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# Isles of Scilly Sea Defences Non-Technical Summary

**Final Report**

**November 2022**

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**Council of the  
ISLES OF SCILLY**

## JBA Project Manager

Harriet Thomlinson  
 JBA Consulting  
 Salts Mill  
 Victoria Road  
 Saltaire  
 Shipley  
 BD18 3LA

## Revision History

Revision Ref/Date	Amendments	Issued to
November 2022	Final Report	CIoS

## Contract

This report describes work commissioned by The Council of the Isles of Scilly. JBA Consulting carried out this work.

Prepared by ..... Harriet Thomlinson BA MSc MIEMA CEnv  
 Senior Environmental Consultant

Reviewed by ..... Tim Carter BSc MSc CMLI MIEMA CEnv  
 Technical Director

## Purpose

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## 1 Background

The Council of the Isles of Scilly is proposing to construct new coastal erosion and flood protection works at nine sites on the Isles of Scilly. Five of these sites are on the island of Bryher. Three sites are located on St Agnes Island, and one site, on St Martin's.

The Isles of Scilly are generally low lying and therefore many areas are vulnerable to flooding. This flood risk is likely to increase in the future because of the effects of climate change. The flood risk to the islands have been highlighted by storms in 1989, 2004 and 2014.

The aim of this project is to sensitively restore the large-scale dunes present across the islands and improve the flood protection they can provide. This will help protect infrastructure including freshwater supplies and road network.

An Environmental Impact Assessment (EIA) identifies, predicts, and evaluates the possible environmental effects of a proposed development. The findings of the Environmental Impact Assessment are then presented in an Environmental Statement. This document is the non-technical summary of the Environmental Statement, which explains the findings of the longer Environmental Statement in non-technical language.

### 1.1 Environmental Impact Assessment

An Environmental Impact Assessment (EIA) is required for some construction projects, when it is thought that they could create significant environmental effects, as set out in European and UK law. European Council (EC) Directive No. 85/337/EEC as amended by EC Directive No. 97/11/EC, EC Directive No. 2011/92/EU and EC No. Directive 2014/52/EU (hereafter collectively referred to as 'the EIA Directive') is transposed into UK law through the EIA Regulations and continues to apply following the UK's exit from the European Union.

An EIA screening opinion request was made by the Council of the Isles of Scilly to the Council of the Isles of Scilly Planning and Development department in May 2021 and it was determined in August 2021 that the proposed development would constitute EIA development. An EIA Scoping Request for similar proposed coastal and flood defence schemes across the islands of St Mary's and Tresco was made to the Council of the Isles of Scilly in 2017 and the Council of the Isles of Scilly Planning and Development department advised that the scope identified for these works should also be applied to the proposed development. Discussion with relevant Statutory Consultees about the specific issues and constraints to be considered within the EIA for the proposed scheme (to meet both planning and Marine Licence requirements) has been undertaken.

Environmental issues that were 'scoped in' required further detailed technical studies. These are presented in the Environmental Statement, the findings of which are summarised below.

### 1.2 Description of the sites

The Isles of Scilly are a group of over 200 islands located approximately 40km southwest of Lands' End, Cornwall (see Figure 1). The total population of the islands is around 2,200, which is largely spread across five islands. Tourism contributes significantly to the islands' economy, and during the summer months the population increases to about 6,000 people. The whole archipelago is designated as an Area of Outstanding Natural Beauty, a Conservation Area, and an area of Heritage Coast, which reflects the high quality of the environment there.

The coastline and adjacent low-lying land on Bryher, St Agnes, and St Martin's are vulnerable to flooding and coastal erosion during storms. Due to climate change, these issues are expected to worsen in the future.

Construction of new coastal defences are proposed at nine sites on Bryher, St Agnes and St Martin's. These are described below.

A range of alternative options were identified to manage coastal erosion and flood risk at each of the sites. A short list of options: do nothing, do minimum, do something (option 1) and do something (option 2) was identified for each location with a detailed options appraisal undertaken during the preliminary design stage which considered potential environmental impacts. Preferred options were selected based on the level of protection they would provide and potential environmental impacts.



**Figure 1: Site locations within the Isles of Scilly**

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

### **Bryher**

Bryher is the smallest populated island in the Isles of Scilly. It is in the north-west of the group of islands. Around 84 people permanently live on the island and the economy is largely based around tourism and agriculture. There are five proposed sites on the island of Bryher, shown in Figure 2.



**Figure 2: Location of the proposed works across Bryher**

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

### **Great Popplestone**

Great Popplestone is located on the west coast of the island of Bryher. The beach is made up of granite boulders and cobbles to the south and more typical sand dunes to the north. The bay faces the Atlantic Ocean and is therefore exposed to waves from the deep water.

The beach is a short distance from the Pool of Bryher and Popplestone Bank (Bryher) Site of Special Scientific Interest (SSSI). This site is protected as an important freshwater habitat for a range of plants and animals. There is also a large lagoon (Great Pool) located 45m south of the beach. There are numerous holiday accommodation properties close to the bay.





**Figure 3: Great Popplestone Location Plan.**

The current flood defences at Great Popplestone include a sea wall and rock revetment which is in poor condition. These defences are regularly overtopped by waves, allowing salt-water to flood Great Pool.



**Figure 4: Run down sea wall at Great Popplestone.**

Works are needed at Great Popplestone to protect the island's drinking water supply from being flooded with seawater.

The proposed works involve raising the height of the sea wall at the southern end of the bay to prevent waves from overtopping. Two options are currently under consideration to achieve this: moving scattered rock from the northern end of the bay for this purpose and allowing the dune to re-grade naturally or importing the required rock.

To prevent the areas of erosion from people walking along the beach, a potential board walk over this area is suggested. This will be supported with rocks and cobbles from the area.

### **Stinking Porth**

Stinking Porth is located on the west coast of Bryher, southwest of Great Pool. The beach is relatively narrow compared to other beaches on Bryher, in some shallow areas, waves have overtopped washing the cobbles over the top. A storm in 2014 damaged the crest of the bay. The beach is a short distance from the Pool of Bryher and Popplestone Bank (Bryher) SSSI.

Access to the area has led to some areas of the embankment being worn away over time. The bay is located approximately 60m southwest of the Great Pool and water abstraction points which provide the island's drinking water. Therefore, defences at Stinking Porth aim to protect Great Pool and water abstraction points.



**Figure 5: Stinking Porth Location Plan.**



**Figure 6: View of Stinking Porth and Great Porth from Gweal Hill.**

There is a need to increase the height of the top of the bay to protect the island's water supply. To do this, the proposed works include the construction of a new, taller revetment. This will be made from locally sourced rock; however some may also need to be imported.

This coastal defence will change the overall appearance of the beach from the current dune appearance but will protect the island's freshwater supply. Grasses will be planted behind the revetment to help recreate habitat and help make the soil more stable.

#### **Great Porth (Great Par) North of Great Carn**

Great Porth (Great Par) is located on the western coast of the island of Bryher. On the west of the island, the beach is directly exposed to the Atlantic Ocean. The beach is made up of sand with rocks and cobbles and is a short distance from the Pool of Bryher and Popplestone Bank (Bryher) SSSI and Rushy Bay and Heathy Hill (Bryher) SSSI which are important freshwater habitats for a range of plants and animals. Gig Shed is a Scheduled Monument approximately 10m south of the site, which is a nationally important archaeological site.



**Figure 7: Great Porth (Great Par) North of Great Carn Location Plan.**

The Great Pool, and water abstraction points which contains the island’s freshwater source, are located approximately 130m from the site. The existing flood defences include a concrete wall and rock armour, which require replacement.

Historic storms have affected Great Porth, which have disturbed the existing flood defences and led to the dunes being worn away. Based on observations, some residents have been adding materials to support the current flood defences.



**Figure 8: Embankment along the North of Great Porth.**

The proposed works at Great Porth (Great Par) North of Great Carn involve the construction of a sloping rock structure protecting the coastline from extreme storm events. Some of the rock material will be sourced locally however, some rock may be imported.

A removable flood barrier is proposed to protect the boat ramp. This flood barrier will be made from a steel frame with a stop log panel which can easily be erected by one person. In the case of a flood, there would need to be a warning system in place to allow an individual to build the barrier.

There is a similar structure on the northern end of the beach, so it is considered that the change in appearance in the beach will mirror the existing defences.

### **Green Bay**

Green Bay is located on the east coast of Bryher and is made up of sand and cobble with vegetation on the top. The bay is vulnerable to waves overtopping the embankment which could cause flooding of the boatyard.



**Figure 9: Green Bay Location Plan.**

The current flood defences include a stone wall and embankment which protect the coastal paths. Locally important community, cultural and commercial activities are located both on the frontage and behind Green Bay. The bay was affected by 2014 winter storms where waves overtopped the beach causing seawater to pond in the area behind the frontage.



**Figure 10: Green Bay beach.**

There is a Scheduled Monument approximately 40m north of Green Bay, 'prehistoric field system and Romano-British cist in Green Bay, Bryher' with multiple other Scheduled Monuments close by.

The proposed scheme looks to prevent flooding of the adjacent boatyard. To achieve this, a barrier will be constructed at the top of the beach to reduce water entering the boatyard. This will be made of containers filled with material, which will then be covered by the existing beach material. This additional embankment will be vegetated to help hold the material together, it is expected to be designed to have a natural appearance whilst protecting the boatyard.

### **Kitchen Porth**

Kitchen Porth is located on the northeast side of Bryher and is a small beach mainly composed on sand and some cobbles. The south corner of the beach is especially vulnerable to wave activity. There is evidence of erosion in the beach as tree roots are exposed along the edge of the beach which help to keep the beach stable.



**Figure 11: Kitchen Porth Location Plan.**

There are some residential and non-residential properties at risk of flooding, including the post office and an access road. The Shipman Head and Shipman Down (Bryher) SSSI (designated for waded; maritime heathland) and Isles of Scilly Ramsar are located at the back of the bay, with a small area to the north. A prehistoric cairn cemetery and field system to Shipman Head Down and Great Bottom, Bryher is located alongside to Kitchen Porth.

At Kitchen Porth, the proposed scheme seeks to protect some residential and non-residential properties including the adjacent road, the Shipman Head and Shipman Down (Bryher) SSSI and the Isles of Scilly Ramsar site.

To protect the current defences, many large boulders will be placed in front of the existing structure on the beach without increasing the height of the coast. It is expected that waves may still travel over the top of the beach and some overtopping discharge may reach/percolate the gardens of the adjacent properties.

### **St Agnes**

St Agnes is located south-west of St Mary's, and has a population of 85. The three proposed sites on the island are in the northwest of the island.

Big Pool and Big Pool and Browarth Point (St Agnes) SSSI are located between the three sites. Sea water flooding is a big threat to Big Pool and it is currently protected by the existing defences.



**Figure 12: Location of proposed sites on St Agnes.**

### **Porth Killier**

Porth Killier is located at the northern area of the island of St Agnes, approximately 120m east of Big Pool. Big Pool and Browarth Point SSSI, the Isles of Scilly Ramsar site and a Scheduled Monument, 'prehistoric settlement and field system at Porth Killier, St Agnes' are located in close proximity of the site.



**Figure 13: Porth Killier Location Plan.**

Currently, there is a large concrete wall which is protecting a cliff which contains internationally important prehistoric remains. This wall is being eroded away at the base, and in the south-east section of the wall is at risk of being overtopped. An area of the embankment to the northwest is also at risk.

Coastal erosion at Porth Killier could result in the contamination of freshwater sources for the island. There is also a risk that the Big Pool may become flooded with saltwater and the water abstraction points close by. Flooding could also result impact the road which runs along the southern area of Porth Killier. There are also multiple residential and non-residential properties located 80m south of Porth Killier, including the Porthconger Quay, which is the main access route for the island, 150m east.

Improved defences are needed at Porth Killier due to potential contamination of Big Pool and potential flooding of roads and properties close by. The proposed scheme is split into three areas: the sea wall, the eastern end, and the western end.

At the seawall, it is proposed that rocks will be placed at the bottom of the wall to protect the structure and prevent waves from overtopping the wall. Where the wall is the most damaged (eastern side), a larger rock armour toe berm will be used. This may require rocks to be imported if they cannot be found locally.

In the eastern end, there will be a sloping rock structure built to prevent erosion. This structure will also be protected by cobbles placed at the bottom, which will make use of the materials on the beach. This should make this area more stable.

There are no proposed works for the western end as no overtopping of waves has occurred in this area of Porth Killier.

### **Porth Coose**

Porth Coose is located on the north-western extent of the island of St Agnes and is approximately 40m northwest of Big Pool. A low dune separates the site from Big Pool and Browarth Point SSSI and Isles of Scilly Ramsar site.





**Figure 14: Porth Coose Location Plan.**

Following storms in 1989/90, boulders were placed in the weakest area of the dune, with more defences built in 1996. During 2014 storms, the flood defences were overtopped and damaged. Following these storms, local observation suggests that some informal defences were laid. At present, the existing flood defences leave much of the area vulnerable to flooding, including Big Pool. There is a path which runs along the edge of Porth Coose, however, there are no residential or non-residential properties close by.



**Figure 15: Former rail and boulder groyne from Ginamoney Carn to the point between Porth Coose and Periglis Beach.**

The proposed work at Porth Coose aims to protect Big Pool, important freshwater habitat, wells, aquifers, and local infrastructure. As the current defences have been overtopped by waves, improved defences are required.

To improve the defences, it is suggested that a layer of rocks is placed along the top of the beach. This would increase the height of the beach, using both materials found

locally and imported. This will be placed on top of a geotextile which will allow plants to grow through. A layer of soil planted with locally found plants will help tie this material together. This should increase the height of the top of the beach by approximately 7.3m.

### Periglis

Periglis is located in the northwestern area of the St Agnes adjacent to Porth Coose. The site is located approximately 70m west of Big Pool with a natural embankment which protects it. The beach is made of sand and pebbles with multiple residential and non-residential properties towards the southern end, including St Agnes church.



**Figure 16: Periglis Location Plan.**

A Scheduled Monument 'two early post-medieval quays in north and northwestern Periglis, St Agnes' is located at the northern end of the beach. Big Pool and Browarth Point (St Agnes) SSSI and Isles of Scilly Ramsar site are located next to the beach.

The beach is protected by an embankment and supported by material which is experiencing frequent erosion. Repairs were made to the embankment following the 2014 winter storms, rocks and boulders have been added to the defence near the beach entrance.



**Figure 17: Additional rocks and boulders at entrance to Periglis Beach.**

Erosion risks the loss of a coastal path which surrounds the bay. There are some lower sections of the dunes which are overtopped by waves and therefore present a flooding risk to the meadow south of Big Pool, including properties, local buildings, important freshwater habitat, wells, and areas where water enters the groundwater. It has also resulted in the loss of vegetation to the top of the dune at the southern end of the bay. The landward side is in better condition and has a good covering of vegetation.

The proposed scheme at Periglis seeks to improve existing defences which are experiencing regular erosion. The proposed scheme aims to protect both residential and non-residential properties, local infrastructure, and Big Pool.

To achieve this, the proposed scheme includes placing containers of sand covered with cobbles along the bay. Where possible, this material will be sourced locally, but if it is not available, it will be filled with local or imported rocks and nets. As the containers will be covered, they will not be directly visible. These will be protected with a layer of matting which will encourage plants to grow on the area and provide further protection.

This will raise the height of the bank by approximately 7.5m and increase the width to a minimum of 4m to prevent waves from overtopping the beach. To achieve this height, the existing bank will be topped up. If locally sourced material is not available to add to the dune, some material will be imported, possibly from quarries in Cornwall.

### **St Martin's**

St Martin's is the furthest east of the five populated islands of the Isles of Scilly and has a 136 people inhabitants. There are no formal sea or coastal defence structures on the island. The island has several local quays and slipways on the south/southwest of the island.



**Figure 18: St Martin's Plan.**

**Lower Town Beach**

Lower Town Beach is located on the western extent of the island of St Martin's Island. It is located to the southwest of the village of Lower town, and alongside St Martin's Sedimentary Shore SSSI which is protected for the presence undisturbed of marine wildlife and associated habitat. The sand dunes represent an important habitat which should be protected, as well as protecting properties and infrastructure from flooding.



**Figure 19: Lower Town Beach Location Plan.**

The beach is made up of sand and vegetated dunes, which were damaged in 2014 but are showing signs of self-repair. There are signs of erosion across the beach because of human activity, which has exposed some cables within the dunes. To prevent further erosion, human activity will be managed and controlled.

The main aim of the proposed work at Lower Town Beach is to prevent erosion which is caused by human activity on the beach, and which may weaken the current dune defences.

To achieve this, the proposed scheme includes fencing off the areas which are the most sensitive to development to limit access. At the west of the beach, extra protection is proposed which involved grids filled with sand which will allow vehicle access. This would match the existing appearance of the area. The proposed scheme also suggests general pedestrian footpath management which will use signage and fencing to allow areas of the dunes to recover following erosion.

In addition, the proposed scheme entails the provision of a removable slipway that can be laid as needed and removed and stored during the winter to enhance beach access.

### 1.3 Scheme construction

It is expected that construction of the proposed schemes across the islands of Bryher, St Agnes and St Martin's will commence in the winter of 2022/23, subject to obtaining the necessary permissions and consents, and will be completed by March 2024. This avoids the busiest summer period when most of the tourists visit the island. However, works on sites which are least used by tourists may occur outside of this timescale.

Due to site constraints, each island will have its own methodology or plan/material deliveries. It is intended that all materials will be delivered to the sites where they will be used directly by barge, however, where this is not feasible, they will be delivered to the nearest site and transported by road. The exact methodology will be determined by the appointed contractor before construction starts.

#### **Bryher**

The construction of the proposed schemes across the island will be facilitated through the access routes, landing sites and temporary storage areas illustrated on Figure 20 below. There will be a forward working area behind Great Popplestone, and temporary materials storage areas located close to each site. It is expected to take 48 working days to complete the construction of the five schemes.



**Figure 20: Construction access routes across the island of Bryher.**

### **Great Popplestone**

It is expected that the works at Great Popplestones will take approximately 15 days in May 2023. Materials will either be transported by barge using the landing site at Great Popplestone beach and moved to the adjacent materials storage area, or if not feasible, landed at the closest site and transported along the access track which runs along New Road and connects to an existing track to the west of Great Pool. There is also an alternative access track running across the island to the north of Great Pool.

An excavator will be used to either move exposed Cornish granite rocks from the north of the beach or move the imported rocks into position. A boardwalk will be built to return access to the beach.

### **Stinking Porth**

It is expected that the works at Stinking Porth will take approximately 10 days in May 2023. Materials will either be transported by barge using the landing site at Stinking Porth beach and moved to the adjacent materials storage area, or if not feasible, landed at the closest site and transported along the access track along New Road. There is also an alternative access track running across the island to the north of Great Pool.

It is assumed that the rock armour revetment will be built using an excavator and dumper truck.

### **Great Porth (Great Par) North of Great Carn**

It is expected that the works at Great Porth (Great Par) North of Great Carn will take approximately 15 days in April and May 2023. It is acknowledged that boat users and fishermen use the beach and therefore works will avoid June and September (inclusive).

Materials will either be transported by barge using the landing site at the beach at Great Porth (Great Par) North of Great Carn and moved to the adjacent materials storage area, or if not feasible, landed at the closest site and transported along the access track along New Road.

It is assumed that the new revetment will be built using an excavator and dumper truck.

### **Green Bay**

It is anticipated that the proposed works will take 3 days in June 2023. Materials will either be delivered directly to the beach via barge using the landing site on the beach, or if not feasible, will be landed and stored at the closest site and transported from Church Quay southwards along the beach at Green Bay within the tidal patterns to the location at the south of the beach. An excavator will be used during construction and work.

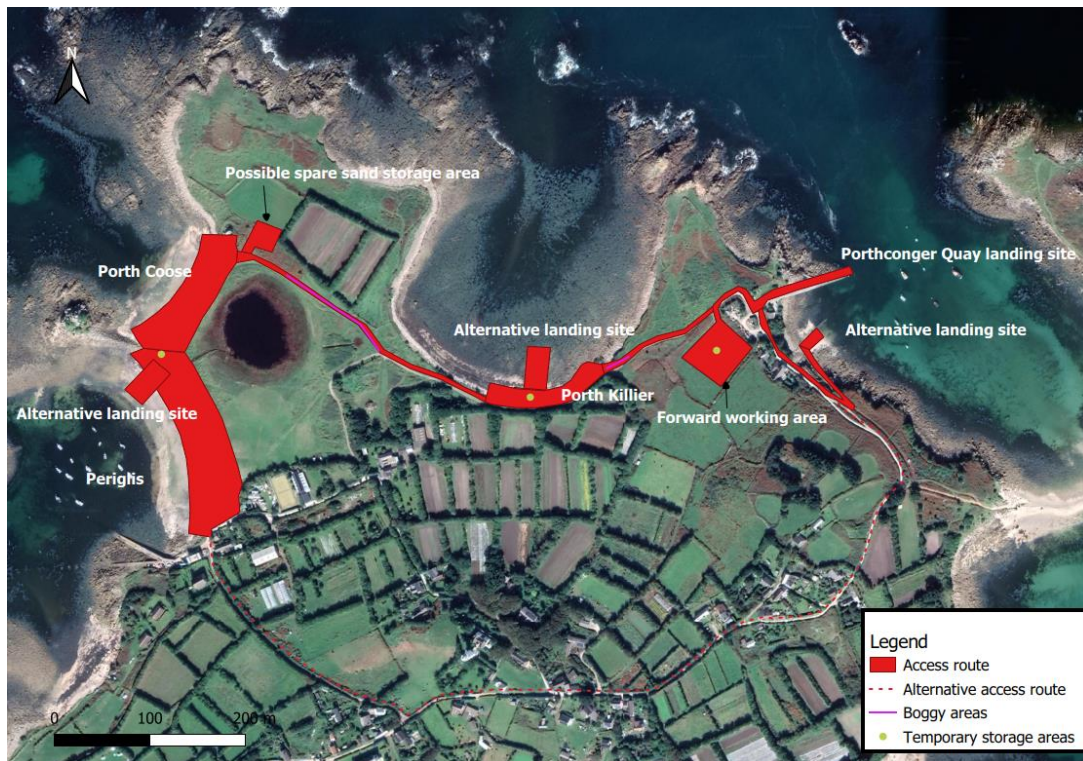
### **Kitchen Porth**

It is expected that the proposed scheme at Kitchen Porth will take approximately 3 days in May 2023. Materials will either be delivered directly to the beach via barge, using the landing site on Kitchen Porth beach, or if not feasible, landed and stored at the closest site and be transported along the proposed access track. The construction of the armourstone will require a 360° 20 tonne excavator.

### **St Agnes**

The construction of the proposed scheme across the island of St Agnes will use the access routes, landing site and forward working area shown on Figure 21 below. As well as the forward working area, there is a storage area for spare sand and materials to the east of Porth Coose. The construction compound and materials storage area for the proposed works on St Agnes is located next to Porthconger Quay. A temporary storage and working area will also be defined at each of the scheme locations for the duration of the construction period.

It is expected that the construction works will take a total of 53 working days.



**Figure 21: Construction access routes across the island of St Agnes.**

### **Porth Killier**

It is expected that the construction of the works will take approximately 10 days in March 2023. Materials will either be delivered directly to Porth Killier beach by barge using the landing site on the beach, and moved to the adjacent temporary storage area, or if not feasible, landed at the closest site and transported along the access track using a truck, or an alternative smaller vehicle depending on the width of the track. It is assumed that a 360° 20 tonne excavator and a 6-tonne dumper truck will be used for the construction.

### **Porth Coose**

It is anticipated that construction of the proposed schemes at Porth Coose will be undertaken over approximately 15 days in February 2023. Materials will either be delivered directly to Porth Coose beach by barge using the landing site on the adjacent Periglis beach, and moved to the adjacent temporary storage area, or if not feasible, landed at the closest site and transported along the access track (using the alternative access track during wet periods). It is assumed that a 360° 20 tonne excavator will be used to move the material needed for construction.

### **Periglis**

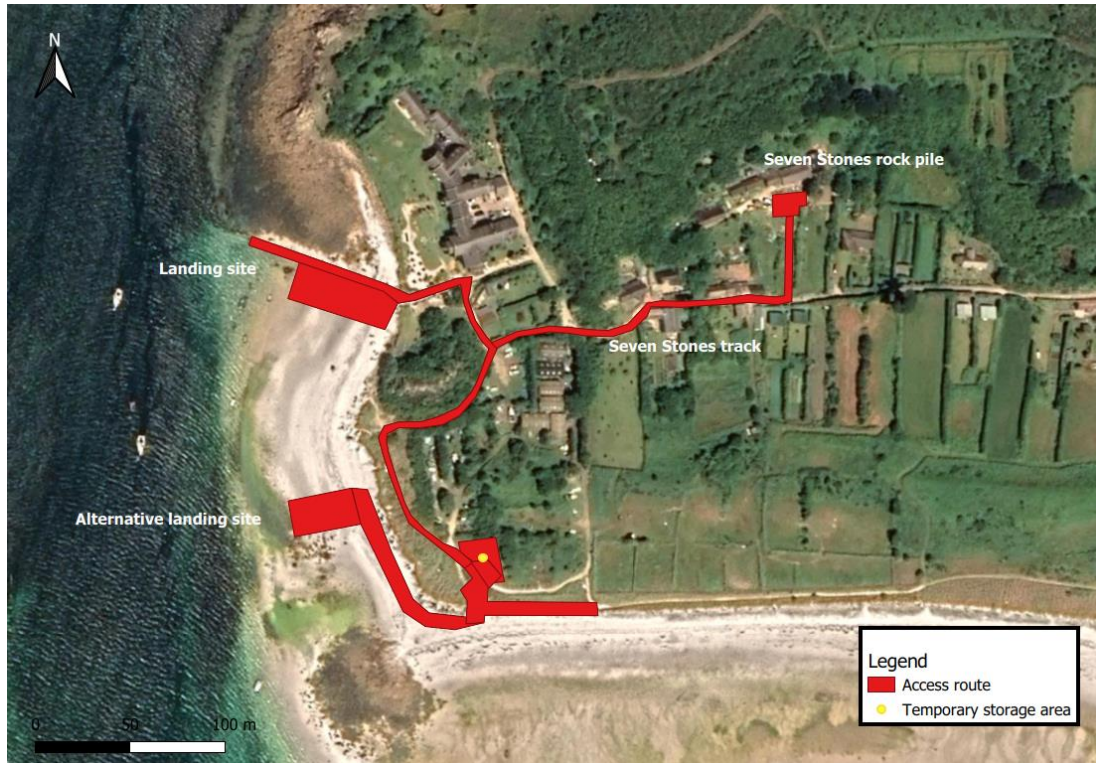
The proposed works at Periglis is expected to take approximately 28 days in January and February 2023. Materials will either be delivered directly to Periglis by barge using the landing site on the Periglis beach, and moved to the adjacent temporary storage area, or if not feasible, landed at the closest site and transported along the access track (using the alternative access route during wet periods). It is assumed that it will be transported using a 20-tonne truck, or an alternatively smaller vehicle if required. It is assumed that a 360° 20 tonne excavator will be used to move the material needed for the excavation and movement of existing material at the top of the beach (mix of sand and cobbles).



## **St Martin's**

### **Lower Town Beach**

Construction of the proposed scheme on the island of St Martin's will use access routes shown on Figure 22. Construction materials will be transported to St Martin's by an appropriate vessel which will arrive either at St Martin's quay and transported via Lower Town ramp, or at the beach landing site approximately 120m south. Construction materials will be offloaded and transported to the temporary storage area behind the beach. It is anticipated that deliveries will be staggered. Any intertidal works will cease three hours prior to the anticipated high tide time. It is assumed that a 360° 20 tonne excavator will be used to fill the open grid protection matting.



**Figure 22: Construction access routes across the island of St Martin's.**

## **2 Summary of Environmental Impacts**

### **2.1 Coastal Processes**

The flow of seawater between the Isles of Scilly is very complicated. As the islands are exposed to waves from the Atlantic Ocean, these waves can be very large and have a lot of energy. Sand is constantly being transported around the islands by wave action to a greater extent than in most other coastal areas.

Construction of new coastal defences can affect the existing coastal processes, which include waves, tides, sediment movement, and flooding. Impacts upon these physical processes can have wider environmental consequences, which can affect the amount of sand on a beach and affect local wildlife.

An assessment has been undertaken to identify any impacts on these coastal processes because of the new flood defences. Where impacts have been identified, actions have been recommended to minimise the significance of these impacts.

Across the nine sites across the islands of Bryher, St Agnes and St Martin's, it is expected that the construction of the works outlined will not have significant impacts on the sand and wave movements locally

It is also expected that the once the flood defences have been built across Bryher, the work will have a positive effect on flood risk at Great Popplestone, Stinking Porth, Great Porth (Great Par) North of Great Carn, Green Bay, Porth Killier, Porth Coose and Lower Town Beach.

### **2.2 Biodiversity and Nature Conservation**

Within 2km of the proposed works there are several statutory sites, many of which multiple overlap. This includes Isles of Scilly Special Protection Area (SPA), Isles of Scilly Complex Special Area of Conservation (SAC), Isles of Scilly Ramsar site, and seven Marine Conservation Zones (MCZ). These are designated for a range of habitats and species including bird species, marine invertebrates, important marine and freshwater habitats, rare plant species and features of geological interest. It is not anticipated that the proposed works will lead to a significant adverse effect on the conservation status of the sites.

An Ecological Impact Assessment was undertaken to identify the potential ecological impacts of the proposed schemes across the islands of Bryher, St Agnes and St Martin's. For the most part, impacts arising from the schemes will be small in scale and limited to the construction phase of the project.

The schemes will result in the small scale loss of maritime vegetation (including vegetated shingle plants) present within the existing flood defence structures or in sediments built up against them. It is likely that the same plants will recolonise the new defence structures, however, a small scale residual loss is possible.

The schemes will result in the small scale loss of sand above the high tide mark, this habitat does not hold high ecological value.

There is the potential for small-scale impacts to coastal birds through construction-related visual and noise disturbance in the winter months. However, sequential working will be undertaken (where works are completed at one site before moving onto the next) to minimise energy loss from birds moving away from disturbance.

Compaction of the foreshore will be temporary and will recover quickly once the works have been completed.

Appropriate mitigation during the construction phase has been recommended to minimise impacts to an acceptable level at all of the sites. An Ecological Clerk of Works should be present during any landing of materials on the beach to ensure that any sensitive marine habitats are avoided.

To minimise disturbance and habitat degradation, plant will keep to agreed haul routes and not stray outside of these areas.

Strict pollution prevent measures will be implemented across the site to ensure any potential damage to habitats via pollution run-off is minimised.

An invasive species management plan will be written in order to ensure that the works do not cause the spread of any invasive non-native species, and strict biosecurity and mitigation measures will be put in place. All local biosecurity measures to ensure the works do not facilitate the spread of Brown Rats will be adhered to and documented in a biosecurity risk assessment.

### **2.3 Landscape and Visual**

An assessment has been undertaken to determine whether the proposed flood defences would have an impact on the local landscape.

The Isles of Scilly AONB is a designation which covers the whole of the Isles of Scilly. The islands have a wide variety of scenery and designations. The Isles of Scilly are also within the National Character Area 158: Isles of Scilly, which is characterised by low-lying granite islands, a sense of remoteness and tranquillity and a strong influence by the ocean.

To assess how the proposed sea defences would impact upon landscape character and views of the affected areas, viewpoints were selected for each site and the potential changes to the views from these viewpoints were assessed.

The most common impacts on landscape receptors across Bryher include a small loss of existing landscape character at Green Bay and Kitchen Porth and increase or introduction of uniform rocks at Kitchen Porth, Great Porth and Stinking Porth. There would be temporary disruption during construction which includes moving vehicles across all sites in Bryher. There will also be some slight impacts to landscape by the construction of flood defences which are different to the existing landscape at Great Porth (Great Par) North of Great Carn and Stinking Porth.

There will be temporary construction impacts including moving vehicles at all three sites at St Agnes. At Porth Killier, impacts also include increasing the amount of uniformly sized ricks and covering the embankment. At Porth Coose and Periglis the impacts will also include the construction of a structure which is different to the surrounding area, covering the existing engineered fabric at Periglis, and the addition of vegetation to the area.

The impacts to landscape at Lower Town Beach are likely to include the construction of a fence, filled grid structure and ramp and some temporary disruption during the construction including moving vehicles.

The significance of effects upon landscape receptors during construction and upon completion it was considered to be slight adverse (negative).

The assessment concluded that the visual impacts likely to result from the proposals are small in scale and for the most part slight adverse (negative). The most common visual impacts are because of the construction of proposed works.

Once built, the most significant impacts are the appearance of a new crest at Green Bay; rock bags along the length of Porth Coose and the erosion control mats at Lower Town Beach.

Overall, the measures suggested would result in a slight beneficial long-term significance upon landscape character and effects of very low or neutral significance upon views. These effects should also be considered that without the proposed works, the current coastal erosion trend will be more damaging to landscape character and views.

## 2.4 Historic Environment

An assessment was undertaken to determine whether the proposed flood defences could impact any heritage sites or archaeological remains.

There will be no direct impacts on any known designated or non-designated heritage assets at many of the sites across Bryher, St Agnes and St Martin's, and it is very unlikely that archaeological remains are present at many of the sites, or that the proposed works will affect the setting of designated assets,

At Great Porth (Great Par) North of Great Carn, the proposed works will take place within the scheduled area of the post-medieval boathouse and will impact on surviving structural remains of the boathouse through construction of the proposed rock armour. The work will need approval from Historic England for working within a scheduled area of Scheduled Monument. Mitigation measures to minimise impacts on the boathouse remains will be agreed with Historic England. Potential mitigation measures could include recording and evaluation or restoration and conservation of any remains that will survive. The presence of the boathouse should be included with the Construction Environmental Management Plan.

At Green Bay, the works will not impact any known or non-designated heritage assets. The assessment showed there is a low/ very low potential for remains to survive within the site. Any remains were likely to have been disturbed by recent activity. It is also very unlikely that the work will have an impact on the setting of designated assets and unknown archaeological remains. However, the transport of materials to the site along the foreshore from Church Quay passes through the Scheduled Monument Prehistoric field system and Romano-British cist in Green Bay (1014989) and has the potential to damage features related to it.

At Porth Killier, the proposed works lie within the scheduled area of the Prehistoric Settlement and Field System at Porth Killier and installation of rock armour will take place within the Scheduled Monument. The Scheduled Monument is currently suffering from coastal erosion, which could impact on buried remains within the Scheduled Monument. Therefore, the proposed defences would serve to reduce the threat the monument faces from coastal erosion and provide protection to surviving buried remains. The construction of the scheme may impact the setting of the Scheduled Monument due to vehicle movement along the route.

At Porth Coose and Periglis, the assessment concluded that there will be no direct physical impacts on any known designated assets. The works will directly impact on the 1996 seawall; however, this asset is of low importance, so mitigation measures are not necessary. Raising the height of the crest is likely to have a neutral impact on the Isles of Scilly Conservation Area. There will be no direct physical impacts on any other recorded non-designated assets and is very low potential for archaeological remains to survive within the site. There will be some impacts on the setting of St Agnes Church, however this will only occur during construction.

The delivery of materials to the island will not impact any designated or non-designated assets. The alternative landing location adjacent to Turk's Head would use a non-designated slipway and it is recommended that this should be avoided where possible. The proposed sand storage area adjacent to Porth Coose has the potential to impact on archaeological remains.

All of the sites are within the Conservation Area, the construction of the proposed works may impact this asset by plant activity, movement of vehicles and storage of materials. The impacts will be temporary and will end following construction. The impact of the proposed works is likely to be minimised through sensitive design choices.

## 2.5 Land Use, Tourism and Recreation

An assessment was carried out to determine whether the proposed flood defences would have an impact on land use, tourism or access to areas by the public.

The construction of the proposed works across the islands are mostly in areas where there are existing coastal defences. During the construction, the existing roads, permissive footpaths and tracks will be used to access the sites. There will be some disruption during the works on each island as the contractor moves between sites. However, it is not expected to have any long-term significant impacts on site because of the proposed works.

As the majority of the proposed works means replacing existing coastal defences it is not expected to affect the existing land-uses.

At all sites across Bryher, the proposed construction works would have a temporary impact on access and recreation due to restricted access for users to the area. The delivery of materials to the sites, is likely to have a temporary slight impact on access for users of the nearby existing roads, footpaths and the beach at Green Bay due to closures and restricted access.

At Porth Coose and Periglis, there may be an impact on beach access due to the construction of the proposed works. This is broadly due to closures, and restricted access to beaches.

The delivery of material for access on St Agnes is expected to have a slight temporary negative impact on the surrounding footpaths, tracks and Porthconger Quay due to restricted access for users. However, an alternative option is the delivery the materials directly to the site, if feasible.

At Lower Town Beach there will be an impact on beach access as a section of the dune and footpath will be closed. Materials will be delivered to site using a track from St Martin's quay, or to the beach directly, therefore there will be some temporary disturbance to users and restricted access to vehicles.

There is potential for the construction of the proposed schemes to impact tourism through restriction of some access to beaches to facilitate the construction works, visibility of the construction works, and potential disturbance of this peace and quiet due to the movement of construction vehicles and the associated noise emissions. However, it is proposed that the construction works will be undertaken outside of the main tourist season.

## 2.6 Climate Change

The overall impact of climate change relating to the proposed scheme are likely to include risk from sea level rise, currents and waves, storms surge, increases in winter rainfall, extreme rainfall, storms, droughts, extreme temperature events, gales, and extreme wind events.

During construction, most effects are likely to be insignificant, there are some climate hazards which have a significant risk for the health and safety of site workers, the site compounds, materials and machinery and plant. However, these risks can be minimised to reduce the level of risk. The construction phase will also emit greenhouse gases and contribute to climate change, due to the sourcing of materials, transportation and use of construction equipment.

Once built, there are significant risks to any repair and maintenance workers. Climate change is resulting in more extreme weather events, and this will make some increase some risks.

The proposed scheme is a response to the consequences of climate change. Climate change is resulting in more extreme weather phenomena and will continue to cause

flood events to be more frequent, more severe, and less predictable. The potential impact climate change will have upon storminess could further worsen these issues. The scheme has been designed to adapt to future climate change.

## **2.7 Other construction related effects**

An assessment was undertaken to determine whether construction of the nine schemes could cause other impacts on the environment, namely air pollution, traffic congestion, noise pollution and light pollution.

The Isles of Scilly are largely rural. As a result, air quality is very high and traffic levels are low. The Isles of Scilly is a mainly a low-noise environment, with background noise coming from the sea in most areas, or traffic and boats. The entire Isles of Scilly Local Authority Area is designated as an Area of Outstanding Natural Beauty and light pollution is very low.

Air quality, traffic, noise/vibration and light pollution have all been assessed for each construction process to assess whether these impacts might be significant or noticeable.

There is no traffic data available for the islands of Bryher, St Agnes and St Martin's, however, anecdotal evidence suggests that the roads are not used frequently. It is intended that all materials will be delivered directly to the site where they will be used by barge to minimise impacts of construction traffic. However, where this is not feasible, materials will be delivered to the closest site and transported by road.

The nine schemes will not be constructed simultaneously, rather one will be built before the next. It is assumed that all necessary vehicle journeys will be staggered throughout the day, and not need any road closures. Therefore, the additional construction vehicles using the roads will not cause significant effects on delays for drivers and pedestrians during the construction period.

Given the low level of existing traffic, these increased vehicle movements may lead to negative impacts for road users and surrounding residential receptors. However, a range of temporary traffic management measures are likely to be required to allow for the construction works and lessen potential impacts. A Construction Traffic Management Plan will be developed and put in place by the contractor and agreed with the Council of the Isles of Scilly before works start and to record an in-depth approach and timings for deliveries and other matters relating to safety on the access routes.

There is the potential for construction works to lead to dust emissions due to earthworks and vehicle track out. However, appropriate mitigation measures will be implemented to manage these risks, in accordance with the Institute of Air Quality Management guidelines, with measures including the development and implementation of a Dust Management Plan and erecting screens or barriers around dusty activities.

There is also the potential for construction works and vehicles to lead to temporary noise and vibration effects on surrounding receptors. Appropriate mitigation measures will be implemented to reduce noise impacts from construction plant in accordance with British Standard 5228 including restricting the movement of vehicles at particular times of day and fitting more efficient exhaust sound reduction equipment on excavators and dumpers.

It is assumed that ground investigations will be undertaken prior to the start of construction to identify any requirements for remedial works to be undertaken associated with ground conditions. Measures will be undertaken to minimise risks of pollution to the marine environment following the CIRIA guidance Control of Water Pollution from Construction sites.

## **2.8 Cumulative effects**

An assessment of potential cumulative effects has been undertaken. It identified whether the effects caused by the flood defence schemes could combine to cause a greater effect, and whether other developments and operations on the Isles of Scilly could cumulatively combine with effects caused by the proposed sea defences, to impact the environment in a greater way than the developments alone. Overall. No residual effects regarding cumulative or combined impacts were identified.

## **2.9 Conclusion**

It has been determined that the proposed development may lead to a number of environmental effects, however, none of these are predicted to be significantly adverse. The development will in fact result in beneficial impacts on flood risk across Bryher, St Agnes and St Martin's during extreme events and recovery of sand dune habitat on St Martin's.

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Wallingford  
Warrington

Registered Office  
1 Broughton Park  
Old Lane North  
Broughton  
SKIPTON  
North Yorkshire  
BD23 3FD  
United Kingdom

+44(0)1756 799919  
info@jbaconsulting.com  
www.jbaconsulting.com  
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