# Case study 64. Shoreham Harbour Shingle Bypassing and Recycling


## Authors: Tony Parker, Uwe Dornbusch


## Main driver: Improved defences

## Project stage: Ongoing construction/operation since 1992


**Photo 1: Shoreham beach shingle recycling (source: Shoreham Port)**

## Project summary:


The harbour arms at the seaward entrance of Shoreham Harbour in West Sussex represent a major obstruction to the natural process of littoral drift along the Sussex coast. Without action, foreshore levels to the east of the harbour would quickly drop to levels that threaten the stability of seawall structures and the build-up of beach material to the west would form a bar across and block the harbour entrance. Shingle bypassing has been carried out every 2 years since 1992.


## Key facts:

Littoral drift has caused the accumulation of material west of the harbour entrance with a corresponding lowering of beach levels to the east. Shingle transfer operations (see Map 1) have (mostly) prevented the collapse of coastal structures in areas of depletion. Collapse of these structures would rapidly endanger the ability of Shoreham Port, Shoreham Power Station and Shoreham Wastewater Treatment Works to function. A collapse would also threaten the A259 and residential properties behind it.

**Map 1: Location of Shoreham Port also showing the approximate route for the shingle bypassing operation (source: Channel Coastal Observatory)**

## 1. Contact details

| Contact details | |
|---|---|
| **Name:** | Tony Parker |
| **Lead organisation:** | Shoreham Port |
| **Partners:** | Environment Agency |
| **e-mail address:** | tparker@shoreham-port.co.uk |

## 2. Location and coastal/estuarine water body description

| Coastal/estuarine water body summary | |
|---|---|
| **National Grid Reference:** | TQ2354804513 |
| **Town, County, Country:** | Shoreham, West Sussex, UK |
| **Regional Flood and Coastal Committee (RFCC) region:** | Southern |
| **Transitional and coastal Water body size ($km^2$):** | 190$km^2$ |
| **Transitional and coastal water body and location:** | Sussex |
| **Water Framework Directive water body reference:** | GB640704540003 |
| **Land use, geology, substrate, tidal range:** | Land use: industrial and residential<br>Geology: storm beach gravels and made ground<br>Substrate: Lambeth group gravels and clays<br>Mean spring tidal range: ~5.7m |

## 3. Background summary of the coastal/estuarine water body

### Socioeconomic/historic context

Shoreham Port has been in its present location since the early 19th century. The modern day harbour entrance, east and west breakwaters were constructed in the early 1950s. The port is established as a trust port and is intrinsically linked with the local community and economy.

### Flood and coastal erosion risk management problem(s)

Longshore transport along the Sussex coast is from west to east and the harbour entrance with its breakwaters has provided a block to sediment transport (Map 1). As a result, sediment accumulates against the western breakwater while to the east the continued longshore drift removes beach material, increasing the risk of flooding to the port and infrastructure (Shoreham Power Station and Wastewater Treatment Works among them). The nature of longshore transport would also mean that, once the beach disappears from the port frontage, the erosion risk at Hove and eventually Brighton would increase.

### Other environmental issues

Shoreham Beach to the west of the port is designated as a Local Nature Reserve for vegetated shingle. Shingle arriving through longshore transport from the west is also needed as the source for beach recycling to Worthing and Lancing.

## 4. Defining the problem(s) and developing the solution

### What evidence is there to define the flood and coastal erosion risk management problem(s) and solution(s)

The most recent evidence base is provided in the 'Brighton Marina to River Adur Flood and Coastal Erosion Risk Management Strategy Review' and the 'Littlehampton to Brighton Beach Management Plan'. These include the assessment of longshore transport and the evidence base for beach accumulation to the west and erosion to the east of the harbour arms. They also consider wider perspectives including the potential for beach recycling from west of Brighton Marina.

### What was the design rationale?

The shingle transfer operation is intended to replicate the natural longshore drift that would occur if the harbour arms had not been built and thus maintain beach levels and standards of protection to coast protection structures to the east of the harbour entrance. A second objective is to prevent shingle building up to the west of the harbour entrance to the extent that it flows around the seaward end of the western harbour arm, blocking the harbour entrance and rendering the harbour arm ineffective.

Shingle is transferred in the direction of littoral drift rather than recycled 'updrift' because the work is carried out and paid for by the Shoreham Port Authority. Shoreham Port Authority is not a Flood Risk Management Authority and has no powers or funding to arrange for recycling works outside the harbour limits.

The legal basis for the transfer operation lies in Shoreham Port Authority's powers under the Shoreham Harbour Act 1929, et alia, 'Powers to Make and Maintain etc.' and the Shoreham Harbour Act 1949, Clause 49 (7) & (8), et alia, '(The Harbour Authority) may remove use sell or dispose of any shingle (on the West Beach)'.

| Project summary | |
|---|---|
| **Types of measures/interventions used (Working with Natural Processes and traditional):** | Beach bypassing to support the natural movement of shingle, seawall and groynes to provide additional protection and resilience |
| **Numbers of measures/interventions used (Working with Natural Processes and traditional):** | 1 |
| **Standard of protection for project as a whole:** | Not applicable |
| **Estimated number of properties protected:** | Not applicable |

**How effective has the project been?**

Shingle transfer occurs biannually. Just before each recent transfer, coast protection structures have shown signs of distress such as overturning in steel sheet pile walls and movement of concrete elements in concrete revetments. It is evident that the transferred shingle provides essential support to the hard coast protection structures.

The bypassing operation is effective in addressing the updrift accumulation and downdrift erosion issues.

## 5. Project construction

**How were individual measures constructed?**

The amount of bypassing depends on the amount of material accumulated on the western side and how much as disappeared on the eastern side.

**How long were measures designed to last?**

Shingle bypassing has been carried out since 1992 and is envisaged under the Brighton Marina to River Adur Flood and Coastal Erosion Risk Management Strategy to continue into the future.

**Were there any landowner or legal requirements which needed consideration?**

Shoreham Port Authority has statutory powers and an implied statutory duty to provide and maintain a navigable entrance to Shoreham Harbour under the Shoreham Harbour Act 1929, et alia.

## 6. Funding

| Funding summary for Working with Natural Processes (WWNP)/Natural Flood Management (NFM) measures | |
|---|---|
| **Year project was undertaken/completed :** | Shingle bypassing has been carried out since 1992 and is envisaged under the strategy to continue into the future. |
| **How was the project funded:** | The work is funded by Shoreham Port Authority. |
| **Total cash cost of project (£):** | Average annual contractor costs are ~£170,000 |
| **Overall cost and cost breakdown** | Not applicable |

| | |
|---|---|
| **for WWNP/NFM measures (£):** | |
| **WWNP/NFM costs as a % of overall project costs:** | Not applicable |
| **Unit breakdown of costs for WWNP/NFM measures:** | Not applicable |
| **Cost–benefit ratio (and timescale in years over which it has been estimated):** | Not applicable |

## 7. Wider benefits

**What wider benefits has the project achieved?**

The beach material bypassed has benefited the amenity frontages of Southwick, Portslade and Brighton and Hove to the east by increasing beach levels and width. There is also a resultant impact in Brighton and Hove on the amenity value and spatial extension of public and private sector businesses and property onto the growing beach.

**How much habitat has been created, improved or restored?**

No habitat has been created as the natural sediment movement on the port frontage is of a magnitude that does not allow for widespread vegetated shingle to establish. On the Brighton and Hove frontage, amenity usage prevents establishment of vegetated shingle.

## 8. Maintenance, monitoring and adaptive management

**Are maintenance activities planned?**

The project of beach bypassing is fundamentally a maintenance activity and will carry on into the future.

**Is the project being monitored?**

Performance of the beach is monitored visually by Shoreham Port Authority on a very frequent basis. Beach volumes on both sides of the port are monitored 2–3 times per year through the Coastal Monitoring Programme.

**Has adaptive management been needed?**

As the activity is undertaken on an annual basis, this is in itself a form of adaptive management.

## 9. Lessons learnt

**What was learnt and how could it be applied elsewhere?**

Beach bypassing is a useful measure. However, the landward route can often be very long and alternatives are presently explored. There is also a need to consider what benefits or damage the bypassed sediment brings to frontages downdrift of the bypass location.

## 10. Bibliography

BRIGHTON AND HOVE CITY COUNCIL, 2014. *Brighton Marina to River Adur Flood and Coastal Erosion Risk Management Strategy Review*. Brighton, East Sussex: Brighton and Hove City Council.

Littlehampton to Brighton Marina Beach Management Plan (2016)

## Project background

This case study relates to project SC150005 'Working with Natural Flood Management: Evidence Directory'. It was commissioned by Defra and the Environment Agency's Joint Flood and Coastal Erosion Risk Management Research and Development Programme.