

# Coastal Processes and Landforms



These icons indicate that teacher's notes or useful web addresses are available in the Notes Page.



This icon indicates that the slide contains activities created in Flash. These activities are not editable.

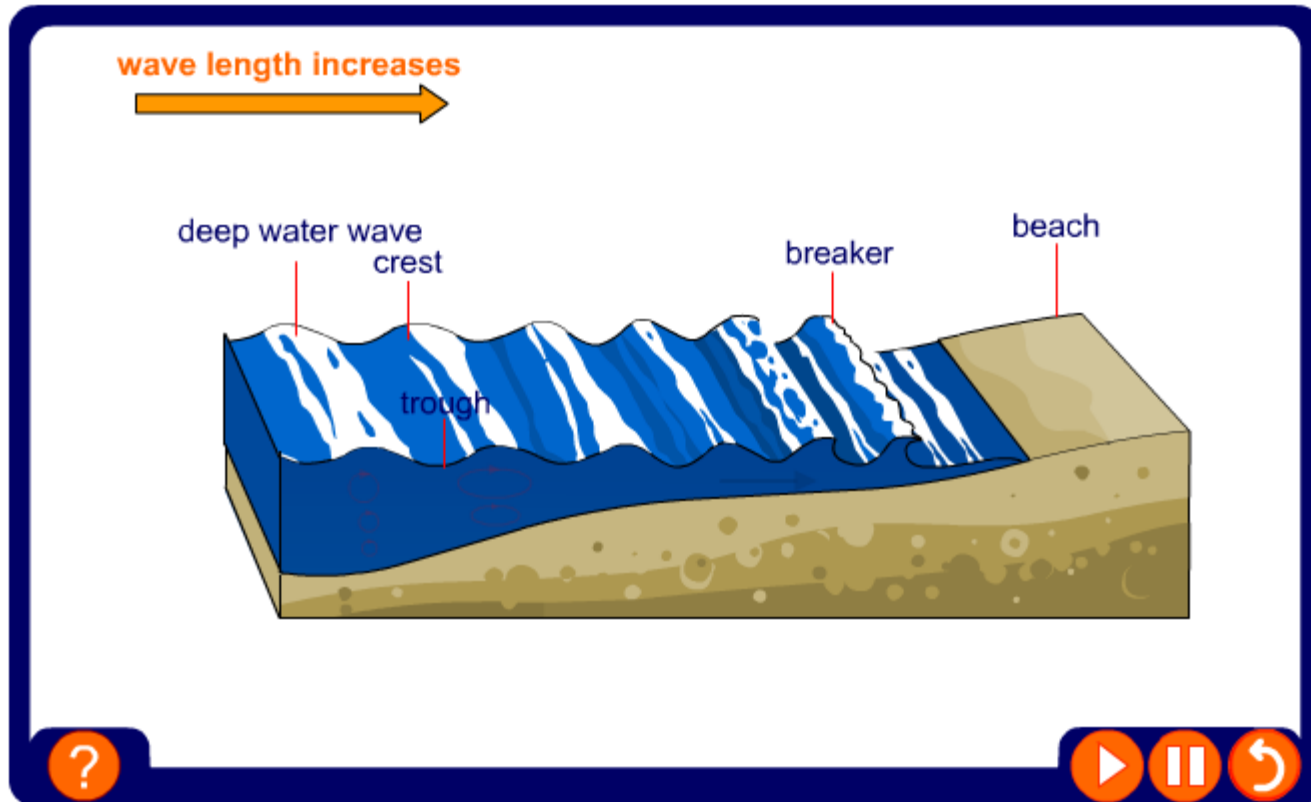
For more detailed instructions, see the *Getting Started* presentation.

- **How do waves operate?**
- What are sub-aerial processes and why are they important?
- What processes of erosion operate at the coast?
- What landforms are created by erosion?
- What processes of transport operate at the coast?
- What landforms are created by deposition?



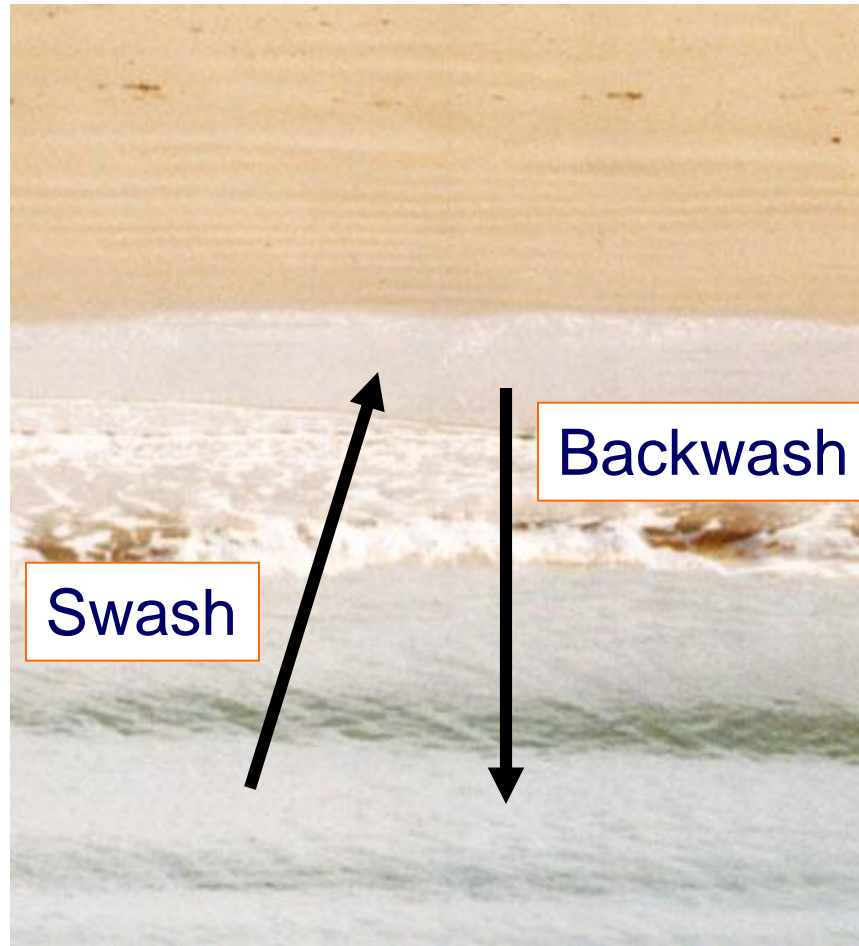
# Why do waves break?

Waves are the result of the wind blowing over the sea. As they approach land they break.



The bottom of the wave touches the sand and slows down due to increased friction. The top of the wave becomes higher and steeper until it topples over.

# Swash and backwash



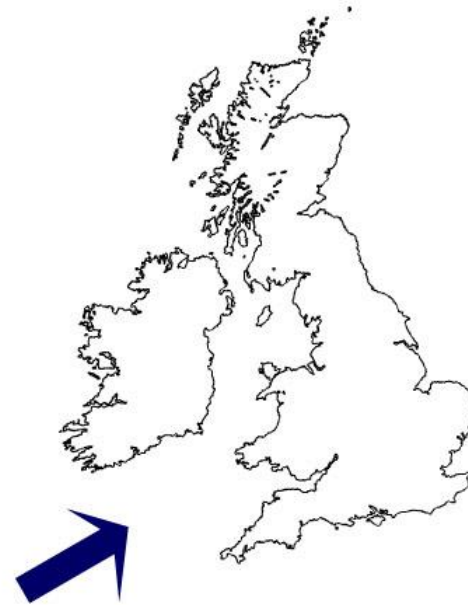
Note: *Backwash is always at right angles to the beach*



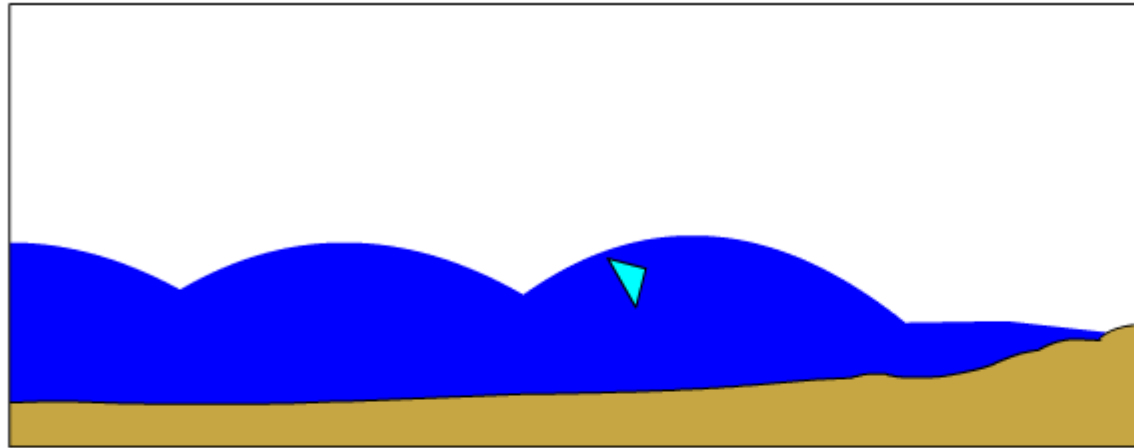
# Why are waves generally larger in the south west?

Wave energy depends on the **fetch**, the **strength** of the wind and the length of **time** over which the wind has blown.

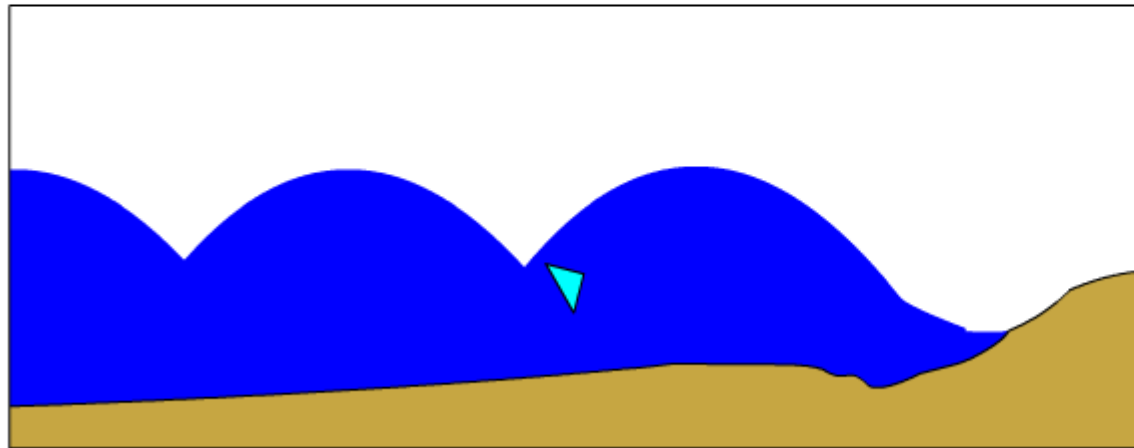
*fetch = the distance over which the wind has blown*



Look at an atlas or a wall map to find out the largest fetch around the British Isles.



**Constructive waves** have a strong swash and a weak backwash. Deposition is greater than erosion.



**Destructive waves** have a weak swash and a strong backwash. Erosion is greater than deposition.



Are you up to speed on your waves?

Read the definition at the bottom and then  
'shoot' the right answer...  
press start to begin.

start





- How do waves operate?
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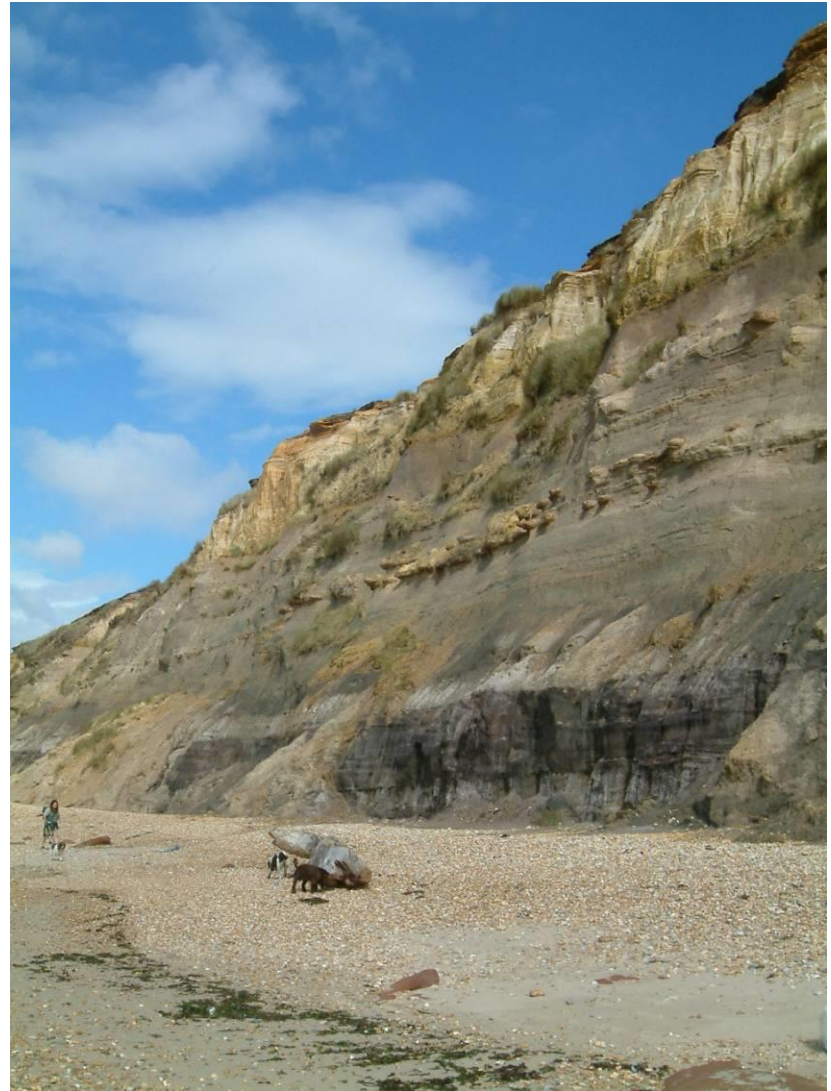


# What are sub-aerial processes?

The coast is the narrow zone between the land and the sea.

It is worth remembering that the landscape will be influenced by processes on the land as well as the sea.

**Sub-aerial** processes include weathering and mass movement. These processes operate on the cliff face to weaken it and provide material for coastal erosion.





This is Hengistbury Head on the south coast of England.

How do weathering and mass movement contribute to formation of this cliff face?

Click on the 5 hotspots to find out more.



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# Processes of erosion

hydraulic  
action

corrosion



attrition

abrasion





## Attrition

Materials carried by the waves bump into each other and so are smoothed and broken down into smaller particles.

## Hydraulic action

This process involves the force of water against the coast. The waves enter cracks (faults) in the coastline and compress the air within the crack. When the wave retreats, the air in the crack expands quickly, causing a minor explosion. This process is repeated continuously.

## Corrosion

This is the chemical action of sea water. The acids in the salt water slowly dissolve rocks on the coast. Limestone and chalk are particularly prone to this process.

## Abrasion/Corrasion

This is the process by which the coast is worn down by material carried by the waves. Waves throw these particles against the rock, sometimes at high velocity.



# Do you know your coastal processes?

Drag each coastal process into the correct box

Weathering

Mass  
movement

Erosion

Salt crystallisation

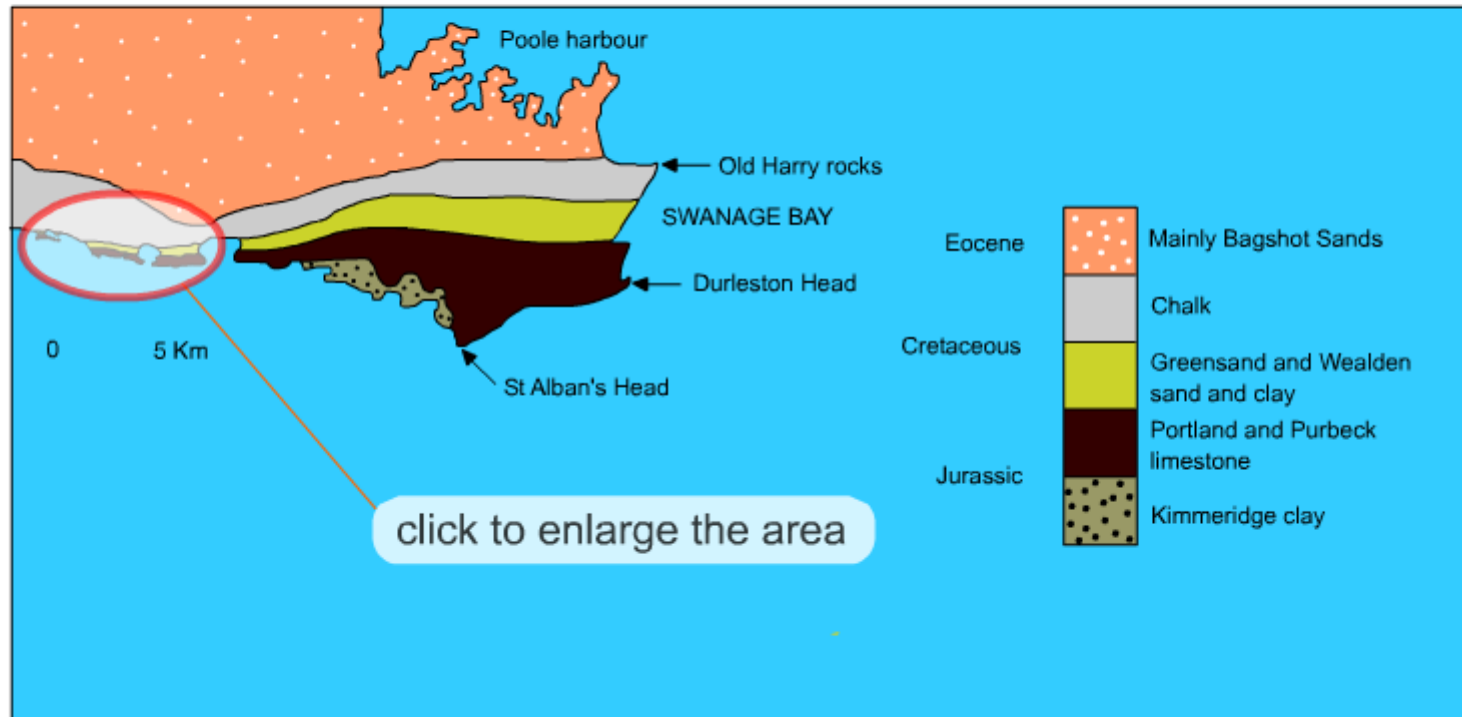


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## Geology of Dorset



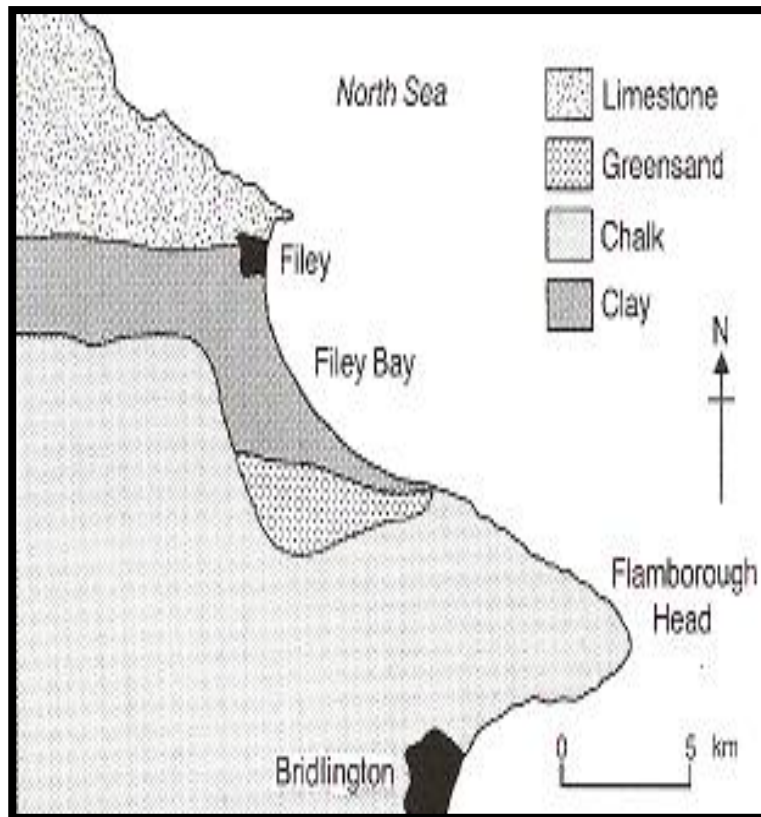


- 1) Headlands and Bays
- 2) Cliffs and Wave Cut Platforms
- 3) Caves, Arches, Stacks and Stumps



# Landforms created by erosion

## Headlands and Bays



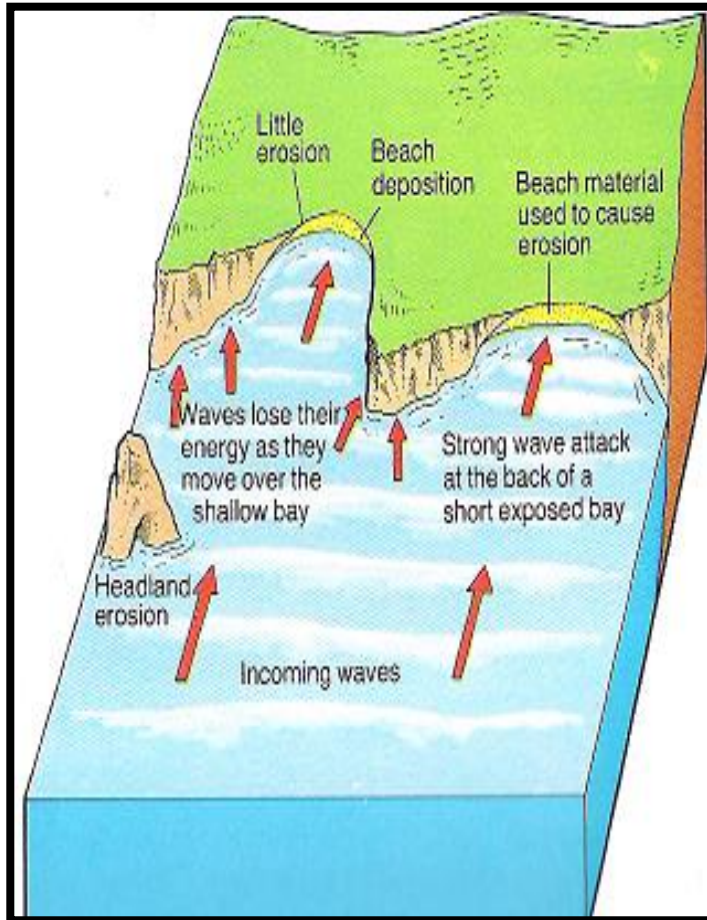
They are most likely found in areas of alternating resistant and less resistant rocks.

Initially, the less resistant rock is eroded away more quickly than the more resistant rock.

The less resistant rock is eroded back to form bays.

The more resistant rock is left protruding out to sea as headlands.

# • Headlands and Bays

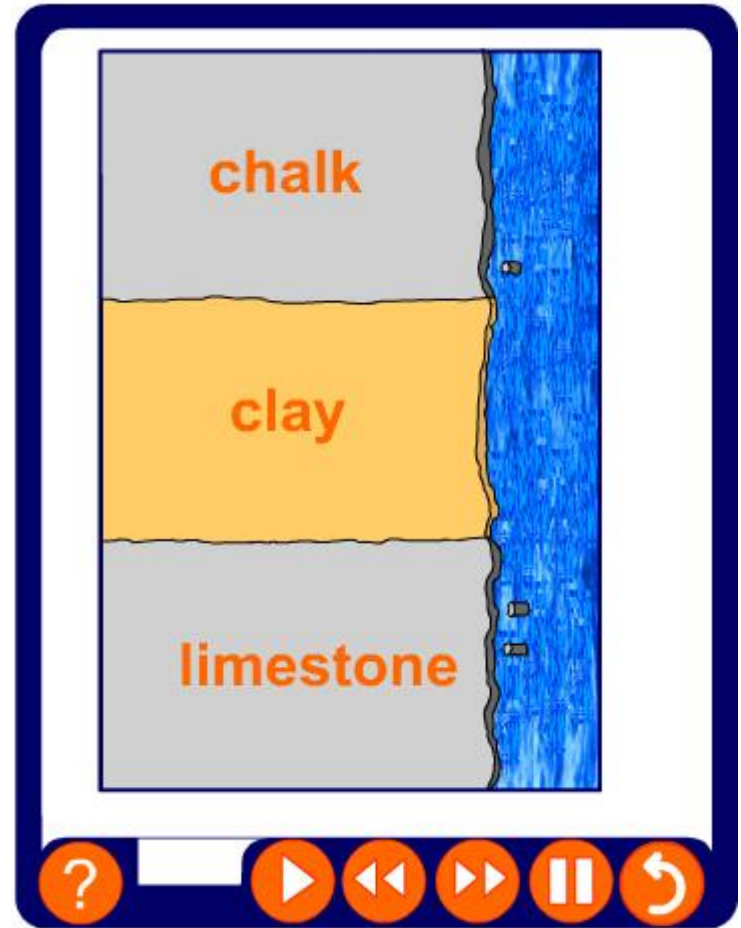
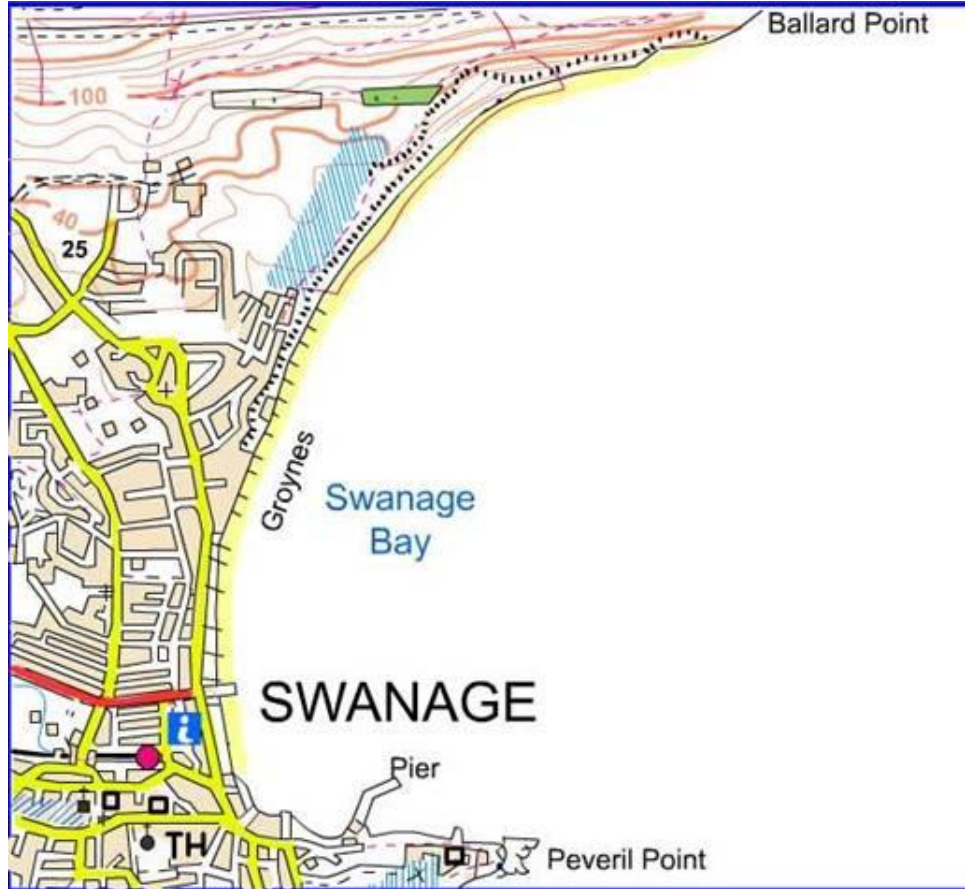


Headlands are always exposed to wave attack.

A bay is only eroded when waves with enough energy can reach the back.

As a bay is eroded back, the waves must travel further over shallow sheltered water.

There can be no more erosion until the headlands have worn back further.

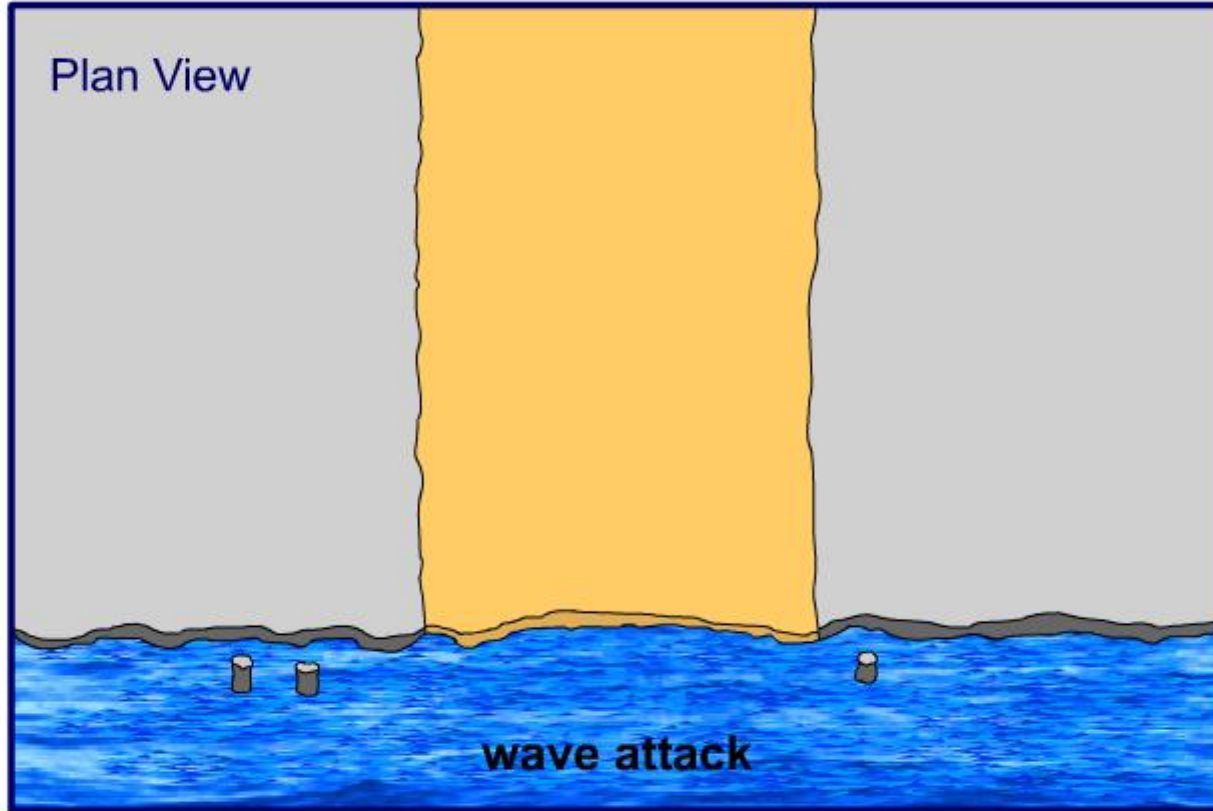


An example of headlands and bays on the Dorset coastline.

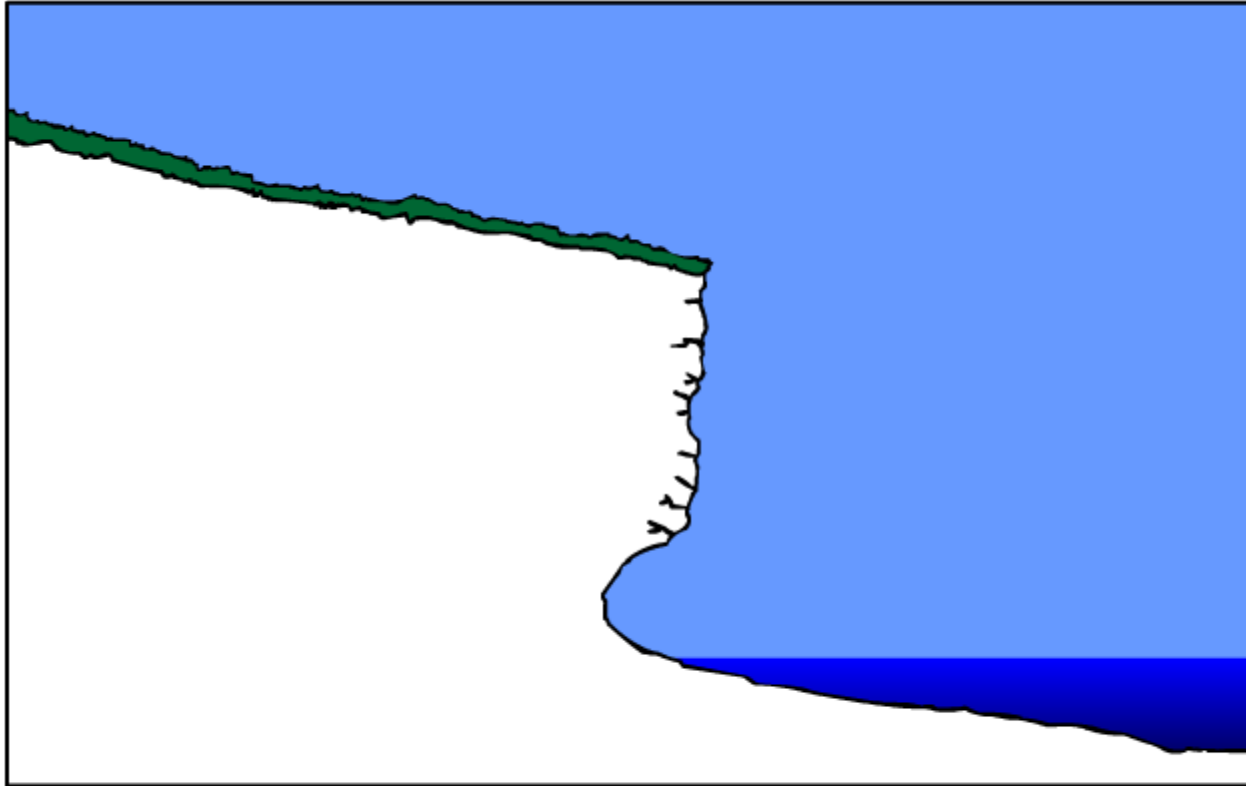




# Headlands and bays



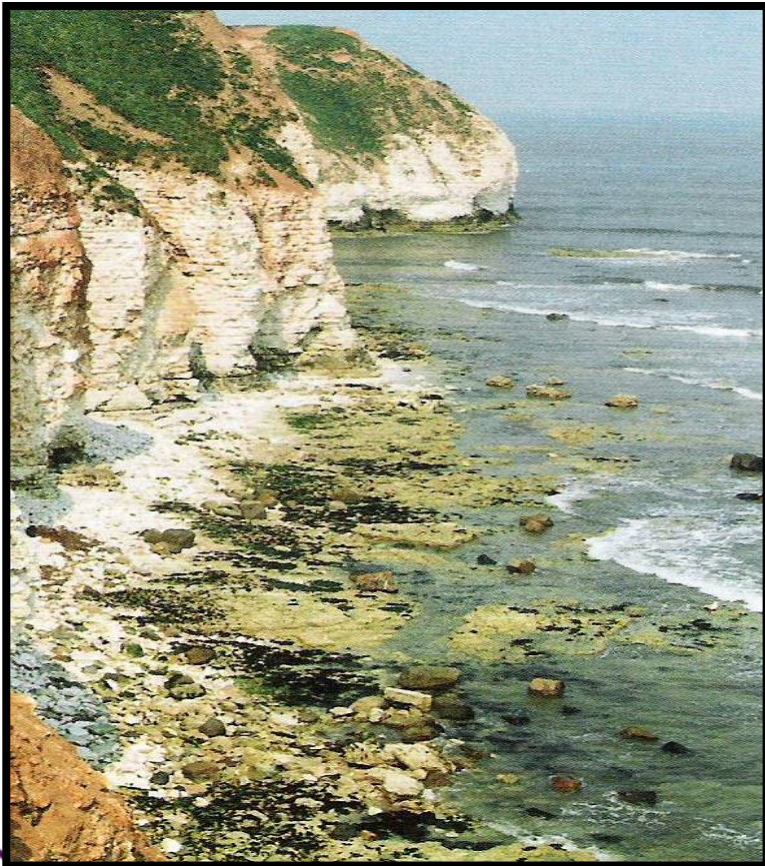
# How are cliffs and wave-cut platforms formed?





# Landforms created by erosion

## Cliffs and wave-cut platforms



Wave action is concentrated at the foot of a headland.

Wave action is concentrated on weaknesses such as joints or fault lines.

Hydraulic action and abrasion open up these weaknesses to form a groove or a wave cut notch. This starts to undercut the cliff.

# Cliffs and wave-cut platforms



Continual undercutting of the cliff gradually increases the overhang.

This sets up stresses and tension in the cliff until bits of rock fall into the sea or the cliff collapses



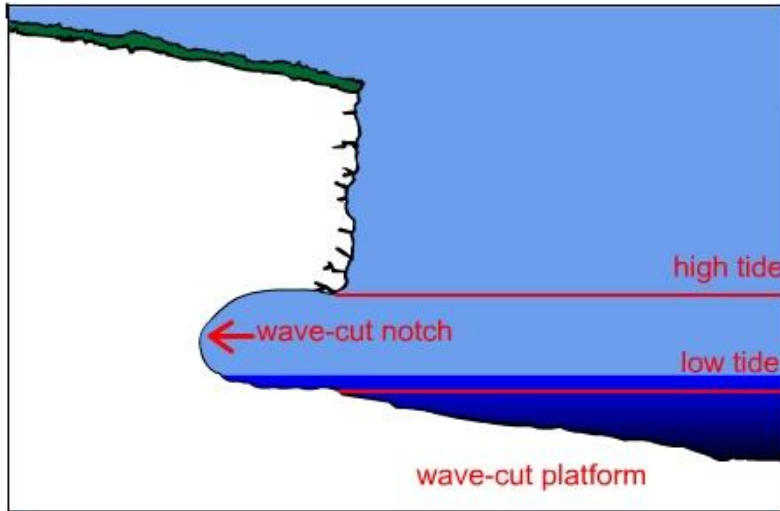
As the cliff retreats, the eroded remains are gradually planed off by the sea, making a gentle sloping shelf or wave-cut platform.

This wave cut platform is generally visible at low tide, covered with rock pools and seaweed.





# Wave-cut platform



- The waves attack the base of the cliff through the processes of abrasion, corrosion, hydraulic action and attrition.
- Over time the cliff will be undercut and a **wave-cut notch** is formed.
- Eventually the cliff becomes unstable and collapses. Further cliff retreat will form a **wave-cut platform**.



# Caves, arches, stacks and stumps

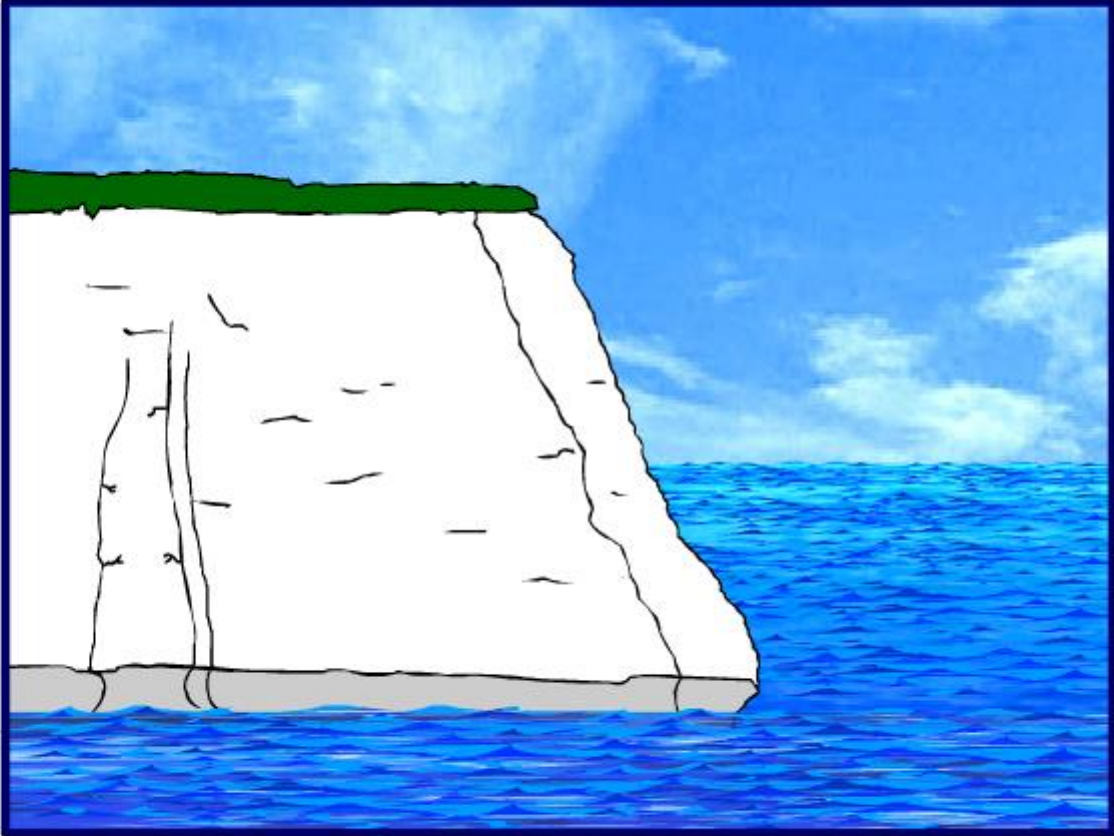
Can you identify this famous Scottish Landmark?



What do you think formed this feature??



# How are caves, arches, stacks and stumps formed?

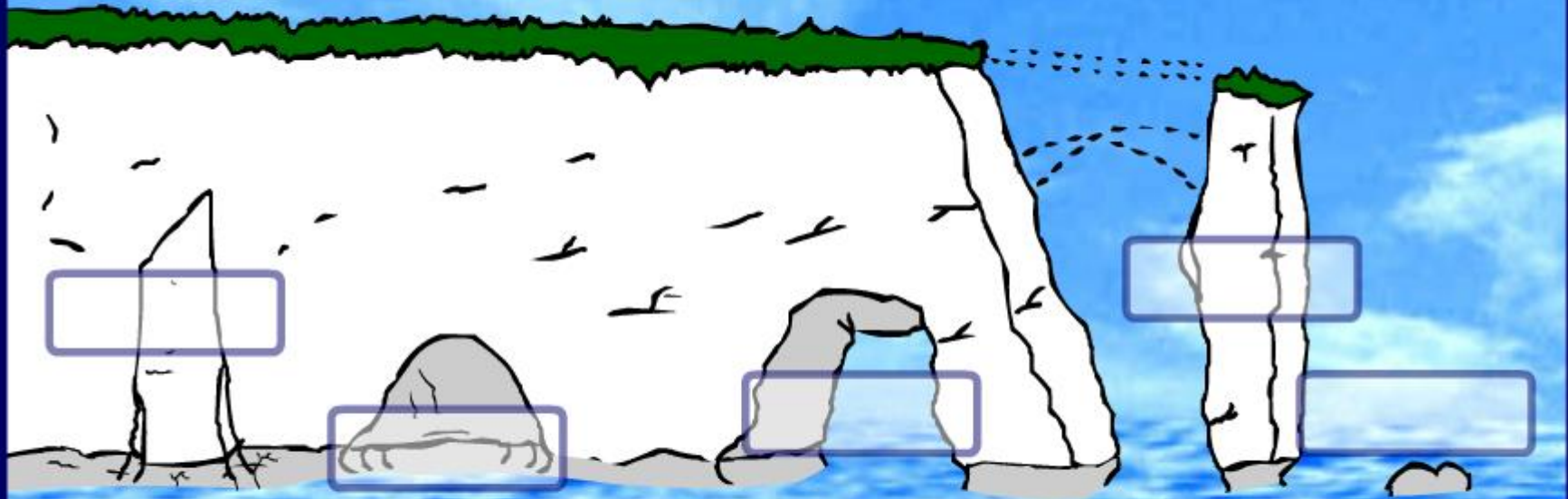




# Caves, arches, stacks and stumps



## Caves, Arches, Stacks and Stumps



stump

arch

stack

cave

fault





- 1 The sea erodes the foot of the arch and widens it.
- 2 A stump is the remains of the eroded stack.
- 3 The sea cuts through to form an arch.
- 4 The roof of the arch becomes too heavy and collapses.
- 5 Lines of weakness such as faults occur in headlands.
- 6 Part of the former cliff is now isolated as a stack.
- 7 Abrasion and hydraulic action erode the fault to form a cave.
- 8 Over time the stack is undercut and collapses.
- 9 The cave is widened and deepened.



solve



# Caves, arches, stacks and stumps

*What do you think will happen to this coastal landscape over time?*



If these photos were taken of one headland over time, which of these landforms would be the first to be formed?

Order the photos in the correct sequence to form a stump.



solve



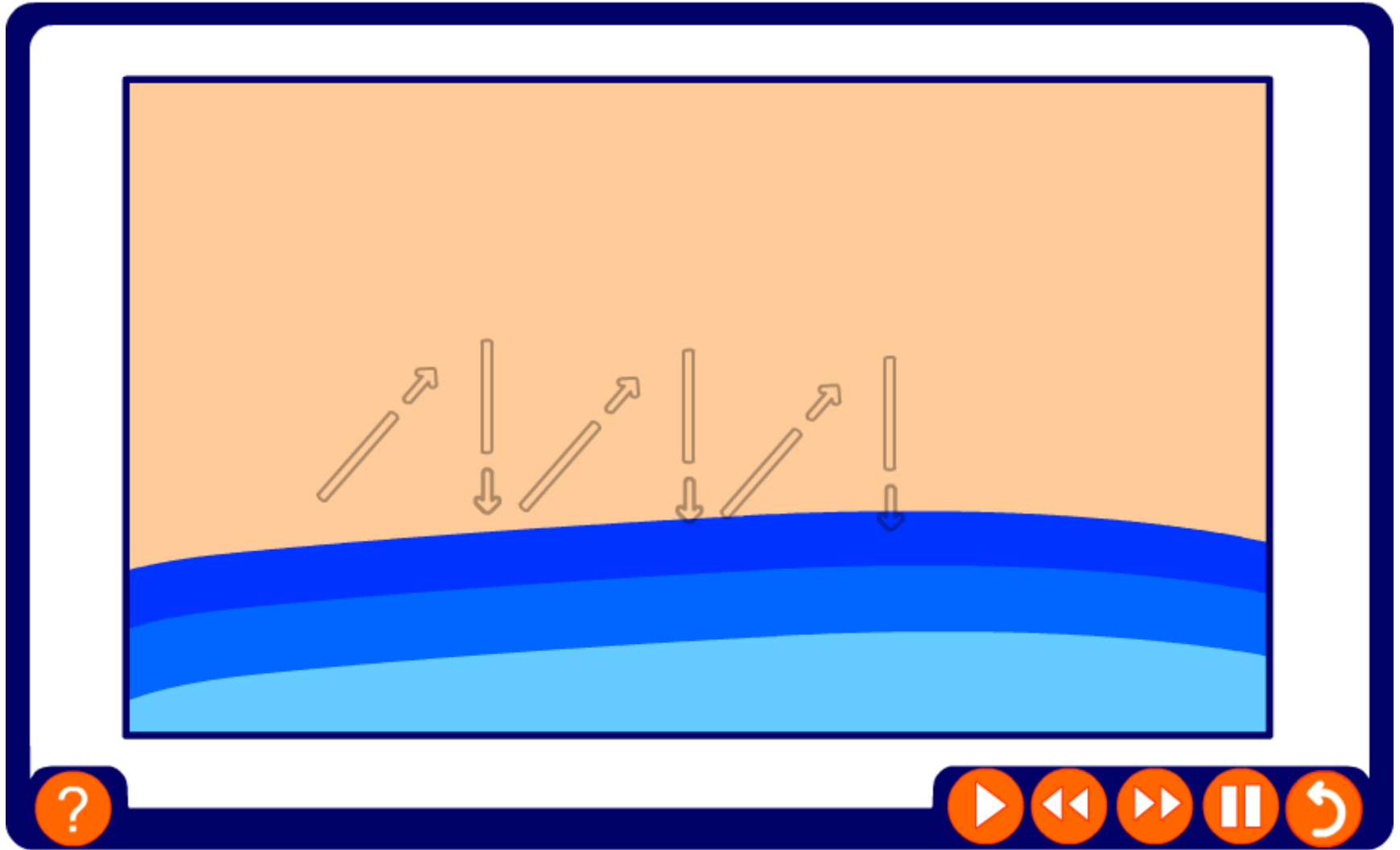
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- What landforms are created by deposition?



# How is sediment transported along the coast?

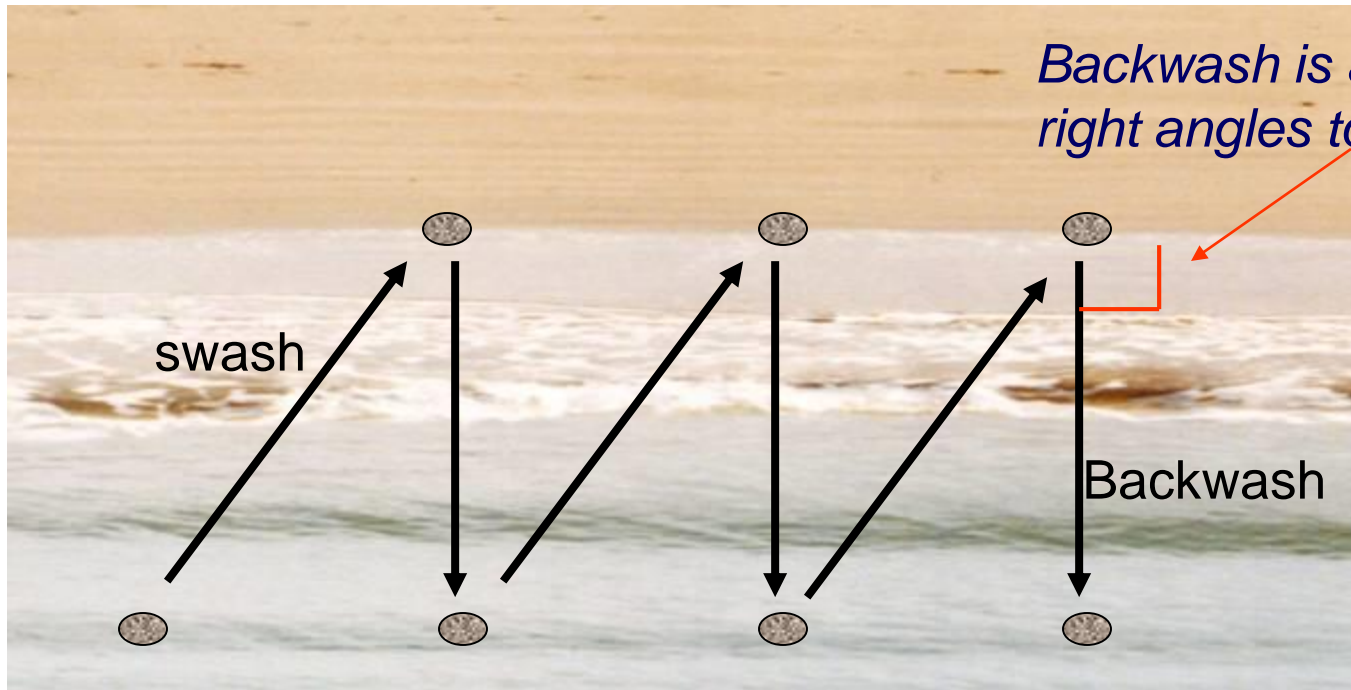


# How is sediment transported along the coast?





Direction of movement



*Backwash is always at right angles to the beach*

This movement of sediment along the coastline is called **longshore drift**.





- 1) Read the information of Page 100-101 (Geog.Scot 1) on Coastal Erosion and Transport.
- 2) In you jotters, draw a diagram to explain how Longshore drift moves stones and sand along a beach.
- 3) What influence does the Wave Direction have on the movement of particles?



# Examination question

Study the photograph of Swanage Beach.



What is longshore drift?

Add an arrow to the photo to show which direction longshore drift is operating in.

Draw your own diagram to explain how longshore drift operates.



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# Landforms of coastal deposition

- 1) Beaches
- 2) Spits
- 3) Tombolos and Bars



# How are beaches formed?

Beaches form in sheltered environments, such as bays. When the swash is stronger than the backwash, deposition occurs.

Sometimes sand from offshore bars can be blown onto the shore by strong winds.

In such cases dunes may form – such as at Studland on the Dorset Coast.



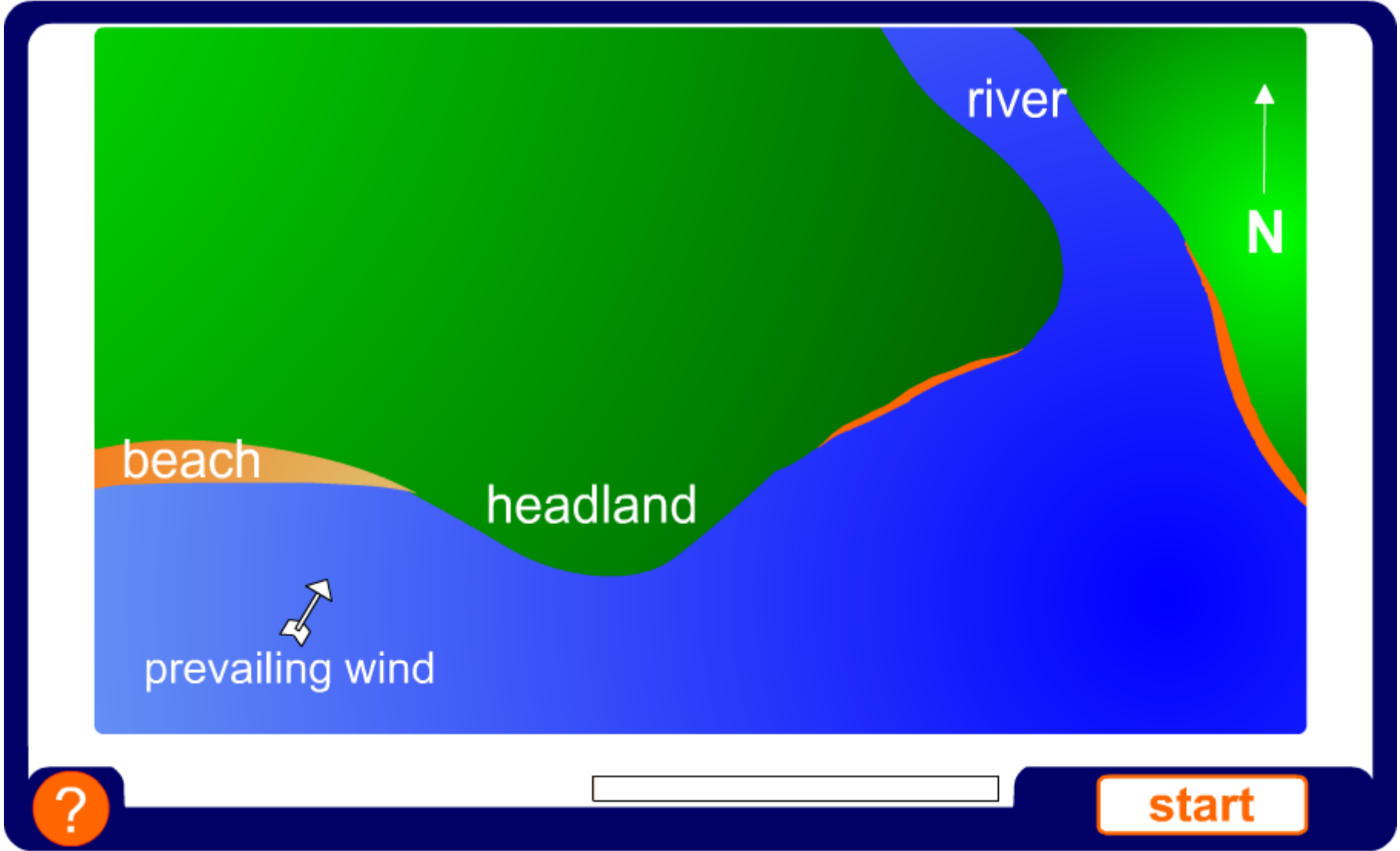


# How are spits formed?





# How are spits formed?



# How are spits formed?



# How are spits formed?


A spit is an accumulation of \_\_\_\_\_ with one end attached to the land and the other reaching out across an \_\_\_\_\_ or into the sea. They are features of coastal \_\_\_\_\_.

They are formed where large amounts of sediment are \_\_\_\_\_ by longshore drift and where the coastline suddenly changes direction to leave a sheltered, \_\_\_\_\_ area of water. Due to an increase in \_\_\_\_\_ more deposition can occur in the water sheltered by the \_\_\_\_\_ and the

estuary	deposition	curved	shallow
sand	waves	marsh	transported
length	current	headland	friction

Sketch and annotate this aerial photograph using the words below.

**Pagham, West Sussex**



- marsh
- caravan park
- farmland
- spit
- sea

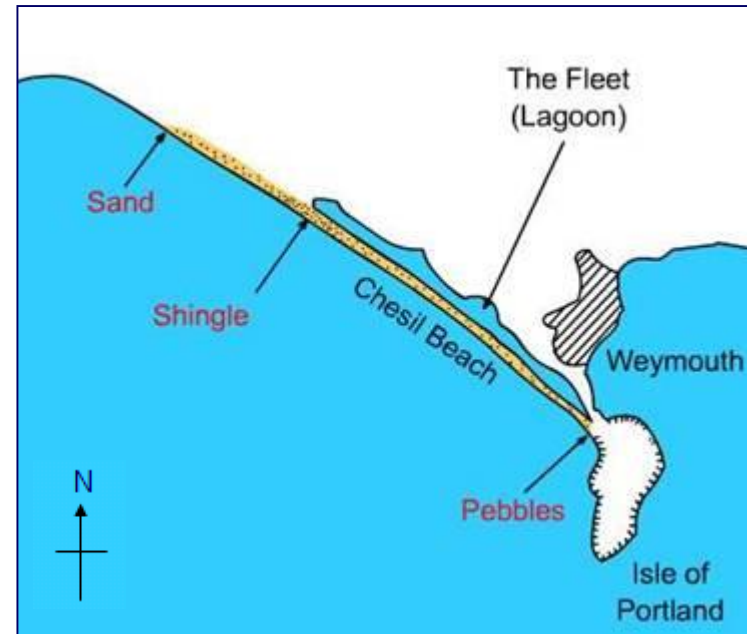
?      C      solve      ↺



# What is a tombolo?

If a spit joins the mainland to an island it is called a **tombolo**.

At Chesil Beach in Dorset, the mainland is joined to the Isle of Portland.









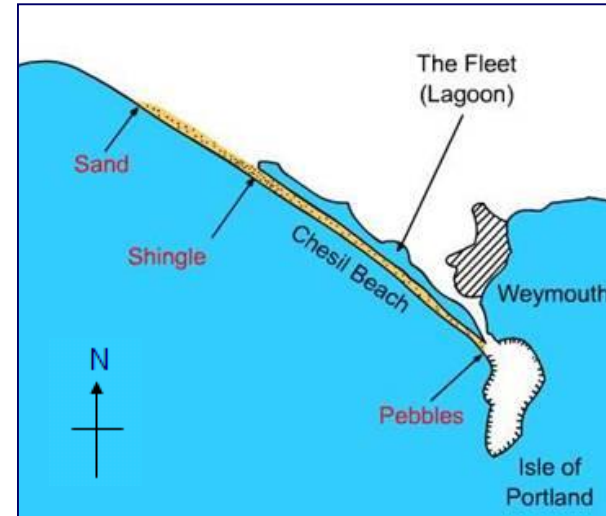
# Chesil Beach

Study the photograph.

X



Y



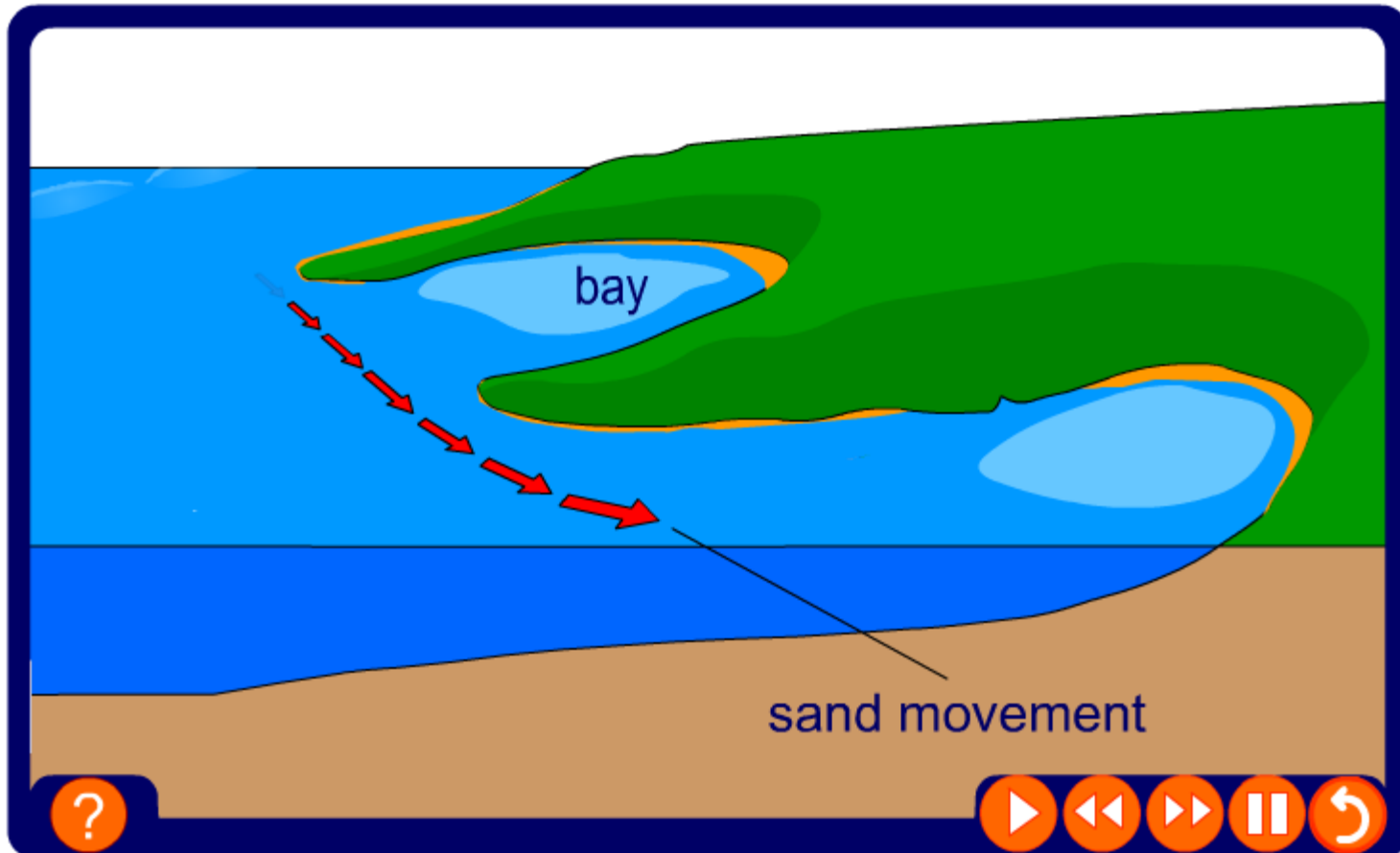
Portland

From what direction was the photograph taken?  
Name features X and Y.



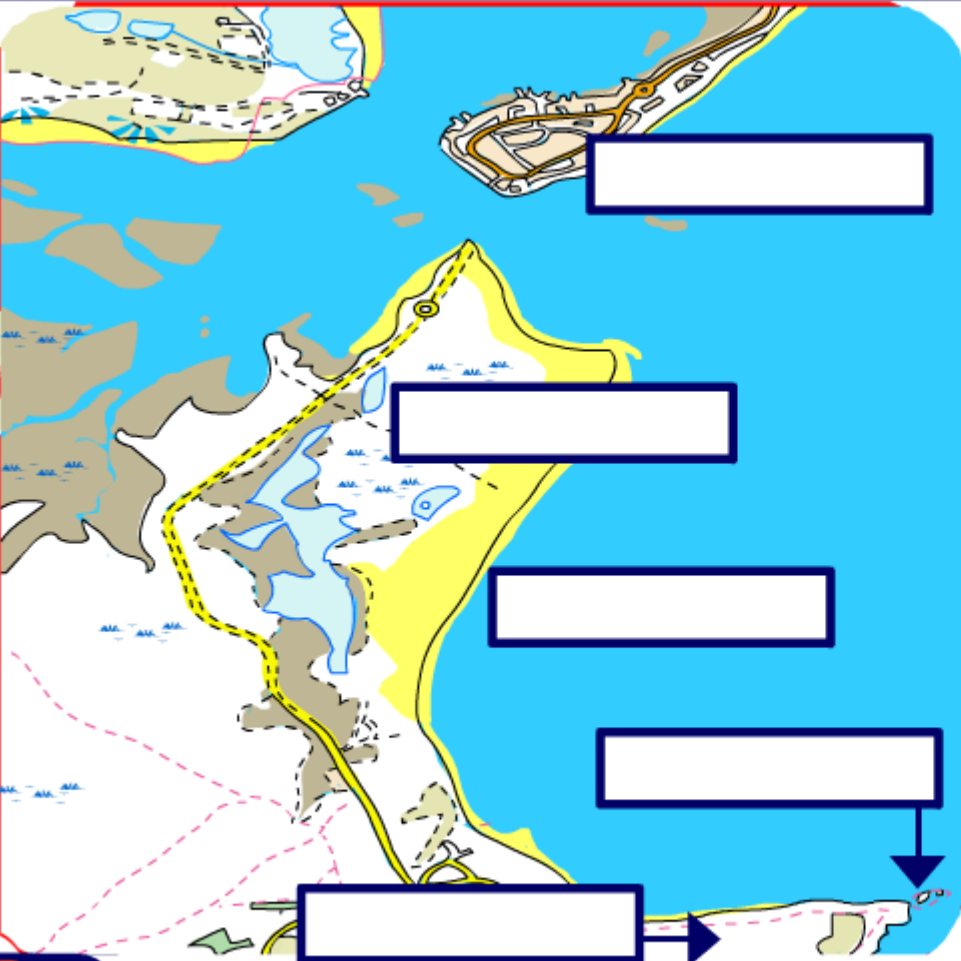
# What is a bar?

If a spit joins one part of the mainland to another it is called a **bar**.



For example, there is a bar at Orford Ness in Suffolk.

# Coastal landforms in Studland



The map shows a coastline with several features: a headland at the top, a bay in the middle, marshes on the left, stacks on the right, and a spit at the bottom. Five empty boxes are provided for labeling these features.

- Box 1: Headland
- Box 2: Bay
- Box 3: Marsh
- Box 4: Stacks
- Box 5: Spit

Navigation buttons: ? (question), C (cancel), solve, ↺ (undo), ↻ (redo)



# Erosion or deposition?



Landform of erosion

Landform of deposition



# How much do you know about coasts?

1	2	3	4
5			8
9	10	11	12

**Picture Quiz!**

Click on a number to reveal an image.  
Answer the question by choosing one of  
the words below...press start to begin.

start



# Key Ideas

**Waves** are the result of the wind blowing over the sea. They break as they approach land.

**Swash** and **backwash** describe the movement of a wave on the beach. **Fetch** is the distance that the wind has travelled.

**Sub-aerial processes** such as weathering and mass movement occur on the cliff face.

Coastal **processes of erosion** include hydraulic action, attrition, corrosion and solution.

Landforms created by **erosion** include **headlands and bays, caves, arches, stacks and stumps.**

**Longshore drift** is a method of coastal **transport.**

Landforms created by **deposition** include **beaches, spits, tombolos and bars.**





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