Environment Agency

Lewes District Council

Telscombe Cliffs

Coastal erosion investigations report and findings for the local community

October 2024

Telscombe Cliffs coastal erosion investigations

Report of findings for the local community

October 2024

Lewes District Council and Environment Agency, supported by JBA Consulting and Van Oord (Mackley)

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1. Key messages

- A new detailed assessment of coastal erosion at Telscombe Cliffs has shown that there are not expected to be impacts to properties before 2070.
- For this reason, there is not a need to develop a scheme to reduce erosion currently.
- We will continue to monitor the cliffs to make sure any risks to people, property and infrastructure are understood by the relevant authorities. Information from the monitoring will be used to plan for the future.

2. Summary

Since January 2021, Lewes District Council and the Environment Agency have worked together to investigate the coastal erosion risk along the undefended chalk cliffs at Telscombe Cliffs. JBA Consulting and Van Oord subsidiary Mackley were appointed to support this investigation and explore options that could be implemented to reduce the erosion risk.

Telscombe Cliffs was identified as an area that could be prioritised for further investigation, due to the potential risk to properties from previous studies including the *Brighton Marina to Newhaven Western Harbour Arm Coastal Management Implementation Plan* (2016). We have recently carried out a more detailed assessment of the coastal erosion rates at Telscombe Cliffs, using the latest techniques and data. The results of this assessment show erosion is not expected to impact properties before 2070. After 2070, without interventions to reduce erosion, there would be a loss of access to properties and impact to underground utilities along parts of The Esplanade. This would be followed by the direct loss of properties towards the end of this century.

The A259 is not expected to be impacted within the next 100 years in Telscombe Cliffs, but in East Saltdean the road (and the major utilities that lie underneath) may be at risk in the second half of this century.

The work included an assessment of options that could be implemented to reduce the risks of erosion, either through slowing the rate of erosion or by relocating property and infrastructure. The environmental designations at the site mean that engineering options, such as a concrete wall, should be avoided.

As erosion is not expected to impact this area before 2070, there is no current benefit to introducing a new coastal protection scheme at present.

We will continue to monitor the cliffs to identify any changes in erosion rates. Monitoring data will be used to re-evaluate the coastal erosion assessment approximately every 10 years. This ongoing monitoring and reviewing will make sure suitable measures can be implemented in advance of predicted coastal erosion impacts.

With Lewes District Council, we have engaged with East Sussex County Council and Southern Water, aiming to ensure to make sure the risks are understood and are acted on where necessary.

3. A detailed investigation into the coastal erosion risk

In January 2021, Lewes District Council and the Environment Agency agreed to work together to explore possible options to manage the coastal erosion risk at Telscombe Cliffs. Lewes District Council has permissive powers to take action to manage erosion along this part of the coast. The Environment Agency also has these permissive powers and has a national overview role for coastal erosion issues. As previous studies on this coastline identified that due to erosion risk to properties and infrastructure, measures to reduce this risk were economically viable, both

> Further background information can be found on the Lewes & Eastbourne Councils Coast management and protection webpage. This includes the previous summary document that was provided to residents in 2016, following completion of the *Brighton Marina to Newhaven Western Harbour Arm Coastal Management Implementation Plan*. Telscombe Cliffs was identified in the plan as an area that could be prioritised for further investigation, due to the risk to properties.

organisations recognised the need for a more detailed investigation. JBA Consulting and Mackley were appointed in autumn 2021 as expert consultants for the investigation. JBA are flood and coastal erosion risk consultants and Mackley are construction engineers with considerable experience of constructing coastal defences. The study area included the two undefended sections of cliff between East Saltdean and Peacehaven, which are separated by the Portobello Southern Water site (Figure 1.1). By using up-to-date information and the latest national guidance, the work has significantly improved understanding of the issues and potential options at Telscombe Cliffs. The work produced by the consultants includes the erosion assessment, options appraisal and economic appraisal described in this report.

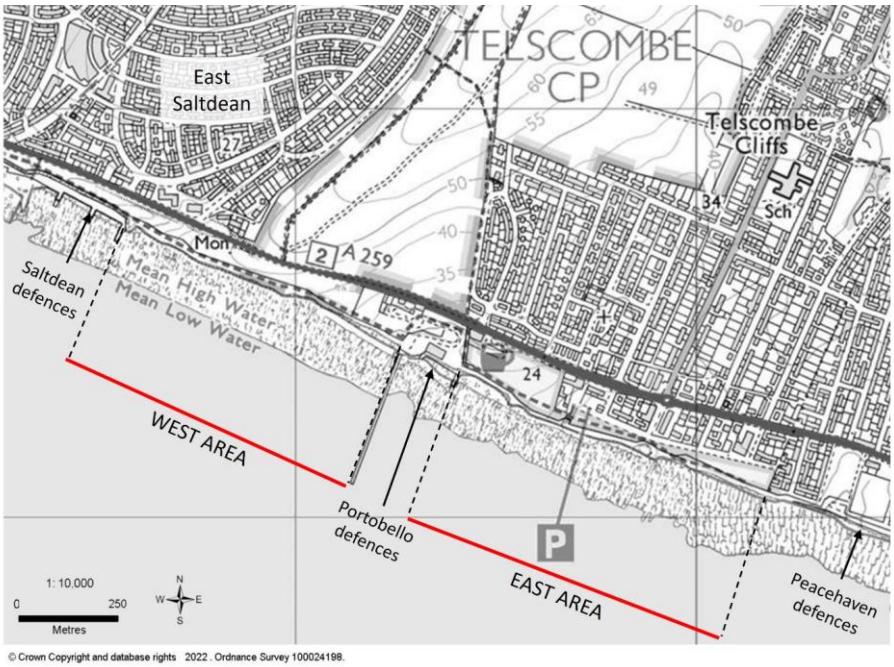

Figure 3.1: Map of the two undefended sections of cliff at Telscombe Cliffs, which are the focus of the recent work.

4. Prediction of future coastal erosion

Coastal erosion at Telscombe Cliffs is primarily caused by the action of waves against the foot of the cliffs. The rate at which erosion progresses is affected by many factors, including the amount of shingle at the foot of the cliffs and the geological structure and composition of the cliffs (Figure 2.1). If there is a large amount of shingle, this will help to prevent waves from reaching the cliff, which will protect the cliff from erosion. A smaller amount of shingle can result in faster erosion than if there was no shingle, because the pebbles can be thrown against the cliffs by the waves. Additionally, some sections of cliff are formed of harder rock than others.

For example, erosion is slow immediately west of Portobello because the cliffs are protected by a large shingle beach. Erosion is faster immediately east of Portobello, where the beach is smaller, and the cliffs are composed of softer rock. Further to the east near Fairlight Avenue there is more resistant chalk at the foot of the cliff and very little shingle, and erosion is slower in this area. Incremental rockfalls will result in a gradual retreat of the cliff line over time.

Figure 4.1: The cliffs south of The Esplanade. Along the back of the beach, the foot of the cliff is relatively white, indicating that there has been some recent erosion there. Further along where there is no beach, the foot of the cliff is covered in algae and limpets, suggesting that erosion has been slower there.

JBA Consulting completed a detailed assessment of the erosion using the following method:

- Firstly, by studying historical maps and aerial images it was possible to calculate the erosion rate in the past. These historic erosion rates were calculated every 20 metres along the coast, to ensure that the variability along the coast would be revealed. Historic erosion rates were calculated for the time periods 1876-2020 and 1973-2020, to understand how erosion has progressed over both the long term and the more recent past.
- The historic erosion rates were projected into the future, to show the extent of erosion if it were to continue at the same rates as in the past. The position of the cliff top was estimated for the years 2040, 2070, and 2120. This was done using both the 1876-2020 rates and the 1973-2020 rates, generating two different future projections.
- A gradual acceleration in erosion was added, which was calculated using estimates of future changes in the rate of sea level rise due to climate change (from the latest UK Climate Projections: UKCP18). The acceleration in erosion rates gives a sense of the impact that sea level rise could have on cliff erosion.

- Various alternative scenarios were tested, including a greater or lesser response to future sea level rise, a faster rate of sea level rise, and the use of erosion rates from the period 1990-2020.

The results of this assessment show that, across most of the study area, the erosion rate in more recent times (1973-2020) has been slower than the longer-term rate (1876-2020). This change may have multiple causes, including variations in the distribution of shingle at the base of the cliffs. Projecting each of these historic erosion rates into the future results in two different estimates of the future cliff top position. The two estimates have been used to define the erosion bands shown in the maps below (Figures 2.2 and 2.3). The bands do not cover the whole range of potential future scenarios, only those calculated using the two past erosion rates.

There are considerable uncertainties associated with the prediction of future erosion, and many assumptions and simplifications that must be made as part of the assessment. These uncertainties increase the further into the future erosion is considered, and the results give an overview of how erosion may progress but are not an accurate representation of the future coastline. The study used a precautionary approach to ensure that the risks posed by erosion were not underestimated.

Estimated impacts east of Portobello

The results of the erosion assessment show that there are not expected to be impacts to properties, The Esplanade road or utility connections in Telscombe Cliffs before 2070. The timing of impacts after 2070 is more difficult to predict. In the absence of interventions to reduce erosion, there would be a loss of the existing access route and underground utilities along parts of The Esplanade. This would eventually be followed by the direct loss of properties on The Esplanade, which could occur around the end of the century. Erosion is not expected to impact The Smuggler's Rest pub building or the A259 within Telscombe Cliffs during this century.

Estimated impacts west of Portobello

Immediately to the west of Portobello, the cliffs are currently protected by a large beach which slows down the rate of erosion. The three houses to the south of the A259 are not expected to be at risk this century. Moving west towards Saltdean, the A259 gradually gets closer to the cliff edge. The road embankment is less than 30 metres from the cliff near to the Bannings Vale bus stop. It is possible that the A259 will be at risk of erosion in the latter half of this century, though the rock armour that was placed at the foot of the cliff in the 1990s aims to help to prolong the life of the road. Properties north of the A259, and the major sewer from Brighton & Hove, are not expected to be at risk this century. Further west, the cliffs are protected by the Saltdean sea wall and promenade.

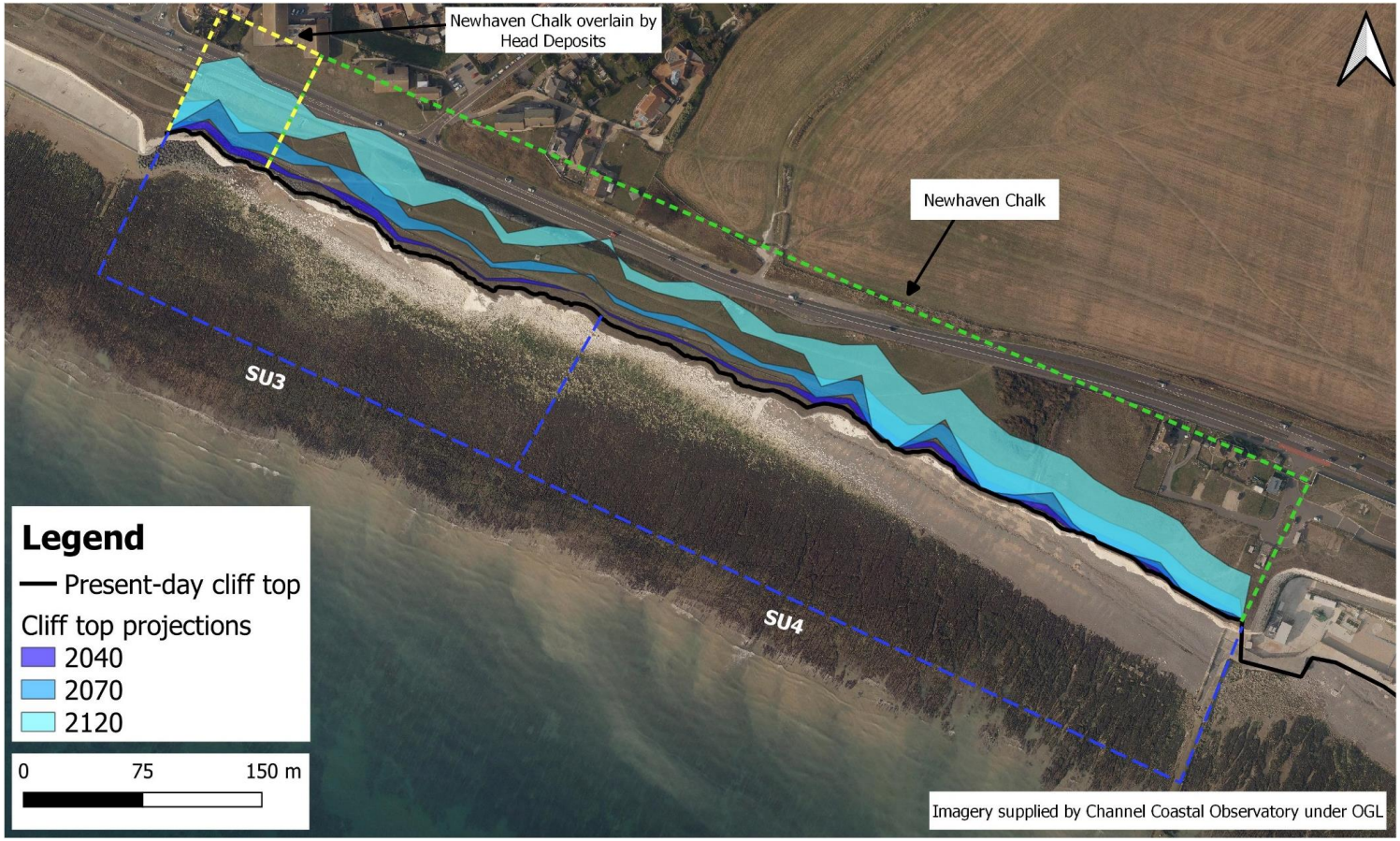

Figure 4.2: Map of predicted future erosion for the cliffs between Saltdean and Portobello. Each coloured band represents the possible future cliff top position, based on the calculations described in this report. The larger width of the 2120 band shows how it is more difficult to accurately predict the scale of erosion in the longer term.

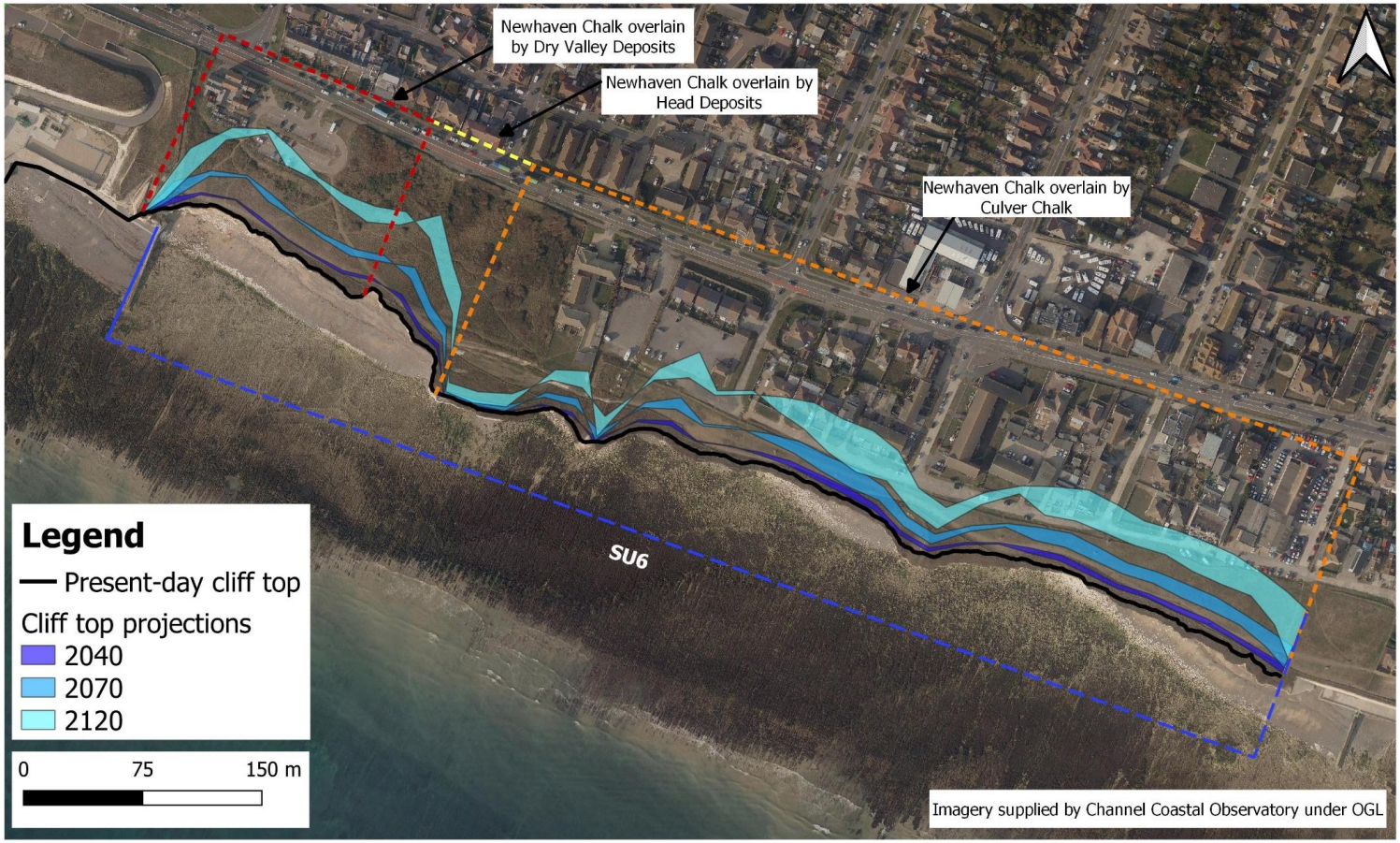

Figure 4.3: Map of predicted future erosion for the cliffs between Portobello and Peacehaven. Each coloured band represents the possible future cliff top position, based on the calculations described in this report.

5. Environmental designations at Telscombe Cliffs

Any proposals to manage the risk of erosion must have regard to the environmental designations at this site (Figure 3.1). The coastal zone at Telscombe Cliffs is legally protected, due to its ecological and geological significance, and it is also home to protected species of plants and animals. These protections include a number of areas:

- The cliffs and foreshore are part of the *Brighton to Newhaven Cliffs Site of Special Scientific Interest*. This is designated for its geology and rare habitats.
- Below the high tide mark, the foreshore is part of the *Beachy Head West Marine Conservation Zone*, designated for its marine chalk habitats and home to rare species such as the short-snouted seahorse.
- The cliffs between Saltdean and Portobello are within the *South Downs National Park*, an area that has additional protections due to its unique landscapes and important habitats.
- Protected species that live on the cliffs include the peregrine falcon, and there are also likely to be protected species out to sea.

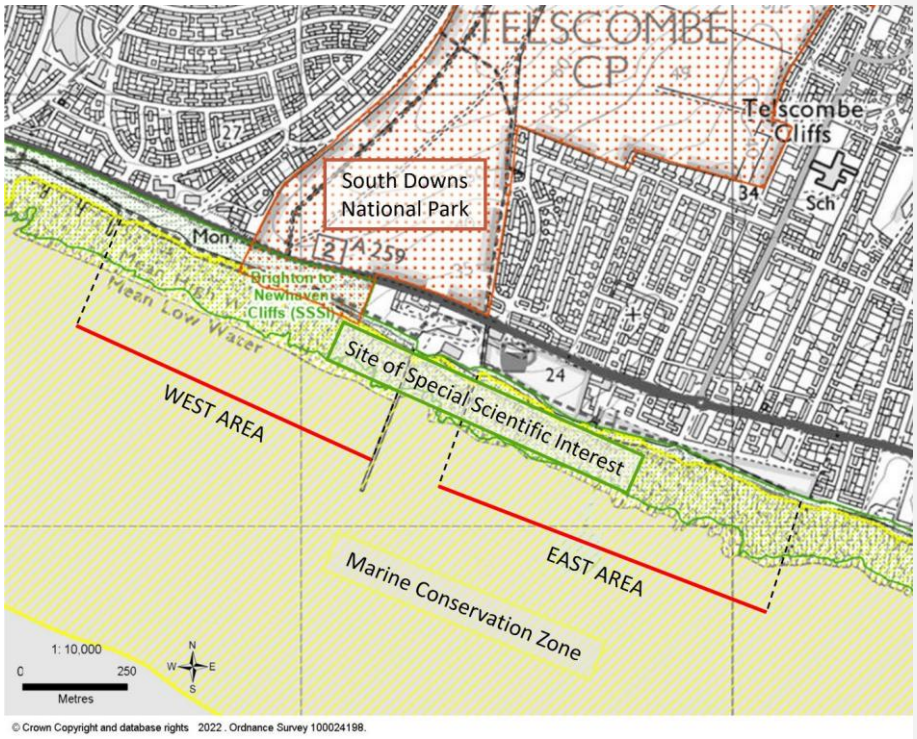

Figure 5.1: Map of the environmental designations at Telscombe Cliffs.

Any structure built along the coast will likely require planning permission and a licence from the Marine Management Organisation. Additional consents are needed

to carry out construction work on the cliffs or the shore because of the environmental protections. These consents are granted by government organisations such as Natural England. It is unlikely that consent would be easily granted for any activities that damage the protected areas or stop the natural erosion of the cliffs. If any measures were to be introduced to slow down the rate of erosion in the future, they would most likely be targeted to the areas of greatest erosion risk and would need to work with natural processes and/or mitigate and manage their environmental impact. New approaches are currently emerging around the world which work more closely with natural processes to reduce coastal erosion. These approaches have an influence on the assessment of options described in the next section.

6. Options to manage the risk of coastal erosion

As part of the investigation into the coastal erosion risk at Telscombe Cliffs, potential options to manage this risk have been explored. It was considered necessary for the options to meet the following objectives:

Economic: Improve resilience of property and infrastructure to coastal change within the project area while enabling sustainable economic growth.

People: Improve resilience of communities and places to coastal change within the project area while enhancing quality of life.

Environment: Minimise the impact on natural coastal processes, the natural environment and built heritage and maximise enhancement opportunities.

Business case delivery: Achieve affordability, value for money, deliverability (technical and management), environmental sustainability and stakeholder acceptance.

Carbon: Reduce emissions and where possible increase storage of carbon through coastal change management.

Following standard engineering practice, a longlist of options was considered:

Do nothing: the ‘baseline’ option to which other options can be compared.

Do minimum: continued management of the public space on the cliff top and monitoring of the cliff erosion. Removal of buildings when they are at imminent risk of erosion.

Coastal adaptation: a planned approach to demolishing and rebuilding properties and infrastructure as cliff erosion progresses.

Concrete wall: construction of a wall, either for the full length of coast or for localised sections where the erosion risk is greater.

Concrete wall and promenade: construction of a promenade similar to the neighbouring defences at Saltdean and Peacehaven.

Rock revetment: use of large blocks of granite or limestone to protect the foot of the cliffs, either for the full length of coast or for localised sections where the erosion risk is greater.

Mixed solution: construction of a rock revetment in the area of the caves, with a concrete wall elsewhere.

Offshore breakwater: construction of a rock breakwater out to sea, to reduce the energy of the waves reaching the cliffs, thereby slowing the rate of erosion.

Nature-based solution: construction of an offshore reef that would provide a suitable platform for marine organisms such as oysters to colonise (Figure 4.1). The aim would be for the reef to develop naturally through the growth of organisms, and to slow the rate of erosion by reducing the energy of the waves reaching the cliff. Sections of larger breakwater could be constructed in areas at greater risk of erosion, if needed.

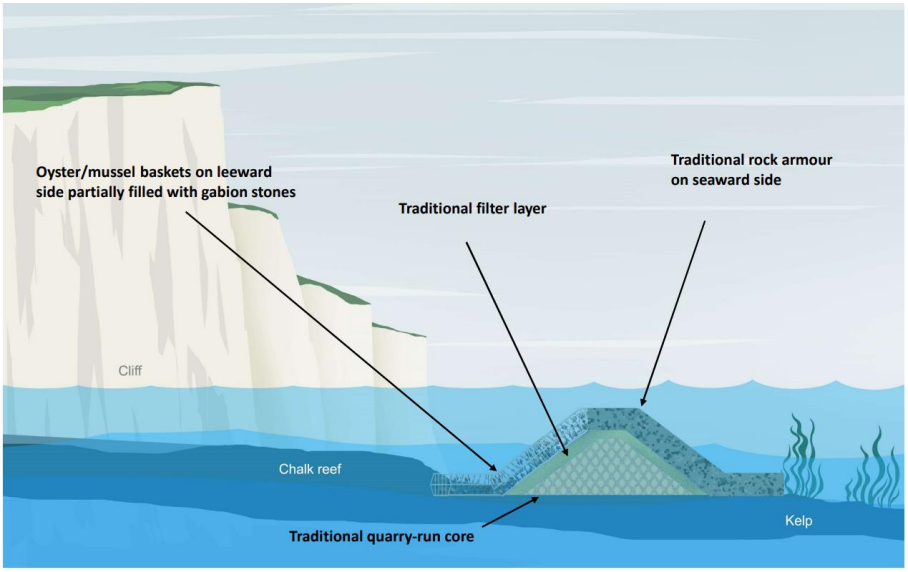

Figure 6.1: Sketch of the proposed structure of the nature-based solution option. An artificial reef would be constructed offshore, which would be designed to encourage the natural development of a reef habitat.

Biomimicry of nature-based solution: construction of an artificial reef that would replicate the nature-based solution described above. Sections of larger breakwater could be constructed in areas at greater risk of erosion, if needed.

Beach recharge: enlargement of the existing beaches through the addition of shingle. The beaches would help to absorb the energy of the waves and protect the foot of the cliff. Groynes could be added if needed to keep the shingle in place.

Localised secant pile from behind the cliffs: insertion of a piled retaining wall into the ground from the cliff top, that would provide a defensive wall for when erosion reaches that point. This is not considered to be a viable engineering option at this time.

These options were scored against their ability to meet the objectives outlined above. Options with the potential to meet the objectives were shortlisted for further assessment of their costs and benefits. Options that have not been shortlisted can still be considered in the future. The shortlisted options are:

- **Do nothing** and **do minimum**, for comparison with the other options (a standard practice).
- **Coastal adaptation**
- **Nature-based solution**, consisting of a 300-metre reef east of Portobello (protecting properties) and a 150-metre reef or breakwater west of Portobello (protecting the A259).
- **Biomimicry of nature-based solution**, consisting of a 300-metre reef east of Portobello and a 150-metre reef or breakwater west of Portobello.

The more 'traditional' options in the longlist, such as a concrete wall or rock revetment, would be unlikely to be granted the necessary approvals for construction in this location, due to the environmental designations outlined in Section 3 of this report. The options that work more closely with natural processes could be more likely to gain approval and might also provide environmental benefits. Coastal adaptation remains on the shortlist as an alternative approach to managing the risk of erosion. Both the nature-based solution and coastal adaptation options are relatively untested but are the subject of ongoing research projects elsewhere in the country. The evidence from these studies could be used to inform any future reviews of options for this stretch of coast.

7. Economic assessment of the shortlisted options

The economic costs and benefits of the shortlisted options were calculated in line with the relevant government guidance. The costs of each option were estimated by Mackley, using their experience of marine and coastal construction projects. The calculated benefit of implementing an option is based on the value of property and infrastructure that are protected, which would otherwise be lost through coastal erosion. Costs and benefits in future years must be 'discounted' to a lower amount to give an estimate of their value at the present day (the 'present value'). The present value benefits must exceed the costs for an option to be eligible for government funding. This is standard practice for any coastal or flood protection scheme requiring public money.

Benefit of protecting properties and infrastructure

Benefits were calculated assuming that the options would successfully prevent the loss of properties that may otherwise be at risk of loss during this century. This includes properties that may not be at risk of direct loss but are at risk of having their

access or utilities cut off by erosion. In this assessment, properties were considered at risk of loss when the clifftop reaches within 10 metres of the building, access route or utilities. The 10 metres is a buffer zone which should ideally be present between a property and the top of a cliff. For the coastal adaptation option, it was assumed that properties would be rebuilt in a different location before they would be lost to erosion.

The present value benefit of protecting the properties is estimated at £1.9m. This value is much less than the market value of the properties because they are not at risk for some time, meaning that the property values are heavily discounted to calculate the present value benefit of protecting them. The present value benefit of protecting the properties will rise as erosion continues.

The benefit of protecting the A259 was calculated based on the economic disruption that would be caused through loss of the road, from the year of loss up to the year 2120. This is estimated to have a present value of £293.5m. The present value benefit of protecting the main Southern Water sewer was estimated at £0.8m, considering the cost of construction of the sewer and the long time before it is at risk of erosion. Combining the calculated benefits gives a total of £296.2m.

Cost of implementing the shortlisted options

The estimated costs of the shortlisted options are shown in the table below. These are the present value costs of construction as well as the future operation and maintenance costs. The estimated costs of the shortlisted options are comparable to a more traditional engineering option. For example, a promenade or rock revetment between Portobello and Peacehaven would have an estimated cost of £25m.

Option	Total Present Value Cost
Do minimum	£1.3m
Coastal adaptation	£21.9m
Nature-based solution (reef in east and west)	£27.0m
Nature-based solution (reef in east; breakwater in west)	£23.2m
Biomimicry of nature-based solution (reef in east and west)	£23.0m
Biomimicry of nature-based solution (reef in east; breakwater in west)	£20.6m

Comparison of benefits and costs

The comparison of the benefits and costs demonstrates that the benefits of the options outweigh the costs by a ratio of 11:1 (for the most expensive option) to 14:1 (for the cheapest option). These positive ratios are entirely reliant on the benefits provided through the protection of the A259. If it were not for the road benefits the costs of the options would far outweigh the current benefits of protecting the properties.

Funding for the options

The positive comparison of benefits to costs means that a scheme to construct coastal defences would be eligible for a contribution from government funding subject to the necessary approvals being granted. The nature-based solution and biomimicry options would be eligible for this funding, known as Flood Defence Grant-in-Aid, if it can be demonstrated that these options would be effective in reducing the rate of erosion. Grant-in-Aid would cover the majority, but not all, of the costs of these options. The remaining costs could potentially be covered through a contribution from another fund, such as funding to support highways and wastewater infrastructure.

Commented [MJ1]: Subject to the necessary approvals being granted.

The coastal adaptation option is not currently eligible for Grant-in-Aid funding, because the funding is provided for the construction of defences and not the planned relocation of properties and infrastructure. Mechanisms for funding coastal adaptation are the focus of ongoing research such as the *Coastal Loss Innovative Funding and Finance (CLIFF)* project which is supported by Lewes District Council, the Environment Agency, and other local and national organisations.

8. Decision and next steps

The Environment Agency and Lewes District Council have considered the results of the recent investigations to plan the next steps. The new erosion assessment has significantly improved understanding of the risks associated with coastal erosion. Due to the low risk to property over the next 50 years there is not a case to intervene to reduce erosion currently. Therefore, there is no need to proceed with the development of options to reduce erosion. This section of coast will continue to be actively monitored and consideration will be given to future erosion risk management.

The investigations highlighted the future risks to infrastructure, such as the A259, and the significant benefits of avoiding the loss of this infrastructure. The infrastructure owners – East Sussex County Council and Southern Water – have been informed of the outcomes of this study, so that they are aware of the risks are understood, and it is hoped managed in collaboration across all relevant organisations. Work will continue to develop plans for this coast that aim to benefit both the local community and the wider region.

Uncertainties remain in the prediction of future coastal erosion, and a precautionary approach has been applied to avoid an underestimation of the erosion risk. While there will always be some uncertainties, they will be reduced significantly by the ongoing monitoring of the cliffs. New information is routinely collected for these cliffs as part of the *South East Regional Coastal Monitoring Programme*, which is supported by both Lewes District Council and the Environment Agency. This l data will be used to re-evaluate the coastal erosion assessment approximately every 10 years. This will allow any changes in erosion rates to be identified, and for the need for intervention to be periodically reviewed.

Current research in other parts of the country will provide greater clarity on the approaches that could be used in the future at Telscombe Cliffs. Topics of ongoing

research include the effectiveness of nature-based solutions in slowing erosion rates and the funding mechanisms for coastal adaptation.

The current management of the clifftop area by Lewes District Council is continuing. This includes the monitoring of the fence-line, and when necessary, the relocation of sections of fence.