



# STORMS AND COASTAL DEFENCES AT CHISWELL

UPDATED FEBRUARY 2021



# WHAT IS THIS BOOKLET ABOUT?

## This booklet provides information about:

- How Chesil Beach and the Fleet Lagoon formed and how it has changed over the last 100 years
- Why coastal defences were built at Chiswell and how they work
- The causes and impacts of the worst storms in a generation that occurred over the winter 2013 / 14
- Update of storm events after 2014
- What will happen in the future?

Chesil Beach has considerable scientific significance and has been widely studied. The sheer size of the beach and the varying size and shape of the beach material are just some of the reasons why this beach is of worldwide interest and importance.

Chesil Beach is an 18 mile long shingle bank that stretches north-west from Portland to West Bay. It is mostly made up of chert and flint pebbles that vary in size along the beach with the larger, smoother pebbles towards the Portland end. The range of shapes and sizes is thought to be a result of the natural sorting process of the sea.

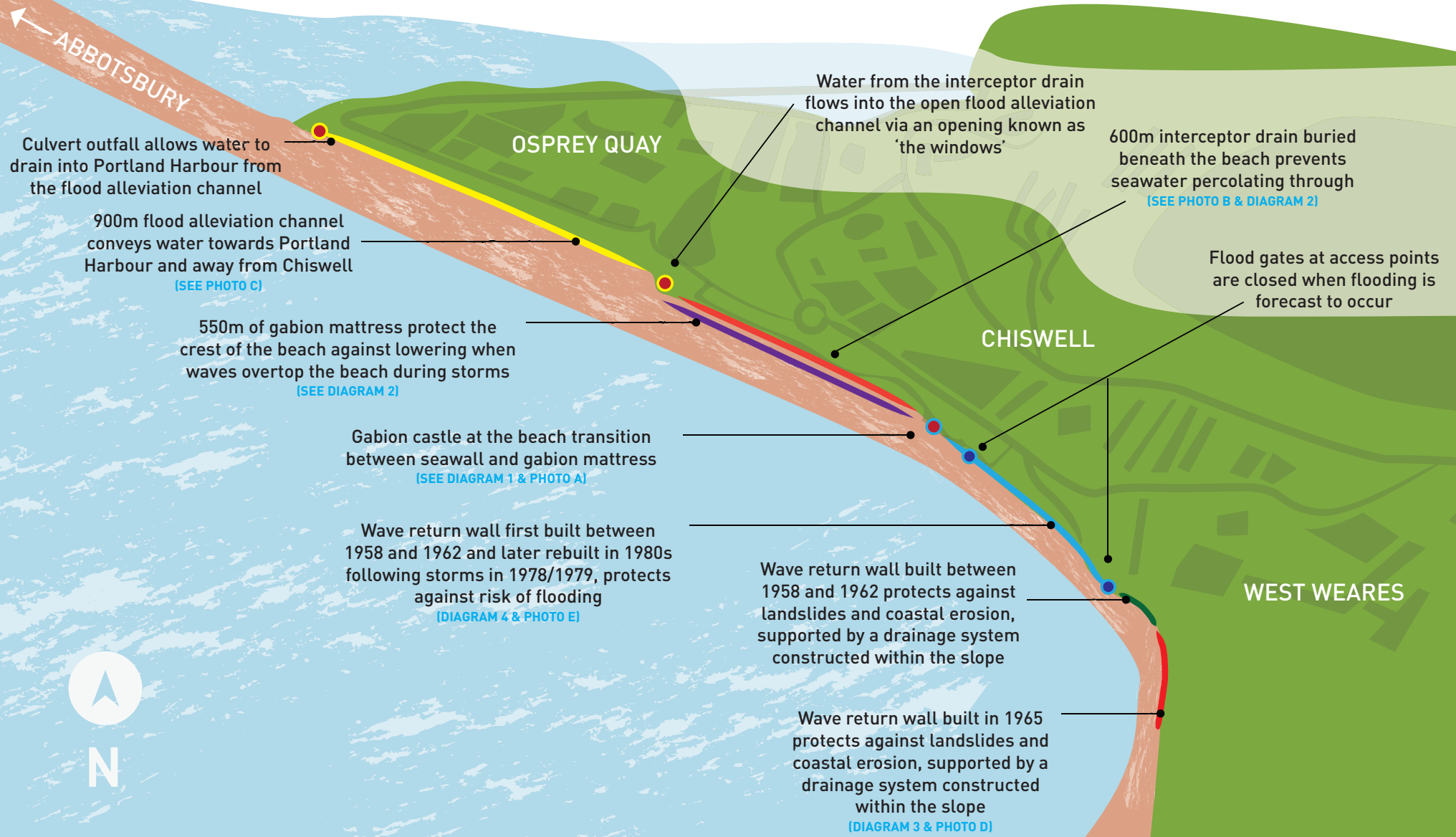
The southern part of the beach towards Portland shelves steeply into the sea and continues below sea level, only levelling off at 18m depth. It is slightly shallower at the western end where it levels off at a depth of 11m. This is mirrored above sea level where typically the shingle ridge is 13m high at Portland and 4m high at West Bay. For 8 miles Chesil Beach is separated from the land by the Fleet lagoon - a shallow stretch of water up to 5m deep. This is connected to the sea at Ferrybridge, Portland. Both the beach and the lagoon are important areas for wildlife and have a number of national and international designations to help protect the area. Chesil Beach also falls within the Jurassic Coast World Heritage Site.





# CHESIL BEACH

## DEFENCE SYSTEMS



# CHANGING CHESIL BEACH

Chesil is known as a Barrier Beach because it runs parallel to the coastline above the high tide and is separated from the coastline by the Fleet lagoon. The beach itself is thought to have formed at the end of the last ice age (14,000-20,000 years ago) when water levels rose rapidly and gravel and sand deposits from Lyme Bay were eroded and driven onshore to form a bar. The saline Fleet Lagoon, started to form about 7,000 years ago due to the rising sea level and the beach moving towards the present day land.

When it first formed, Chesil Beach was predominantly sandy with layers of shell and coarser material. The erosion of ancient landslide rubble in West Dorset and East Devon supplied large quantities of gravel that was transported by the sea to Chesil Beach. This is known as longshore drift. When this flush of material buried the older sandy beach it created the enormous shingle bank we see today.

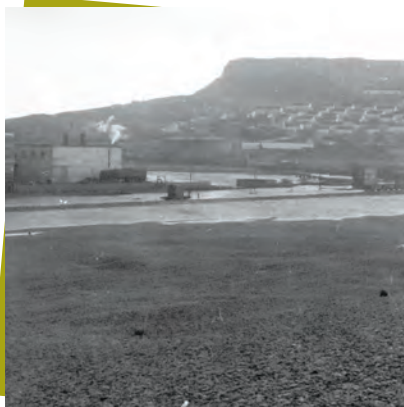
Over the past 100 years or so, Chesil Beach has experienced many changes, particularly at the Portland end of the beach.

Chesil Beach is still slowly moving towards the land and is gradually shrinking, mainly because the supply of new shingle from cliff erosion has reduced significantly compared to 20,000 years ago. The beach at Chiswell has changed due to human intervention as far back as 1958, when the first attempts at providing coastal defences were made. The Chiswell area of Portland has a long history of flooding and two concrete seawalls with promenades were constructed between 1958 and 1965. These were designed to reduce both flood risk and the risk from coastal erosion and landsliding along the cliffs at West Weares.



Despite the first defences constructed between 1958 and 1965, further flood events occurred, notably in 1978 and 1979. High tides and storms created big waves that overtopped the beach and flooded the village of Chiswell. In the 1980s the northern part of the seawall, gabions, interceptor drain and flood alleviation channel were built to reduce the risk of flooding in Chiswell village. These defences also helped to protect Portland Beach Road, the main road between Portland and Wyke Regis, from flooding.

Circa 1960s



Circa 1960s



Circa 1978/9



Circa 1978/9





# HOW THE COASTAL DEFENCES AT CHISWELL WORK

There are a number of coastal defences at Chiswell - all working together to reduce the risk of coastal flooding, coastal erosion and landslides. They are:

## GABION CASTLE AND MATTRESS

Gabions are wire baskets filled with beach pebbles and provide a transition between the seawall in front of the Cove House Inn and the natural Chesil Beach. These create a 'castle' structure and a further 550m of mattress layers (thin sloping gabions baskets) on top, to prevent the crest of the beach being lowered when waves overtop the beach. These structures are managed and maintained by the Environment Agency.

DIAGRAM 1:  
CROSS-SECTION OF THE GABION CASTLE

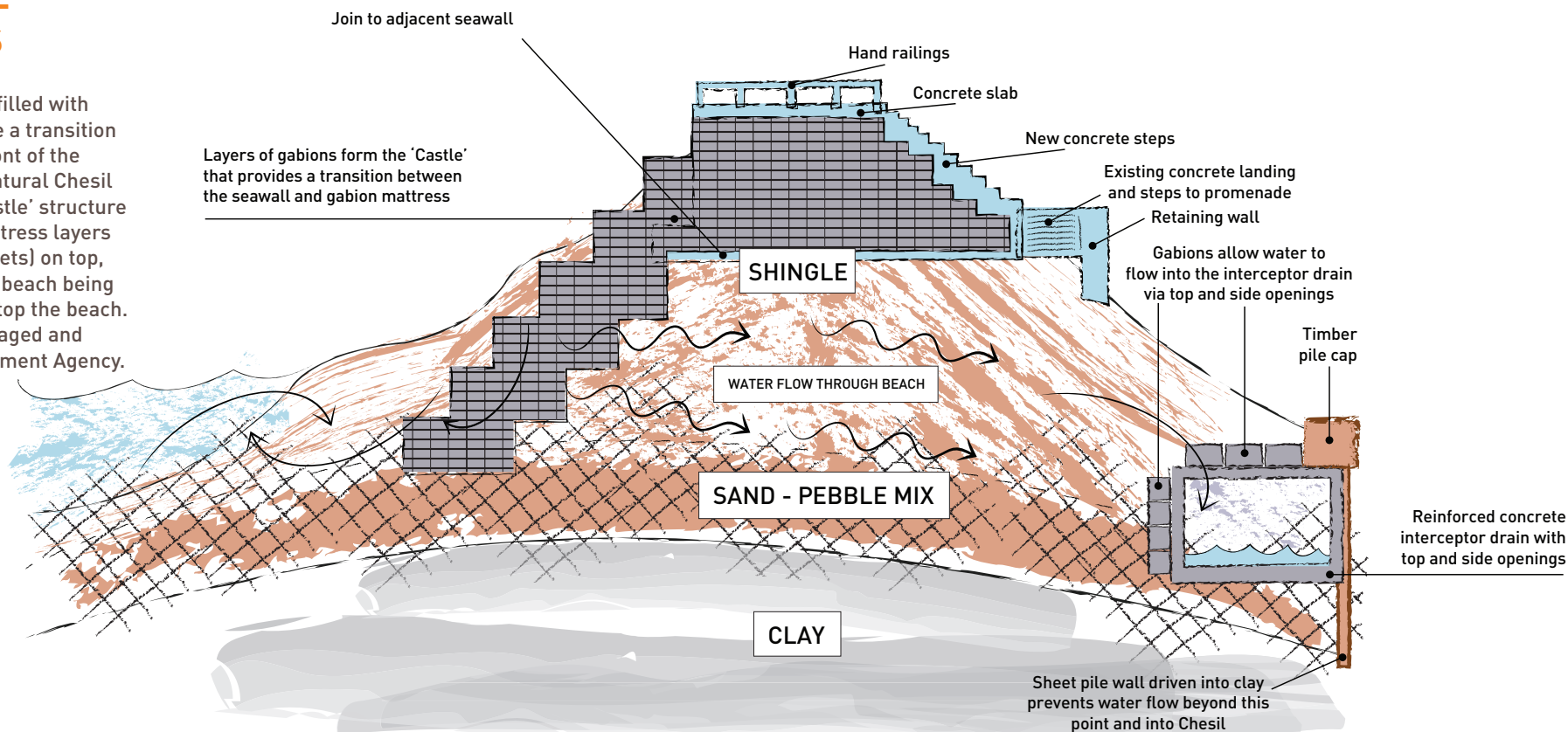


DIAGRAM 2:  
CROSS-SECTION OF A MATTRESS

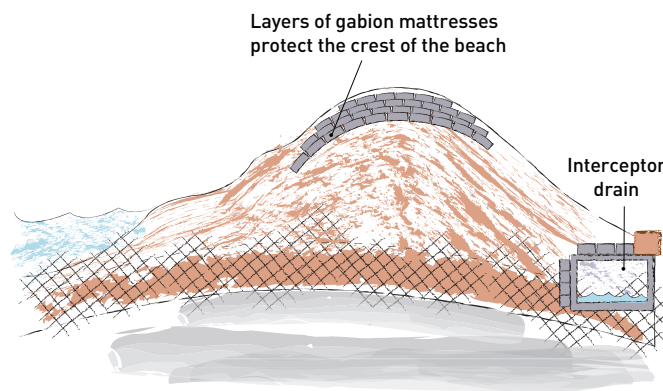


PHOTO A: GABION CASTLE

## INTERCEPTOR DRAIN

Running beneath the seawall (from near the Cove House Inn) and the gabion mattresses is an interceptor drain. During storm events, large waves push seawater through the shingle beach. This drain prevents that water flowing through the beach and into Chiswell by diverting the water into the flood alleviation channel and ultimately into Portland Harbour.

It is managed and maintained by the Environment Agency.

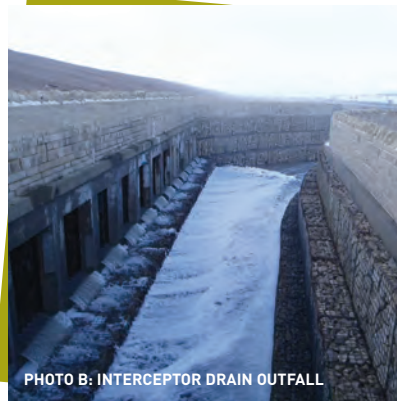


PHOTO B: INTERCEPTOR DRAIN OUTFALL

## FLOOD ALLEVIATION CHANNEL

The flood alleviation channel is the open channel that runs beside the Portland Beach Road. This carries sea water from the interceptor drain into Portland Harbour via a culvert located on Osprey Quay, Portland. It is managed and maintained by the Environment Agency.



PHOTO C: FLOOD ALLEVIATION CHANNEL

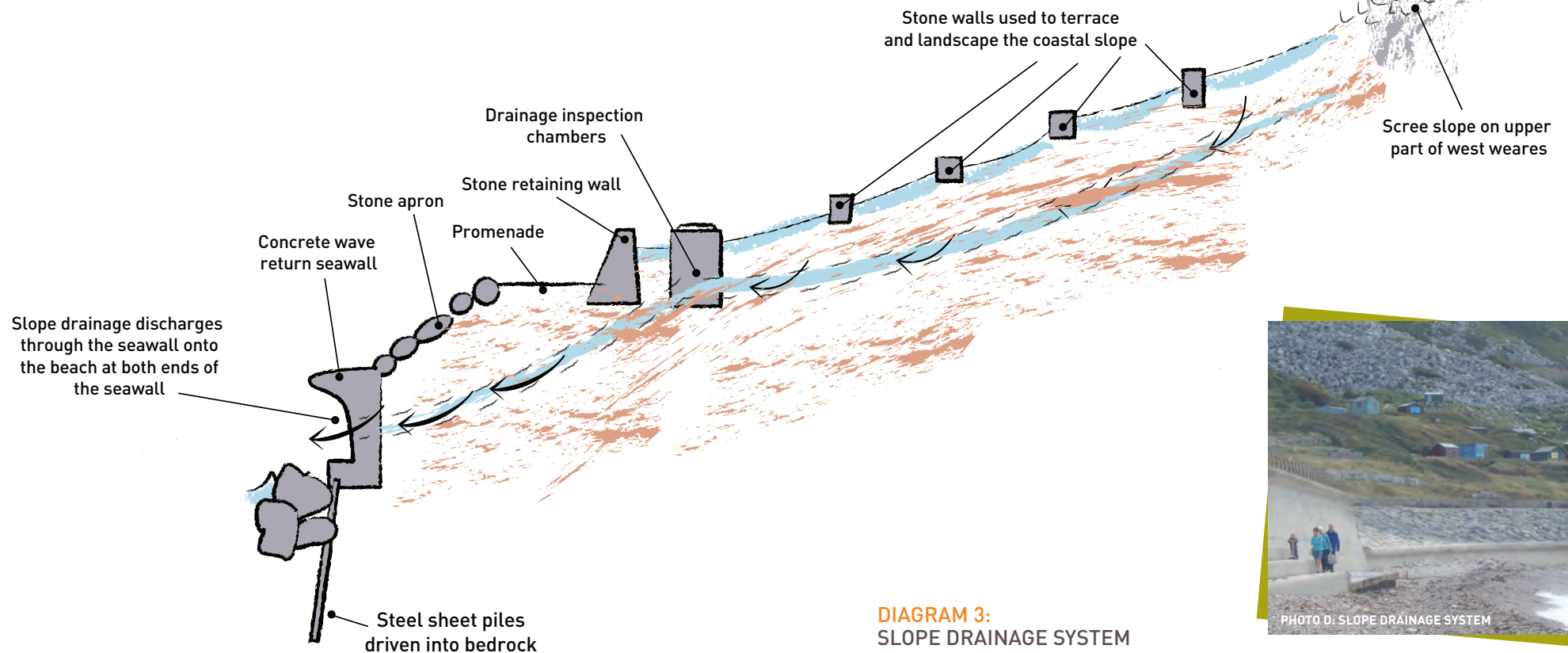


DIAGRAM 3:  
SLOPE DRAINAGE SYSTEM



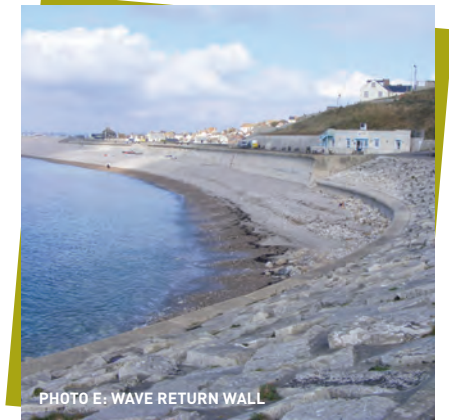
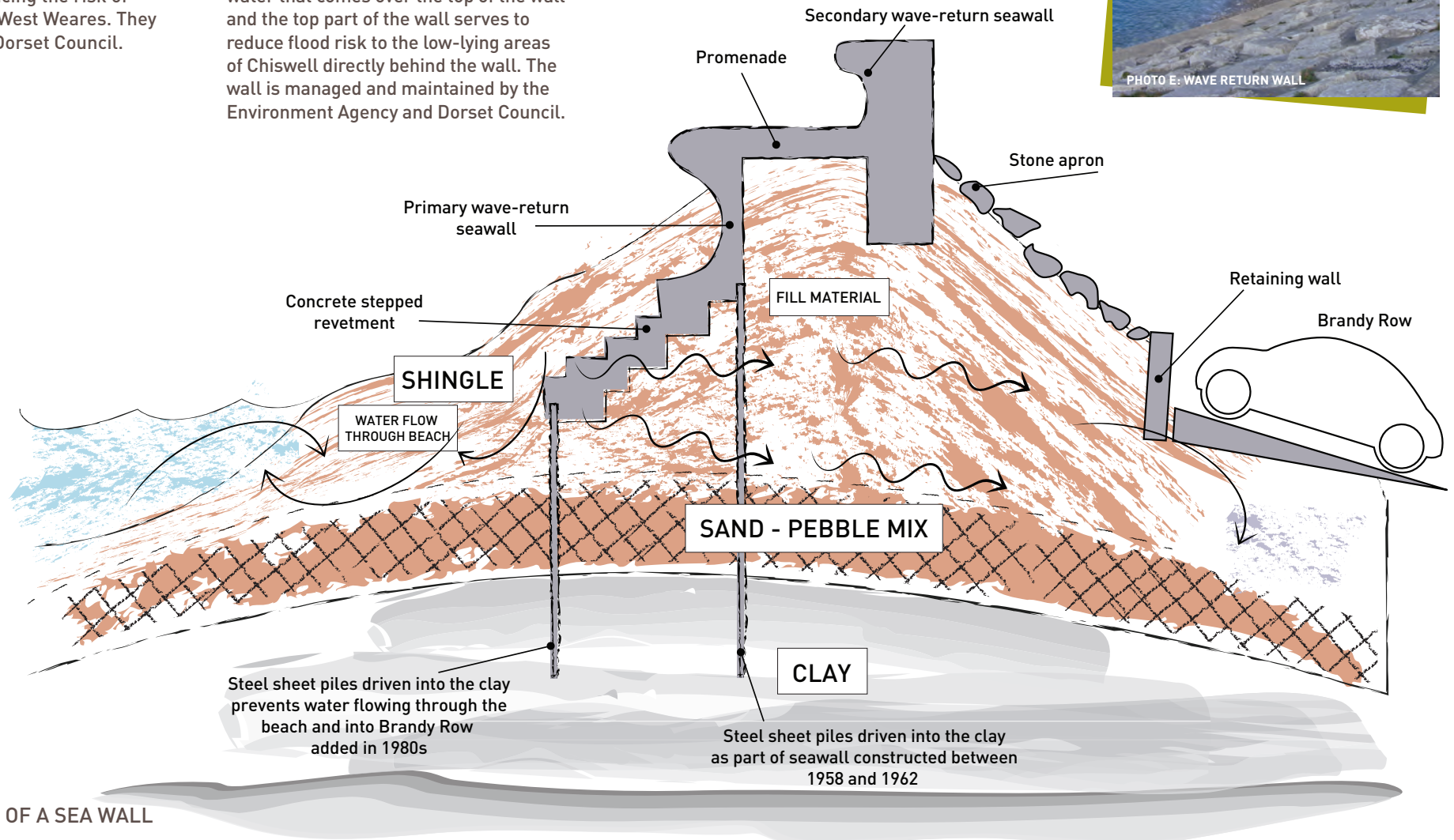
PHOTO D: SLOPE DRAINAGE SYSTEM



## SEAWALLS

Three distinct concrete seawalls were built between 1958 and 1984 to protect Chiswell. The two south-easternmost sections of seawall are the oldest and are supported with drainage systems that help to stabilise the coastal slopes behind, thus reducing the risk of landslides along West Weares. They are managed by Dorset Council.

The third seawall, which was originally built in the 1960's, has curved top sections that were added in the 1980's as part of the Chesil Beach Sea Defence Scheme. This wave return wall on top is designed to reduce the amount of water that comes over the top of the wall and the top part of the wall serves to reduce flood risk to the low-lying areas of Chiswell directly behind the wall. The wall is managed and maintained by the Environment Agency and Dorset Council.



**DIAGRAM 4:**  
CROSS-SECTION OF A SEA WALL

# THE WINTER STORMS OF 2013 / 14

*"The series of storms experienced between January and March 2014 affecting Chesil Beach were a consequence of the most energetic seas recorded for at least 60 years. High winds and big waves caused damage to Chiswell's coastal defence system including a significant removal of shingle."*

- NEIL WATSON, ENVIRONMENT AGENCY -



Storms affecting Chesil Beach are nothing new and there are accounts of storm events such as the great storm of 1824.

The major winter storms between December 2013 and March 2014 were the worst seen in Chesil Beach for at least 30 years.



## WHAT HAPPENED?

The storms were a result of fluctuations to the Pacific and North Atlantic jet streams, which were partly driven by prolonged rainfall over Indonesia and the tropical West Pacific due to higher ocean temperatures in that region. The North Atlantic jet stream was also unusually strong over this period. These global influences resulted in strong wave forces, driven by strong winds which, combined with high tides, culminated in high storm surges. Waves reached nearly 8m high on some days in December, January and February.



The strength of the waves dragged large amounts of shingle into the sea and this caused the Chiswell area of the beach to be reduced by up to 3m in height and narrowed by 6m. The size and power of the waves also forced water through the beach and into the flood alleviation channel. 'Canns' were formed where this water had burst through the beach and scattered shingle. This also caused significant damage to the long standing vegetation on the Fleet side of the beach.



CANNS WHERE WATER HAS BURST THROUGH THE BEACH



## IMPACTS OF 2013/14 STORM

Whilst the coastal defences helped to reduce the level of flooding experienced in Chiswell, they were damaged as a result of the powerful storms.

### Damage included:

- The storm on February 14th left a hole at the base of the seawall in front of Quiddles Cafe. The loss of shingle meant that the foundations of the seawall and blue-clay bed that lies beneath Chesil Beach were both exposed.
- The gabion castle and mattresses were badly damaged on the seaward face with the wire mesh being ripped open and the pebbles being scattered. However, they still prevented the crest of the beach lowering during the storms. Further widespread flooding in Chiswell would have occurred if the gabion castle had not been constructed.
- The flood alleviation channel started filling with shingle during the storm events as a result of the 'canns' along the beach. This reduced the capacity of the channel, meaning it was not able to carry as much water towards Portland Harbour as it would normally do.



- There was significant impact on the local community. The waves which overtopped the seawall scattered shingle towards properties and also caused fast flowing seawater to run down Brandy Lane and the 'Opes' (lanes). This caused flooding to the High Street, Victoria Square and the surrounding homes and businesses. The flow of water was so strong that it moved boulders, large blocks of concrete and debris that caused damage to property, vehicles and roads.



- The A354 Portland Beach Road was closed on a number of occasions. The combination of the reduced capacity of the flood alleviation channel, high tides and water flowing through the beach caused the road to flood. The road closures had a wider economic impact on Weymouth and Portland as businesses could not operate normally and people were unable to get to or from places of work.



- The coastal defences on Chesil Beach helped reduce the risk of flooding to approximately 110 properties in the village of Chiswell. Although six properties flooded as a result of the storms, this number would have been higher if the defences did not exist.





# THE REPAIR WORK AFTER THE STORMS OF 2013/14

Emergency repair work started in between the storms and included moving shingle to protect the defences. As soon as the storms subsided a team of organisations including the Environment Agency, the Military, Weymouth and Portland Borough Council (no longer in existence), and their contractors Team Van Oord and CH2M HILL, worked together to repair the damage.

## WHAT WAS DONE?

Whilst the coastal defences helped to reduce the level of flooding experienced in Chiswell, they were damaged as a result of the powerful storms and needed repair.

### Repairs included:

- Construction of a new concrete section to fill and protect the hole that opened up in the seawall.
- Re-surfacing of the promenade along the seawall.
- The complete re-construction of the gabion castle and mattresses using new gabions.
- Re-profiling of the flood alleviation channel to restore its capacity.
- Speeding up the natural recovery of shingle by recycling and re-profiling shingle along Chesil Beach, in preparation for any further storms.



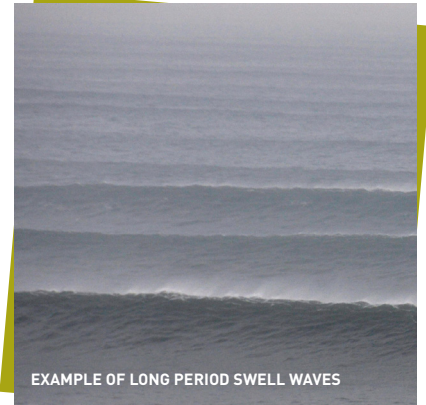


# 2021 UPDATE

The Environment Agency continue to study and investigate the impacts of storms and large swell waves on the Chesil beach profile and wave overtopping of the sea defences.

Recent work in collaboration with the University of Plymouth has identified the importance of a wide healthy beach in reducing wave overtopping and associated flood damage to the sea defences and homes behind. The most important influence on flooding at Chiswell are long period swell waves (over 15 seconds long) which have high energy and wave run up, causing overtopping of defences and erosion of the beach.

- These waves are generated by large storms in the Atlantic Ocean and often arrive accompanied by storm force winds. Recent examples of long period swell waves overtopping the defences include the storms during December 2019 and January 2021.
- Dorset Council are also in the final stages of completing a 5 year monitoring study that looks at the beach, curved sea wall, and coastal slopes above the wall. In that period, annual laser scans and crack monitoring has been carried out, a network of ground movement and ground water monitoring instruments have been installed and a detailed model of ground conditions has been produced. The final report that draws all of this information together is about to be commissioned. The report will provide a range of short and long term management options.



EXAMPLE OF LONG PERIOD SWELL WAVES



STORMS HITTING CHISWELL IN DECEMBER 2019



IMPACT OF STORMS IN JANUARY 2021

# THE FUTURE

Chesil Beach will slowly move towards the land. How fast this happens will depend on the frequency of future storms and their size and strength. While there is still uncertainty, as the climate continues to change, many experts predict that storms such as those experienced over the winter of 2013/14 will become more frequent and so the eastward movement of Chesil Beach toward the land will speed up.

The undefended beach between Chiswell and the end of the Fleet will be free to move eastwards, diminishing the Fleet Lagoon and moving towards Portland Harbour. This has implications for the A354 Portland Beach Road which would likely be covered by the beach, if the road remains in its current form. Over a long period of time, Chesil Beach may eventually breakdown and change its form entirely. This will ultimately result in completely changing tides and currents in the wider area due to Lyme Bay and Portland Harbour / Weymouth Bay becoming directly linked.

## HINTS AND TIPS ON BEING BETTER PREPARED

Be prepared - know your signs!



**FLOOD ALERT**  
FLOODING POSSIBLE. BE PREPARED



**FLOOD WARNING**  
FLOODING EXPECTED ACTION REQUIRED



**SEVERE FLOOD WARNING**  
SEVERE FLOODING DANGER TO LIFE

Flooding at Chiswell can happen extremely rapidly but there are some simple steps that you can take that will help you prepare for when flooding happens.

1. Sign up to the Environment Agency's free flood warning service - **Floodline Warnings Direct** by calling **0345 988 1188**.
2. Prepare a flood plan, including useful numbers, for you and your family.
3. Check how your insurance company covers you for flooding.
4. Prepare a flood kit with essential emergency items such as insurance documents, a wind up torch, blankets, medication and keep it handy.
5. Know where to turn off your gas, electricity and water supplies. Mark them with coloured tape to remind you which one is which.
6. Consider what items you would move first if you receive a flood warning (e.g. pets, furniture, electrical equipment or your car). Are there some things that would be worth keeping upstairs permanently?

Sandbags are a last resort and only give limited protection to a property. Consider investing in flood protection products for your home (flood boards, air brick covers, window shutters) that can be put in place before flooding takes place.

## WHAT TO DO WHEN THE ENVIRONMENT AGENCY ISSUE A FLOOD WARNING



The flood warning message will give you information about when the Environment Agency is expecting flooding to happen. There may be time to prepare but you need to be ready to act quickly as conditions can change rapidly. When you receive your flood warning phone call (if you are registered for Floodline Warnings Direct) you should put your flood protection products in place (e.g. Flood boards, window shutters, air brick covers).

Plan to move your car out of the flood risk area (e.g. Queens Road) and move or secure any large, loose objects away from the flood risk area at an early stage. Consider encouraging neighbours to do the same. Remember to carry out the other actions you have prepared in your flood plan.

If the Environment Agency is expecting severe flooding the Police and Emergency Services will warn people by knocking on their doors. Follow any instructions you are given. If this happens you may choose to go to a place of safety. You should do so before the onset of flooding and if advised by the Police. They will tell you when and where to go if you don't already have somewhere to go.

## WHEN THE SIREN SOUNDS

The sirens indicate that waves are coming over the seawall and that flooding will happen immediately with extreme risk to people and property. You should take yourself, family and pets to a room upstairs away from the seaward side of the building. Take your flood kit with you and stay there until it is safe to come down. This could be a few hours later. Only leave the building at this stage if you are advised to by the Emergency Services. Follow any instructions they give you.



For more information about flooding and what to do call the Floodline service on **0345 988 1188** or visit their website [www.gov.uk/prepare-for-a-flood](http://www.gov.uk/prepare-for-a-flood)

Always check the Environment Agency Live Flood Warning Map, sign up to the free **Floodline Warnings Direct** on **0345 988 1188** or check the website for the **Three Day Flood Risk Forecast**: <http://apps.environment-agency.gov.uk/flood>

You can also check any severe weather warnings from the **Met Office**: [www.metoffice.gov.uk/public/weather/warnings](http://www.metoffice.gov.uk/public/weather/warnings)



## OTHER GENERAL INFORMATION

### Wave Alerts

Sign into the Channel Coast Observatory Regional Coastal Monitoring Programmes.

[www.channelcoast.org/realtimedata](http://www.channelcoast.org/realtimedata)

### Sweep OWWL

Sign up for overtopping forecast alerts

[www.channelcoast.org/ccoresources/sweep/](http://www.channelcoast.org/ccoresources/sweep/)

### Chesil Beach.org

General information about the beach and the Fleet Lagoon;

[www.chesilbeach.org](http://www.chesilbeach.org)

### CoastSnap

Become a community scientist and help monitor the changing coast.

[southwest.coastalmonitoring.org/coastsnap-home/](http://southwest.coastalmonitoring.org/coastsnap-home/)

### Chesil Beach

Hurricanes, Storms and Storm Surges by Ian West. A more detailed look at the formation of Chesil, processes and storm events.

[www.southampton.ac.uk](http://www.southampton.ac.uk)

### South Devon and Dorset Coastal Advisory Group

Information about the Shoreline Management Plan, Coastal Monitoring and research publications.

[southwest.coastalmonitoring.org](http://southwest.coastalmonitoring.org)

### Standing Conference on Problems Associated with the Coastline

Research and publications related to coastal risk management.

[www.scopac.org.uk](http://www.scopac.org.uk)

### National Flood Forum

[nationalfloodforum.org.uk](http://nationalfloodforum.org.uk)

This booklet was originally produced in 2015 by Dorset Coast Forum in partnership with Weymouth and Portland Borough Council and updated in 2021 by Dorset Coast Forum in partnership with the Environment Agency and Dorset Council. Dorset Coast Forum is an independent strategic coastal partnership, hosted by Dorset Council, which works across sectors and with communities to look at the long-term broad scale issues facing Dorset's coast and inshore waters.

For more information about the booklet contact: [dorset.coast@dorsetcouncil.gov.uk](mailto:dorset.coast@dorsetcouncil.gov.uk) or call 01305 224833.

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