of the old sea wall was partially demolished and this underlined the poor state of the existing defences. This damage



brought the problem into sharper focus and at this point investigations were put in hand to find the best possible solution.

A check on records revealed that there had been a steady loss of beach shingle over the years and such a loss would have increased the risk of flooding.

It is thought that the loss of shingle was caused by the beach shingle drifting towards Weymouth, making the beach at Overcombe narrower. In addition, the construction of Portland Harbour modified the wave climate and resulted in the lowering of the sea bed at Preston Beach, whilst accretion (an increase in shingle) occurred near Weymouth Harbour. As a result of this process, the shingle on Preston

Beach tried to roll further inland and this was likely to overtop the wall in storm conditions. With this reduction in volume, there was a greater likelihood of the sea wall partially collapsing with consequent inundation.

Should such an event have arisen, there would have been considerable damage to about 30 properties on the outskirts of Weymouth and Overcombe. The Sea Life Centre and adjacent tourist attractions would have also been seriously at risk.

If the old municipal tip (now a car park) had flooded, there would have been the chance of potentially toxic leachate escaping and this would threaten the

Lodmoor Country Park, an RSPB nature reserve and site of special scientific interest. The A353 Preston Beach Road would also have suffered damage and would have taken a long time to repair resulting in chaotic traffic conditions.

A comprehensive solution was clearly required and three authorities joined forces to promote a new sea defence project in partnership.

These were the National Rivers Authority (which became part of The Environment Agency on April 1 1996), Weymouth and Portland District Council and Dorset County Council.

The Environment Agency has responsibility for the new defences, Weymouth and Portland are the main landowners, and Dorset County Council owned the old sea wall.



Front cover main photo:
The completed sea defences

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THE SCHEME

After detailed studies by consultants, a major £6m scheme was agreed by the Wessex Regional Flood Defence Committee.

The scheme - which was granted by the Ministry of Agriculture Fisheries and Food - provided a double boost for the resort.

Not only did the project provide vastly improved sea defences, but the method used - beach recharge or nourishment - had the added benefit of providing a brand new beach.

Scott Wilson Kirkpatrick, Consulting Engineers, were appointed as designers in 1993 and work started on site in January 1995. It was carried out in two phases and completed in July 1996. The scheme was officially opened in September 1996.



PHASE 1

This first part of the contract involved beach recharge together with the associated marine works. The material for the recharge was dredged just off the Isle of Wight and transported to Preston Beach by boat. The shingle was then pumped onto the beach. All in all, about 214,000 cubic metres of shingle was used during this part of the project. Beach recharge was selected as the best and most effective option to overcome the problem.

Prior to the work starting on site, detailed computer and laboratory modelling was undertaken to discover what size the new beach would need to be to ensure that it would absorb the wave action and prevent waves overtopping the new sea wall. Hence, future blocking of the A353 by shingle or flooding would be virtually impossible.

The modelling determined how quickly the new shingle would drift towards Weymouth. This information formed a critical part of the new assessment as it was this phenomenon that denuded the original beach. The modelling also helped to design the construction of a rock groyne at the Weymouth end of the beach. The groyne would catch the drifting shingle which could then be moved back up the beach on an estimated 7-10 year cycle.

The contract for this phase was awarded to Tarmac Construction for just over £3 million. Their brief was to find a suitable source to dredge the replacement shingle, construct the rock groyne and extend a storm water drain, the outfall from Lodmoor Park and the Sea Life Centre.

This page: Beach recharge operations in progress



OVERCOMBE

**A353
PRESTON
BEACH ROAD**

**LODMOOR
NATURE
RESERVE**

**FORMER
MUNICIPAL
TIP, NOW A
CAR PARK**

**WEYMOUTH
SEA LIFE
CENTRE**



These works were necessary as the renourished beach would have covered the existing outfalls and intake.

Tarmac started work on 30 January 1995 and planned to complete by 31 May of that year. This was, of course, subject to prevailing weather conditions. In fact, during the first week a storm caused the road to be blocked by shingle, a strong reminder of the need for the scheme. Tarmac elected to start work on the Lodmoor Park outfall, using a conventional sheet-piled cofferdam to permit the installation of the pre-cast culvert units to provide the 43 metre extension to the outfall.

The construction company made use of large concrete blocks - originally World War II anti-tank defences on the beach - as platforms for the crane. All the material removed from the cofferdam was drained on the beach before being removed. Towards

the end of the contract, the sheet piles were cut off with burning gear in the conventional way, to leave the completed outfall. The recharge of the beach began in late March. A specialist vessel arrived in the bay and moored up for the duration of the operation. This was a booster pumping station to assist with the offloading of the shingle. The borrow area off the Isle of Wight produced a shingle and sand mix similar to that found on Preston Beach. The area selected by Tarmac was already licensed for gravel extraction from the Crown Estates.

The shingle was extracted by a suction hopper dredger. This vessel was capable of carrying 2,200 cubic metres of shingle in a single load. To complete the operation required around 100 trips.

Once the dredger arrived at the beach, a tugboat was needed to manoeuvre it into position to enable it to be coupled to a 700mm diameter hose from the booster station vessel. Water is added by jets in the



hold of the dredger so that during pumping there was about 90% water and 10% shingle. The booster vessel was fitted with two pumps and these produced a pressure of 1.1 Mega Pascal (160 pounds per square inch) in the pipeline. Wear and tear on the pumps is especially high when pumping shingle, so the five-man crew was equipped to replace worn parts, if necessary.

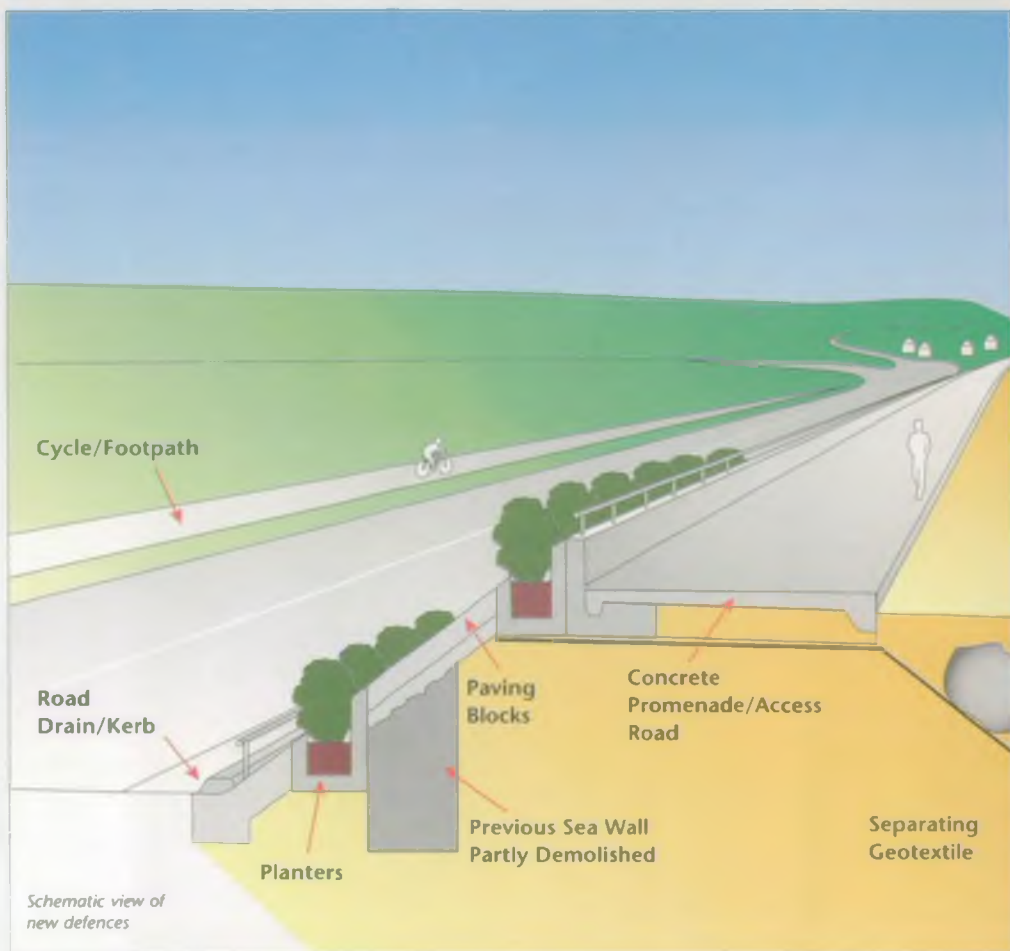
Each load of shingle took between 3 and 4 hours to pump ashore. Following discharge of the load, the dredger immediately returned to the dredging site to reload. The operation was a 24 hour, 7 day a week activity. Each round trip from dredging up the material, sailing to Weymouth, discharging the shingle and return took around 15 hours. Because the specialist marine plant is costly to run, the beach recharge programme was planned to work unhindered and in fact, the work was completed in only 9 weeks. This section of the contract accounted for £2m of the overall cost.

After the shingle was landed and the water had drained away, earthmoving plant was able to work to profile the beach. The shingle was carefully spread so that allowance was made for the future drift of the material. The slope remained the same as the previous beach.

Another part of the first stage was the building of a terminal rock groyne over the existing storm water sewer that drains a significant part of Weymouth.

The rocks were delivered by road from the quarry on the Isle of Portland. The stones were unloaded onto the beach for sorting. Each stone weighed between 1 and 8 tonnes.





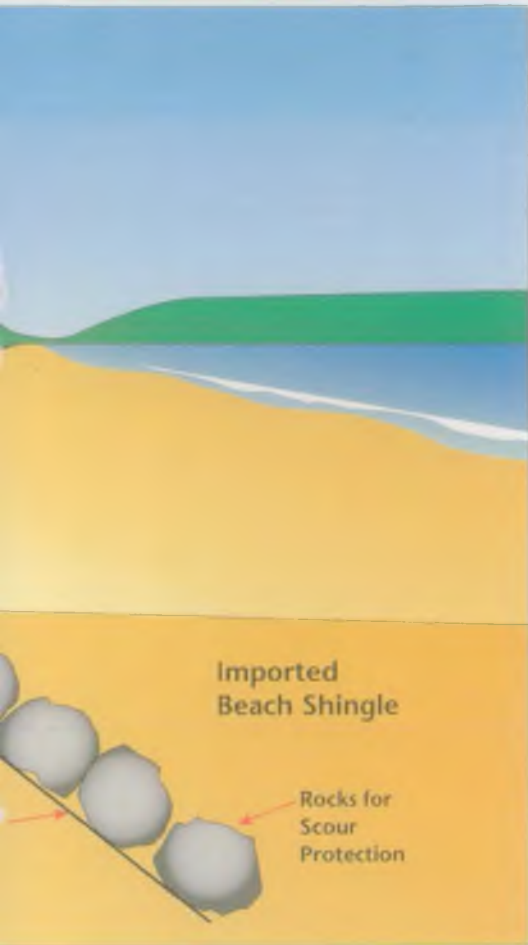
It was essential that they were placed accurately in the groyne with the larger rocks being placed on the outside so that they could resist the most direct wave attack.

The rocks needed to be placed so that there were small voids to absorb some of the wave energy. Otherwise the sea would break straight over the groyne causing a risk to public safety.

The groyne serves the purpose of preventing the natural drift of shingle away from the beach. To complete this work, the contractors

needed to extend the storm outfall by 35 metres. Rock was then placed over the culvert. The outfall was fitted with a debris screen together with a marker for navigation purposes.

The sea water intake to the Weymouth Sea Life Centre was a little more complicated than the outfalls. Two 100mm diameter pipes were laid from an existing manhole at the top of the beach. The intake is designed to allow filtered seawater to be continuously sucked from beneath the seabed.



Due to reasonable weather conditions throughout this part of the contract, the work was completed on 22 May 1995, one week ahead of schedule.

PHASE 2

This stage of the construction involved the provision of a small sea wall at the rear of the newly recharged beach. This would provide protection against shingle being thrown up by wave action.

Future management of the beach was taken into consideration and the newly constructed promenade would also double as a roadway for the heavy lorries that would occasionally be needed to shift the shingle from one end of the beach to the other. This work would counteract the natural drift of shingle over a period of time.

The contract for this stage of the works was awarded to P Trant of Southampton and work commenced in September 1995.

Before starting work on the new sea wall, the contractor built a new footpath on the inland side of the road. This new path provided a more pleasant and safer route for pedestrians. As an additional enhancement, a cycleway was also constructed and this has proved to be a valuable new amenity for the area.



200,000 blocks were used to pave the rear slope

Users of the path and cycleway also benefit from the installation of three new road crossings, including a Toucan which makes special provision for cyclists.

Once the amenity work was completed, the contractors then moved onto the beach itself. The first part of the job involved placing a layer of rock armour to prevent scouring beneath the newly constructed promenade. One of the coldest winters for several years made concrete pouring impossible and work was halted for several days.

Great care was taken to ensure that the design and construction of the new sea defence was pleasing to the eye. The old sea wall was partly demolished to facilitate the construction of a paved slope. Portland stone being local to the area, the paving blocks

were selected for their stone-like appearance. Large boxes were built into the slope in readiness for shrubs to be planted in them. The shrubs were specially chosen so as to be completely hardy against a north facing aspect subject to salt water spray. These planters had a built-in watering system to ensure the plants had a healthy environment in which to flourish.

Improved access to the beach for everyone



The contract was completed in July 1996 and local people and visitors made immediate use of the new beach and accompanying amenities of footpath, promenade and cycleway. It was agreed that the scheme as a whole

had vastly improved the visual and recreational amenity of the area, together with providing a



long term defence against the destructive forces of the sea.

The partnership between The Environment Agency, Weymouth and Portland Borough Council and Dorset County Council was one of the most successful on record.

Good working relations resulted in the scope of the scheme being widened from purely sea defence to a transformation of the Preston Beach area.



FACTSHEET

Funding Authorities

Ministry of Agriculture, Fisheries and Food
Environment Agency
Weymouth and Portland Borough Council
Dorset County Council

Feasibility Studies

Posford Duvivier, Consulting Engineers

Computer and Laboratory Modelling

Hydraulics Research, Wallingford

Detailed Design and Contract Supervision

Scott Wilson Kirkpatrick and Co Ltd,
Consulting Engineers

Beach Recharge and Marine Works

Tarmac Construction with main
sub-contractors, Ham Dredging and South
Coast Shipping

Promenade, wall and cyclepath

P Trant Ltd

Planting of rear slope of wall

Weyport Services

Overall Construction period

January 1995 to August 1996

Total Project Cost

£6 million

Length of Defence

1.4km

Quantity of imported beach shingle

214,000 cubic metres

Source of shingle

Needles borrow area, off the Isle of Wight

Terminal rock groyne

6,200 tonnes of Portland Stone

Concrete in wall and promenade

8,200 cubic metres

Number of Paving Blocks on wall slope

200,000



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