DUMFRIES & GALLOWAY
SHORELINE MANAGEMENT PLAN

Strategic Environmental Assessment
Environmental Report

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Shoreline Management Plan
F05

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Prepared by:

RPS

Richard Bingham
RPS Consulting Engineers

Elmwood House
74 Boucher Road, Belfast
Co. Antrim BT12 6RZ

T +44 2890 667 914

E richard.bingham@rpsgroup.com

Prepared for:

Dumfries & Galloway Council

Brian Templeton
Team Leader, Flood Risk Management Team, Roads and Infrastructure
Garroch Business Centre, Cargenbridge
Dumfries DG2 8PN

T 01387 260303

E Brian.templeton@dumgal.gov.uk

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ABBREVIATIONS

AA	Appropriate Assessment
ASA	Archaeologically Sensitive Area
ATL	Advance the Line
AWI	Ancient Woodland Inventory
BAP	Biodiversity Action Plan
BAT	Best Available Techniques / Technology
BFF	Biodiversity Flora and Fauna
CEMP	Construction Environmental Management Plans
CH	Cultural Heritage
CF	Climatic Factors
CJEU	Court of Justice of the European Union
CPU	Coastal Process Unit
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EU	European Union
FRMP	Flood Risk Management Plan
GES	Good Environmental Status
GDL	Gardens of Designed Landscape
GHG	Greenhouse Gas
GSL	Geology Soils and Land use
HD	Habitats Directive
HES	Historic Environment Scotland
HRA	Habitats Regulation Appraisal
HTL	Hold the Line
IED	Industrial Emissions Directive
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
LCA	Landscape Character Assessment
LDP	Local Development Plan
LNR	Local Nature Reserve
MA	Material Assets
MCA	Marine Conservation Area
MHWS	Mean High Water Spring
MPA	Marine Protected Area

MoD	Ministry of Defence
MSFD	Marine Strategy Framework Directive
MR	Managed Realignment
NAI	No Active Intervention
NFRA	National Flood Risk Assessment
NMPi	National Marine Plan interactive
NSA	National Scenic Area
OTA	Objective Target Area
PHH	Population and Human Health
PMF	Priority Marine Feature
PU	Policy Unit
PVA	Potentially Vulnerable Area
RBD	River Basin District
RBMP	River Basin Management Plan
RCP	Representative Concentration Pathway
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SEO	Strategic Environmental Objective
SEPA	Scottish Environment Protection Agency
SIMD	Scottish Index of Multiple Deprivation
SMP	Shoreline Management Plan
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
STW	Sewage Treatment Works
SWPA	Shellfish Water Protected Area
UKCP	United Kingdom Climate Projection
UNCLOS	United Nations Convention on the Law of the Sea
WFD	Water Framework Directive
WHS	World Heritage Site
WTW	Water Treatment Works

NON-TECHNICAL SUMMARY

Introduction

The requirement for the Dumfries & Galloway Shoreline Management Plan (SMP) was identified by the Scottish Environment Protection Agency (SEPA) and Dumfries & Galloway Council, through the development of the Solway Local Flood Risk Management Plan. The SMP aims to provide guidance to operating authorities and regulatory bodies as to future sustainable flood and coastal erosion risk management; essentially providing an agreed high level approach, intent, and framework for management. In addition, the SMP aims to provide guidance to planners, and to individuals and organisations, with interests in the coast; setting out an understanding of coastal behaviour, the pressures, constraints, and opportunities for the sustainable use of the coastal zone, to guide others in developing their own planning. The SMP is being developed in partnership with the operating authorities and those other organisations with key roles in shoreline management.

The SEA Directive has been implemented in order to integrate environmental considerations into the preparation of plans and programmes and is a means of ensuring a high level of protection for the environment, while also promoting sustainable development. The SEA Directive will ensure that consideration is given to the environment in developing the SMP.

An SEA Scoping Report for the SMP was circulated in March 2020 to the following statutory consultees:

- Scottish Environment Protection Agency (SEPA)
- NatureScot
- Historic Environment Scotland (HES)

Non-statutory stakeholders were also provided with this Scoping Report and all information was made publicly available via the Dumfries & Galloway Council website. Consultee responses to the SEA scoping were considered during preparation of the SEA Environmental Report, wherever possible.

Description of the Plan

The SMP is a large-scale assessment of the risks associated with coastal processes. It identifies policies to manage these risks to people and the developed, historic, and natural environment. The objectives of the SMP are as follows:

- Setting out the risks from flooding and erosion to people and the developed, historic, and natural environment within the SMP area;
- Identifying opportunities to maintain and improve the environment by managing the risks from floods and coastal erosion;
- Identifying the preferred policies for managing risks from flooding and erosion over the next century;
- Identifying the consequences of putting the preferred policies into practice;
- Setting out procedures for monitoring how effective these policies are;
- Informing others so that future land use, planning and development of the shoreline takes account of the risks and the preferred policies;
- Discouraging inappropriate development in areas where the flood and erosion risks are high; and
- Ensuring compliance with international and national nature conservation legislation and aiming to achieve the biodiversity objectives, and
- Ensuring that key stakeholders and communities are engaged throughout the study to inform and contribute to the development of updated SMP policy recommendations.

The SMP covers the period from 2022-2122, split into three epochs of short term, 0 - 20 years, medium term, 20 – 50 years and long term, 50 – 100 years. The SMP will be reviewed periodically for updates and to monitor progress and impacts.

Six Coastal Process Units (CPUs) were identified for the Solway coastline, defining the areas within which various measures can be applied without affecting adjoining sections of the coast.

Four alternative high-level policy options were identified for the SMP to meet its objectives, as follows:

- No Active Intervention (NAI);
- Hold the Line (HTL);
- Advance the Line (ATL); and
- Managed Realignment (MR).

The CPUs were divided into smaller areas called Policy Units (PUs), with each PU assigned its own policy for future management of the shoreline. In total, 35 PUs were defined across the six CPUs. For each PU, a four-stage process was followed to identify the preferred policy / policies, including identification of receptors and assets at risk of coastal flooding and erosion, technical, economic, environmental, and social considerations, identification of preferred and alternative management approaches over the short, medium, and long term and consultation with stakeholders and the public regarding these identified policies.

Methodology and Consultations

This SEA Environmental Report has been produced to assess the potential environmental impacts of the preferred shoreline management policies put forward in the Plan, and to provide environmental guidance to help create a more sustainable Plan. In parallel to this, a Habitats Regulation Appraisal (HRA) Report has been prepared to inform the decision-making process, in terms of the potential for the preferred SMP policies to adversely impact upon the integrity of any European site.

The preferred SMP policy / policies for each Policy Unit (PU), as well as alternative policies available to the Plan, have been assessed in the short, medium, and long term for likely effects, the significance of the effects, and whether they are positive or negative effects against the SEA objectives. Other aspects that have been assessed for significance are secondary effects, cumulative effects, synergistic effects, temporary and permanent effects, and the interrelationship of effects. The scenario of 'The Evolution of the Environment without the Plan' has also been assessed in the same format. This was considered the Do-Nothing Scenario.

Environmental Baseline

An environmental baseline was produced by SEA environmental topic, which included: a description of the state of the environment at present; a discussion of the key problems / issues currently being faced in the area; and a description of the expected evolution of the environment should the SMP not be implemented, i.e. in the absence of the Plan.

Biodiversity, Flora and Fauna

There are a wide variety of protected natural habitats within the SMP area, including:

- 13 Special Areas of Conservation (SACs) designated under the Habitats Directive (92/43/EEC), including the likes of Solway Firth, Luce Bay and Sands and Mull of Galloway.
- Five Special Protection Areas (SPAs) designated under the Birds Directive (EC/79/409 as amended by Directive 2009/147/EC), including areas such as Solway Firth and Loch of Inch and Torrs Warren.
- Four 'Ramsar' sites designated under the Convention on Wetlands of International Importance especially as Waterfowl Habitat.

There are 13 Special Areas of Conservation (SACs); these are designated under the Habitats Directive (92/43/EEC) and include the likes of Solway Firth, Luce Bay and Sands and Mull of Galloway. There are also five Special Protection Areas (SPAs); these are designated under the Birds Directive (EC/79/409 as amended by Directive 2009/147/EC) and include areas such as Solway Firth and Loch of Inch and Torrs Warren. There are also four 'Ramsar' sites within the SMP area, designated under the Convention on Wetlands of International Importance especially as Waterfowl Habitat.

There are a large number of nationally important Sites of Special Scientific Interest (SSSIs) within the Plan Area. Those designated for nature conservation interests include the Upper Solway Flats and Marshes (designated as an SSSI in both Scotland and England), the Cree Estuary and Torrs Warren-Luce Sands. There is also one Marine Protected Area (MPA), the Clyde Sea Sill MPA, and one Marine Conservation Area (MCA),

Loch Ryan, within the SMP area. Two National Nature Reserves (NNRs) and one Local Nature Reserve (LNR) are also located within the SMP area.

In addition to these designated areas, a wide range of valued species occur within the SMP area. Amphibians such as the natterjack toad and great crested newt are present within the area. Fish species such as sole, anglerfish, blue whiting, cod and sparling are common along the Dumfries & Galloway coast. This region also hosts populations of cetaceans, including harbour porpoise and various dolphin species, as well as populations of shark and ray. The SMP area is also important to a wide variety of bird species, including seabirds such as razorbill, guillemot, and kittiwake; and both resident (e.g. lapwing, shelduck) and wintering (e.g. plover, whooper swan) waterbirds. There are two seal haul-out sites within the SMP area, with a record of both grey and common seals.

Population and Human Health

The population of Dumfries & Galloway is approximately 148,860, according to the latest census figures. Of this population, 70% consider their health to be either ‘good’ or ‘very good’. The population structure includes more old people and fewer people of working age than the national average which has implications for the management of coastal flood and erosion risk as the elderly and very young are generally considered to be if higher vulnerability from flood risk.

Residents in Dumfries & Galloway are predominantly concentrated within the larger settlements, including Dumfries, Stranraer, and Annan. Outside of these areas the region is relatively sparsely populated. A risk to the population from coastal flooding is present within all Coastal Process Units (CPUs) within the SMP area. It is estimated that approximately 1,478 people are currently at risk of coastal flooding (within a medium likelihood scenario), and this is expected to significantly increase in the future due to the predicted effects of climate change. No people are currently at risk of coastal erosion within the SMP area, however residential properties are at future risk.

Geology, Soils and Land Use

The SMP area is largely made up of brown soils and mineral gleys. The underlying bedrock geology of the SMP area is comprised of undifferentiated Triassic rocks (mudstone, siltstone, and sandstone) in the east, thin to medium bedded greywacke and interbedded silty mudstone with thin red mudstone beds in the centre, and graded beds that may include wacke sandstone, siltstone, and mudstone in the west. The seabed is largely comprised of infralittoral sand in the east, muddy sands, mixed sediments and shallow circalittoral coarse substrate in the central section of the SMP area and shallow circalittoral seabed and deep circalittoral coarse substrate in the west. Land use in the SMP area is generally dominated by pastures and non-irrigated arable land with me estuaries, intertidal flats, and salt marshes present; only a small proportion of the land area is considered to be prime agricultural land.

There are 14 SSSIs within the SMP area that are designated, at least in part, for geological or geomorphological interests; these include Corsewall Point to Milleur Point, Torrs Warren-Luce Sands, and Upper Solway Flats and Marshes.

According to the outputs from the Dynamic Coast Project, significant areas of land within the SMP area are at risk of future coastal erosion.

Water

The SMP area lies within the Solway Tweed River Basin District (RBD). The coastline within the SMP area encompasses ten transitional water bodies and eight coastal water bodies. All coastal water bodies within the SMP area have a current overall Water Framework Directive (WFD) status of ‘Good’, with the exception of Solway Firth Offshore area which has an overall status of ‘High’. Transitional water bodies within the SMP area are predominantly at ‘Good’ overall status, with the exception of the Solway Estuary, which currently has an overall status of ‘Moderate’, and the Dee (Kirkcudbright) Estuary, Cree Estuary and Southwick Estuary, which all have an overall status of ‘High’.

There are seven designated Bathing Water Protected Areas within the SMP area; three currently have an overall status of ‘Good’, while four are currently ‘not at target objective’. There is one designated Shellfish Water Protected area at Loch Ryan. There are also nine Wildlife Conservation Area Protected Areas (i.e.

water-dependent European designated sites) within the SMP area, each of these are currently 'at target objective'.

SEPA's National Flood Risk Assessment (NFRA) identified Potentially Vulnerable Areas (PVAs) for flood risk across Scotland, with strategies to be implemented to manage risk at the Local Plan District level. The SMP lies within the Solway LPD; there is a risk of coastal flooding within all CPUs of the SMP area, while several PVAs also occur within this area.

Climate

The climate of Western Scotland is relatively mild, with the Dumfries & Galloway area having an annual mean temperature in the range 8.0 to 9.4°C. The west of Scotland is one of the more exposed areas of the UK, with 5 to 25 days of gale force winds annually. Average rainfall in the area is less than 1000mm along the coast, while the average annual sunshine approaches 1,450 hours.

The predicted impacts of climatic change are likely to include increases in annual mean temperatures, precipitation, sea levels and storminess. These effects of climatic change are likely to increase coastal flooding and erosion and will require future developments to be adaptable or resilient to future climate change and associated impacts.

Material Assets

Development along the Dumfries & Galloway coastline primarily comprises rural areas of low density, while there are a few more built-up urban settlements such as Dumfries, Stranraer, and Annan. These larger settlements are connected by road and rail and host a variety of infrastructure and material assets such as Industrial Emissions Directive (IED) Sites. Energy-related infrastructure, including windfarms and power stations occur along the coastline / offshore, and sub-sea infrastructure such as power and tele-communications cables are situated within several of the SMP area's CPUs including connections between Scotland and Northern Ireland. The Scotland to Northern Ireland Pipeline (SNIP) for natural gas runs from the Dumfries & Galloway coast to Northern Ireland, while two further subsea natural gas pipelines run from this area to the Republic of Ireland.

A risk to material assets from coastal flooding or erosion is present within all coastal process units within the scope of the SMP but varies significantly, with high risk primarily in the population centres such as Annan, Kirkcudbright, Stranraer, Dumfries and Glencaple.

Cultural, Architectural and Archaeological Heritage

There are a large number of heritage features within the SMP area. These include 1732 listed buildings, 128 scheduled monuments, 16 Conservation Areas, three Properties in Care and eight Gardens and Designed Landscapes, including Loch Ryan, Cally and Arbigland. There are two National Trust of Scotland Sites, a battlefield at Gretna, and a significant number of Canmore Sites within the SMP area. There are several Archaeologically Sensitive Areas (ASAs) within the SMP area, where the archaeological interest extends over large areas.

Heritage assets within the SMP area are at risk from flooding and coastal erosion, the extent and rate of which is projected to increase with climate change. This is particularly the case for GDLs such as Arbigland that extend to the coastline.

Landscape and Visual

Landforms in the region range from the high cliffs of the Mull of Galloway to the sand dunes and machair around Luce Bay and the extensive saltmarsh, sand, and mudflats of the inner Solway. The Landscape Character types in the SMP area are predominantly 'coastal flats', 'peninsula' and 'peninsula with gorsey knolls', and land cover is predominantly improved grassland, with areas of arable and horticultural land, and small areas of saltmarsh, broadleaved, mixed and yew woodland, littoral and supralittoral rock / sediment and substrates, and heather. Agriculture accounts for >73% of the land area within the Dumfries & Galloway region, while forests and woodlands also constitute a major element in the landscape.

The importance of the area's landscape is reflected in designations including three National Scenic Areas (NSA), Fleet Valley, East Stewartry Coast, and Nith Estuary, as well as a further six Regional Scenic Areas (RSA).

Evolution of the Environment in the Absence of the Plan

The evolution of the environment in the absence of the Plan was assessed in this SEA Environmental Report. In the absence of an updated SMP i.e. the 'do-nothing' scenario, Dumfries & Galloway Council would rely on the policies set out in the 2005 SMP. The SMP, and the policies set out for sections of the shoreline, are likely to become less appropriate to the changing circumstances, with potential for this to adversely affect environmental receptors. The likely future effects of this are assessed by environmental topic.

Review of Relevant Plans, Programmes and Policies

A review of the Plans, Policies and Programmes relevant to the Plan was carried out at International, European, National, Regional and Sub-Regional scales. This exercise was carried out with a view to establishing the hierarchical position of the SMP, the influence these Plans and Programmes will have on the SMP and how the SMP will interact with the objectives of these other Plans.

Environmental Objectives, Targets and Indicators

The proposed preferred and alternative policies set out in the SMP have been assessed against SEA Objectives, in order to examine the likely significant environmental effects of implementing the SMP. These are referred to as the Strategic Environmental Objectives (SEOs). This assessment is relatively strategic, with the aim of reporting likely positive or negative effects at the CPU level to reflect the scale at which the management policies are being set. Indicators, targets and scoring guidelines were developed to help provide a consistent assessment of the proposed measures.

Appropriate Assessment

A Habitats Regulations Appraisal (HRA) for the SMP has been carried out in parallel with the SEA process. The Stage 1 screening appraisal assessed the potential for the SMP to result in LSEs on any European site, either alone or in-combination with other plans and projects. This concluded that a Stage 2 HRA should be undertaken as the SMP is not directly connected with or necessary to the management of a European site and Likely Significant Effects (LSE) on seven European sites could not be excluded at the screening stage, alone or in-combination with other Plans and projects.

A Stage 2 appraisal for HRA of the policies comprising the SMP on the European sites that were screened in at Stage 1 was undertaken. This recognised that the SMP, as a strategic-level plan, does not determine the precise location or nature of any development project, and that implementation of the preferred policies of the SMP will be subject to further study. At this strategic level, implementation of the preferred SMP policies in a number of locations was considered to have the potential to result in significant effects on European sites, and it was therefore necessary to outline mitigation for these. For each European site, avoidance and mitigation measures were outlined to prevent potential adverse effects on the integrity of the European sites concerned. The HRA record concluded that, subject to securing the prescribed mitigation, the SMP will not adversely affect the integrity of any European site, either alone or in-combination with other relevant plans or programmes. Further assessment should be undertaken at project level when detailed information on preferred shoreline management measures is known. The findings of the HRA have been integrated into this SEA Environmental Report and subsequently into the SMP.

Alternatives

The methodology for development and selection of a preferred policy for each PU involved an assessment of the likely environmental issues associated with each viable policy, and the scale of potential impacts, as well as the potential for social issues of implementing these policies. The preferred policy approaches were those which had the best environmental outcomes, unless these were considered technically unfeasible or would lead to significant social effects. Where a preferred policy was selected to avoid significant adverse effects on

social grounds, consideration was given to implementing a preferred environmental policy (such as MR) in a later epoch, giving time for the population in this area to adjust to coastal change, and for later options to be more fully investigated. Alternative primary or localised policies for PUs were identified during this process, providing either a more socially, or a more environmentally beneficial alternative to the preferred policy, or altering the epoch during which a policy would be applied. Stakeholder and public consultation of the preferred policies for the SMP was undertaken, and these were reviewed and refined, where necessary.

Assessment

Following the policy development process, the SMP selected preferred and alternative policies for each PU. The assessment of SMP policies was undertaken for each CPU and included a high-level assessment of the likely effects of implementing the preferred and alternative policies for each SEA receptor. The assessment of these policies considered the potential types of actions that may be implemented to meet the shoreline management policy and assessed them against the SEOs. To simplify the assessment process and avoid repetition during assessment within each CPU, potential SMP policies were first assessed generically for their potential effects against SEOs.

All potential positive and negative effects are presented individually. In addition, a summary of the overall balanced potential effect has been presented for each CPU. The scores assigned to effects are from +3 to -3. The purpose of adding numerical scores is to assist in the ranking of options and for the potential incorporation of the environmental and social criteria into future decision making by the SMP project team, as this will provide for a multi-criteria analysis of alternatives if desired. Options may have the potential for both positive and negative effects at the same time.

CPU 1

The significantly beneficial aspects of implementing the SMP are expected to include:

- A reduction in the proportion of the population, number of businesses, and heritage features (listed buildings) at risk of coastal flooding within the main settlement areas in PU 4 and PU 7.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for biodiversity, flora and fauna, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.
- HTL for the full frontage of PU 2, instead of the existing SMP of NAI with limited HTL, will provide protection against degradation of water quality and potential adverse effects on adjacent internationally and nationally designated sites, from the threat of contamination from the former MoD site with increased coastal erosion of the area (unless it is found that there is no risk of contamination). Further study of this area, and quantification of risk, will enable the most appropriate medium to long term policy (HTL or MR) to be defined.

The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- Significant areas of existing agricultural land will continue to be at risk from the effects of coastal flooding or erosion, with the area at risk expected to increase in the future owing to the effects of climatic change.
- There will be social effects on the owners of isolated properties that may remain at flood or erosion risk, or who may need to relocate to an area that is not at risk.
- Some heritage features will continue to be at flood or erosion risk, which is expected to increase in the future owing to the effects of climatic change, including the Sark Battlefield, the grounds of the Scheduled Monument at Caerlaverock, and part of the Garden and Designated Landscape at Arbigland.

CPU 2

The significantly beneficial aspects of implementing the SMP are expected to include:

- A reduction in the proportion of the population, number of businesses, and heritage features (listed buildings) at risk of coastal flooding within the main settlement areas in PU 9.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for BFF, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.
- MR as a long term policy for at risk infrastructure is likely to be more adaptable to climatic change than the current SMP policy of localised HTL.

The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- Significant areas of existing agricultural land will continue to be at risk from the effects of coastal flooding or erosion, with the area at risk expected to increase in the future owing to the effects of climatic change.

CPU 3

The significantly beneficial aspects of implementing the SMP are expected to include:

- A reduction in the proportion of the population, number of businesses, and heritage features at risk of coastal flooding within the main settlement areas in PU 13, PU 16 and PU 18.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for BFF, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.
- The alternative policy of MR, involving the setting back of defences at Janefield and parkland south of Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14, has potential for biodiversity net gain, through the expansion of coastal habitats, allowing the floodplain to function in a more natural manner.

The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- Significant areas of existing agricultural land will continue to be at risk from the effects of coastal flooding or erosion, particularly in PU 15, with the area at risk expected to increase in the future owing to the effects of climatic change.

CPU 4

The significantly beneficial aspects of implementing the SMP are expected to include:

- A slight to moderate reduction in the proportion of the population, number of businesses, and heritage features at risk of coastal flooding within the main settlement areas in PU 20, PU 23 and PU 25.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for BFF, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.

- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.

The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- A moderate area of existing agricultural land will continue to be at risk from the effects of coastal flooding in PU 22, with the area at risk expected to increase in the future owing to the effects of climatic change.

CPU 5

The significantly beneficial aspects of implementing the SMP are expected to include:

- A slight reduction in the proportion of the population and number of businesses, and moderate reduction in the number of heritage features at risk of coastal flooding within Port Logan in PU 27 and Portpatrick in PU 28.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for slight benefits for BFF, including local habitats and species, as well as associated indirect benefits on the local landscape and seascape.

The potential adverse effects of implementing the SMP are expected to include:

- Potential for adverse direct or indirect effects on heritage features (listed buildings) within Port Logan in PU 27 and Portpatrick in PU 28 from HTL maintenance activities, and for a moderate number of heritage features to remain at risk of coastal flooding in Portpatrick in the medium to long term under the policy of MR.

CPU 6

The significantly beneficial aspects of implementing the SMP are expected to include:

- A significant reduction in the proportion of the population and number of businesses, and moderate reduction in the number of heritage features and transport infrastructure at risk of coastal flooding within Stranraer in PU 32.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for slight benefits for BFF, including local habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area, and operation of ferry ports.

The potential adverse effects of implementing the SMP are expected to include:

- Potential for adverse direct or indirect effects on heritage features (listed buildings) within Stranraer in PU 32 from HTL.
- Potentially significant effects on internationally and nationally designated sites Glen App and Galloway Moors SPA / SSSI from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, or construction phase disturbance effects. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.

Mitigation and Monitoring

A number of mitigation measures for the potential impacts of implementing the Plan have been established for both the SEA and HRA. These aim to prevent, reduce and, as fully as possible offset, any significant adverse effects on the environment due to the implementation of the SMP. This mitigation has been taken across into the SMP.

Article 10 of the SEA Directive requires that monitoring be carried out to identify at an early stage any unforeseen adverse effects due to the implementation of the Plan. Monitoring will focus on aspects of the environment that are likely to be impacted by the SMP. Where possible, indicators have been chosen based on the availability of the necessary information and the degree to which the data will allow the target to be linked directly with the implementation of the SMP. The proposed environmental monitoring is based on the Targets and Indicators established in the SEA Objectives.

Next Steps

Consultation on the draft Plan, SEA Environmental Report and HRA record are anticipated to commence in April 2022. The consultation activities will take the form of Public Consultation Days, Key Stakeholder Group meetings and Elected Member briefings, with documents made available for viewing at Dumfries & Galloway Council premises, and the same documents made available digitally the Council's website.

Following completion of the consultation period, all comments will be collated and the SMP, SEA Environmental Report and HRA record will be reviewed and revised as necessary. Provided there are no objections or comments that will significantly alter the Plan, the final version of the SMP can be drafted and adopted. This is anticipated to be in October 2022. Following release of the adopted SMP, an SEA Statement will be drafted to summarise the process undertaken and identify how environmental considerations and consultations have been integrated into the Plan.

Please send all comments on the Dumfries & Galloway Shoreline Management Plan or this SEA Environmental Report of the Plan to:

Richard Bingham,
RPS Consulting Engineers,
Elmwood House,
74 Boucher Road,
Belfast,
BT12 6RZ
Email: richard.bingham@rpsgroup.com

1 INTRODUCTION

1.1 Background

This Strategic Environmental Assessment (SEA) Environmental Report has been prepared in accordance with the Environmental Assessment (Scotland) Act 2005, which implements European Union Directive 2001/42/EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment.

The purpose of this Environmental Report is to provide a formal and transparent assessment of the likely significant effects on the environment arising from implementation of the Dumfries & Galloway Shoreline Management Plan (SMP), including consideration of reasonable alternatives.

The SMP and the SEA of the SMP are being prepared on behalf of Dumfries & Galloway Council.

1.2 Strategic Environmental Assessment

The SEA Directive requires that certain Plans and Programmes, prepared by statutory bodies, which are likely to have a significant impact on the environment, are subject to the SEA process. The SEA process is broadly comprised of the steps shown in Figure 1-1. These are given in a summary description in Table 1-1.

Stage	Description	Status
Screening	Determines whether SEA is required for a Plan or Programme, in consultation with the designated statutory consultees.	Completed September 2019
Scoping	Determines the scope and level of detail of the assessment for the SEA, in consultation with the designated statutory consultees.	Completed March 2020
Environmental Assessment	Formal and transparent assessment of the likely significant effects on the environment arising from the implementation of the SMP, including all reasonable alternatives. The output from this is an Environmental Report which must go on public display along with the draft SMP.	Current Stage
SEA Statement	Summarises the process undertaken and identifies how environmental considerations and consultations have been integrated into the final SMP.	September 2022

Table 1-1 Summary Descriptions of Main Stages in SEA Process

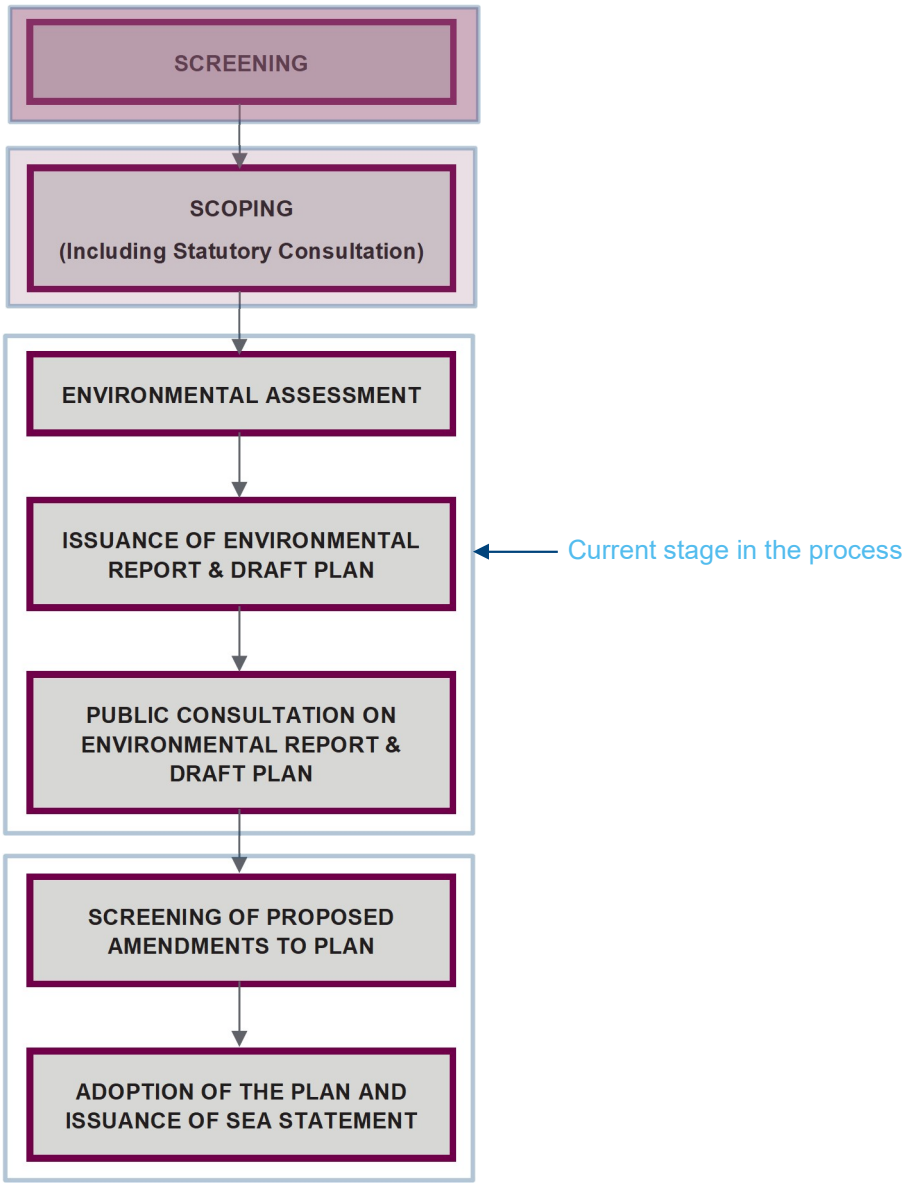


Figure 1-1 Overview of the SEA Process

1.3 Project Team

The project team that developed and created the SMP, the SEA and the Appropriate Assessment (AA) for the Plan was made up of qualified and experienced engineers, scientists, and planners. The SEA and AA professionals were involved throughout the Plan development process.

1.4 Screening for SEA

On behalf of Dumfries & Galloway Council, RPS carried out an SEA Screening for the SMP in September 2019. This established the following:

- Dumfries & Galloway Council is the Responsible Authority for the development and implementation of the SMP.
- The Responsible Authority determined that the SMP requires an SEA, as the likelihood exists for significant environmental effects to arise as a result of the Plan. The Plan falls within Section 5(3) of the Environmental Assessment (Scotland) Act 2005.

- The Responsible Authority has identified that the SMP sets the framework for future shoreline works along the Dumfries & Galloway coast, that there is the potential for significant impacts as a result of the scale and duration of effects and that sensitive receptors along the Dumfries & Galloway coast include SACs, SPAs, SSSIs and LNRs.

Responses to the SEA Screening from the Scottish Environment Protection Agency (SEPA), Scottish Government, Scottish Natural Heritage (now NatureScot) and Historic Environment Scotland can be found in Appendix A of this report. The SEA Screening Determination was advertised in local papers and on the Dumfries & Galloway Council website. It was also provided to the environmental consultees in September 2019.

1.5 Scoping for SEA

SEA Scoping for the Plan took place from October 2019 - March 2020. A Scoping Report was prepared to provide sufficient information on the Plan to enable the consultees to form an opinion on the appropriateness of the scope, format, level of detail, methodology for assessment and the consultation period proposed for the Environmental Reports.

The SEA Scoping Report for the Plan was circulated to the following statutory consultees:

- Scottish Environmental Protection Agency
- Scottish Natural Heritage (now NatureScot)
- Historic Environment Scotland

The Scoping Report was also made publicly available via the Dumfries & Galloway Council website. The issuing of a draft Scoping Report to consultees is good practice and can inform stakeholders about the key environmental issues and the key elements of the Plan. In addition, the Scoping Report is a tool to generate comments from stakeholders on the scope and approach of the SEA. The responses received in relation to the Scoping for this SEA can be found in Appendix B.

1.6 SEA Guidance

Key guidance documents that were used in the SEA for the Plan are listed in Appendix C of this SEA Environmental Report.

1.7 Statutory Consultees for SEA

Under Article 6 of the SEA Directive, the competent authority (in this case Dumfries & Galloway Council) preparing the plan or programme is required to consult with specific 'environmental authorities' (statutory consultees) within appropriate time frames to obtain their opinion on the draft plan or programme and the accompanying environmental report before the adoption of the plan or programme. The statutory consultees established within Scottish SEA legislation are:

- Scottish Environment Protection Agency (SEPA)
- NatureScot
- Historic Environment Scotland (HES)

Consultation on the draft Plan, SEA Environmental Report and the Habitats Regulation Appraisal will commence in April 2022. The consultation activities will take the form of Public Consultation Days, Key Stakeholder Group meetings and Elected Member briefings. The documents will be made available at the Dumfries & Galloway Council premises and will be available digitally on the Council website.

1.8 Appropriate Assessment

The Habitats Directive (Council Directive 92/43/EEC) on the conservation of natural habitats and of wild fauna and flora obliges member states to designate, protect and conserve habitats and species of importance in a European Union context. Article 6(3) of the Habitats Directive requires that "*Any plan or project not directly*

connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives." This Directive was initially transposed into Scottish Law through the Habitats Regulation 1994 as amended in 2004, 2007, 2008, 2011 and 2012. Any proposed plan or project that has the potential to result in a significant effect on a designated European site will require an Appropriate Assessment (AA). Case law has determined that the likelihood need not be great, merely possible, and that the precautionary principle must apply as set out in European Commission Guidance and as required by CJEU case law (i.e. C 127/02 '*Waddenzee'*).

An Appropriate Assessment for the SMP has been carried out in parallel with the SEA process. The output of this is a Habitats Regulations Appraisal (HRA), which has been prepared to influence the draft Plan and to provide NatureScot with information on the draft Plan, the process undertaken for the HRA and to establish whether or not the SMP is likely to have a significant effect upon any European sites(s). The findings of the HRA have been integrated into this SEA Environmental Report and subsequently into the Plan.

2 DESCRIPTION OF THE DUMFRIES & GALLOWAY SMP

2.1 Background

An SMP is a large-scale assessment of the risks associated with the coastal processes of flooding and erosion, which identifies measures to manage these risks to people and the developed, historic, and natural environment. An SMP for Dumfries & Galloway was produced in 2005, which required updating in order to further develop understanding of flooding, coastal erosion, wave overtopping, and the current coastal protection along the Dumfries & Galloway coastline.

The SMP aims to provide guidance to operating authorities and regulatory bodies as to future sustainable flood and coastal erosion risk management; essentially providing an agreed high level approach, intent, and framework for management. It establishes a robust, evidence-based and sustainable long-term approach for managing the risk of coastal flooding and erosion along each part of the Dumfries & Galloway coast. This will help to develop an understanding of coastal issues and identify where further work may be required to mitigate against flooding by highlighting constraints and opportunities for sustainable use of the coastal zone. The SMP provides guidance to manage coastal erosion and flooding in the short, medium and long term for the next 100 years.

2.2 Objectives of the SMP

The objectives of the SMP are as follows:

- Setting out the risks from flooding and erosion to people and the developed, historic and natural environment within the SMP area;
- Identifying opportunities to maintain and improve the environment by managing the risks from floods and coastal erosion;
- Identifying the preferred policies for managing risks from flooding and erosion over the next century;
- Identifying the consequences of putting the preferred policies into practice;
- Setting out procedures for monitoring how effective these policies are;
- Informing others so that future land use, planning and development of the shoreline takes account of the risks and the preferred policies;
- Discouraging inappropriate development in areas where the flood and erosion risks are high; and
- Ensuring compliance with international and national nature conservation legislation and aiming to achieve the biodiversity objectives.
- Ensuring that key stakeholders and communities are engaged throughout the study to inform and contribute to the development of updated SMP policy recommendations.

It is not an objective of the SMP to develop detailed designs for individual shoreline management measures; however, outline options and scenarios to meet the proposed objectives were identified and assessed.

2.3 Scope of the SMP

2.3.1 Temporal Extent of the SMP

The SMP will cover the period from 2022-2122, split into three epochs of short term, 0 - 20 years, medium term, 20 – 50 years and long term, 50 – 100 years. The SMP will be reviewed periodically for updates and to monitor progress and impacts.

2.3.2 Geographic Extent of the SMP

The SMP covers approximately 340km of shoreline, its boundaries being defined by the coastal extent of the Dumfries & Galloway Council operational area. The western limit of the SMP is just north of Cairnryan on the shore of Loch Ryan, whilst the eastern limit is the mouth of River Sark in Gretna. The inland and offshore

extents of the SMP are within approximately 1km of the coastline. The SMP proposes policies for management of the shoreline within these extents.

2.4 Development of Shoreline Management Policies

2.4.1 Coastal Process Units

The SMP builds upon the SMP produced in 2005. As part of the technical development of the current SMP, a review of the coastal processes along the shoreline was undertaken to confirm the sediment movement patterns, and to evaluate whether the coastal sub-cells identified in the 2005 SMP remained appropriate. Eleven coastal cells were originally identified by HR Wallingford in 1997 for the entire Scottish coastline in a study for Scottish Natural Heritage. These coastal cells were identified on the basis that sediment movement between cells was relatively limited, i.e. the sediment dynamics of each cell was relatively independent to that of adjoining cells. The coastal process review included within the 2005 SMP further sub-divided each coastal cell for the Dumfries & Galloway coastline, by identifying points across which there was limited potential for sediment movement, even during storm conditions. These were referred to as Coastal Process Units (CPUs) one to six. Six CPUs were identified for the Dumfries & Galloway coastline; the boundary locations of these are shown in Figure 2-1 and defined in Table 2-1. The definition of these CPUs is critical in terms of the development of a sustainable Plan for the management of the Dumfries & Galloway coast, as these sub-cells define the areas within which various measures can be applied without affecting adjoining sections of the coast. Thus, the CPUs define the geographic boundaries for future studies associated with the detailed design of a wide range of coastal management measures with potential to impact on coastal sediment dynamics.

Sub-cell	Boundary locations
CPU 1	A74(T) – Southerness Point
CPU 2	Southerness Point – Torrs Point
CPU 3	Torrs Point – Isle of Whithorn
CPU 4	Isle of Whithorn – Mull of Galloway
CPU 5	Mull of Galloway – Milleur Point
CPU 6	Milleur Point – Galloway Burn

Table 2-1 Coastal sub-cell boundary locations

None of the CPUs identified as part of the analysis for the 2005 SMP include any part of the shoreline of the Cumbria or Ayrshire Council areas. CPU 1 begins at the mouth of the River Sark within the Dumfries & Galloway Council area, while CPU 6extends to just north of Cairnryan on the shore of Loch Ryan within the boundaries of the Dumfries & Galloway Council area although in reality coastal processes are likely to extend into the South Ayrshire council area, as this area is also within sediment cell 6a2 of the South Ayrshire Plan and the same coastal processes operate across this shoreline section.

Figure 2-1 SMP Extent and Coastal Process Units

2.4.2 Identification of Strategic Policy Options

The policies employed by the SMP to meet its objectives will be dependent upon the issues identified at various locations along the Dumfries & Galloway coastline. Such issues include the risk of flooding or coastal erosion to people, property, and infrastructure, along with the existing and proposed development pressures and sensitivities along the coastline. The four generic policy options available to the SMP are summarised in Table 2-2.

Policy	Description
Advance the Line (ATL)	The shoreline is advanced, defences are built seawards of the existing defence line or land is reclaimed for development. This policy will require active management and construction.
Hold the Line (HTL)	The shoreline is proposed to be held in its contemporary position. This policy is likely to require active management and construction.
Managed Realignment (MR)	This policy allows the shoreline to move backwards or forwards, with management to control or limit movement such as building new defences on the landward side of the original defences.
No Active Intervention (NAI)	No action is taken and natural uninterrupted coastal processes, including erosion and accretion, continue.

Table 2-2 Summary of Generic SMP Policy Options

2.4.3 Identification of Policy Units

As there could be a need for more than one policy within a CPU, as well as several asset owners or administrative boundaries within each, these were divided into smaller discrete areas called Policy Units (PUs). The PUs defined are summarised in Table 2-3**.** Each PU is assigned its own policy for future management of the shoreline. In total, 35 PUs were defined across the six CPUs.

Policy Unit	Location	Policy Unit	Location
1	Gretna to Browhouses	**19**	Isle of Whithorn to Barsalloch Point
2	Browhouses to Dornock Burn	**20**	Barsalloch Point to Low Drumskeog (Port William)
3	Dornock Burn to Waterfoot	**21**	Low Drumskeog to Kilfillan Point
4	Waterfoot to Nethertown	**22**	Kilfillan Point to Sandhead
5	Nethertown to Drum-Mains	**23**	Sandhead to Chapel Rossan
6	Glencaple to Dumfries	**24**	Chapel Rossan to Drummore
7	Drum-Mains to Southerness	**25**	Drummore
8	Southerness to Castlehill Point	**26**	Drummore to the Mull of Galloway
9	Castlehill Point to Dalbeattie	**27**	Mull of Galloway to Portpatrick
10	Castlehill to Balcary Point	**28**	Portpatrick
11	Balcary Point to Torrs Point	**29**	Portpatrick to Milleur Point
12	Torrs Point to Doon of Carsluith	**30**	Milleur Point to Kirkcolm
13	St Mary's Isle to Tongland	**31**	Kirkcolm to McCulloch's Point
14	Gatehouse of Fleet	**32**	McCulloch's Point to Innermessan (Stranraer)
15	Doon of Carsluith to Eggerness Point	**33**	Innermessan to Bankhead
16	Garlieston	**34**	Bankhead to Old House Point

Policy Unit	Location	Policy Unit	Location
17	Garlieston to Isle of Whithorn	35	Old House Point to Galloway Burn
18	Isle of Whithorn		

Table 2-3 SMP Policy Units

2.4.4 Development of Preferred Policies for PUs

For each PU, an assessment was carried out to identify receptors and assets at risk of coastal flooding and erosion, including homes, businesses, utilities, community facilities, cultural heritage, transport infrastructure and agricultural land. SEPA's National Flood Risk Assessment (NFRA) mapping was used to define coastal flood risk, and the Scottish Governments Dynamic Assessment was used to define erosion risk. Visual inspections of existing defence assets were also undertaken, detailing their current condition and location.

Selection of Preferred Policies for each PU, from the options described in Table 2-2, was carried out by means of a four stage process:

Stage 1

- Identify the coastal flood and erosion risk, and the constraints and opportunities within each PU.

Stage 2

- Review each policy for technical issues, if a potential policy is not technically viable, then consider another policy;
- Review likely economic justification for policy, if not economically viable consider another policy;
- Identify environmental issues associated with each viable policy, quantify the scale of impacts; and
- Identify potential social issues associated with each viable policy.

Stage 3

- Identification of the preferred policies and possible alternative policies over the short, medium and long Term, to determine the most sustainable approach.

Stage 4

- Stakeholder and public engagement and review of the draft preferred policies.

3 BASELINE AND ENVIRONMENTAL PROBLEMS

3.1 Current State of the Environment

Scotland's State of the Environment Report provides an assessment of the state of Scotland's environment and how it is changing. The most recent report was published in 2014[1], and summaries key messages for the following:

- Air;
- Land;
- Water;
- Climate; and
- People and the environment.

Scotland's environment is considered to be of good quality overall, with significant improvements over recent years, however some species and habitats are under threat, and poor air quality affects the population of some cities and towns. Table 3-1 summarises the current state of the environment in Scotland for the topics of water, land, climate, and people and the environment, as outlined in the 2014 State of the Environment Report. A State of the Environment Report was also prepared for the Dumfries & Galloway area by the Council in 2017[2], which considered a range of environmental aspects of the local environment; Table 3-2 outlines the challenges identified for environmental topics in that report, and their potential relevance to the SMP.

Theme	State and Trend
Water	Scottish water is generally in good condition, with significant pollution reductions over the past 25 years. Most seas, coasts and estuaries are in good or excellent condition; there are localised areas of concern, but pollution problems caused in the past have largely been addressed. Within Scottish inshore waters, habitats are declining in condition or are stable but still of concern, and most areas have some species that are declining to a point that is now of concern. Groundwater is mostly in good condition, while WFD assessments have reported that approximately two-thirds of lochs and just over half of rivers are in good or better condition. Overall, the wildlife of rivers and lochs is considered to be in good condition, although a number of individual species are declining.
Land	The rocks, landforms and soils in Scotland are the foundation of its wildlife, landscape and cultural heritage. The wide variety of soils present provide benefits such as the growth of food and trees, filtering of water impurities and storage of carbon. Habitat condition in Scotland is varied; two-thirds of farmland habitats are currently in favourable or recovering condition, while many upland habitats are beginning to improve under protection and management actions, however numbers of some farmland birds and insects are decreasing and some species associated with upland habitats are also in decline. Within protected sites, most wetlands are in a favourable condition, with the exception of lowland raised bogs, of which 59% are currently in unfavourable condition. Woodland cover in Scotland is increasing, from 4.5% at the beginning of the 20th century, to 18% cover by 2013; owing to human influence and climate change, no woodlands are considered strictly natural. Most upland areas have been modified

[1] 2014 state of the environment report | Scotland's environment web

[2] https://www.dumgal.gov.uk/media/19007/LDP2-State-of-the-Environment/pdf/State_of_the_Environment_Report_2016.pdf

Theme	State and Trend
	through drainage, grazing, forestry and atmospheric pollutant deposition, with near-natural habitats now a rarity. The land contributes significantly to the economy, through agriculture, forestry and tourism that is based on the landscapes and historic environment of the country. Agriculture remains vital to the rural economy, although many activities receive external support payments. Wind farm development, as well as built development have been responsible for the most significant changes in the landscape in the past five years, while changes in farming and forestry practice are also leading to changes.
Climate	The climate of Scotland is currently in a good state but is showing rapid changes. It has become warmer over the past 100 years and altered patterns of precipitation have led to drier summers, wetter winters and an increased frequency of heavy rainfall. Future changes to Scotland's climate over the next few decades are unavoidable owing to the levels of greenhouse gases currently in the atmosphere. The UK is projected to experience an increase in milder, wetter winters, and hotter, drier summers in the future, which will have major implications for our way of life.
People and the environment	Close to 70% of Scotland's population reside in urban areas. Significant health inequalities exist and improving the environment could help to reduce these. Scotland's environment makes a valuable contribution to quality of life, cultural identity and education, and outdoor recreation benefits health and wellbeing as well as generating income. The production of waste has reduced by 40% since 2005 (primarily owing to reductions in industrial and commercial waste), and household waste recycling has doubled since 2004. However, much waste is still sent to landfill, and the amount of waste created will need to be further reduced in order to protect the environment.

Table 3-1 Summary of Current State of the Environment in Scotland

Theme	Challenges and relationship to the Shoreline Management Plan
Biodiversity, Flora and Fauna	The key issues identified for biodiversity, flora and fauna are: • There are a number of international and national designations across the region; • Of the 29 international designations, 10 have some element that is in an unfavourable and declining state; • Biodiversity generally is in decline, but the rate of decline appears to be slowing; • Invasive non-native species continue to spread; • Approximately a third of the region is covered in woodland and forestry; and • Climate change may rise in significance in the future, adding to existing pressures. The SMP considers the potential positive and negative contributions of shoreline management policies to these pressures and issues for habitats and species.
Population and Human Health	The key issues identified for Population and Human Health are: • Declining and older population with high life expectancy rates; • The number of households is increasing although household size is predicted to decrease; • Over a quarter of the region's population live in Dumfries but, overall, the region has a relatively low population density of 23 persons per km^2; • Overall, there are low levels of household income, with a poorly performing labour market;

Theme	Challenges and relationship to the Shoreline Management Plan
	• The region is diverse, containing some of the most, and least, deprived areas of Scotland; • There is a high reliance on car ownership in the rural parts of the region, although 20% of households do not have access to private transport; and • There is a wealth of recreational opportunities within the region. The overarching challenge is to achieve a sustainable balance between short-term needs and maintaining or enhancing the quality of the environment for future generations. The SMP assesses the policies and actions for the shoreline that will be of most benefit to people and the environment of the area over the short to long term (up to 100 years).
Soil	The key issues identified for Soil are: • Only a small proportion of land is considered to be prime agricultural land; • The region contains large areas of peatland; • There are a number of sites with potential contaminated land issues that may require mitigation; • There are issues of soil erosion, particularly through flood events and in coastal areas. The SMP considers the potential positive and negative contributions of shoreline management policies to these pressures and issues for soils and geological sites. It presents measures to manage flood and erosion in coastal areas, taking into account public safety, preservation of property and infrastructure and preservation of the environment.
Water	The key issues identified for Water are: • There are a number of watercourses that are subject to potential flood risk; • The number of flood incidents has fluctuated over the years and appears to be directly related to rainfall; • The condition of water bodies has generally improved over the long term but not in the short term; • The quality of groundwater in the region is generally good, but there appears to be a declining trend; • The quality of the public water supply is generally high, although there is a relatively high number of private water supplies; and • Climate change may cause increased competition for water, as well as increased flood risks. The SMP considers the potential positive and negative contributions of shoreline management policies to these pressures and issues for water, and the habitats and species that it supports. It presents measures to manage flood risk in coastal areas, taking into account public safety, preservation of property and infrastructure and preservation of the environment.
Material Assets	The key issues identified for Material Assets are: • The number of vacant and derelict sites in the region has recently reduced; • There are a number of important mineral resources in the region; • A programme to rollout recycling collections across the region is ongoing along with a regional network of household waste cycling centres; and • Designation of the Galloway Dark Sky Park has provided a driver to install LED street lights. The overarching challenge is to achieve a sustainable balance between short-term needs and maintaining or enhancing the quality of the environment for future generations. The SMP assesses the policies and actions for the shoreline that will be of most benefit to people and the environment of the area over the short to long term (up to 100 years).
Climatic Factors	The key issues identified for Climatic Factors are:

Theme	Challenges and relationship to the Shoreline Management Plan
Climatic Factors	• Anticipated that summers will be warmer and drier, autumn and winter will be milder and wetter, with an increase in intense rainfall, and rising sea levels; • There are a significant number of renewable energy schemes installed throughout the region using a variety of technologies with wind and hydro being the main elements; • Car ownership in the region is relatively high recognising the relatively sparse population and limited public transport options; • Rail usage has increased in the region however, overall, the region is poorly served by rail routes; and • Observed climate changes have had impacts on many aspects of our environment, the resilience of our businesses, the health and well-being of our people and our infrastructure and these impacts will continue and even intensify in the projected future climate. Reductions in greenhouse gas emissions are necessary in order to prevent further climate change. Preparation is also necessary for the unavoidable climate change resulting from previous emissions. The SMP aims to assess the most appropriate policies and actions for the shoreline in the area under current conditions, while also taking into account the implications of future climate change for the area.
Cultural Heritage	The key issues identified for Cultural Heritage are: • The region contains a range of diverse historic assets, and there have been few changes to the number of designated historic assets; • A significant number of historic assets are under-used or in poor condition • Within the region there are potential restoration schemes for 15 of the buildings on the Buildings at Risk Register for Scotland; and • There are a relatively high number of designated archaeological sites throughout the region. The SMP considers the potential positive and negative effects of shoreline management policies to these pressures and issues for cultural heritage.
Landscape	The key issues identified for Landscape are: • The region has a rich and diverse landscape, and includes areas designated for their landscape and scenic qualities at both the national and local levels; • NatureScot have identified two areas of wildland in the region; • TPO records in the region are limited and require updating; • The loss of larch and ash trees to *Phytophthora ramorum* and ash die-back is likely to have a significant impact on the region's landscape; and • The changing climate is already altering our unique Scottish landscapes. The SMP considers the land use in the Plan area, and directly contributes to land management in the area, through the provision of shoreline management policies.

Table 3-2 Dumfries & Galloway State of the Environment Key Issues and Relevance to the SMP

3.2 Environmental Characteristics of the Plan Area

Included in the following section is a discussion of the environmental baseline for the area, of relevance to the SMP. The baseline has been divided by topic into the issues requiring assessment under SEA legislation. The purpose of this section is to demonstrate the level of baseline environmental information used in the assessment of the potential impacts of implementing the SMP policies and actions. This baseline information forms the indicators which the measures within the SMP will have the potential to impact upon. Future variation in these indicators owing to implementation of the SMP will be monitored as part of the SMP and SEA review. Unless otherwise stated, the environmental issues discussed in the following sections are generally intersected by or within 1km of the coastal sub-cells. As the SMP covers a large length of coastline, the information used in the assessment needed to be consistent across the geographical extent of the study. The baseline data

used in the environmental assessment was therefore restricted to data available at a high / strategic level, in order to allow a reliable and replicable assessment across the study area.

3.2.1 Biodiversity, Flora & Fauna

Biodiversity is the variety of all plants and animals, and the communities that they form. The conservation of biodiversity is important in its own right. Humans are also dependent on biodiversity for the provision of ecosystem services such as clean air and water, food and shelter, as well as for the health and amenity value that the natural environment can provide.

The importance of preserving biodiversity has increasingly been recognised from an international to a local level, and Scotland has legal obligations under International and EU commitments and legislation. The UN Convention on Biological Diversity (1992) is an international legally binding treaty with three main goals: conservation of biodiversity; sustainable use of biodiversity; and the fair and equitable sharing of the benefits arising from the use of genetic resources. It requires the development of national strategies for the conservation and sustainable use of biological diversity. The most recent biodiversity strategy for the EU (EU Biodiversity Strategy to 2030) was published in 2020. It aims to put Europe's biodiversity on the path to recovery by 2030 for the benefit of people, climate and the planet, and to build societies' resilience to future threats such as climate change impacts, forest fires, food insecurity and disease outbreaks. The Strategy contains specific commitments and actions to be delivered by 2030. The Scottish Biodiversity Strategy comprises the original strategy 'Scotland's Biodiversity: It's in Your Hands (2004)[3] and the '2020 Challenge for Scotland's Biodiversity'[4]. The 2020 Challenge aims to protect and restore biodiversity on land and seas and support healthy ecosystems; connect people with nature, for their health and well-being and involve them in decision making; and maximise the benefits of a diverse natural environment and its provision of services. To meet these aims, the focus is on tackling the key pressures on biodiversity, as set out in 'Scotland's Biodiversity: A Route Map to 2020'.

The SMP must also have regard for the Habitats Directive and the Birds Directive, as transposed through the Conservation (Natural Habitats, &c.) Regulations 1994, which require that any plan or project not directly connected with or necessary to the management of a European site but likely to have a significant effect on such a site, must undergo an appropriate assessment in view of best scientific knowledge and in view of the conservation objectives of the site. The SMP falls under this remit, and an Appropriate Assessment is being undertaken in parallel to the SEA process, to assess the potential implications of the Plan for European Sites.

It is considered that the key issues associated with implementation of the SMP and Biodiversity, Flora and Fauna comprise:

- Effects on protected areas, including those protected at a European (SACs, SPAs, Ramsar Sites), National (SSSIs, nature conservation MPAs, NNRs) and local (LNPs) level;
- Potential for interaction with Habitats Directive, i.e. Article 6, 10, 12;
- Effects on Priority Marine Features (PMFs);
- Effects on flora and fauna (including migratory bird species, protected fish and shellfish species);
- Effects on wetlands and on sensitive habitats such as saltmarsh;
- Potential introduction or spread of invasive non-native species (INNS);
- Potential for habitat loss, fragmentation or deterioration (temporary or permanent); and
- Potential for habitat creation and enhancement.

[3] Scotland's Biodiversity: It's in Your Hands

[4] 2020 Challenge for Scotland's Biodiversity

3.2.1.1 Designated Sites

3.2.1.1.1 Overview of Designated Sites

There are a wide variety of natural habitats and species within the SMP area. Sites have been designated in order to provide protection to those habitats and species considered to be of particular conservation value. These include features whose conservation is considered to be of importance at a European level. There are 13 Special Areas of Conservation (SAC) within 15km of the Dumfries & Galloway shoreline: Kilhern Moss SAC, Luce Bay and Sands SAC, Mull of Galloway SAC, Burrow Head SAC, River Bladnoch SAC, Carsegowan Moss SAC, Mochrum Lochs SAC, Galloway Oakwoods SAC, Solway Mosses North SAC, Solway Mosses South SAC, Solway Firth SAC (also designated under English legislation), Raeburn Flow SAC, and River Eden SAC (designated under English legislation). These are designated in accordance with the Habitats Directive (92/43/EEC) for the conservation of certain habitats and species.

Special Protection Areas (SPAs) are designated under The EU Directive on the Conservation of Wild Birds (EC/79/409), as amended by Directive 2009/147/EC. “The Birds Directive” identifies areas that are important for rare and vulnerable bird species as they use them for breeding, feeding, wintering or migration. There are five SPAs within 15km of the Dumfries & Galloway shoreline: Solway Firth SPA, Loch of Inch and Torrs Warren SPA, Glen App and Galloway Moors SPA, Loch Ken and River Dee Marshes SPA, and Castle Loch, Lochmaben SPA. Solway Firth is also designated as an SPA under English legislation. This site was designated in December 2020, expanding the previously designated Upper Solway Flats and Marshes SPA to include a significantly larger area of the firth in recognition of the large bird populations supported by the habitats present, especially during winter. These include the Svalbard population of barnacle geese, pink-footed goose, whooper swan and pintail, as well as waders including golden plover, bar-tailed godwit, dunlin, oystercatcher, knot, redshank and curlew. Together these SACs and SPAs are considered as European sites; any development with the potential to impact upon a European site is required to undergo Habitats Regulations Appraisal by the Habitats Regulations 1994 (as amended) in Scotland and The Conservation of Habitats and Species Regulations 2017 in England.

Under the Convention on Wetlands of International Importance especially as Waterfowl Habitat, Contracting Parties are required to designate suitable wetlands within their territory for inclusion on a List of Wetlands of International Importance. There are four such designated ‘Ramsar’ sites located within 15km of the Dumfries & Galloway shoreline: Loch of Inch and Torrs Warren, Upper Solway Flats and Marshes, Loch Ken and River Dee Marshes SPA, and Castle Loch, Lochmaben SPA.

Sites of Special Scientific Interest (SSSI) are protected under the Nature Conservation (Scotland) Act 2004. These are areas of land and water which NatureScot considers to best represent Scotland’s natural heritage – its diversity of plants, animals and habitats, rocks and landforms, or a combination of such natural features. There are 22 SSSIs within the SMP study area, designated for the presence of flora or fauna of special scientific interest; Glen App and Galloway Moors SSSI, Corsewall Point to Milleur Point SSSI, Salt Pans Bay SSSI, Mull of Galloway SSSI, Torrs Warren – Luce Sands SSSI, Back Bay to Carghidown SSSI, Burrow Head SSSI, Cree Estuary SSSI, Cotland Plantation SSSI, Carsegowan Moss SSSI, Lower River Cree SSSI, Ravenshall Wood SSSI, Borgue Coast SSSI, Carrick Ponds SSSI, Torrs to Mason’s Walk SSSI, Abbey Burn Foot to Balcary Point SSSI, Auchencairn and Orchardton Bays SSSI, Port O ’Warren SSSI, Upper Solway Flats and Marshes SSSI, Kirkconnell Flow SSSI, Longbridge Muir SSSI, and Royal Ordnance, Powfoot SSSI.

Marine Protected Areas are designated under the Marine (Scotland) Act 2010 and the UK Marine and Coastal Access Act for the purpose of protecting Scotland’s marine wildlife, habitats, geology and undersea landforms. The Clyde Sea Sill MPA is the only MPA within the Plan area, and is designated, in part, for its biodiversity features. Marine Consultation Areas (MCAs) are identified by NatureScot as deserving particular distinction in respect of the quality and sensitivity of the marine environment within them. Loch Ryan is the only MCA within the Plan area.

National Nature Reserves (NNRs) are declared under the National Parks and Access to the Countryside Act 1949 (as amended) and the Wildlife and Countryside Act 1981 (as amended). There is one NNR within the SMP study area, Caerlaverock NNR. Local Nature Reserves (LNRs) are also declared under the National Parks and Access to the Countryside Act 1949 (as amended). There is one LNR within the SMP study area, Wigtown Bay LNR. NNR and LNR sites are managed for conservation purposes and provide opportunities for research and education as well as public enjoyment.

The designated sites in the SMP area, and within 15km of its boundary for International and European designated sites, are detailed in Table 3-3 and their locations shown in Figure 3-1.

Site Designation	Number
Special Areas of Conservation (SACs)	13
Special Protection Areas (SPAs)	5
Ramsar Sites	4
Sites of Special Scientific Interest (SSSIs) (Biological)	22
Marine Protected Areas (MPAs)	1
Marine Consultation Areas (MCAs)	1
National Nature Reserves (NNRs)	1
Local Nature Reserves (LNRs)	1

Table 3-3 Number and type of sites designated for conservation of Biodiversity, Flora and Fauna in the SMP area

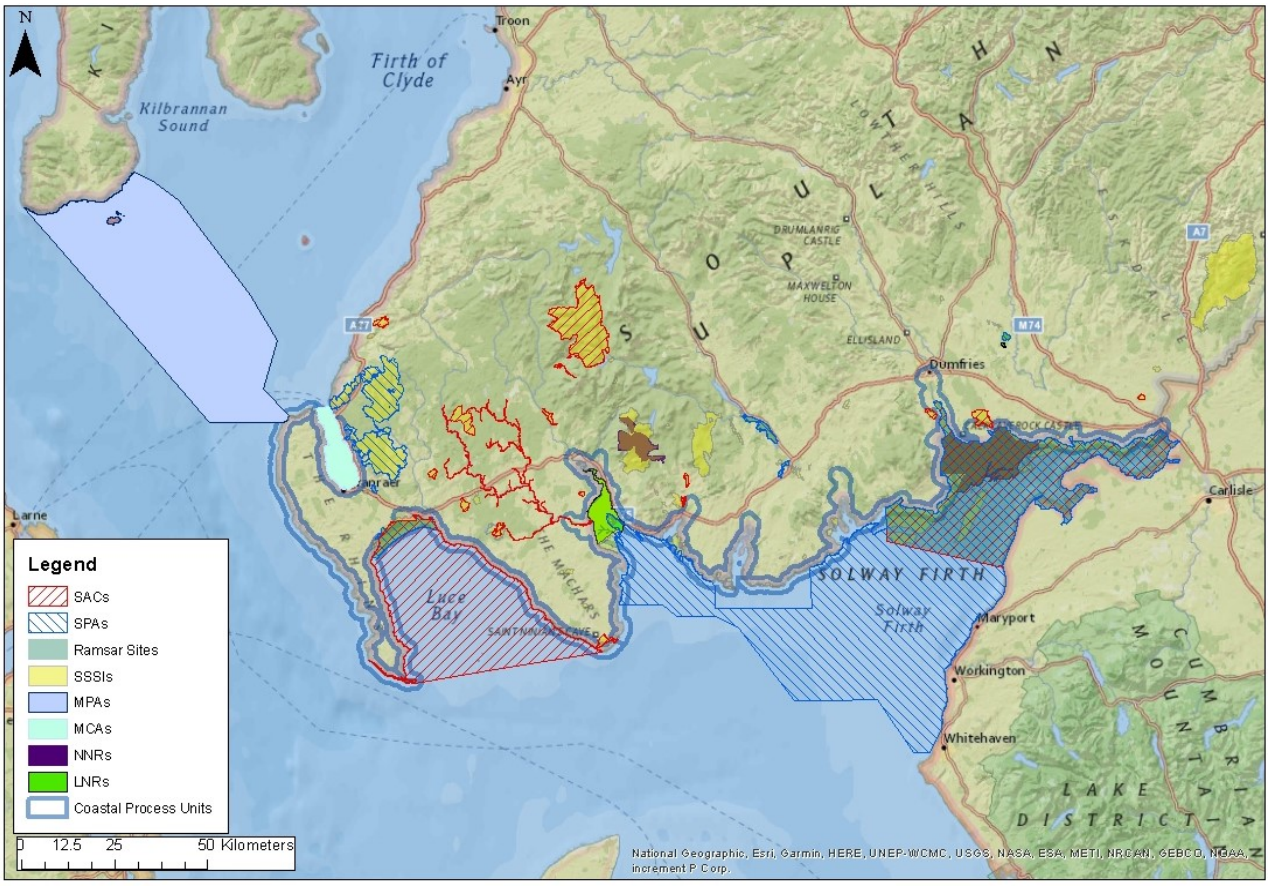


Figure 3-1 Designated sites within 15km of the SMP area

3.2.1.1.2 Status and Trends for European Sites

The conservation condition of qualifying species and habitats within European sites in Scotland is monitored by NatureScot. The most up to date information available on the condition of sites within the SMP area is outlined in Table 3-4.

Site Name	Designation type	Site Condition
Kilhern Moss	SAC	**Favourable Maintained:** Blanket bog; Depressions on peat substrates
Luce Bay and Sands	SAC	**Unfavourable Declining:** Coastal dune heathland; Shifting dunes; Shifting dunes with marram; Great crested newts **Unfavourable No Change:** Dune grassland **Unknown:** Shallow inlets and bays; Intertidal mudflats and sandflats; Reefs
Mull of Galloway	SAC	**Favourable Declining:** Vegetated sea cliffs
Burrow Head	SAC	**Unfavourable Declining:** Great crested newts
River Bladnoch	SAC	**Unfavourable Recovering:** Atlantic salmon
Carsegowan Moss	SAC	**Unfavourable No Change:** Active raised bog; Degraded raised bog
Mochrum Lochs	SAC	**Unfavourable No Change:** Blanket bog; Depressions on peat substrates
Galloway Oakwoods	SAC	**Unfavourable Declining:** Oak woodland
Solway Mosses North	SAC	**Unfavourable Recovering:** Active raised bog; Degraded raised bog
Solway Firth	SAC	**Favourable Maintained**: Atlantic salt meadows; Coastal shingle vegetation outside the reach of waves; Glasswort and other annuals colonising mud and sand; Subtidal sandbanks **Unfavourable No Change:** Dune grassland **Unknown:** Estuaries; Intertidal mudflats and sandflats; Reefs; Sea lamprey; River lamprey
Raeburn Flow	SAC	**Favourable Declining**: Active raised bog **Unfavourable No Change**: Degraded raised bog
Solway Firth	SPA	**Favourable Maintained condition for Upper Solway Flats and Marshes SPA:** Svalbard barnacle goose; Cormorant; Golden plover; Lapwing; Pink-footed goose; Pintail; Redshank; Ringed plover; Scaup; Shelduck; Waterfowl assemblage **Favourable Declining condition for Upper Solway Flats and Marshes SPA:** Dunlin; Grey plover; Knot; Oystercatcher **Favourable Recovered condition for Upper Solway Flats and Marshes SPA:** Whooper swan

Site Name	Designation type	Site Condition
		Unfavourable Declining condition for Upper Solway Flats and Marshes SPA: Bar-tailed godwit ; Goldeneye **Unfavourable No Change condition for Upper Solway Flats and Marshes SPA:** Curlew **Unknown:** Black-headed gull; Common gull; Common scoter; Goosander; Herring gull; Red-throated diver; Sanderling; Shoveler; Teal; Turnstone
Loch of Inch and Torrs Warren	SPA	**Favourable Maintained:** Greenland white-fronted goose; Hen harrier
Glen App and Galloway Moors	SPA	**Favourable Maintained:** Hen harrier
Loch Ken and River Dee Marshes	SPA	**Favourable Maintained:** Greenland white-fronted goose; Greylag goose
Castle Loch, Lochmaben	SPA	**Unfavourable No Change:** Pink footed goose

Table 3-4 Designated habitats with pressures or threats relating to flood / coastal protection, and their presence in the SMP area.

Article 17 of the Habitats Directive requires that, every six years, all EU Member States report on the implementation of the Directive, including on the conservation status of habitats and species (informally known as the Article 17 report). The 4th UK Habitats Directive Report was submitted to the European Commission in August 2019, and included a General Implementation Report, Habitat Reports and Species Reports. These outlined any changes in designated habitats and species, for the UK as a whole, in the period 2013-2018[5].

The status of designated habitats, as summarised from the 2019 reports is as follows:

- For six habitats, the overall conservation status was “Favourable”;
- For eight habitats, the overall conservation status was “Inadequate”;
- For 62 habitats, the overall conservation status was “Bad”; and
- For one habitat, the overall conservation status was “Unknown”.

Of these, 22 habitats showed improvement in overall conservation status, 29 habitats showed no change, 22 habitats showed a decline, and four were uncertain in comparison with the results of the 3rd UK Habitats Directive Report. Scotland’s supporting documentation for the conservation status assessment of each habitat was examined to gain insight into which of these included pressures or threats that related to flood or coastal protection. Of the 61 habitats for which specific supporting documentation for Scotland was available, 15 assessments included at least one pressure or threat relating to flooding and / or coastal protection. These comprised the following:

- Modification of coastline, estuary and coastal conditions for development, use and protection of residential, commercial, industrial and recreational infrastructure and areas (including sea defences or coastal protection works and infrastructures) (F08); and

[5] Article 17 Habitats Directive Report 2019 (Habitats) | JNCC - Adviser to Government on Nature Conservation

- Modification of flooding regimes, flood protection for residential or recreational development (F28).

Table 3-5 shows those habitats for which these pressures / threats were listed and outlines their presence within the designated European sites in the SMP study area. Ten of these habitats are a qualifying interest of European Sites within the SMP area; these are found within Luce Bay and Sands SAC and Solway Firth SAC. The site-specific pressures and threats included in the Natura 2000 Standard Data Forms for these sites were examined; Luce Bay and Sands the pressure 'J02- Human-induced changes in hydraulic conditions' is included as a medium ranking pressure at the site[6], while no relevant pressure or threats are listed as having importance within Solway Firth SAC[7].

Habitat	Designated habitats present within the SMP area
H1110 Sandbanks which are slightly covered by sea water all the time	Luce Bay and Sands SAC Solway Firth SAC
H1130 Estuaries	Solway Firth SAC
H1140 Mudflats and sandflats not covered by seawater at low tide	Luce Bay and Sands SAC Solway Firth SAC
H1150 Coastal lagoons	No
H1160 Large shallow inlets and bays	Luce Bay and Sands SAC
H1170 Reefs	Luce Bay and Sands SAC Solway Firth SAC
H1310 *Salicornia* and other annuals colonising mud and sand	Solway Firth SAC
H1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Solway Firth SAC
H2110 Embryonic shifting dunes	Luce Bay and Sands SAC
H2120 Shifting dunes along the shoreline with Ammophila arenaria ('white dunes')	Luce Bay and Sands SAC
H2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes')	Luce Bay and Sands SAC Solway Firth SAC
H2140 Decalcified fixed dunes with *Empetrum nigrum*	No
H2190 Humid dune slacks	No
H21A0 Machairs	No
H3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitrichio-Batrachion* vegetation	No

Table 3-5 Designated habitats with pressures or threats relating to flood / coastal protection, and their presence in the SMP area.

The status of designated species, as summarised from the 2019 reports is as follows:

- For 33 species, the overall conservation status was "Favourable";
- For 24 species, the overall conservation status was "Inadequate";
- For 16 species, the overall conservation status was "Bad"; and
- For 20 species, the overall conservation status was "Unknown".

[6] Luce Bay and Sands SAC Natura 2000 Standard Data Form

[7] Solway Firth SAC Natura 2000 Standard Data Form

Of these, nine species showed improvement in overall conservation status, 47 showed no change, 12 showed decline and 25 were uncertain in comparison with the results of the 3rd UK Habitats Directive Report. Scotland's supporting documentation for the conservation status assessment of each species present as a qualifying interest of sites within the SMP area was examined to gain insight into which of these included pressures or threats that related to flooding or coastal protection. No assessments included pressures or threats that specifically related to flooding and / or coastal protection. However, species such as sea and river lamprey (qualifying interests for Solway Firth SAC) and great-crested newt (qualifying interest for Luce Bay and Sands SAC) may be indirectly affected through changes in the area and / or condition of the qualifying habitats at these sites.

3.2.1.2 Priority Marine Features

In 2014, 81 Priority Marine Features (PMFs) were identified in Scottish seas by Marine Scotland, the Joint Nature Conservation Committee (JNCC) and NatureScot, covering a variety of habitats and species considered as priority for conservation. This list includes 26 broad habitats, seven low or limited mobility species, and 48 mobile species, including fish and marine mammals. Many of these features occur within MPAs, however others are present outside of this network. Table 3-6 shows the eight PMFs that are known to occur in the SMP area, as detailed in the 2016 report by NatureScot 'Descriptions of Scottish Priority Marine Features'[8] and mapped on Marine Scotland's NMPi[9].

Broad Habitat	Additional Protection	SMP Area*
Blue mussel beds	BAP priority habitat Annex I HD	Loch Ryan, Luce Bay, Wigtown Bay, Balcary Bay, Auchencairn Bay, Orchardton Bay, Rough Firth, Port O'Warren, Southerness Point, Annan (Channel of River Eden)
Intertidal mudflats	BAP priority habitat Annex I HD	Extensive
Kelp and seaweed communities on sublittoral sediment	One subtype also a BAP habitat	Luce Bay
Kelp beds	No	Unknown
Native oyster	BAP priority habitat	Unknown
Seagrass beds	BAP priority habitat Annex I HD	Loch Ryan, Kirkcudbright Bay, Auchencairn Bay, Rough Firth
Tide-swept algal communities	BAP priority habitat Annex I HD	Unknown
Tide-swept coarse sands with burrowing bivalves	BAP priority habitat Annex I HD	Extensive

* For features mapped on NMPi

Table 3-6 Broad habitat PMFs occurring within the SMP area.

The bivalve Ocean Quahog (*Arctica islandica*) occurs in subtidal areas of the area, and the following fish species are known to be present within the area: European Eel (*Anguilla Anguilla*), Atlantic salmon (*Salmo salar*), European river lamprey (*Lampetra fluviatilis*), Sea lamprey (*Petromyzon marinus*), Sea trout (*Salmo trutta*), Sparling (*Osmerus eperlanus*), Anglerfish (*Lophius piscatorius*), Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), Cod (*Gadus* morphua), Ling (*Molva molva*), Saithe (*Pollachius virens*), Sandeels (*Ammodytes marinus* and *Ammodytes tobianus*), Sand goby (*Pomatoschistus minutus*), Whiting (*Merlangius merlangus*), Basking shark (*Cetorhinus maximus*), Common skate (*Dipturus batis complex*) and

[8] NatureScot Report - Descriptions of Scottish Priority Marine Features

[9] Marine Scotland - National Marine Plan Interactive (atkinsgeospatial.com)

spiny dogfish (*Squalus acanthias*). With the exception of Saithe and Sand Goby, these fish species are also considered as priority species in the BAP, while Atlantic salmon, European river lamprey and sea lamprey are also protected under Annex II of the Habitats Directive, as well as Annex V for Atlantic salmon and European river lamprey. Basking sharks are also afforded protection under Schedule 5 of the Wildlife and Countryside Act.

This region also hosts populations of cetaceans, including the PMFs harbour porpoise (*Phocoena phocoena*), short-beaked common dolphin (*Delphinus delphis*) and white-beaked dolphin (*Lagenorhynchus albirostris*), also listed as priority species in the BAP and afforded protection under Annex II and Annex IV of the Habitats Directive, as well as Schedule 5 of the Wildlife and Countryside Act. Other mammals present in the area include the PMFs otter (*Lutra lutra*), harbour (common) seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). These species are also protected under Annex II and Annex V of the Habitats Directive, while grey seal and otter are listed as priority species in the BAP. Seal haul-out sites are also designated by Scottish Ministers under the Marine (Scotland) Act 2010. These are locations on land where seals come ashore to rest, moult or breed. There are two haul-out sites within the SMP area; Solway Firth Outer Sandbank and Little Scares.

3.2.1.3 Status and condition of Marine Habitats and Species in the SMP Area

Scotland's Marine Atlas (2011) provides an overall assessment of the condition of marine habitats in Scotland[10], and the condition of marine habitats within the Solway Firth and North Channel is reproduced in Figure 3-2. For the Solway Firth and North Channel area, the condition of intertidal rock and sediment habitats showed a deteriorating trend on the basis of 2005-2009 assessment, while subtidal rock habitat, and shallow and shelf subtidal sediment habitats were stable.

An overall assessment of the condition of marine species in Scotland is provided in Scotland's Marine Atlas (2011), and the condition of species within the Solway Firth and North Channel is reproduced in Figure 3-2. The condition of plankton, cetaceans, grey seals, harbour seals, demersal fish and non-natives in the area was stable for the trend assessment period 2005-2009, seabirds showed an improvement in status, while sharks / rays and water birds showed a deterioration in status.

[10] Scotland's Marine Atlas 2011 - Overall Assessment

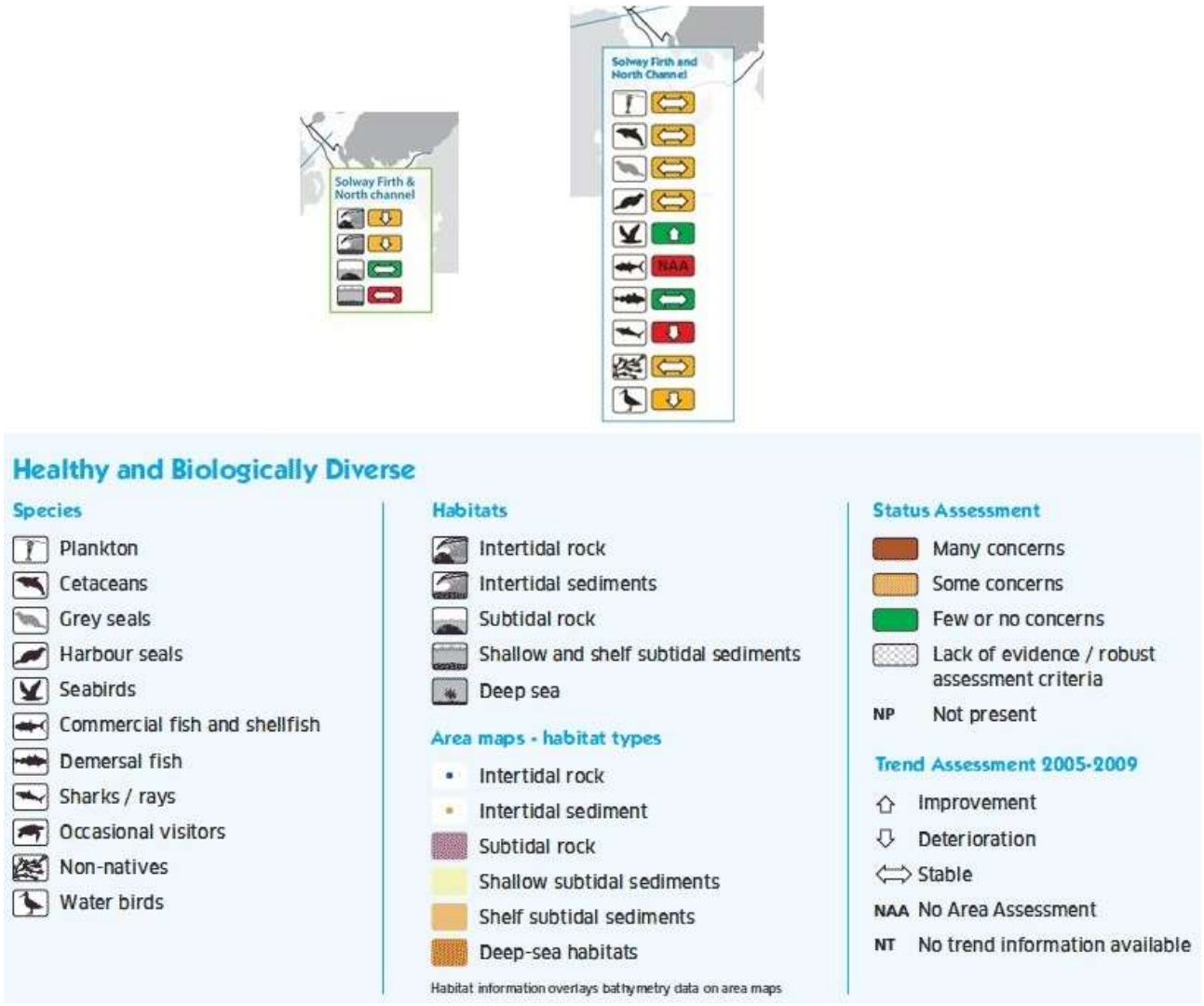


Figure 3-2 Assessment of the condition of marine habitats and species for the Solway Firth and North Coast

3.2.1.4 Invasive, Non-Native Species

Invasive, non-native, species (INNS) are those released either intentionally or unintentionally outside of their natural geographic range. These species can be a threat to the native flora and fauna in an area and can have implications for the conservation condition of designated sites, and the achievement of objectives under the Water Framework Directive. The Wildlife and Natural Environment Act (2011) introduced legal measures for the control of non-native species in Scotland, and the Code of Practice on Non-Native Species for Scotland (2012) includes species control agreements and orders[11]. Marine Scotland works with other UK organisations to co-ordinate the management of INNS in the UK.[12] Control of INNS, particularly in the marine environment, is difficult and expensive, and the Scottish Government follows a hierarchical approach to the management of INNS of 'Prevention, rapid response, control'[13]. Biosecurity advice for those who use the marine environment can help to prevent the spread of INNS. The Solway Firth Partnership produced a Biosecurity Plan for the Solway in 2013, highlighting the issues and identifying actions for the management of INNS in the area, including marine INNS, and those INNS of freshwater and brackish water that impact upon the marine and coastal environment. This Plan was updated for the 2018-2021 period[14]. Currently, nine marine INNS are

[11] Code of Practice on Non-Native Species for Scotland, 2012

[12] Scotland's State of the Environment Report, 2014

[13] Scotland's National Marine Plan, 2015

[14] Marine INNS in the Solway Firth 2018-2021

known to occur within the Solway Firth, Japanese wireweed (*Sargassum muticum*), Pacific oyster (*Crassotrea gigas*), Common cord grass (*Spartina anglica*), Orange tipped sea squirt (*Corella eumyota*), Acorn barnacle (*Elminius modestus*), Leathery sea squirt (*Styela clava*), Green sea fingers (*Codium fragile*), Japanese skeleton shrimp (*Caprella mutica*) and American lobster (*Homarus americanus*), as detailed in Table 3-7. In terms of the potential for environmental impacts from these species, the Japanese skeleton shrimp and American lobster are considered to pose a high-level threat, and the Common Cord Grass, Pacific Oyster and Wireweed a medium-level threat. In addition, three other species have been recorded in close proximity or as a potential threat to the area, the Chinese mitten crab (*Eriocheir sinensis*), Carpet sea squirt (*Didemnum vexillum*) and Killer shrimp (*Dikerogammarus villosus*).

Water Body Name	Species of Concern
Loch Ryan, points along North Solway	Japanese wireweed (*Sargassum muticum*)
North Solway – various points	Pacific oyster (*Crassotrea gigas*)
North Inner Solway and South Inner Solway – various points	Common cord grass (*Spartina anglica*)
North Solway, including Loch Ryan	Orange tipped sea squirt (*Corella eumyota*)
North Inner Solway and South Inner Solway – various points	Acorn barnacle (*Elminius modestus*)
Loch Ryan	Leathery sea squirt (*Styela clava*)
Loch Ryan, North Solway	Green sea fingers (*Codium fragile*)
Loch Ryan	Japanese skeleton shrimp (*Caprella mutica*)
Solway, landed at Workington	American lobster (*Homarus americanus*)

*Reproduced from Marine INNS in Solway 2018-2021, produced by the Solway Firth Partnership.

Table 3-7 Marine INNS currently present in the Solway Firth*

3.2.1.5 Summary of Existing Pressures and Issues for Biodiversity, Flora and Fauna in the SMP area

Existing pressures on biodiversity, flora and fauna within the SMP area include agricultural land use, development, fisheries, recreation and tourism, the presence of non-native species, electricity and communications transmission and wind power, and climate change effects (including temperature changes, changes in intertidal habitat size or quality through rising sea levels and / or altered erosion rates, and the potential for expansion of non-native species through creation of more favourable conditions).

Where active management and construction is proposed as a means of managing the Dumfries & Galloway shoreline it is likely that there will be potential interference with natural coastal processes and a loss of local habitats and their dependant species due to direct and indirect construction impacts and coastal squeeze. However, the adoption of the SMP can also provide the opportunity for habitat creation and enhancement, along with increasing public awareness of local biodiversity, flora and fauna issues, which could give greater protection and appreciation in the long term.

3.2.2 Population and Human Health

Population and human health, relates to the presence and wellbeing of people, and their activities and use of receiving environments. Population size, growth predictions and distribution within an area can indicate both the potential pressures that people may exert on resources and infrastructure, and the potential extent to which they may be exposed to risks. Health of a population can be adversely affected through a number of direct and indirect pathways, the most common of which being through emissions to water and air.

It is considered that the key issues associated with implementation of the SMP on Population and Human Health comprise:

- Flood risk to residential properties;
- Erosion risk to residential properties;

- Construction disturbance (visual, noise or access);
- Effects on local amenities and recreation;
- Effects on local views.

3.2.2.1 Population demographics for the SMP area

The census undertaken in 2019[15] found there to be approximately 148,860 people living within Dumfries & Galloway. This represents a population increase of 0% since 2001. In terms of overall size, the 45 to 64 age group was the largest in 2019, with a population of 44,454. In contrast, the 16 to 24 age group was the smallest, with a population of 13,169. The health of the population of Dumfries & Galloway is not too dissimilar to that of the nation's health. The average age of the population, at 45.6 years old, is higher than the national average of 41.5 years old. Of this population, 70% consider their health to be either 'good' or 'very good'; just slightly below the national average of 72%. The population structure of Dumfries & Galloway has fewer young people, more old people and fewer people of working age than the national average. This has implications for shoreline management as the elderly and the very young considered to be of higher vulnerability from flood risk.

Residents along the coast are predominantly concentrated within the larger settlements. The largest town in the region is Dumfries, with a population of 31,600, while the two other main towns in the region are Stranraer (population 10,800) and Annan (population 8,300). All other settlements in the area are smaller, with populations comprising less than 4,500 individuals. On the whole, the region is relatively sparsely populated, with a population density of 60 people per square mile compared to the Scottish average of 168. The locations of the major settlement areas in the region with their associated populations, based on 2019 UK census data, are illustrated in Figure 3-3.

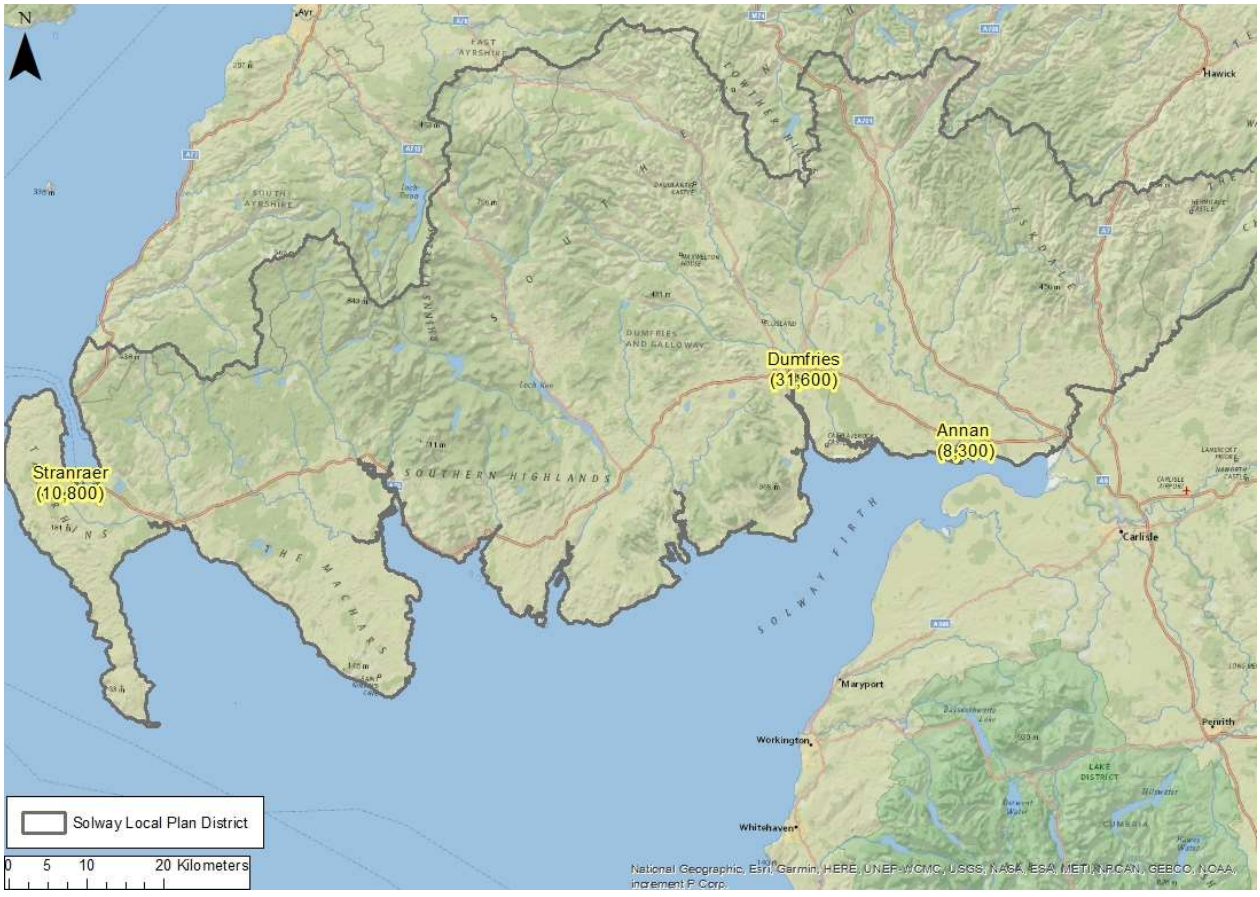


Figure 3-3 Main settlement locations and associated populations within the SMP Area

In terms of deprivation, Dumfries & Galloway is a very diverse region containing some of the most deprived and some of the least deprived areas in Scotland. The most deprived areas in the region are located in

[15] Statistics.gov.uk

Dumfries, Stranraer and Upper Nithsdale. The 2020 Scottish Index of Multiple Deprivation (SIMD)[16] indicates that some of the 20% most deprived data zones in Scotland are situated within Dumfries & Galloway; for the most part these are in or around the largest towns in the region. Within the Dumfries & Galloway region itself, however, the 20% most deprived data zones also comprise areas of a more rural nature[17].

3.2.2.2 Residential flood risk

The risk to people from coastal flooding is present within all coastal process units within the scope of the SMP, according to SEPA's strategic flood mapping data. With that being said, the extent to which such risk is present varies significantly (see Table 3-8). Overall, in a medium likelihood scenario, there are approximately 672 residential properties at risk of coastal flooding within the scope of the SMP. The average number of persons per household within Dumfries & Galloway is approximately 2.2. Given this information, it can be estimated that approximately 1,478 people within Dumfries & Galloway are currently at risk from coastal flooding within a medium likelihood scenario. When predicted potential changes due to climate change based on UKCP09 are considered, this increases to 1,198 residential properties equating to approximately 2,636 people estimated to be at flood risk.

Policy Unit	No. residential properties at flood risk (Medium likelihood)	No. residential properties at flood risk (Medium likelihood with climate change)
1 Browhouses	2	6
2 Browhouses to Dornock Burn	6	13
3 Dornock Burn to Waterfoot	14	17
4 Waterfoot to Nethertown	149	259
5 Nethertown to Drum-Mains	15	25
6 Glencaple to Dumfries	23	73
7 Drum-Mains to Southerness	44	83
8 Southerness to Castlehill Point	3	4
9 Castlehill Point to Dalbeattie	39	66
10 Castlehill Point to Balcary Point	0	0
11 Balcary Point to Torrs Point	0	0
12 Toors Point to Doon of Carsluith	2	3
13 St Mary's Isle to Tongland (Kirkcudbright)	90	170
14 Gatehouse of Fleet	4	8
15 Doon of Carsluith to Eggernes Point	44	76
16 Garlieston	36	44
17 Garlieston to Isle of Whithorn	0	0
18 Isle of Whithorn	51	58
19 Isle of Whithorn to Barsalloch Point	0	0
20 Barsalloch Point to Low Drumskeog	2	8

[16] https://www.spatialdata.gov.scot/geonetwork/srv/eng/catalog.search#/metadata/02866b0b-66e5-46ab-9b1c-d433dc3c2fae

[17] https://www.gov.scot/publications/scottish-index-multiple-deprivation-2020/pages/6/

Policy Unit	No. residential properties at flood risk (Medium likelihood)	No. residential properties at flood risk (Medium likelihood with climate change)
21 Low Drumskeog to Kilfillan Point	0	0
22 Kilfillan Point to Sandhead	1	2
23 Sandhead to Chapel Rossan	3	9
24 Chapel Rossan to Drummore	0	0
25 Drummore	4	9
26 Drummore to the Mull of Galloway	0	0
27 Mull of Galloway to Portpatrick	0	8
28 Portpatrick	4	9
29 Portpatrick to Milleur Point	0	0
30 Milleur Point to Kirkcolm	0	0
31 Kirkcolm to McCullochs Point	1	1
32 McCullochs Point to Innermessan (Stranraer)	137	248
33 Innermessan to Bankhead	0	0
34 Bankhead to Old House Point	0	0
35 Old House Point to Galloway Burn	0	0

Table 3-8 Population flood risk in the SMP area

3.2.2.3 Summary of Existing Pressures and Issues for Population and Human Health in the SMP area

Where active management and construction is proposed as a means of managing the Dumfries & Galloway shoreline it is likely that associated construction activities may lead to short term disturbances to local communities. However, the implementation of measures to reduce flood risk will serve to protect human health. Sustainable management of the coastline can also lead to greater recreational potential, which in turn can provide health benefits to the local population.

3.2.3 Geology, Soils and Land use

Geology, soils and land use considers the physical nature of the Plan area, and the manner in which this may influence, or be influenced by, the proposed SMP.

It is considered that the key issues associated with implementation of the SMP and geology, soils and land use comprise:

- Effects on sites designated for earth science features;
- Effects on potentially contaminated lands, and
- Effects on erosion or accretion of the shoreline.

3.2.3.1 Geology of the SMP Area

Within the area of the SMP, the soil is largely made up of brown soils and mineral gleys with some humus-iron podzols. Peaty gleys, peaty podzols and dystrophic semi-confined peat can be found further inland to the north at areas of higher elevation. The underlying bedrock geology runs in a southwest to northeast direction. The east of the SMP area is underlain by Triassic rocks (undifferentiated) composing of mudstone, siltsone and

sandstone. The central portion of the SMP area is primarily underlain by thin to medium-bedded greywacke and interbedded silty mudstone with thin red mudstone beds in the Carghidown Formation and laminated fossiliferous carbonaceous siltstone beds in Ross Formation. The western portion of the SMP area is underlain by graded beds that may include wacke sandstone, siltstone and mudstone in variable proportions, interpreted as turbidites with sandstone / siltstone turbidite sequences in the northwest. The seabed is largely comprised of infralittoral sand in the east, muddy sands, mixed sediments and shallow circalittoral coarse substrate in the central section of the SMP area and shallow circalittoral seabed and deep circalittoral coarse substrate in the west. These substrates are mainly underlain by sandstone (undifferentiated), mudstone and halite-stone and mudstone and limestone.

There are 22 SSSIs within the SMP area; of these, 14 are designated, at least in part, for their geological or geomorphological interests. These sites are listed in Table 3-9, along with designated earth science features and their current conservation condition, as assessed by NatureScot. The most recent condition assessment for Quaternary features at Upper Solway Flats and Marshes SSSI includes flood defence / coastal defence works as a negative pressure, while 'natural events' are also included as a negative pressure, as well for this feature within Port Logan SSSI.

SSSI	Earth Science Feature(s)	Current Condition
Corsewall Point to Milleur Point	Caradoc-Ashgill	Favourable Maintained
Morroch Bay	Llandeilo	Favourable Maintained
Grennan Bay	Caledonian structures of the Southern Uplands	Favourable Maintained
Port Logan	Quaternary of Scotland	Favourable Maintained
Torrs Warren-Luce Sands	Coastal geomorphology of Scotland	Favourable Maintained
Back Bay to Carghidown	Caledonian structures of the Southern Uplands	Favourable Maintained
West Burrow Head	Caledonian structures of the Southern Uplands	Favourable Maintained
Isle of Whithorn Bay	Caledonian structures of the Southern Uplands	Favourable Maintained
Cruggleton Bay	Caledonian structures of the Southern Uplands	Favourable Maintained
Cree Estuary	Coastal geomorphology of Scotland	Favourable Maintained
Borgue coast	Caledonian structures of the Southern Uplands Wenlock	Favourable Maintained Partially Destroyed
Shoulder O'craig	Caledonian Igneous	Favourable Maintained
Torrs to Mason's walk	Wenlock	Favourable Maintained
Upper Solway Flats and Marshes	Coastal geomorphology of Scotland Lower Carboniferous [Dinantian-Namurian] Mineralogy of Scotland Quaternary of Scotland	Favourable Maintained Favourable Maintained Favourable Maintained Favourable Maintained

Table 3-9 Geological SSSIs in the SMP area and Current Condition

3.2.3.2 Land use in the SMP Area

The SMP area is generally dominated by pastures and non-irrigated arable land with some estuaries, intertidal flats and salt marshes present. Only a very small proportion of land in the Dumfries & Galloway region is considered as prime agricultural land; primarily located in the Rhinns, the Machairs and around Dumfries,

Annan and Lochmaben in the vicinity of population centres[18]. The east of the plan area, in the vicinity of Gretna and Dumfries, contains the largest area of continuous and discontinuous urban fabrics. In the central portion of the SMP area, there are woodland areas present, particularly broad-leaved forest, coniferous forest and areas of mixed forest, which continue inland. The western coastline also contains intertidal flats, some port areas and areas of moors and heathland. Along the western coastline, approximately 5km inland, large areas of peat bogs are present.

Several active quarries are located within the SMP area, including Sandmill and Clayshant Quarries situated close to the shoreline at Sandhead, and Broom and Hoddam Quarries situated at Powfoot; each of these quarries extract sand and gravel. Two landslides have occurred within the SMP area, one confirmed by BGS on the A77 just north of the ferry terminal at Cairnryan, and another unconfirmed at Portpatrick.

Although there is no legislation specifically protecting ancient woodland, Scottish Planning Policy identifies it as an important and irreplaceable national resource that should be protected and enhanced. The Ancient Woodland Inventory (AWI) identifies many small areas of ancient woodland within the SMP area, including some areas close to the shoreline such as at Garlieston, Kirkdale / Ravenshall Woods, within Fleet Bay, and Kirkcudbright Bay.

The Kirkcudbright training centre, Ministry of Defence (MOD), lands is located on the northern coastline of the Solway Firth occupying an exposed headland 5 km south of the town of Kirkcudbright.

In terms of planning and coastal development, the Dumfries & Galloway LDP2, adopted in 2019, identified planning policy for ‘developed’ and ‘undeveloped’ coastline within the county. According to Policy NE9, development proposals outside of the areas identified as developed are considered unlikely to be suitable for development unless the council is satisfied that the proposal has a requirement for a coastal location that cannot be satisfied within the developed coast; and taking account of climate change and in particular sea level rise, the proposal would maintain or improve the integrity and quality of the coastal environment.

3.2.3.3 Coastal erosion and accretion within the SMP area

Scotland’s Dynamic Coast[19] project aimed to establish an evidence base of national coastal change. The project supports Scottish Government and Scottish Public Sector decision-making and indicates areas of highest coastal erosion risk, where a more detailed evidence base may be required. The initial research was published in 2017 but was superseded by further work in 2021[20] which included increased extents of eroding shoreline using the latest climate change projections on sea level rise (UKCP18).

Key findings from the project indicate that coastal erosion is expected to affect an increasing proportion of Scotland’s shoreline in the future, and at an increasing rate. The current Dynamic Coast project has investigated the soft / erodible shoreline in Scotland (excluding salt marshes), identifying that coastal erosion now affects 46% of the soft coast, an increase over the 38% identified in 2017. The average rate of erosion currently is 0.43 m / yr, though core methodological differences mean that comparisons with the 2017 average of 1 m / yr should not be made. The proportion of shorelines experiencing coastal erosion, and the rate of erosion, increases under all climate change emissions scenarios. Figure 3-4 indicates the projected extent of future (2050) erosion under a high emission scenario.

[18] https://www.dumgal.gov.uk/media/19007/LDP2-State-of-the-Environment/pdf/State_of_the_Environment_Report_2016.pdf

[19] Dynamic Coast - Scotland's NCCA

[20] Dynamic Coast. The National Overview (2021)

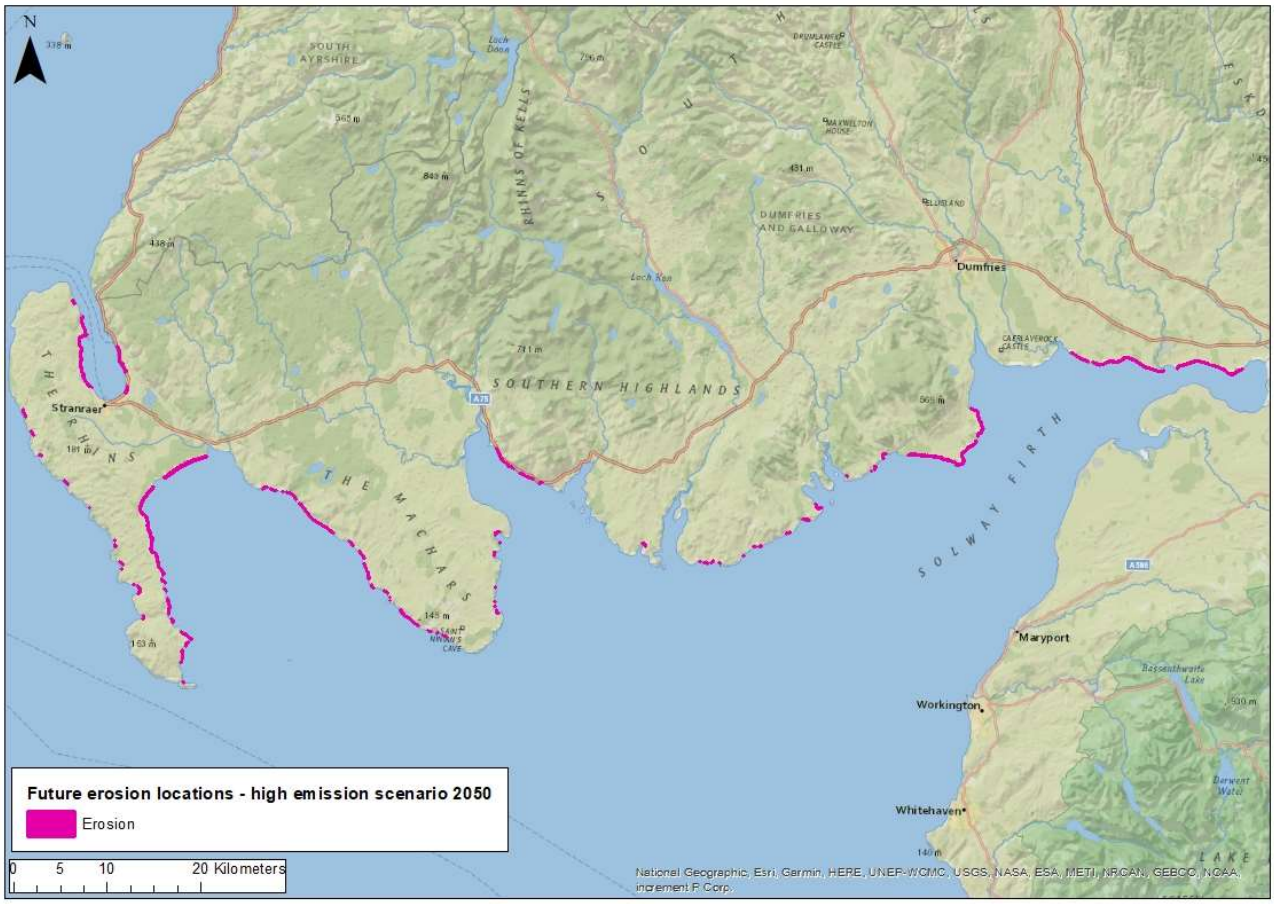


Figure 3-4 Dynamic Coast projection of future coastal change by 2050 within the SMP Area

The coastal erosion risk along the Dumfries & Galloway coastline can be summarised as follows:

- In some Policy Units (1, 3, 5, 11, 12, 19, 21, 33, 35) no receptors were identified to impacted by coastal erosion.
- It was estimated that by 2050, 13 coastal properties would be located within the Erosional Area and a further 33 located within the Erosion Influence area. It was noted that most of these properties were situated within Policy Unit 7 (Carsethorn and Southerness).
- It was also anticipated that by 2050, about 2km of road would be located within the Erosional Area, and almost 3km within the Erosion Influence area.
- By 2100, due to the ongoing influences erosion and of climate change, 225 properties were identified to potentially be located within the Erosional Area and 68 within the Erosion Influence area.
- Within Policy Unit 23, Sandhead was identified as an area where a present relatively low erosion risk would become significant by 2100, with up to 172 properties potentially within the Erosional Area and 10 properties in the Erosion Influence area by this time.

3.2.3.4 Summary of Existing Pressures and Issues for Geology, Soils and Land use in the SMP area

The existing natural processes of erosion and accretion have influenced the current shoreline within the SMP area. The effects of climate change have influenced the rates at which the shoreline is changing and are anticipated to lead to a loss of land within areas of soft eroding shoreline. Land use and soils within the Plan area are also influenced by developments along the coast for residential, industrial or recreational purposes, and by existing recreational use of the area.

Where the continuation of natural coastal process is deemed to be the most viable and sustainable option available to the SMP, it is unlikely that there will be any form of significant impact upon local geology, soil and / or land use, apart from the natural erosion / accretion processes. Where active management or construction is preferred in the Plan, coastal morphology and sediment dynamics may be impacted upon.

3.2.4 Water

Water is essential for the maintenance of biodiversity, supports the population through the provision of drinking water and supports many of our core activities. Construction activities in or near water can result in pollution or sedimentation, with implications for the status of water bodies, and sensitive habitats and species, and can also result in the spread of non-native species.

It is considered that the key issues associated with implementation of the SMP and Water comprise:

- Impacts on the ecological status of WFD surface water bodies from pollution or sedimentation associated with construction activities, or from the introduction or spread of invasive non-native species;
- Morphological impacts on water bodies from engineering and other works;
- Impacts on WFD protected areas from pollution or sedimentation associated with construction activities, including bathing water protected areas, shellfish water protected areas and wildlife conservation protected areas; and
- Effects on susceptibility to flooding and or erosion.

3.2.4.1 Water Framework Directive Surface water bodies and status

The EU Water Framework Directive (WFD) (200/60/EC), implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003, established a new legal framework for the protection, improvement and sustainable use of rivers, lochs, transitional waters, coastal waters and groundwater across Europe. This was undertaken to prevent deterioration and to enhance the status of aquatic ecosystems, promote sustainable water use and reduce pollution. Statutory objectives are implemented through River Basin Management Plans (RBMPs) for River Basin Districts (RBDs). These are produced every six years by SEPA and summarise:

- The state of the water environment;
- Pressures affecting the water environment, when it is in less than ‘Good’ condition;
- Actions to protect and improve the water environment; and
- A summary of the outcomes following implementation.

Scotland contains three RBDs; the majority of Scotland lies within the Scotland RBD, while areas sharing a border with England are included within the Solway Tweed RBD and Northumbria RBD. The Dumfries & Galloway coastline lies within the Solway Tweed RBD. This RBD is comprised of a significant number of surface water bodies, including rivers, lakes, coastal and transitional water bodies. The coastline within the SMP area encompasses ten transitional water bodies and eight coastal waterbodies. All coastal waterbodies within the SMP area have a current overall WFD status of at least Good, with the Solway Firth Offshore having an overall status of High (Table 3-10). Transitional waterbodies within the Plan are largely given an overall status of Good, with the exception of the Solway Estuary, which currently has an overall status of Moderate, and the Dee (Kirkcudbright) Estuary, Cree Estuary and Southwick Estuary, which have an overall status of High. Invasive species are listed as a pressure for the achievement of WFD objectives for many of the water bodies in the SMP area, however the progress against the objective ‘freedom from invasive species’ is recorded by SEPA as on target for 2027. Water quality pressures, including both chemistry and ecology, are also listed for Solway Estuary.

Water Body	2018 Overall Status	2027 Objective
Transitional Water Bodies		
Piltanton and Luce Estuary	Good	Good
Bladnoch and Cree Estuary (Outer)	Good	Good
Cree Estuary	High	High
Fleet Estuary	Good	Good
Dee (Kirkcudbright) Estuary	High	High
Auchencairn Bay / Rough Estuary	Good	Good
Solway Estuary	Moderate	Good
Annan Estuary	Good	Good
Nith Estuary	Good	Good
Southwick Estuary	High	High
Coastal Water Bodies		
Loch Ryan	Good	Good
Loch Ryan Offshore	Good	Good
Mull of Galloway to Corsewall Point	Good	Good
Luce Bay	Good	Good
Wigtown Bay	Good	Good
Balcary Point to Kirkcudbright Bay	Good	Good
Southerness Point to Balcary Point	Good	Good
Solway Firth Offshore	High	High

Table 3-10 WFD water bodies and status in the SMP area

The WFD required Member States to establish a register of protected areas for water bodies or parts thereof that require additional water quality protection due to their importance to people or wildlife. This is outlined in Article 6 (Annex IV) of the Directive, and in Section 7 of the Water Environment and Water Services (Scotland) Act 2003.

There are seven Designated Bathing Water Protected Areas within the Plan area: Mossyard, Carrick, Brighouse Bay, Dhoon Bay, Rockcliffe, Sandyhills and Southerness. SEPA's Water Environment Hub details the 2015 condition for designated bathing water sites; the general water quality for each location is described as 'excellent', 'good', 'at target objective', 'not at target objective' or 'poor', on the basis of four years of monitoring data. Three of the designated Bathing Water sites currently have an overall status of 'Good', while four (Mossyard, Dhoon Bay, Rockcliffe and Sandy Hills) are currently 'not at target objective'.

There is one designated Shellfish Water Protected Area within the immediate SMP area, Loch Ryan, designated under The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2016. This covers the whole of Loch Ryan, with the boundary crossing the mouth of the loch at Milleur Point. There are also two designated shellfish sites on the English side of the Solway Firth, Solway and Siloth. The 2014 condition of designated Shellfish Water is detailed on SEPA's Water Environment Hub, however Loch Ryan is not currently included within this list. Solway and Siloth SWPAs are currently 'at target objective' and expected to remain at this status for 2021.

There are also nine Wildlife Conservation Area Protected Areas within the SMP area, as detailed on SEPA's Water Environment Hub; these are given an overall condition of 'at target objective' or 'not at target objective'. Each of these sites has a current condition 'at target objective'. The WFD protected areas within the SMP area are summarised in Table 3-11 below.

Protected Area	Overall Condition*
Bathing Water Protected Areas	
Mossyard	Not at target objective
Carrick	Good
Brighouse Bay	Good
Dhoon Bay	Not at target objective
Rockcliffe	Not at target objective
Sandyhills	Not at target objective
Southerness	Good
Shellfish Water Protected Areas	
Loch Ryan	NA
Solway	At target objective
Siloth	At target objective
Wildlife Conservation Protected Areas	
Glenn App and Galloway Moors	At target objective
Loch of Inch and Torrs Warren	At target objective
Mull of Galloway	At target objective
Luce Bay and Sands	At target objective
Burrow Head	At target objective
River Bladnoch	At target objective
Carsegowan Moss	At target objective
Upper Solway Flats and Marshes	At target objective
Solway Mosses North	At target objective

*Bathing water condition results are from 2015, Shellfish waters and Wildlife Conservation areas are from 2014.

Table 3-11 Number and current status of WFD Protected Areas in the SMP area

3.2.4.2 Marine Strategy Framework Directive

The European Marine Strategy Framework Directive (MSFD) (2008/56/EC) is implemented in Scotland through the Marine Strategy Regulations 2010. The MSFD required Member States to achieve Good Environmental Status (GES) of their waters by 2020, defined as: “The environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive” (Article 3). The Regulations required the production of a marine Strategy for UK waters, coordinated across the four UK Administrations. The Strategy aims to help in the delivery of international obligations and commitments such as those under the UN Convention on the Law of the SEA (UNCLOS), UN Sustainable Development Goal 14, OSPAR Strategy and Convention on Biological Diversity. The Strategy applies an ecosystem - based approach to the management of human activities, and considers the following 11 quality descriptors:

- D1 – Biological diversity (cetaceans, seals, birds, fish, pelagic habitats and benthic habitats);
- D2 – Non-indigenous species;
- D3 – Commercially-exploited fish and shellfish;
- D4 – Food webs (cetaceans seals, birds, fish and pelagic habitats);
- D5 – Eutrophication;
- D6 – Sea-floor integrity (benthic habitats);

- D7 – Hydrographical conditions;
- D8 – Contaminants;
- D9 – Contaminants in fish and other seafood;
- D10 – Marine litter; and
- D11 – Underwater noise.

The UK Marine Strategy comprise three parts, to be updated every six years: assessment, monitoring programmes and a programme of measures. The first UK assessment of our seas was published in 2012[21], and set objectives, targets and indicators for achieving GES; this was updated in 2019[22], and the status of descriptors for the UK is summarised in Table 3-12.

Descriptor	GES Achieved	Trend	Description
D1 & D4 Cetaceans	Partially	Stable / mixed	Achievement of GES uncertain. Status of coastal bottlenose dolphin & minke whale consistent with GES in the Greater North Sea, but uncertain elsewhere.
D1 & D4 Seals	Partially	Improving	GES achieved for grey seals. Harbour seals have not achieved GES in the Greater North Sea; in the Celtic Sea, significant increase in West Scotland but status uncertain in other areas.
D1 & D4 Birds	No	Declining	GES achieved for non-breeding waterbirds in the Greater North Sea but not the Celtic Sea. Breeding seabirds have not achieved GES.
D1 & D4 Fish	No	Improving	GES not yet achieved in the Greater North Sea or Celtic Seas; demersal fish communities recovering from past over-exploitation.
D1 & D4 Pelagic Habitats	Partially	Stable / mixed	Achievement of GES uncertain; prevailing environmental conditions likely driving changes in plankton communities but influence of human activities not certain.
D1 & D6 Benthic habitats	No	Stable / mixed	GES achievement uncertain for intertidal & soft sediment habitats; for soft sediments, the level of physical damage consistent with GES in waters west of the Celtic Seas but not in the Celtic Seas or the Greater North Sea. GES not achieved for sublittoral rock and biogenic habitats.
D2 Non-indigenous species (NIS)	No	Stable / mixed	GES not achieved, but ability to detect new NNIS has improved.
D3 Commercial fish	No	Improving	GES achieved for some commercially exploited fish. In 2015, 53% of marine fish (quota) stocks fished below maximum sustainable yield (MSY) and has increased significantly since 1990. Most national shellfish stocks have not achieved GES or their status is uncertain.

[21] Marine Strategy Part One: UK initial assessment and Good Environmental Status (publishing.service.gov.uk)

[22] Marine Strategy Part One: UK updated assessment and Good Environmental Status (publishing.service.gov.uk)

Descriptor	GES Achieved	Trend	Description
D4 Food webs	Partially	Improving	Achievement of GES is uncertain, components of the marine food web are changing but it is not clear how they are affecting each other.
D5 Eutrophication	Yes	Stable / mixed	GES largely achieved. A small number of problems remain in coastal and estuarine waters, representing 0.03% of the UK EEZ and 0.41% of estuarine and coastal waters.
D7 Hydrographical conditions	Yes	Stable / mixed	GES continuing to be achieved.
D8 Contaminants	Yes	Improving	GES largely achieved. Highly persistent legacy chemicals cause of new failures, mainly in coastal waters close top polluted sources.
D9 Contaminants in seafood	Yes	Improving	GES achieved, high level of compliance with agreed safety levels.
D10 Marine litter	No	Stable / mixed	Beach litter levels in the Celtic Seas largely stable, while levels in the Greater North Sea have slightly increased.
D11 Underwater noise	Partially	Stable / mixed	Achievement of GES is uncertain but research and monitoring programmes are improving understanding.

Table 3-12 UK Assessment of Environmental Status for the MSFD

3.2.4.3 Flood risk in the SMP area

The Floods Directive (Directive 2007/60/EC on the assessment and management of flood risks) required Member States to assess flood risk from fluvial, pluvial and coastal sources and to take adequate and coordinated measures to reduce this risk through the production of Flood Risk Management Plans (FRMPs). This was transposed into Scottish legislation by the Flood Risk Management (Scotland) Act 2009. The approach to flood risk management follows a six year planning cycle, including the identification of priority areas at significant flood risk, development of flood hazard and risk maps, identification of objectives and actions, consideration of climate change and future flood risk, and development of FRMPs and Local FRMPs. SEPA's National Flood Risk Assessment (NFRA), published in 2011, identified Potentially Vulnerable Areas (PVAs) across Scotland[23]. They produced a national FRMP, setting national priorities for flood risk management, while local authorities are responsible for the production and implementation of local FRMPs within their areas. The national level plan produced by SEPA comprised 14 flood risk management strategies, covering each of the Local Plan Districts in Scotland. For priority areas (PVAs) within each district there is a description of the causes and consequences of flooding, agreed objectives for local flood risk management and specific actions over the short to long term to achieve these.

The SMP lies within the Solway Local Plan District. Coastal flood risk within the SMP has been established from SEPA Indicative Flood Maps from the first cycle FRMPs. The risk of coastal flooding is present throughout the SMP area, i.e. in all CPUs. The PVAs and Objective Target Areas (OTAs) identified by SEPA within the SMP area are shown in Figure 3-5.

[23] Flood Risk Management Maps (sepa.org.uk)

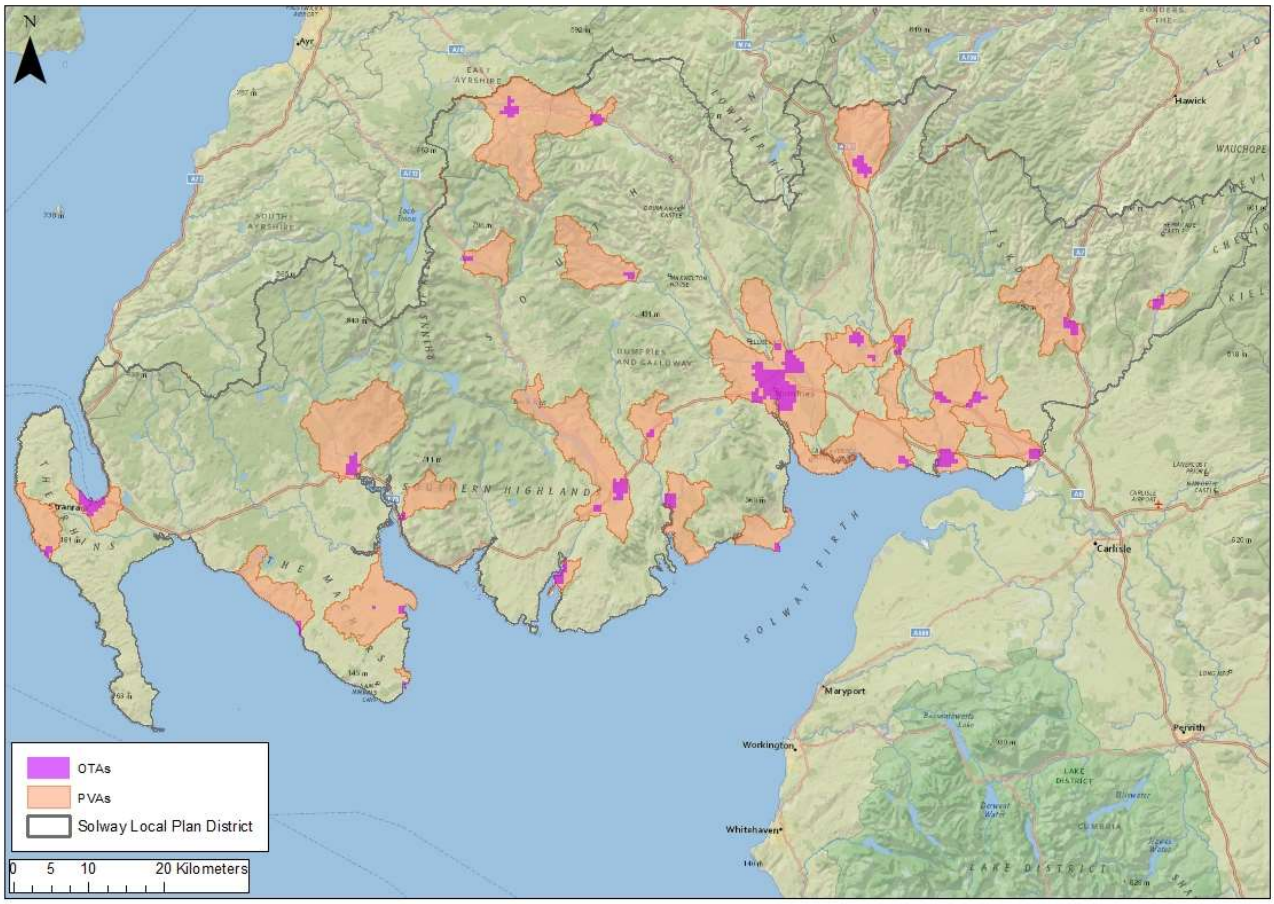


Figure 3-5 Potentially Vulnerable Areas and Objective Target Areas within the SMP area

3.2.4.4 Summary of Existing Pressures and Issues for Water in the SMP area

While water bodies in the Plan area are generally at least at good WFD status, the Solway estuary is currently failing to achieve good status for chemicals and ecology owing to pressures within the catchment. The presence of non-native species is an issue in many of the water bodies within the area, however progress is being made on this issue. Four of the seven Bathing Water Protected Areas within the Plan area are currently not meeting target objectives for water quality.

Actions from the SMP have the potential for indirect impacts on coastal and transitional waterbodies from sedimentation and release of contaminants in runoff from construction activities, and potential for direct effects on the morphological status of these water bodies from engineering works. Actions from the SMP are unlikely to cause or exacerbate flood risk or erosion, and are proposed to manage these issues; however, it is important that the Plan ensures that it is not transferring risk onto other receptors.

3.2.5 Climatic Factors

Climate change represents one of the most important threats to our environment, and to our economy, and projections indicate that hotter, drier summers and warmer wetter winters will occur over the next century as a result of climate change. The Paris agreement, signed in 2015, committed to strengthening the global response to the threats of climate change, by holding the global temperature rise to no more than 2°C and preferably below 1.5°C. Key to this agreement is the reduction of Greenhouse Gas (GHG) emissions fast enough to achieve this temperature goal.

It is considered that the key issues associated with implementation of the SMP and Climate comprise:

- Effects on susceptibility to climate-changed exacerbated extents or rates of flooding; and
- Effects on susceptibility to climate-changed exacerbated extents or rates of erosion.

3.2.5.1 Current Climate of the SMP area

The climate of Western Scotland is relatively mild, due, in part, to the strong maritime influence of the prevailing winds which come in from across the sea [24]. The southern region of western Scotland, including the Dumfries & Galloway area, has an annual mean temperature in the range 8.0 to 9.4°C, with a relatively small annual temperature range of about 9°C. July and August are the warmest months in the region, with a mean daily maximum of more than 19°C in southern Dumfries & Galloway, while February is the coldest, with a mean daily minimum temperature of 1 to 2°C along most of the Solway Firth.

The west of Scotland is one of the more exposed areas of the UK, and the region has between five and 25 days of gale force winds each year; exposed places on coasts experience stronger wind speeds and more days of gale.

Annual average rainfall within Dumfries & Galloway is estimated to be less than 1,000mm along the coast. Autumn and winter, and October and January in particular, are the wettest seasons of each year, during which time Dumfries & Galloway experiences approximately 45 wet days and fewer than five days of snow. The spring and summer months, particularly from April to June, are the driest months of the year, with May and June being the sunniest, and the average annual sunshine total along the Dumfries & Galloway coast approaches 1,450 hours.

3.2.5.2 Climatic change

The most recent State of the UK Climate 2019 report presents trends indicating that the climate in the UK is continuing to warm, and that sea levels continue to rise[25]. The UK Climate Projections (UKCP) provide the most up to date assessment of how the UK's climate is expected to change in the future, with future projections for both land and marine environments. The most recent projections are provided by UKCP18, which is the fourth generation of national climate projections for the UK. Findings are provided for both a low (RCP2.6) and high (RCP8.5) greenhouse gas emission scenarios. Generally, these climate change projections show an increased chance of milder, wetter winters and hotter, drier summers over land in the UK, and an increase in the frequency and intensity of extremes[26].

Probabilistic projections of average warming across the UK by 2070 give a range of 0.9°C to 5.4°C warmer in summer and 0.7°C to 4.2°C in winter in the high emission scenario[21]. Regional projections of annual data for western Scotland indicate annual mean air temperatures by 2080 of between 10.7°C and 11.6°C in the RCP8.5 scenario. This includes annual mean summer temperatures of between 15.8 and 17.5, and annual mean winter temperatures of between 5.8 and 6.3. Probabilistic projections for rainfall averaged across the UK give a range of average changes by 2070 of -47% to +2% in summer, and -1% to 35% in winter in the high emissions scenario; rainfall patterns currently vary across the UK on seasonal and regional scales, and this will continue in the future. Regional projections of average rainfall for all seasons for western Scotland indicate a precipitation rate of between 4 .59mm and 5.95mm per day.

Marine projections under UKCP18 show that the sea level around the UK will continue to rise under all emission scenarios[21]. The pattern varies across the UK, being less in the north, with sea level rise by the end of the century for Edinburgh projected to be in the range 0.08m to 0.49m for the low emission scenario, and in the range 0.30m and 0.90m in the high emission scenario. There are a number of very low-lying areas within the Solway estuary which may be affected by a change in sea level.

3.2.5.3 Summary of Existing Pressures and Issues for Climatic Factors in the SMP area

Since the start of the 20th century records show that the climate in Scotland is changing, and climate change is recognised as a significant threat in Scotland's most recent State of the Environment report (2014). It is known that Scotland is now experiencing relative sea-level rise although the rate of increase differs regionally mainly due to the different rates at which the land is moving relative to sea level due to isostatic uplift. All future

[24] western-scotland_-climate---met-office.pdf (metoffice.gov.uk)

[25] State of the UK Climate 2019: International Journal of Climatology: Vol 40, No S1 (wiley.com)

[26] ukcp-headline-findings-v2.pdf (metoffice.gov.uk)

projections expect this rate to accelerate in the future, thus sea level rise and coastal flooding are key climate change risks for Scotland in the future.

Activities associated with the development of flood management infrastructure along the Dumfries & Galloway coastline, are anticipated to reduce the effects on susceptibility to climate-changed exacerbated flooding and / or erosion. The SMP the potential to contribute to long term sustainable protection from climate change-related pressures within the area.

3.2.6 Material Assets

The term 'Material Assets' can be considered very broadly within the SEA process, encompassing for example infrastructure, settlements, transport and utilities.

It is considered that the key issues associated with implementation of the SMP and material assets comprise:

- Potential flooding and erosion impacts on material assets.
- Potential climate change influenced flooding and erosion impacts on material assets.
- Potential for direct or indirect impacts on material assets from construction activities; and
- Potential for the protection of material assets from flooding or coastal erosion.

3.2.6.1 Material Assets within the SMP area

Development along the Dumfries & Galloway coastline primarily comprises rural areas of low density. There are a few more built up urban settlements, the largest of which are Dumfries, Stranraer and Annan. These larger settlements are connected by transport routes including roads, such as the A75. Other roads, such as the A710, A711, A746, A747, run along the Dumfries & Galloway coastline, connecting the smaller towns in the area. A railway line also connects the towns of Gretna, Annan and Dumfries, before travelling north towards Ayr and Glasgow.

There are 25 Sewage Treatment Works (STWs) in the SMP area: Cairnryan, Kirkcolm, Portpatrick, Drummore, Sandhead, Port William, Monreith, Isle of Whithorn, Whithorn, Garlieston, Wigtown, Creetown, Borgue, Kirkcudbright, Auchencairn, Palnackie, Kippford, Carsethorn, Cargenbridge, Troqueer, Glencaple, Powfoot, Annan, Eastriggs and Gretna. In 2018, in Dumfries & Galloway, the overwhelming majority of STW outfalls were small discharges (<15,000pe) with there being 52 outfalls. There are only 4 larger secondary STW treatment plants with a capacity between 15,000 and 100,00pe. There are 56 outfalls for STW in the Solway marine region[27].

There are a number of Industrial Emissions Directive (IED) Sites within the area. These are concerned with a variety of sectors including the food and beverage sector, the chemical industry, the farming sector and waste disposal. According to the Scottish Pollutant Release Inventory (2013), industrial marine discharges in the area occur at Stranraer (animal and vegetable products from the food and beverage sector, and waste and waste water management), and at Newbie (chemical industry).

There is also a variety of energy-related infrastructure along the Dumfries & Galloway coastline; including a number of onshore windfarms as well as the Robin Rigg site situated offshore and the Galloway biomass plant. Sub-sea infrastructure such as power and telecommunications cables, both active and residual, are situated within several of the SMP area's CPUs; these include cables from Portpatrick to Northern Ireland. In addition, the Scotland to Northern Ireland Pipeline (SNIP) for natural gas runs from Twynholm in Scotland to Ballylumford in Northern Ireland, while two further subsea natural gas pipelines run from Brighouse Bay in Scotland to the Republic of Ireland.

3.2.6.2 Flood risk to material assets within the SMP area

The risk to material assets from coastal flooding is present within all coastal process units within the scope of the SMP. With that being said, the extent to which such risk is present varies significantly across Policy Units. In a medium likelihood scenario, the highest level of risk to residential and non-residential properties occurs at

[27] https://www.solwayfirthpartnership.co.uk/solway-review/clean-and-safe/waste-water-and-industrial-outfalls/#chapter_1

Annan, Waterfoot, Powfoot, Kirkcudbright and Stranraer (within Policy Units 4, 13 and 32), while the risk to utility infrastructure is highest at Dumfries and Glencaple (Policy Unit 6), and the risk to roads, including A roads, occurs across many of the SMP Policy Units.

Overall, in a medium likelihood scenario, there are approximately 672 residential properties, 298 non-residential properties, 44 utilities, 7.1km of A roads, 5.3km of B roads, 14.9km of minor roads and 0.8km of railway at risk of coastal flooding within the scope of the SMP. When predicted potential changes due to climate change based on UKCP09 are considered, this increases to 1,198 residential properties, 477 non-residential properties, 10.8km of A roads, 7.7km of B roads, 20.1km of minor roads and 2km of railway estimated to be at flood risk.

3.2.6.3 Erosion risk to material assets within the SMP area

The nature of the shoreline and anticipated coastal change analysis from the Scottish Government's Dynamic Coast project (Phase 2 results, published summer 2021, www.DynamicCoast.com) was used to inform the quantification of erosion risk for the updated SMP. Table 3-13 presents a summary of the coastal erosion risk along the entire Dumfries & Galloway coastline. This summary table highlights the assets at risk under a 'do nothing' High Emission Scenario and a 'do nothing' coastal management scenario.

3.2.6.4 Summary of Existing Pressures and Issues for Material Assets in the SMP area

There are existing development pressures on material assets within the SMP area, particularly in urban areas. Assets, including residential and non-residential buildings, and roads in some areas of the SMP are currently at risk of flooding and / or erosion, and this risk is expected to increase with climatic change. Where active management and potentially future construction is proposed as the preferred policy, it will need to be planned appropriately at the detailed design phase in order to work with existing and proposed material assets.

Homes			Businesses			Roads (all) (km)		
2050								
Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity
11	25	170	2	8	67	1.92	2.673	15.382
2100								
Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity	Erosional Area	Erosion Influence	Erosion Vicinity
212	43	202	41	13	72	11.884	16.377	18.22

Table 3-13 Summary of Coastal Erosion Risk

3.2.7 Cultural, Archaeological and Architectural Heritage

The SMP area is rich in cultural, archaeological and architectural heritage, with many important archaeological sites, monuments and heritage buildings. It is considered that the key issues associated with implementation of the SMP and Cultural, Architectural and Archaeological Heritage comprise:

- Potential flooding and erosion impacts on heritage assets.
- Potential climate change influenced flooding and erosion impacts on heritage assets.
- Potential for direct or indirect impacts on archaeological and architectural features and their settings from construction activities; and
- Potential for protection of cultural heritage assets from flooding or erosion.

3.2.7.1 Heritage features within the SMP area

There are a large number of cultural, archaeological and architectural heritage features within the SMP area. These include the following:

- 1,732 listed buildings;
- 128 Scheduled Monuments;
- 16 Conservation Areas;
- Three coastal Properties in Care (Carsluith Castle, St. Ninian's Cave and Barsalloch Fort);
- Eight Gardens of Designed Landscape (GDL) (Loch Ryan, Castle Kennedy, Logan House, Ardwell House, Monreith, Galloway House, Cally, and Arbigland);
- Two National Trust of Scotland Sites (Rockcliffe and Broughton House and Garden);
- One battlefield (the site of the Battle of Sark at Gretna); and
- A significant number of Canmore Sites.

Dumfries & Galloway Council have designated several Archaeologically Sensitive Areas (ASAs) within the SMP area, where the archaeological interest is not confined to a particular site but extends over large areas. These occur both within settlements (Annan, New Abbey, Dumfries, Dundrennan, Wigtown, Whithorn, Isle of Whithorn, Kirkcudbright, Stranraer) and within rural areas (Cairnholy, Changue Fell, Torrs Warren).

Within the waters of the SMP area there are a large number of vessels which are presumed to have been lost. There are also a number of wrecks which have been found along the coastline, including three protected wrecks at Garlieston.

In addition, locally important heritage assets occur within the SMP area, which may not be subject to a formal designation.

3.2.7.2 Heritage features at risk from flooding or erosion within the SMP area

Existing heritage features within the SMP area include Battlefields, GDLs, Scheduled Monuments and Properties in Care. Heritage features were identified to be at flood and / or erosion risk in several Policy Units within the SMP area (4, 6, 16, 18, 27, 28, and 32). Arbigland is one of the 13 identified locations where cultural heritage interests are affected by anticipated erosion; this site is also identified to be at risk from flooding (in a medium likelihood scenario).

3.2.7.3 Summary of Existing Pressures and Issues for Cultural Heritage in the SMP area

Cultural heritage assets, particularly those in urban areas of the SMP, are at risk from developments. Heritage assets within the SMP area are also at risk from flooding and coastal erosion, the extent and rate of which is projected to increase with climate change. This is particularly the case for GDLs such as Arbigland that extend to the coastline. Shoreline management policies and their implementation has the potential to lead to positive or negative effects on the condition or setting of heritage assets in the SMP area.

3.2.8 Landscape and Visual Amenity

'Landscape' is defined by the European Landscape Convention as ''an area as perceived by people whose character is the result of the action and interaction of natural and / or human factors' and 'it concerns landscapes that might be considered outstanding as well as everyday or degraded landscapes'. It aims to promote landscape protection, management and planning, and to organise European co-operation on landscape issues. The UK ratified the Convention in 2006, and it came into effect in 2007. Signatories to the Convention are required to draw up specific and / or sectoral landscape strategies, linked by landscape quality objectives.

It is considered that the key issues associated with implementation of the SMP and Landscape and Visual Amenity comprise:

- Effects on areas of designated landscape quality and scenic views;
- Effects on the general landscape and seascape; and
- Effects on the tourism value of the landscape.

3.2.8.1 Landscape character assessment

The land cover of Dumfries & Galloway has developed through a combination of complex natural processes and human intervention and management. Many areas of land cover support a diverse range of flora and fauna and are of high nature conservation value. Other areas are important for their geological and geomorphological features. Landforms in the region range from the high cliffs of the Mull of Galloway to the sand dunes and machair around Luce Bay and the extensive saltmarsh, sand and mudflats of the inner Solway[28].

Landscape Character Assessment identifies, describes and maps variation in landscape character in a systematic way. In doing so it considers the way in which topography, land use and settlement of an area have combined to create unique places. Regional studies undertaken in the 1990s have been reviewed and updated to form the 2019 Landscape Character Type map and descriptions for Scotland. This characterises the Landscape Character Types of the SMP area as predominantly 'coastal flats', 'peninsula' and 'peninsula with gorsey knolls'. Amongst these major landscape types are smaller areas of 'lower dale', 'coastal uplands', 'foothills', 'narrow wooded river valley', 'upland fringe' and 'drumlin pasture'.

Agriculture accounts for >73% of the land area within the Dumfries & Galloway region; land of sufficient quality for crop production is found predominantly in lowland locations, e.g. pastures, sheltered estuaries and along the main river valleys, while much of the land area is suited only to improved grassland or rough grazing for dairy and beef cattle and for sheep. Forests and woodlands also constitute a major element in the landscape; in total, about 25% of land cover within the Dumfries & Galloway region is classified as forest or woodland. This includes ancient semi-natural woodlands which are scattered throughout the region; many of those >2ha are designated as SSSIs. Land cover in the SMP area is predominantly improved grassland, with areas of arable and horticultural land, and small areas of saltmarsh, broadleaved, mixed and yew woodland, littoral and supralittoral rock / sediment and substrates, and heather.

3.2.8.2 Designated landscapes

The importance of the area's landscape is reflected in designations including the three National Scenic Areas that intersect the SMP area; Fleet Valley, East Stewartry Coast, and Nith Estuary. These represent some of Scotland's finest landscapes. A further six Regional Scenic Areas also intersect the SMP area; Rhins Coast, Mochrum Lochs, Machars Coast, Galloway Hills, Solway Coast and Terregles Ridge.

As outlined in Section 5.2.7, there are nine GDLs within the SMP area. These landscapes have been assessed on their setting, the contribution they make to the surrounding scenery, and on the various components of the landscape within its structure, as well as being assessed with reference to their historical value. Broadleaved woodland often forms part of long-established policy parkland around large estates.

Military heritage is significant in parts of the region, for example the munitions workings along the Annadale coast at Powfoot and Gretna, now derelict, and the military port at Cairnryan. The structures of ports, both thriving and those in decline, remain as characteristic features of the region's coasts and estuaries, for example Southerness Lighthouse, and harbours at Portpatrick; Port Logan; Kirkcudbright; and Glencaple.

Dumfries & Galloway has not been subject to intense development pressures, and retains a tranquil character overall. The eastern half of the region has been subject to greater development pressures than the west, in part due to better communications with England and the rest of Scotland. The western half of the region remains less developed owing to its peripheral setting, however the importance of the ferry link to Northern Ireland at Cairnryan has led to a programme of improvements to the A75 road.

[28] Land Use Consultants (1998) - SNH Review 94 - Dumfries & Galloway Landscape Character Assessment

3.2.8.3 Summary of Existing Pressures and Issues for Landscape and Visual Amenity in the SMP area

Existing pressures on the landscape and visual amenity of the SMP area include developments in urban areas and along the shoreline, including renewable energy within the Solway Firth. Future changes to the coastline with predicted increases in the extents and rates of coastal erosion and accretion, is likely to affect the landscape and views within the area.

Any construction activities that may result from implementation of the SMP have the potential for temporary, negative impacts upon landscape and visual amenity, while implementation of policies and actions to manage the shoreline may have longer term effects by way of disrupting the setting and view of the coast.

3.2.9 Evolution of the Environment in the Absence of the Plan

The original SMP for the Dumfries & Galloway shoreline was produced in 2005, and considered the risks associated with the coastal processes of flooding and erosion in the area, identifying measures to manage these risks to people and the developed, historic and natural environment.

In the absence of an updated SMP i.e. the 'do-nothing' scenario, Dumfries & Galloway Council would rely on the policies set out in the 2005 SMP. This plan was designed to be a working document, to be updated on a regularly defined basis, in order to take into account the most up to date data on risks, as well as the most current understanding of coastal zone processes. The updated SMP is based on more up to date data on climatic change, land use in the area, the status of the local environment, and heritage features that may be at risk from the coastal processes of flooding and erosion over the next 100 year period. Without taking this updated information into account, the SMP, and the policies set out for sections of the shoreline are likely to become less appropriate to the changing circumstances, with potential for this to adversely affect environmental receptors.

As part of the assessment of potential effects on SEA receptors from implementing the updated SMP in Section 6 of this report, the potential effects on these of continuing to implement the current SMP policies has been considered.

The Flood Risk Management (Scotland) Act 2009 aims to reduce and manage the risks that floods pose to human health, the environment, infrastructure and property. The SMP is developing and implementing the flood risk management proposals for the Dumfries & Galloway coastline and will work together with the upcoming Solway Local Plan District FRMP 2022-2028 to manage the risks to people, property and infrastructure along the Dumfries & Galloway coastline from flooding. If not guided and managed by an up-to-date SMP, the future flood risk is likely to be managed inappropriately, and will not support the objectives of the current draft FRMP.

Current climate change predictions anticipate sea level rises, changes in rainfall patterns and temperatures, as well as changes in the frequency of droughts and extreme weather events. An up-to-date SMP has the potential to contribute to long term sustainable protection from climate change-related flood risk within the area. The UK Climate Projections have been updated since the original SMP and more recent projections are used for the updated SMP. Continuing to implement the 2005 SMP would mean that future risk to people and the environment within the area from coastal flooding and erosion would not be accurately taken into account within the policies for each area. Some policies may become more technically challenging or have more potential to adversely affect environmental receptors should they continue to be applied, e.g. with increasing risk of coastal flooding or erosion, continuing to HTL in some areas may now require the upgrading or extension of exiting defences, which may be more costly, require more significant engineering works, and have more potential to adversely affect the surrounding environment than options such as managed realignment of assets that are at risk.

4 REVIEW OF RELEVANT PLANS, PROGRAMMES AND POLICIES

4.1 Interaction with other relevant Plans and Programmes

As part of the SEA process, the context of the Plan must be established with regard to other Plans and Programmes that have been adopted at International, European and National levels. In particular, the interaction of the SMP with the environmental protection objectives and standards included within these Plans and Programmes requires consideration. Table 4-1 identifies the main significant environmental plans, programmes and legislation, adopted at international, European Community or Member State level, which would be expected to influence, or be influenced by, the Plan. While it is recognised that there are many Plans, Programmes and legislation that could relate to the Plan it is considered appropriate to only deal with those significant texts so as to keep the assessment at a strategic level. More information on these Plans, Programmes and legislation, along with their potential interaction with the Plan is given in Appendix D.

Level	Plan / Programme
International or European Level	• Birds Directive [2009/147/EC] • Habitats Directive [92/43/EEC] • EU Biodiversity Strategy to 2020 [COM(2011)244] • Bonn Convention [L210, 19/07/1982 (1983)] • Convention on Wetlands of International importance especially as Waterfowl habitat (1971) [UN Treaty Series No. 14583] • SEA Directive [2001/42/EC] • EIA Directive [85/337/EEC] [2014/52/EU] • Environmental Liability Directive [2004/35/EC] • Environmental Quality Standards Directive [2008/105/EC] • Bathing Water Directive [2000/7/EC] • Water Framework Directive [2000/60/EC] • EU Marine Strategy Framework Directive [2008/56/EC] • EU Floods Directive [2007/60/EC] • EU Maritime Spatial Planning Directive [2014/89/EU] • EU Thematic Strategy for Soil Protection [COM(2012) 46] • World Heritage Convention [WHC-2005/WS/02] • Granada Treaty (1985) • Valetta Treaty (1992) • European Landscape Convention [ETS No. 176] • Waste Framework Directive [2008/98/EC]
National Level	• The 2020 Challenge • Scotland's Biodiversity: It's in your hands 2004 • The Wildlife and Natural Environment (Scotland) Act 2011 • The Nature Conservation (Scotland) Act 2004 • The Habitats Regulations 1994 (and amendments) • Flood Risk Management (Scotland) Act 2009 • Natural Flood Management Handbook 2015 • Scotland's National Marine Plan 2015 • A Guide to Managing Coastal Erosion in Beach/Dune Systems 2000 • Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) • Water Environment and Water Services (Scotland) Act 2003

Level	Plan / Programme
	• The Marine (Scotland) Act 2010 • The River Basin Management Plan for Scotland River Basin, 2015-2027 • Scottish Planning Policy 2014 • Low Carbon Scotland: Meeting our Emissions Reductions Targets 2013-2027 • Climate Ready Scotland: climate change adaptation programme 2019-2024 • Climate Change (Scotland) Act 2009, and Climate Change (Emissions Reduction Targets) (Scotland) Act 2019. • The Climate Change (Annual Targets) (Scotland) Order 2010 • The Scottish Soil Framework 2009 • The Land Reform (Scotland) Bill 2015 • Land Use Strategy 2016-2021 • The Planning etc. (Scotland) Act 2006 • National Planning Framework 2015 • Planning Advice Notes and Circulars • Equally Well 2008 • Good Places, Better Health: A New Approach to Environment and Health in Scotland, 2008 • Our Place in Time: The historic environment strategy for Scotland 2014 • Historic Environment Policy for Scotland (HEPS, 2019) • Managing Change in the Historic Environment Guidance Notes • Tourism Scotland 2020
Regional or Sub-Regional Level	• Ayrshire Shoreline Management Plan 2018 • Dumfries & Galloway Local Development Plan 2 (LDP2) 2019 • Dumfries & Galloway Shoreline Management Plan Study: Stage 1 2005 • Cumbria Coastal Strategy 2020 • Solway Local Plan District (LPD 14) Draft Flood Risk Management Plan 2022-2028 • Dumfries & Galloway Local Biodiversity Action Plan 2009 • Dumfries & Galloway Council State of the Environment Report 2017 • Dumfries Conservation Area Character Appraisal and Management Plan (2018) • Stranraer Conservation Area Character Appraisal and Management Plan (2018) • Whithorn Conservation Area Character Appraisal and Management Plan (2018) • Kirkcudbright Conservation Area Character Appraisal (2014) • Gatehouse of Fleet Conservation Area Character Appraisal (2014) • Annan Conservation Area Character Appraisal (2014) • Crichton Conservation Area Character Appraisal (2016) • Caring for the Built Environment – Conservation Area Guidance, Dumfries & Galloway Council (2001) • Dumfries & Galloway Regional Tourism Strategy 2016-2020 • Dumfries & Galloway Carbon Management Plan 2 (CMP2) and Climate Change Action Plan 2012 • Draft North West Inshore and North West Offshore Marine Plan 2020

Table 4-1 Summary of Key Plans, Programmes and Legislation Relevant to the Dumfries & Galloway SMP

5 ASSESSMENT METHODOLOGY

This SEA Environmental Report has been produced to assess the environmental impacts of the measures proposed as part of the Dumfries & Galloway SMP. It has further been produced to provide environmental guidance to ensure that the Plan is more sustainable. In conjunction with this, a Plan level HRA has also been prepared to inform the decision-making process, in terms of the potential for the proposed measures to impact upon the integrity of any European sites in view of their conservation objectives. Both environmental assessments have been central to the development of the draft Plan.

5.1 Methodology

The proposed measures have been assessed in terms of their potential positive and negative effects, and the significance of these effects on the environment against the SEA objectives. The purpose of this is to predict and evaluate, as far as possible, the environmental effects of the Plan, highlighting any significant environmental problems and / or benefits that are likely to arise from the implementation of the Plan. Where possible, this assessment has been quantitative, to aid understanding of the implications of each proposed measure in the Plan.

The SMP has been assessed via a Baseline Led Assessment. This method involves the assessment of each option available in the enactment of the SMP against each of the following headings / subjects:

- Biodiversity, Flora and Fauna (BFF)
- Population and Human Health (PHH)
- Geology, Soils and Land Use (GSL)
- Water (W)
- Climatic Factors (CF)
- Material Assets and Infrastructure (MA)
- Cultural, Architectural and Archaeological Heritage (CH)
- Landscape and Visual Amenity (L)

The preferred policies outlined in the SMP have been assessed in the short, medium and long term for likely effects, the significance of the effects, and whether they are positive or negative effects. Other impacts that have been assessed for significance are; secondary effects, cumulative effects, synergistic effects, temporary and permanent effects, and the inter-relationship of effects.

The proposed scenarios for consideration have been assessed in the SEA against the Strategic Environmental Objectives (SEOs) to examine the potential for likely significant environmental effects associated with the SMP. All potential positive and negative effects are presented individually, with a text description. The scores assigned for effects range from +3 to -3, as demonstrated in Table 5-1. The purpose of adding numerical scores is to assist in the ranking of options and for the potential incorporation of the environmental and social criteria into future decision making, as this can provide for a multi-criteria analysis of alternatives if desired. Options may have both positive and negative effects at the same time and hence are not conveyed in terms of net benefit or net loss, which can sometimes be misleading.

Description	Score
Significant positive environmental effects	+3
Moderate positive environmental effects	+2
Slight positive environmental effects	+1
No environmental effects	0
Slight negative environmental effects	-1
Moderate negative environmental effects	-2
Significant negative environmental effects	-3

Table 5-1 Description of SEA Environmental Effect Scores

5.2 Consideration of Alternatives

The SEA process must include an evaluation of the likely environmental consequences of a range of reasonable alternative scenarios.

The methodology for development and selection of a preferred policy for each PU was outlined in Section 2.4.4 of this report. This involved an assessment of the likely environmental issues associated with each viable policy, and the scale of potential impacts, as well as the potential for social issues of implementing these policies. The preferred policy approaches were those which had the best environmental outcomes, unless these were considered technically unfeasible or would lead to significant social effects. Where a preferred policy was selected to avoid significant adverse effects on social grounds, consideration was given to implementing a preferred environmental policy (such as MR) in a later epoch, giving time for the population in this area to adjust to coastal change, and for later options to be more fully investigated. Alternative primary or localised policies for PUs were identified during this process, providing either a more socially, or a more environmentally beneficial alternative to the preferred policy, or altering the epoch during which a policy would be applied. Stakeholder and public consultation of the preferred policies for the SMP was undertaken, and these were reviewed and refined, where necessary.

The assessment of SMP policies in Section 6 includes a high-level assessment of the likely effects of implementing these alternative policies for each SEA receptor. It also includes a high-level assessment of the likely effects on these receptors of continuing to implement the policies of the existing SMP, i.e. the alternative 'Do-Nothing' scenario.

5.3 SEA Objectives

The Strategic Environmental Objectives (SEOs) were developed and consulted on with the environmental consultees. This assessment is relatively strategic, with the aim of reporting likely impacts at the coastal cell and sub-cell level to reflect the scale at which the options are being planned. The SEA Objectives, Sub-Objectives, Indicators and Targets used are given in Table 5-2.

Criteria	Objective		Sub-Objective		Indicators	Minimum Requirement	Aspirational Target
Biodiversity, Flora & Fauna	**1**	Avoid damage to, and where possible enhance, the biodiversity, flora and fauna in the vicinity of the shoreline.	**A**	Avoid detrimental effects to, and where possible enhance, International and European designations for protected species and their key habitats.	Area and condition of SAC, SPA, and Ramsar designation. Numbers of protected species.	No loss of area of or negative impacts on International and European sites and protected species.	Potential enhancement of and increased protection for International and European sites and protected species.
			B	Avoid damage to or loss of, and where possible enhance, national and local nature conservation sites and protected species, or other known species of conservation concern such as Priority Marine Features.	Area and condition of SSSI, LNRs, MCAs, MPAs and local conservation designations. Numbers of protected species.	No loss of area of or negative impacts on national and local conservation sites and species.	Potential enhancement of and increased protection for national and local conservation sites and species.
Population & Human Health	**2**	Protect the public from risk of flooding and coastal erosion and avoid significant social effects on the population.	**A**	Protect the public from risk of flooding and coastal erosion.	Population at risk from flooding and erosion.	No increase in population at risk from flooding and erosion.	No population at risk from flooding and erosion.
			B	Avoid significant negative social effects on the public.	Population displaced by flooding and erosion	Avoid social effects on a significant proportion of the population or community.	Avoid social effects on the population or community.
Geology, Soils and Land Use	**3**	Avoid damage to, and where possible enhance, areas of geological importance and existing functional soil and land resource.	**A**	Maintain or improve areas of existing functional soil and land resource.	Areas of functional soil and land resource at risk from flooding and erosion.	Minimise the loss of functional soil and land resource.	Improvement of functional soil and land resource.
			B	Avoid damage to or loss of, and where possible enhance, national geological conservation sites.	Areas of Geological SSSI.	No loss of area, or negative impacts on national conservation sites.	Potential enhancement of and increased protection for national conservation sites.
Water	**4**	Protect and enhance the state of the water environment.	**A**	Protect and enhance the state of the water environment.	Coastal morphology and waterbody status.	No deterioration of status of coastal and transitional waterbodies.	Contribute to the improvement of status of coastal and transitional waterbodies.

Criteria	Objective		Sub-Objective		Indicators	Minimum Requirement	Aspirational Target
Climatic Factors	**5**	Adaptation to potential climatic change.	**A**	Adaptation of shoreline management to potential climatic change.	Interaction with potential climate change influenced flood extents / wave overtopping and severe weather events.	SMP actions to demonstrate adaptability to climatic change.	SMP actions to be planned for climatic change.
Material Assets & Infrastructure	**6**	Protect material assets and infrastructure from risk of flooding and coastal erosion.	**A**	Protect material assets and infrastructure from risk of coastal flooding and erosion.	Material assets and infrastructure at risk from flooding and erosion.	No increase in material assets and infrastructure at risk from flooding and erosion.	No material assets and infrastructure at risk from flooding and erosion.
Cultural, Architectural & Archaeological Heritage	**7**	Protect or, where appropriate, enhance historic environment features and their settings.	**A**	Avoid loss of, or damage to, heritage features.	International, National and local designated heritage structures, sites and monuments.	No loss or damage to heritage features, or their setting, from construction and operation of proposed measures.	Increased protection / preservation for heritage features and /or improvement of setting.
			B	Minimise effects on the setting of heritage features			
Landscape & Visual Amenity	**8**	Protect, and where possible enhance, the landscape and seascape character and visual amenity of the Dumfries & Galloway shoreline.	**A**	Protect, and where possible enhance, the landscape and seascape character and visual amenity of the Dumfries & Galloway shoreline.	Landscape character assessments. Seascape assessments. Designated landscapes and views, such as NSAs	No negative impacts on landscape quality and amenity of the Dumfries & Galloway shoreline.	Enhancement of the landscape and visual amenity of the Dumfries & Galloway shoreline.

Table 5-2 Strategic Environmental Objectives

6 ENVIRONMENTAL ASSESSMENT OF SMP POLICIES

This section provides an assessment of the policies proposed as part of the SMP for the sustainable management of the Dumfries & Galloway shoreline. As discussed in Section 2.4, the SMP has identified policies for the future management of coastal flood and erosion risk along the Dumfries & Galloway coastline for three epochs, short term (0 – 20 years), medium term (20 – 50 years), and long term (50 – 100 years). These policies are either one or a combination of:

- No Active Intervention (NAI);
- Hold the Line (HTL);
- Advance the Line (ATL); or
- Managed Realignment (MR).

Following the policy development process outlined in Section 2.4, preferred and alternative policies were selected for each PU, as detailed in Table 6-1.

Coastal Process Unit	Policy Unit	Policy	Epoch		
			Short Term	Medium Term	Long Term
1	1	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	MR	MR
		Alternative	MR	X	X
	2	Primary Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
		Localised Policy	X	X	X
		Alternative	X	X	X
	3	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
	4	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
	5	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	NAI	NAI	MR
		Alternative	X	MR	X
	6	Primary Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
		Localised Policy	NAI	NAI	NAI
		Alternative	X	X	X
	7	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X

Coastal Process Unit	Policy Unit	Policy	Epoch		
			Short Term	Medium Term	Long Term
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	X
2	8	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	X
	9	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	X	X	X
	10	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	X	X	X
	11	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X
3	12	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
	13	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	MR	MR	MR
	14	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	MR	MR	X
	15	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	MR	MR
		Alternative	X	X	X
	16	Primary Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
		Localised Policy	NAI	NAI	NAI
		Alternative	X	X	X
	17	Primary Policy	NAI	NAI	NAI

Coastal Process Unit	Policy Unit	Policy	Epoch		
			Short Term	Medium Term	Long Term
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	X
	18	Primary Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
		Localised Policy	NAI	NAI	NAI
		Alternative	X	X	X
4	19	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X
	20	Primary Policy	HTL	HTL	MR
		Alternative	X	X	HTL
		Localised Policy	X	X	X
		Alternative	X	X	X
	21	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	X
	22	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	X
	23	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	MR	MR	HTL
	24	Primary Policy	HTL	MR	MR
		Alternative	MR	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X
	25	Primary Policy	HTL	MR	MR
		Alternative	MR	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X
	26	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	HTL

Coastal Process Unit	Policy Unit	Policy	Epoch		
			Short Term	Medium Term	Long Term
5	27	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	HTL
		Alternative	MR	MR	MR
	28	Primary Policy	HTL	MR	MR
		Alternative	X	HTL	X
		Localised Policy	NAI	NAI	NAI
		Alternative	X	X	X
	29	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X
6	30	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	HTL	MR
		Alternative	X	MR	X
	31	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	HTL	MR	MR
		Alternative	X	X	X
	32	Primary Policy	HTL	HTL	HTL
		Alternative	X	MR	MR
		Localised Policy	X	X	X
		Alternative	X	X	X
	33	Primary Policy	HTL	MR	MR
		Alternative	X	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X
	34	Primary Policy	HTL	HTL	HTL
		Alternative	ATL	ATL	ATL
		Localised Policy	X	X	X
		Alternative	X	X	X
	35	Primary Policy	NAI	NAI	NAI
		Alternative	X	X	X
		Localised Policy	X	X	X
		Alternative	X	X	X

ATL Advance the Line; **HTL** Hold the Line; **MR** Managed Realignment; **NAI** No Active Intervention

Table 6-1 Summary of Preferred and Alternative Policies for each PU

The assessment of these policies considered the potential types of actions that may be implemented to meet the shoreline management policy and assessed them against the Strategic Environmental Objectives (SEO) provided in Section 5.3. In order to simplify the assessment process and avoid repetition during assessment within each CPU, potential SMP policies were assessed generically for their potential effects against SEOs. This is shown in Table 6-2.

The assessment of SMP policies for each CPU included a high-level assessment of the likely effects of implementing the preferred and alternative policies for each SEA receptor. A guide to the scorings used for this assessment is given in Appendix E of this report.

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
HTL Asset Management: Maintain existing defences	Proactive maintenance and / or improvement of existing defences	***Biodiversity, Flora and Fauna***	
		• Maintenance / improvement of existing defences has the potential to provide short to long term protection of habitats on the landward side of the defences.	• Maintenance of existing defences has the potential for short term temporary and localised effects on BFF in the vicinity of the defences. Short term construction related impacts should be minimal with maintenance. There are not expected to be any significant adverse effects on designated or non-designated habitats or species, owing to the established footprint and hydraulic effects of existing defences. • Should existing defences be improved beyond their existing footprint, there is potential for temporary or permanent effects on designated or non-designated habitats and species in the footprint of these defences, or affected by a change in hydraulic processes. • Potential for the loss of intertidal habitats in the long term through coastal squeeze against fixed shoreline defences. There is potential that existing defences could fail in the long term, and that their components could affect designated or non-designated habitats or species in the vicinity.
		Population and Human Health	
		• Potential for protection of residential properties and community and recreational assets in the vicinity of existing defences. Protection is likely to be short to medium term in nature for maintenance of existing defences, and short to long term with improvement of these defences.	• Maintenance of existing defences may not provide sufficient adaptation or protection to local residential properties and recreational assets in the medium to long term, when anticipated increased coastal flood and erosion risks due to climatic change are considered. • In the case of improvement of existing defences, there is potential for short term disruption of the local population during the construction phase. • Should existing defences be at risk of failure in the medium to long term, their constituent materials could affect the local population.
		Geology, Soils and Land use	
		• Potential for protection, allowing a continuation of current land use in the vicinity of existing defences. Protection is likely to be short to medium term in nature for maintenance of existing defences, and short to long term with improvement of these defences.	• Maintenance of existing defences may not provide sufficient adaptation or protection to local geology, soils and land use in the medium to long term, when anticipated increased coastal flood and erosion risks due to climatic change are considered. • Continuing to artificially hold the shoreline in place has potential to interrupt natural geomorphological processes of

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
			erosion and accretion and evolution of the shoreline in the medium to long term. • Should existing defences be at risk of failure in the medium to long term, their constituent materials could affect the local soils and land use.
		Water	
		• None anticipated.	• Potential for short term, construction phase effects on local water quality.
		Climatic Factors	
		• Potential to provide short to medium term (in the case of maintenance of existing defences), or short to long term (in the case of improvement of existing defences) protection against anticipated increased risks from coastal flooding or erosion due to climatic change.	• Maintenance of existing defences may not provide sufficient adaptation or protection from anticipated increased coastal flood and erosion risks due to climatic change. • In the case of improvement of existing defences, none anticipated.
		Material Assets	
		• Potential for protection of non-residential properties, infrastructure and other assets in the vicinity of existing defences. Protection is likely to be short to medium term in nature for maintenance of existing defences, and short to long term with improvement of these defences.	• Maintenance of existing defences may not provide sufficient adaptation or protection to local non-residential properties, infrastructure and other assets in the medium to long term, when anticipated increased coastal flood and erosion risks due to climatic change are considered.
		Cultural, Archaeological and Architectural Heritage	
		• Potential for protection of cultural heritage assets and their settings in the vicinity of existing defences. Protection is likely to be short to medium term in nature for maintenance of existing defences, and short to long term with improvement of these defences.	• Maintenance of existing defences may not provide sufficient adaptation or protection to local cultural heritage assets in the medium to long term, when anticipated increased coastal flood and erosion risks due to climatic change are considered. • In the case of improvement of existing defences, potential for long term direct permanent effects on local heritage assets should the footprint of defences be expanded, or should there be a significant change in appearance that could affect the setting of these heritage assets.

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
		Landscape and Visual Amenity	
		• In the case of maintenance of existing defences, there would be no significant changes to the surrounding landscape and visual amenity. • None anticipated with improvement of defences.	• In the case of maintenance of existing defences, should these be at risk of failure in the medium to long term, their constituent materials could affect the local landscape and visual amenity. • In the case of improvement of existing defences, potential for long term permanent effects on local landscape / seascape character and visual amenity should there be a significant change in appearance of defences.
HTL **Asset management: Coastal flood and erosion protection scheme**	**Scheme could comprise:** **Construction of new hard defences (e.g. seawalls, revetments, embankments);** **Construction of new shore control structures (e.g. groynes, detached breakwaters);** **'Soft' shoreline management measures (e.g. dune management, beach nourishment, beach drain)**	***Biodiversity, Flora and Fauna***	
		• Potential for protection of designated or non-designated habitats on the landward side of new defences. Protection is likely to be medium to long term in the case of hard defences or shore control structures, and short to long term in the case of soft measures.	• Potential for temporary (construction phase) or permanent effects on designated or non-designated habitats and species in the footprint of new defences. • Potential for medium to long term effects on designated or non-designated habitats and species, should new coastal defences indirectly lead to a change in coastal hydraulic processes, or should introduced materials (e.g. beach nourishment) be transported away from the site and affect nearby habitats. • Potential for the loss of intertidal habitats in the long term through coastal squeeze against fixed shoreline defences.
		Population and Human Health	
		• Potential for protection of residential properties and community and recreational assets in the vicinity of new defences. Protection is likely to be medium to long term in the case of hard defences or shore control structures, and short to long term in the case of soft measures.	• Potential for short term disruption of the local population during the construction phase of shoreline defences. • Potential for permanent effects on the local / visitor population, should new shoreline defences limit access to the area for recreation.
		Geology, Soils and Land use	
		• Potential for protection, allowing a continuation of current land use in the vicinity of new defences. Protection is likely to be medium to long term in nature for hard defences or shore control structures, and short to long term for soft measures, depending on their nature.	• In the case of new hard shoreline defences, there is potential for permanent effects on coastal morphology in the vicinity of defences. • Continuing to artificially hold the shoreline in place has potential to interrupt natural geomorphological processes of erosion and accretion and evolution of the shoreline in the medium to long term. New hard shoreline defences may affect sediment distribution in adjacent areas of the shoreline. Shore control structure or soft measures are likely to provide

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
			more a more natural form of shoreline management in the medium to long term than linear hard defences.
		Water	
		• None anticipated.	• Potential for short term temporary effects on local water quality during the construction phase of new defences. • In the case of new hard shoreline defences or shore control structure, potential for permanent effects on coastal morphology and the status of WFD transitional or coastal water bodies.
		Climatic Factors	
		• Potential to provide protection to properties and infrastructure in the vicinity of new defences against anticipated increased risks from coastal flooding or erosion due to climatic change. Protection is likely to be medium to long term in nature for hard defences or shore control structures, and short to long term for soft measures, depending on their nature.	• None anticipated.
		Material Assets	
		• Potential to provide protection to non-residential properties and infrastructure in the vicinity of new defences. Protection is likely to be medium to long term in the case of hard defences or shore control structures, and short to long term in the case of soft measures, depending on their nature.	• None anticipated.
		Cultural, Archaeological and Architectural Heritage	
		• Potential to provide protection of cultural heritage assets in the vicinity of new defences. Protection is likely to be medium to long term in the case of hard defences or shore control structures, and short to long term in the case of soft measures, depending on their nature.	• Potential for temporary short term construction phase effects or permanent effects on local cultural heritage assets from new defences, including potential for direct effects should any heritage assets be within the footprint of these defences. • Potential for permanent effects on the setting of local cultural heritage assets should there be a significant change in visual amenity of the area that could affect the setting of assets in their vicinity.
		Landscape and Visual Amenity	
		• None anticipated in the case of new hard defences.	• Potential for temporary short term construction phase effects on local visual amenity.

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
		• Potential for new shore control structures or soft shoreline management measures to maintain the existing visual amenity of beaches in the short to long term.	• Potential for long term permanent effects on local landscape / seascape character and visual amenity from the addition of new hard defences or shore control structure to the area.
MR **Asset management: Managed realignment**	**Abandoning existing properties or infrastructure and relocate outside the floodplain / erosion zone**	***Biodiversity, Flora and Fauna***	
		• Potential for medium to long term expansion of coastal or intertidal habitats.	• Potential for a permanent loss of terrestrial habitats due to expansion landwards of coastal or intertidal habitats. • Potential for temporary short term construction phase effects and permanent effects on habitats within the footprint of relocation properties or infrastructure. • In the medium to long term, should abandoned properties or infrastructure be at risk of ruin, their constituent materials could affect local designated or non-designated habitats or species in the vicinity.
		Population and Human Health	
		• Potential for reduced long term risk to residential properties and human health from coastal flooding or erosion.	• Potential for long term social effects on individuals relocating from areas at risk of coastal flooding or erosion. • Potential for social effects on established communities.
		Geology, Soils and Land use	
		• In the medium to long term, potential to facilitate the local geology, soils and land use of the shoreline to adapt to the anticipated increased coastal flooding or erosion risk due to climatic change.	• In the medium to long term, should abandoned properties or infrastructure be at risk of ruin, their constituent materials could affect local soils and land use.
		Water	
		• In the long term, may enable the shoreline to function in a more natural manner.	• None anticipated.
		Climatic Factors	
		• In the medium to long term, potential to provide for adaptation of the shoreline to anticipated increased coastal flooding or erosion risks due to climatic change.	• None anticipated
		Material Assets	
		• Potential for reduced risk to non-residential properties and infrastructure from coastal flooding or erosion, both in the short term, and in the	• Potential for indirect social impacts on non-residential (commercial) properties should relocation result in a loss of business.

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
		medium to long term due to anticipated coastal flooding or erosion risk due to climatic change.	
		Cultural, Archaeological and Architectural Heritage	
		• None anticipated.	• Potential for loss of cultural heritage features, or effects on the setting of these features in the medium to long term.
		Landscape and Visual Amenity	
		• In the long term, may enable the coastal floodplain to function in a more natural manner.	• In the medium to long term, should abandoned properties or infrastructure be at risk of ruin, their constituent materials could affect the local landscape and visual amenity.
MR **Asset management: Habitat creation**	**Realignment of existing defences**	***Biodiversity, Flora and Fauna***	
		• Potential for medium to long-term protection of designated or non-designated habitats landward of any new realigned defences. • Potential for coastal or intertidal habitats to expand in the medium to long term, in response to anticipated sea level rise due to climatic change.	• Potential for permanent loss of terrestrial habitats in the medium to long term, should coastal or intertidal habitats expand landwards. • Potential for temporary construction phase effects on designated or non-designated habitats in the vicinity of any new realigned defences.
		Population and Human Health	
		• Potential for protection of residential properties and community and recreational assets in the short to long term landwards of any new realigned defences.	• Potential for significant long term effects on individuals due to a permanent loss of any residential properties located seaward of realigned defences. • Potential for the permanent loss of terrestrial land seaward of realigned defences that may have provided recreational value to the local population.
		Geology, Soils and Land Use	
		• Potential to facilitate the local geology, soils and land use of the shoreline to adapt to anticipated increased coastal flooding or erosion risk due to climatic change in the medium to long term.	• In the short to long term, there is potential for mobilisation of contaminated material from soils in in the seaward side of realigned defences.
		Water	
		• In the long term, may enable the coastal floodplain to function in a more natural manner.	• None anticipated.
		Climatic Factors	
		• Potential to provide for adaptation of the shoreline to increased coastal flooding or erosion risks due to climatic change in the medium to long term.	• None anticipated.

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
		Material Assets	
		• Potential for protection of non-residential properties and infrastructure in the short to long term landwards of any new realigned defences.	• Potential for the permanent loss of non-residential properties and infrastructure in the medium to long term seaward of realigned defences.
		Cultural, Archaeological and Architectural Heritage	
		• Potential for protection of cultural heritage assets in the short to long term landwards of any new realigned defences. • Potential for discovery of archaeological assets in the medium to long term.	• Potential for the permanent loss of cultural heritage assets in the medium to long terms seaward of realigned defences.
		Landscape and Visual Amenity	
		• In the long term, may enable the coastal floodplain to function in a more natural manner.	• None anticipated.
ATL **Asset management: Advance the line**	**Advancement of the existing shoreline**	***Biodiversity, Flora and Fauna***	
		• Potential for protection of designated or non-designated habitats on the landward side of ATL in the medium to long term.	• Potential for permanent loss of designated or non-designated intertidal habitats and supported species in the footprint of expanded hard structures. • Potential for medium to long term effects on designated or non-designated coastal and intertidal habitats and supported species, should ATL lead to a change in coastal hydraulic processes.
		Population and Human Health	
		• Potential for protection of residential properties and community and recreational assets on the landward side of ATL in the medium to long term.	▪ Potential for short term disruption of the local population during the construction phase of ATL.
		Geology, Soils and Land use	
		• Potential for protection, allowing a continuation of current land use on the landward side of ATL in the medium to long term.	• Potential for permanent effects on coastal morphology in the vicinity of ATL. • Potential to interrupt natural geomorphological processes of erosion and accretion and evolution of the shoreline in the medium to long term. ATL may affect sediment distribution in adjacent areas of the shoreline.
		Water	
		• None anticipated.	• Potential for short term temporary effects on local water quality during the construction phase of ATL.

SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
			• Potential for permanent effects on coastal morphology and the status of WFD transitional or coastal water bodies from ATL.
		Climatic Factors	
		• Potential for protection of properties and infrastructure on the landward side of ATL against anticipated increased risks from coastal flooding or erosion due to climatic change.	• None anticipated.
		Material Assets	
		• Potential to provide medium to long term protection to non-residential properties and infrastructure in the landward of ATL. • Potential to provide for the expansion of infrastructure assets in the short to long term.	• None anticipated.
		Cultural, Archaeological and Architectural Heritage	
		• Potential to provide medium to long term protection to cultural heritage assets landward of ATL.	• Potential for permanent effects on local cultural heritage assets in the intertidal area, should any heritage assets be within the footprint of ATL. • Potential for permanent effects on the setting of local cultural heritage assets should there be a significant change in visual amenity of the area from ATL that could affect the setting of assets in their vicinity.
		Landscape and Visual Amenity	
		• None anticipated	• Potential for temporary short term construction phase effects on local visual amenity. • Potential for long term permanent effects on local landscape / seascape character and visual amenity from the expansion of hard structures seaward.
NAI Adaptation and resilience	**Allow shoreline to function naturally**	***Biodiversity, Flora and Fauna***	
		• In the medium to long term, NAI will allow for the coastline to function naturally. In the medium to long term, coastal or intertidal habitats will have the potential to expand in response to anticipated sea level rise due to climatic change. •	• In the medium to long term, there is potential for permanent loss of coastal or intertidal habitats from coastal erosion in response to anticipated sea level rise due to climatic change, or for permanent loss of terrestrial habitats due to expansion of coastal or intertidal habitats. These effects will be a result of natural processes of erosion / accretion of the shoreline, albeit potentially exacerbated by climatic change.

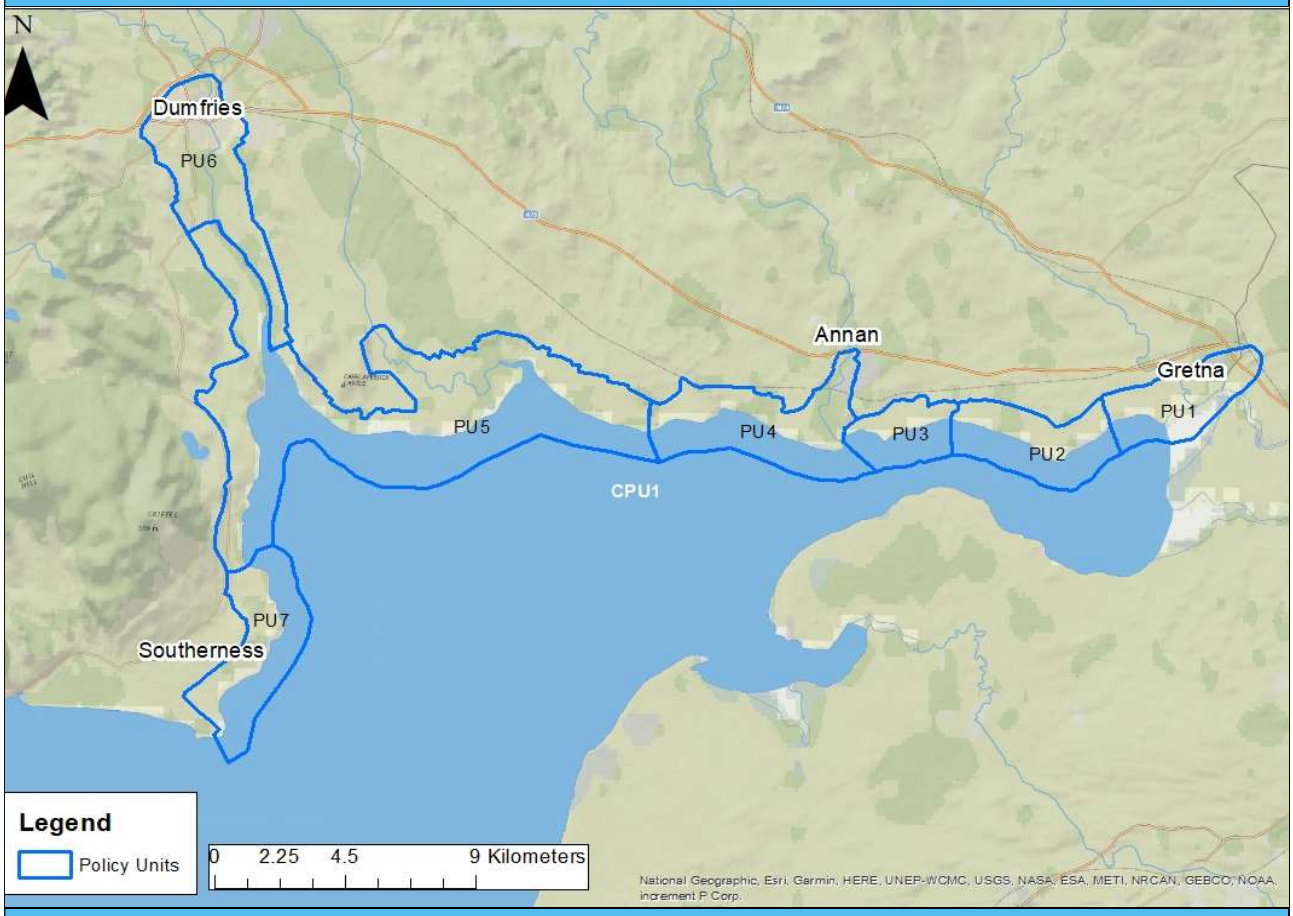
SMP Policy and Action Type	Measure	Potential positive effects	Potential negative effects
		Population and Human Health	
		• None anticipated.	• In the short term, the existing risk to residential properties and / or community assets from coastal flooding or erosion will remain. In the medium to long term, this risk may increase due to the anticipated effects of climatic change.
		Geology, Soils and Land use	
		• In the medium to long term, NAI will facilitate the local geology, soils and land use of the shoreline to adapt to anticipated increased coastal flooding or erosion risk due to climatic change.	• In the short to long term, there is potential for mobilisation of contaminated material from soils in identified areas due to coastal erosion.
		Water	
		• In the long term, NAI will enable the shoreline to function in a natural manner.	• In the short to long term, there is potential for mobilisation of contaminated material from soils in identified areas due to coastal erosion.
		Climatic Factors	
		• In the medium to long term, NAI has the potential to provide for adaptation of the shoreline to anticipated increased coastal flooding or erosion risks due to climatic change.	• None anticipated.
		Material Assets	
		• None anticipated.	In the short term, the existing risk to non-residential properties, infrastructure and other assets from coastal flooding and / or erosion will remain. In the medium to long term, this risk may increase due to the anticipated effects of climatic change.
		Cultural, Archaeological and Architectural Heritage	
		• In the medium to long term, NAI has the potential to lead to the discovery of archaeological assets.	• In the short term, the existing risk to local cultural heritage assets from coastal flooding and / or erosion will remain. In the medium to long term, this risk may increase due to the anticipated effects of climatic change.
		Landscape and Visual Amenity	
		• In the long term, NAI will enable the floodplain to function in a more natural manner.	• None anticipated.

Table 6-2 Potential generic environmental effects of SMP policies

6.1 Coastal Process Unit 1

CPU	CPU 1 – Gretna to Southerness
CPU Information	
CPU 1 extends from Gretna, at the most easterly point of the SMP area, to Southerness in the west. It is the dynamic inner section of the Solway Firth, and includes the tidal reaches of the Rivers Sark, Annan and Nith. There are seven Policy Units within CPU 1.	
PU 1 - For Policy Unit 1 over the next 100 years, essentially a policy of No Active Intervention although Hold the Line or Managed Realignment could be accommodated where there are existing defences along the River Sark and at Redkirk Point if a detailed assessment indicated this to be justified. **PU 2 -** For Policy Unit 2 over the next 100 years, the SMP proposes Hold the Line for the majority of the coastline, based on the precautionary principle due to the unquantified potential for contaminated ground to be at risk as a consequence of historic military use of significant areas of the frontage. If this risk is low then an alternative policy of Managed Realignment or possibly even No Active Intervention would be more sustainable in the future. **PU 3 -** For Policy Unit 3 over the next 100 years, essentially the recommended policy is No Active Intervention for the majority of the coastline, with a localised policy of Hold the Line or Managed Realignment where there are existing defence structures at Battlehill and around the Chapelcross outfall at Seafield. **PU 4 -** For Policy Unit 4 over the next 100 years, essentially the recommended policy is to maintain existing defences to Hold the Line in combination with a policy of No Active intervention for those parts of the coast where coastal flood and erosion risk is low. With anticipated sea level rise it is acknowledged that maintaining a HTL policy will become challenging over time and thus an alternative policy of Managed Realignment is suggested. **PU 5 -** For Policy Unit 5 over the next 100 years, essentially the recommended policy is one of No Active Intervention. A localised policy of Managed Realignment is recommended over the medium to long term to allow for the management of road assets due to the uncertainty associated with the response of natural environment, including salt marsh to future anticipated sea level rise. **PU 6 -** For Policy Unit 6 over the next 100 years, essentially the recommended policy is one of Hold the Line possibly in combination with Managed Realignment (landward movement of roads in the future) for the majority of the coastline. For those parts of the coast that do not require intervention, a localised policy of No Active Intervention is recommended. **PU 7 -** For Policy Unit 7 over the next 100 years, essentially the recommended policy is one of No Active Intervention across all epochs, with localised Hold the Line over the short to medium term, with a move towards a policy of Managed Realignment in the medium to long term for presently defended areas of the coastline.	

CPU 1 policy units



Key Plan Issues

PU 2 - Unquantified potential for contaminated ground to be at risk as a consequence of historic military use of significant areas of the frontage at the Eastriggs MoD site.

PU 4 - High level of coastal flood and erosion risk, including at the settlements of Annan, Powfoot and Newbie.

PU 6 - Coastal flood risk to communities and amenities in Dumfries and Glencaple.

PU 7 – Coastal flood risk to communities at Carsethorn and Southerness.

Key Environmental Issues

Biodiversity, Flora & Fauna – There are three SACs and one SPA located in the vicinity of this CPU. The Solway Firth SAC and SPA sites are located within these PUs (or partly within in the case of PU 6). Solway Mosses North SAC (comprised of two discrete areas) is situated <1km from the shoreline in PU 5, while Raeburn Flow SAC is situated approximately 5.5km inland of PU 1. The Upper Solway Flats and Marshes Ramsar site is also located within these PUs (or partly within in the case of PU 6). Four sites of Special Scientific Interest (SSSIs) are located within or adjacent to this CPU. These are Upper Solway Flats and Marshes SSSI, Royal Ordnance, Powfoot SSSI, Longbridge Muir SSSI, and Kirkconnell Flow SSSI. Upper Solway Flats and Marshes SSSI intersects all PUs, while Royal Ordnance, Powfoot SSSI is situated immediately adjacent to the shoreline of PU 4 and Longbridge Muir SSSI and Kirkconnell Flow SSSI are situated <1km and approximately 1km, respectively, from the shoreline in PU 5. Caerlaverock National Nature Reserve (NNR) is situated within this CPU, intersecting much of the shoreline of PU 5, as well as the western part of PU 4. One Nature Reserve (NR) Kirkconnell Flow, is situated approximately 1km from the shoreline in PU 5.

The shoreline in this CPU is mainly composed of soft (erodible) material, with areas of saltmarsh, shingle, mudflat and sandflat habitats, and some dune habitat in PU 7. The estuary provides important habitat for the passage of migratory fish such as salmon and sea trout, and sea and river lamprey as well as nursery habitat for species such as skates and rays. Natterjack toad is known to be present within this CPU, particularly in PU 4, PU 5, and PU 7.

Population & Human Health – Within this CPU, the areas of highest population density are Dumfries, Annan and Gretna. In Dumfries (PU 6), there are approximately 31,600 residents, while in Annan (PU 4) the population is approximately 8,300. The coastal flood risk to people varies within this CPU. In PU 1 and PU 2, two and five residential properties, respectively are at risk of coastal flooding from a medium likelihood event. In PUs 3, 5 and 6, there is an increased risk to residential properties, with 12, 12 and 16 properties at risk, respectively. In PU 7, the risk of coastal flooding is greater, with 37 homes affected by a medium likelihood event, while the greatest risk in this CPU is within PU 4, where 115 homes (corresponding to over 250 individuals) are at risk from a medium likelihood flood event. A community facility, the Lifeboat Station at Glencaple (PU 6) is also at risk from a medium likelihood coastal flood event. In additional to the risk to residential properties, there is also a risk to community amenities from coastal erosion in some areas of this CPU; this includes sections of Core Paths along the shoreline (sections of the Battlehill Core Path in PU 3, a significant section of the Annandale Core Path in PU 4, sections of the Carse Bay to Southerness Core Path in PU 7).

Geology, Soils & Land use – The land use in the vicinity of the shoreline is primarily comprised of grasslands, improved grasslands and arable land and market gardens, with areas of buildings of cities, towns and villages and road networks, and small areas of coastal dunes and sandy shores, extractive sites / waste deposits, coastal saltmarshes and saline reedbeds and, south of Dumfries, small areas of exotic woodlands and scrub and broadleaved swamp woodland. This CPU lies within the Upper Solway Flats and Marshes SSSI; the shoreline has been designated for the presence of the following earth science features: Coastal geomorphology of Scotland Lower Carboniferous [Dinantian-Namurian], Mineralogy of Scotland, and Quaternary of Scotland.

Water – CPU 1 is within the Solway Tweed RBD. This CPU represents the dynamic inner section of the Solway Firth. The shoreline within this CPU primarily comprises the Solway Estuary WFD transitional water body, which covers a substantial area of 305.6km^2. This water body currently has an overall WFD status of Poor quality, a recent downgrading from Moderate, relating to Poor status of biological elements (phytoplankton). There are two other WFD transitional water bodies in the area; the Annan Estuary and the Nith Estuary, both of which are currently at Good status. The main river water bodies associated with the shoreline in this area are the Sark, Annan, Pow Water, Lochar Water, and Nith. The River Annan is currently at a Poor status, while the other main rivers are currently at Moderate status. Within this CPU, there is a risk of coastal flooding and erosion.

The greatest flood risk to properties is at Annan in PU 4, and at Carsethorn and Southerness in PU 7, while significant areas of agricultural land within the CPU are at coastal flood risk owing to the low-lying nature of the hinterland. Due to the dynamic nature of the inner Solway firth, there are areas of both accretion and erosion within the CPU, however coastal erosion and its effects are expected to increase in the future in this area. The risk from coastal erosion has particular significance in the area around Torduff Point, where contamination could occur from the MoD Eastriggs site located landward of this section of the shoreline. Significant future erosion is also anticipated within PU 4. There is some uncertainty regarding how saltmarsh will react to rising sea levels and effects on erosion within areas fronted by saltmarsh, however in some areas of the CPU significant areas of saltmarsh are at risk of loss due to erosion.

Climatic Factors – When the predicted effects of climatic change are taken into account, there are 340 residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, equating to approximately 748 people; 310 more people than are at risk from the current day medium likelihood event. There are also 176 non-residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, an increase of 81 from the current risk, as well as five additional utility assets and additional lengths of road (including a B road in PU 5) at risk. In addition, the area of agricultural land at risk from a medium likelihood climate change coastal flood event in this CPU is expected to significantly increase owing to the low lying nature of much of the hinterland. The risk to assets from future coastal erosion is also predicted to increase for some areas of the CPU, particularly in PU 4 where some homes, businesses, utility assets and roads are predicted to be directly affected by future erosion (by2100), and also in PU 2, PU 3 and PU 7.

Material Assets & Infrastructure – The principal roads within this CPU are the A75 connecting Gretna with Dumfries and the A710 running from Dumfries westwards towards Dalbeattie. The B721, B724, and B725 connect the towns of Gretna, Annan and Dumfries. Railway track connects Gretna to Annan (intersecting PU 4), moving further inland to the west to connect with Dumfries then north-westward towards Glasgow. There is a risk of coastal flooding to material assets within this CPU. There are approximately 95 non-residential properties and 16 utility receptors at risk from a medium likelihood coastal flood event, as well as a risk to sections of roads including sections of A roads (A710 and A711) in PU 6, B roads in PU 1 and PU 5, and minor / local roads, a section of railway (in PU 4) and a risk to large areas of agricultural land owing to the flat and low-lying nature of much of the hinterland. Assets in PU 2 and PU 3 are anticipated to be affected by future coastal erosion, including a small number of residential properties, access roads, a section of the Scottish water network, and a sewage treatment works.

Cultural, Architectural & Archaeological Heritage – Within the CPU there are a significant number of listed buildings of special architectural or historic interest in the main population centres of Gretna, Annan and Dumfries; outside of these centres, A listed buildings that occur in proximity to the shoreline include Southerness Lighthouse, Arbigland House, and John Paul Jone's Cottage in PU 7, while B or C listed buildings occur in proximity to the shoreline at Newbie Mains and Powfoot in PU 4, adjacent to the B725 and Shore roads in PU 5, and at Arbigland and Carsethorn in PU 7. Sections of Dumfries and Annan are within Conservation Areas. Scheduled monuments in the area include Lochmaben standing stone, Redkirkmill, Burnbrae, Gleningle, Annan Hill Roman Camp, Mote of Annan, Hayknowes, Caerlavrock Castle, Castledykes Park, Curriestanes, Ingleston Mote, and McCulloch's Castle at Arbigland. Arbigland in PU 7 is also listed as a Gardens and Designed Landscapes. There are also a significant number of Canmore assets within CPU 1, while parts of Annan, Dumfries and New Abbey are Archaeologically Sensitive Areas (ASA). Within the CPU, there are a total of 71 cultural heritage features at risk from a medium likelihood coastal flood event, including a significant number of listed buildings within the Powfoot and Annan Conservation Area, and at Kingholm, Glencaple, Whitesands, Kirkconnell, Brow Well, Carsethorn, Southerness and to the east of Gretna and Sark Bridge, as well as Dumfries Old Bridge Scheduled Monument in PU 6, and part of Arbigland Garden and Designated Landscape in PU 7. In addition, a battlefield site located to the south of Gretna in PU 1 (Battle of Sark) is at flood risk. Further coastal flood risk is anticipated in the future to include the Scheduled Monument, Caerlaverock Castle in PU 5, while an area of Scheduled Monument, McCulloch's Castle at Arbigland in PU 7, is anticipated to be in the erosion vicinity by 2050.

Landscape & Visual Amenity – The landscape character type of the entirety of CPU 1 is coastal flats. Within this CPU, the Nith Estuary is designated as a National Scenic Area. This includes the estuary, as far upstream on the River Nith as the Cargen Pow area, in PU 6, and the northern half of PU 7, extending from Drum-Mains to just south of Arbigland.

Potential SMP Effects

Biodiversity, Flora & Fauna – NAI as the primary or localised policy in the PUs of CPU 1 has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Solway Firth SAC, SPA and Ramsar site (+3) and nationally designated site Upper Solway Flats and Marshes SSSI (+2). HTL as the primary policy in PU 2 and PU 6, has the potential for short to long term, significant negative effects on BFF, including on designated habitats and species within internationally designated sites Solway Firth SAC, SPA and Upper Solway Flats and Marshes Ramsar site (-3) and nationally designated site Upper Solway Flats and Marshes SSSI (-2). These sites intersect the entirety of the shoreline of PU 2, and the Glencaple area of PU 6. The significance of effects will be dependent upon the nature and footprint of any extended / new defences. HTL as a localised policy for other PUs, will primarily involve repair and maintenance of existing defences, and has potential for short term, negative effects on habitat within the existing footprint of defences, and short-term disturbance of species within the immediate area, including within the internationally designated sites Solway Firth SAC, SPA and Ramsar site and nationally designated site Upper Solway Flats and Marshes SSSI, The Royal Ordnance, Powfoot SSSI and Caerlaverock NNR. Should HTL in these areas require improvement of existing defences outside of their current footprint, there is potential for short to long term, significant direct or indirect negative effects on BFF, including within these designated sites (-3 / -2). MR (relocation of at risk assets) has potential for long term significant positive effects on BFF, providing some opportunity for coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Solway Firth SAC, SPA and

Ramsar site (+3), and nationally designated site Upper Solway Flats and Marshes SSSI (+2). There is also a slight risk of negative effects in the long term, including within these designated sites, from the potential risk of ruin of existing defence assets.

SMP Alternative Policies - MR as an alternative policy for PU 2 has potential for long term, significant negative effects on BFF, including within internationally designated sites Solway Firth SAC, SPA and Upper Solway Flats and Marshes Ramsar site (-3), and nationally designated site Upper Solway Flats and Marshes SSSI (-2), owing to the threat of contamination from the former MoD site with increased coastal erosion of the area (unless it is found that there is no risk of contamination). Provided there is no risk of contamination, MR (relocation of at risk assets) as an alternative policy for some PUs in the short to medium term has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Solway Firth SAC, SPA and Upper Solway Flats and Marshes Ramsar site (+3), and nationally designated site Upper Solway Flats and Marshes SSSI (+2). There is also a slight risk of negative effects in the long term, including within these designated sites, from the potential risk of ruin of existing defence assets.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within some PUs. The existing approach to continue to HTL for at risk assets in these PUs is unlikely to be sustainable in the long term without the upgrading of defences, which could impact upon the designated sites intersecting this CPU. In the existing SMP, HTL for PU 2 only relates to a small number of at risk properties, whereas HTL now comprises the full frontage owing to potential contamination risk; continuation of the current policy of NAI in this area has potential for long term, significant negative effects on BFF, including within internationally designated sites Solway Firth SAC, SPA and Upper Solway Flats and Marshes Ramsar site (-3), and nationally designated site Upper Solway Flats and Marshes SSSI (-2), owing to the threat of contamination from the former MoD site with increased coastal erosion of the area (unless it is found that there is no risk of contamination).

Population & Human Health – HTL as the primary or localised policy has potential for long term positive effects on PHH, through a reduction in the proportion of the population at risk of coastal flooding; in PU 4 and PU 7, there will be a significant reduction in the proportion of the population at risk (+3), while in other PUs there will be a slight reduction (+1). NAI as the primary or localised policy has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion. MR as a medium to long term policy for PUs 1, 5 and 7 has potential for both positive and negative effects on PHH. There is potential for short term negative effects due to social effects on a small proportion of the population from loss of properties and relocation (-1). There is also potential for long term positive effects due to a slight reduction in the proportion of the population at risk of flooding following relocation outside of at risk areas (+1).

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term has the potential for both positive and negative effects on PHH. There is potential for short term negative effects due to social effects on a moderate proportion of the population from loss of properties and relocation (-2). There is also potential for long term positive effects due to a moderate reduction in the proportion of the population at risk of flooding following relocation outside of at risk areas (+2), particularly within PU 4.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL would have potential for long term positive effects on PHH due to a slight reduction in the proportion of the population at risk of flooding (+1) in these areas.

Geology, Soils & Land use – HTL as the primary or localised policy has potential for moderate positive effects on GSL, as coastal defences will provide for no loss of soil or land resource in these areas from coastal flooding or erosion (+2), which is likely to be short to medium term where existing defences are maintained, and short to long term where defences are improved, while maintenance of existing defences will continue to provide some protection to Redkirk Geological Conservation Review site (+2). There is also potential for short or long term, slight to significant negative effects on GSL should any new or improved defences adversely affect earth science features of Upper Solway Fats and Marshes SSSI, such as the rock exposures around Southerness, and geomorphological features at various location within the site (-2). NAI as the primary or localised policy has potential for moderate negative effects on GSL in the medium to long term, as there is likely to be a moderate natural loss of soil or land resource from coastal flooding or erosion

in these areas, particularly in PU 5 (-2). MR as a medium to long term policy for PUs 1, 5 and 7 also has potential for moderate negative effects on GSL in the long term, as there is likely to be a moderate natural loss of soil or land resource from coastal flooding or erosion in these areas (-2).

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term has the potential for moderate negative effects on GSL in the long term, as there is likely to be a moderate natural loss of soil or land resource from coastal flooding or erosion in these areas (-2).

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL in the long term would have potential for both positive and negative effects on GSL; there is potential for positive effects, as maintaining or upgrading coastal defences would provide for a reduction in the area of existing soil or land resource in these areas at risk from coastal flooding or erosion (+1), while there is potential for negative effects should any new or improved defences adversely affect earth science features of Upper Solway Fats and Marshes SSSI (-2).

Water – NAI as the primary or localised policy has potential for neutral effects on W (0), as there will be no positive or negative effects on the status of coastal and transitional waterbodies or local water quality. HTL as the primary or localised policy has potential for short to long term negative effects on W. There is potential for short term or infrequent negative impacts on coastal or transitional water quality (-1) during the maintenance of existing defences or construction of new defences. With construction of new defences, there is also potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of adjacent transitional or coastal water bodies under the WFD (-2). MR (relocation of at risk assets) as a medium to long term policy for PUs 1, 5 and 7 has potential for neutral effects on W (0), as it is not anticipated to have any significant effects on water quality.

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term generally has potential for neutral effects on W (0), however in PU 2 there is potential for infrequent to frequent effects on water quality (-1 / -2) in the medium to long term owing to a release of contaminants following erosion (unless it is found that there is no risk of contamination).

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL through maintenance or upgraded defences, in the long term would have potential for short term to permanent negative effects on W (-1 to -2). Continuation of the current policy of NAI in PU 2 has potential for infrequent to frequent effects on water quality (-1/-2) in the medium to long term, owing to the threat of contamination from the former MoD site with increased coastal erosion of the area (unless it is found that there is no risk of contamination).

Climatic Factors – NAI as the primary or localised policy has potential for positive effects on CF in the medium to long term (+3), by allowing the shoreline in these areas to react naturally to an increase in coastal flooding or erosion risks. HTL as the primary or localised policy has potential for positive or negative effects on CF. In the case of HTL involving the maintenance of existing defence assets, there is potential for slight positive effects on CF (+1), as this policy will allow the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. Where HTL could require improvement or expansion of defences (PU 2, PU 7), there is potential for slight negative effects on CF in the medium to long term (-1), as defences will be adaptable to climatic change but with a cost: benefit that is marginal and will require a moderate level of engineering. MR (relocation of at risk assets) as a medium to long term policy for PUs 1, 5 and 7 has potential for moderate positive effects on CF in the medium to long term, (+2) allowing the shoreline to react more naturally to climatic change at minimal cost.

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term has potential for moderate positive effects on CF in the medium to long term, (+2) allowing the shoreline to react naturally to climatic change at minimal cost.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL, should defences require upgrading, has potential for

slight to moderate negative effects on CF (-1 to -2); HTL is likely to be adaptable to climatic change, but with a cost-benefit that is marginal to significant, and require moderate to significant engineering.

Material Assets & Infrastructure – HTL as the primary or localised policy has potential for long term positive effects on MA, through a reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion; in PU 4 and PU 7, there will be a significant reduction in the number of assets at risk (+3), while in other PUs there will be a slight reduction (+1). NAI as the primary or localised policy has potential for neutral effects on MA (0), as there will be no change in the number of assets at risk of flooding or erosion. In the medium to long term, a significant area of agricultural land, section of roads, and a small number of isolated residential properties will remain at risk of coastal flooding or erosion within these areas. MR (relocation of at risk assets) as a medium to long term policy for PUs 1, 5 and 7 has potential for significant long term positive effects on MA, through a significant reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion (+3).

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term has potential for long term positive effects on MA due to a slight to significant reduction in the number of assets or infrastructure at risk of coastal flooding (+1 to +3), particularly within PU 4.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL, should defences require upgrading, has potential for a slight reduction in the number of assets or infrastructure at risk of coastal flooding (+1) in these areas. Continuing the policy of NAI for most of PU 2 would have potential for a slight increase in the risk to material assets or infrastructure (-1), owing to a length of the Scottish Water network at erosion risk in the future.

Cultural, Architectural & Archaeological Heritage – HTL as the primary or localised policy has the potential for both positive and negative effects on CH. There is potential for significant positive effects on CH through a significant reduction in the number of designated heritage features, particularly listed buildings within settlement areas, at risk of coastal flooding and erosion (+3); this is particularly the case in PU 4 and PU 7, where a significant number of assets are at risk from coastal flooding. Effects are likely to be long term with improved or new defences that are adaptable to climatic change, and short to medium term where existing defences are maintained. This will include protection of ASA within the CPU. HTL involving new or improved defences also has potential for slight to significant negative effects on CH, owing to potential for negative changes to the setting of these features, including short term effects during construction, and permanent effects in the vicinity of defences (-2). NAI as the primary or localised policy has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). In the medium to long term, however, a small number of scheduled monuments, an area of Garden and Designed Landscape, and a Battlefield, will remain at risk of coastal flooding or erosion within these areas (-2). This includes the Sark Battlefield in PU 1, where the seaward edge is at coastal flood and erosion risk, the grounds of the Scheduled Monument at Caerlaverock in PU 5, and part of the seaward edge of the Garden and Designated Landscape at Arbigland in PU 7. There may also be a loss of Canmore assets and undiscovered archaeological features from coastal flooding and erosion in areas of NAI within CPU 1.

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). However, MR will offer no protection to heritage assets from loss or damage due to coastal flooding or erosion in these areas (-2).

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL, should defences require upgrading, has potential for a slight reduction in the number of designated heritage features at risk of coastal flooding (+1) in PU 7, however there would be no change for those assets at risk in PU 1, which are not currently protected from flooding by defences.

Landscape & Visual Amenity – NAI as the primary or localised policy has potential for neutral effects on L (0), as there will be no positive or negative effects on the landscape / seascape quality and visual amenity within these areas. HTL as the primary or localised policy has potential for short to long term negative effects on L. There is potential for short term / disturbance impacts on local views and the local landscape /

seascape (-1) during the maintenance of existing defences or construction of new defences. HTL involving new or improved defences also has potential for localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2), or for permanent negative impacts on and deterioration of designated landscapes and views (-3), should new or improved defences within PUs 6 or 7 impact upon the landscape / seascape character or visual amenity within the Nith Estuary NSA, intersected by these PUs. MR (relocation of at risk assets) as a medium to long term policy for PUs 1, 5 and 7 has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets across all epochs. In general, this approach is maintained in the updated SMP, however MR is now a policy, or alternative policy in the medium to long term within some PUs, where a small number of assets are at risk. Continuing to HTL in these areas, should defences require upgrading, would have potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during the construction of new defences in PU 1, but for localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2), or for permanent negative impacts on and deterioration of designated landscapes and views (-3), should new or improved defences within PUs 6 or 7 impact upon the landscape / seascape character or visual amenity within the Nith Estuary NSA, intersected by these PUs.

Potential In-Combination / Cumulative Effects

Potential sources of in-combination effects identified as part of this assessment include:

- There is potential for cumulative minor damage to European or nationally protected sites from HTL policies within PUs of CPU 1 (-2), including Solway Firth SAC, SPA and Ramsar site and nationally designated site Upper Solway Flats and Marshes SSSI.
- There is potential for slight temporary cumulative negative impacts on fauna, including birds, from disturbance during the construction phase, should proposed HTL options, in nearby areas be undertaken simultaneously. This includes the potential for effects on locally protected species (-1), as well as the potential for short term disturbance and displacement of species within internationally designated sites Solway Firth SAC, SPA and Ramsar site and nationally designated site Upper Solway Flats and Marshes SSSI, The Royal Ordnance, Powfoot SSSI and Caerlaverock NNR (-2).
- There is potential for in-combination effects with the Dumfries & Galloway Local Development Plan 2 on Solway Firth SAC, and with the Cumbria Coastal Strategy on Solway Firth SAC, SPA and Ramsar Site.
- There is potential for positive in-combination effects between BFF and CF whereby improving biodiversity through a NAI shoreline policy has the potential to positively affect carbon storage and sequestration which will have positive impacts for both the 2020 Challenge for Scotland's Biodiversity and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

Key Conclusions

The significantly beneficial aspects of implementing the SMP are expected to include:

- A reduction in the proportion of the population, number of businesses, and heritage features (listed buildings) at risk of coastal flooding within the main settlement areas in PU 4 and PU 7.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for biodiversity, flora and fauna, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.
- HTL for the full frontage of PU 2, instead of the existing SMP of NAI with limited HTL, will provide protection against degradation of water quality and potential adverse effects on adjacent internationally and nationally designated sites, from the threat of contamination from the former

MoD site with increased coastal erosion of the area (unless it is found that there is no risk of contamination). Further study of this area, and quantification of risk, will enable the most appropriate medium to long term policy (HTL or MR) to be defined.

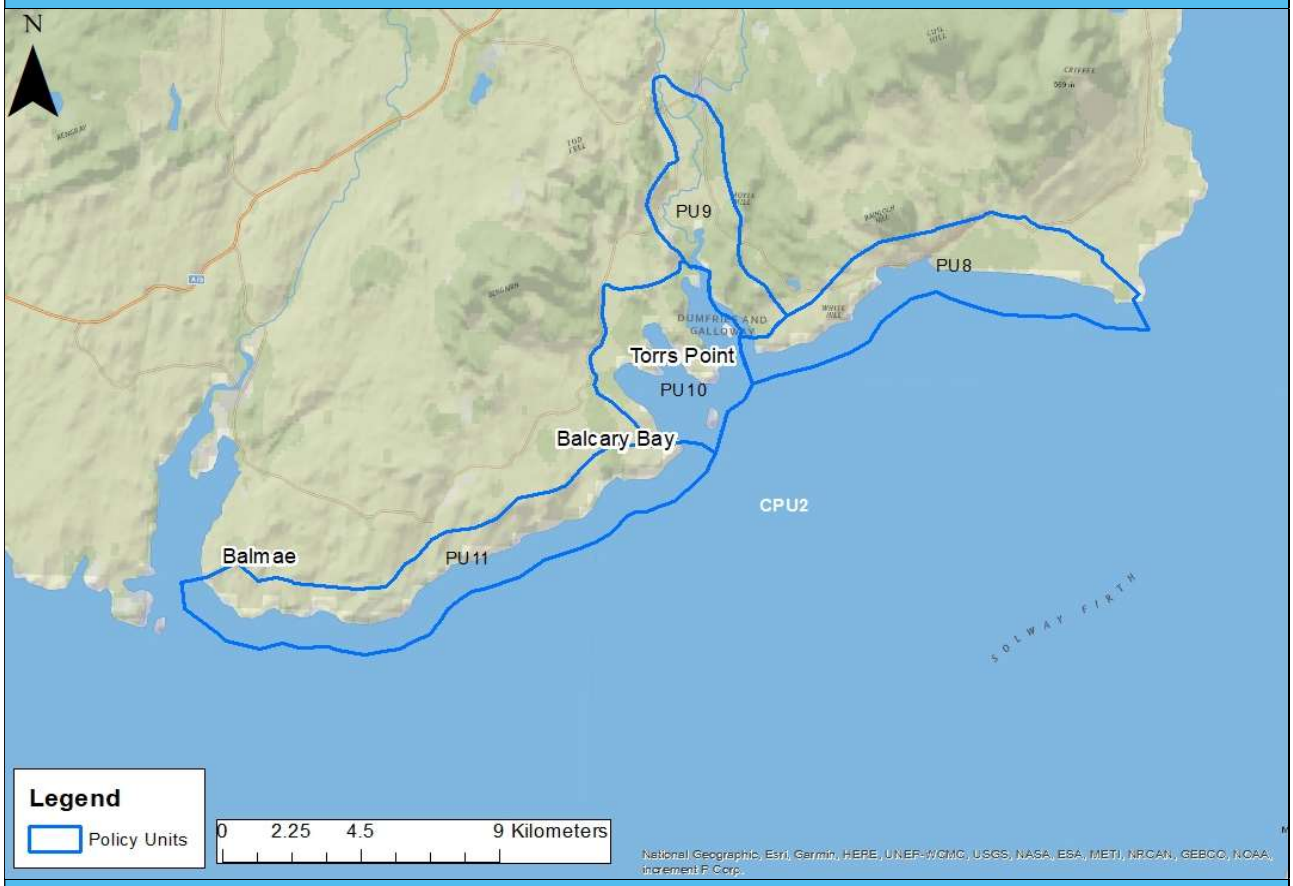
The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- Significant areas of existing agricultural land will continue to be at risk from the effects of coastal flooding or erosion, with the area at risk expected to increase in the future owing to the effects of climatic change.
- There will be social effects on the owners of isolated properties that may remain at flood or erosion risk, or who may need to relocate to an area that is not at risk.
- Some heritage features will continue to be at flood or erosion risk, which is expected to increase in the future owing to the effects of climatic change, including the Sark Battlefield, the grounds of the Scheduled Monument at Caerlaverock, and part of the Garden and Designated Landscape at Arbigland.

6.2 Coastal Process Unit 2

CPU	CPU 2 – Gretna to Southerness
CPU Information	
CPU 2 extends from Southerness in the east, to Torrs Point in the west. It covers the Outer Solway firth, including the tidal reaches of the Urr Water and Dalbeattie Burn. There are four Policy Units within CPU 2.	
PU 8 - For Policy Unit 8 over the next 100 years, essentially a policy of No Active Intervention. A localised policy of Hold the Line / Managed Realignment is recommended for existing defences and a section of road asset if future coastal erosion risk is identified. **PU 9 -** For Policy Unit 9 over the next 100 years, essentially a policy of No Active Intervention for the majority of the coastline, with a localised policy of Hold the Line applied to localised existing defences where this can be justified. **PU 10 -** For Policy Unit 10 over the next 100 years, essentially a policy of No Active Intervention for the majority of the coastline, with a localised policy of Hold the Line applied to localised existing defences, such as those protecting the Shore Road and properties at Balcary Bay where this can be justified. **PU 11 -** For Policy Unit 11 over the next 100 years, a blanket policy of No Active Intervention for this section of the coastline.	

CPU 2 policy units



Key Plan Issues

PU 9 – Coastal flood risk to properties, and other assets in the population centres of Dalbeattie, Kippford and Rockcliffe.

PU 10 – Coastal flood risk to the Shore Road and properties at Balcary Bay.

Key Environmental Issues

Biodiversity, Flora & Fauna – There is one SAC and one SPA located in the vicinity of this CPU. Solway Firth SAC intersects the eastern half of the shoreline in PU 8, while Solway Firth SPA intersects parts of PU 8 and PU 11 and is situated offshore of PUs 9 and 10. The shoreline of PU 8 between Southerness Point and just west of Craigneuk Point is also designated as the Upper Solway Flats and Marshes Ramsar site. There are five SSSIs located within or adjacent to this CPU. These are Upper Solway Flats and Marshes SSSI, Port o'Warren SSSI, Auchencairn and Orchardton Bays SSSI, Abbey Burn Foot to Balcary Point SSSI and Torrs to Mason's Walk SSSI. Solway Firth and Port o'Warren SSSIs intersect the shoreline of PU 8, while Auchencairn and Orchardton Bays SSSI intersects the shoreline of PU 10, and Abbey Burn Foot to Balcary Point SSSI and Torrs to Mason's Walk SSSI the shoreline of PU 11. The shoreline of PU 8-10 is composed of areas of both soft (erodible) material, as well as hard and mixed. Areas of saltmarsh are present, such as at Mersehead in PU 8, in the Urr estuary in PU 9, and in Orchardton Bay and Auchencairn Bay in PU 10. Dune habitats are present in PU 8, while areas of old oak woodland occur along the shoreline of parts of PU 9 and PU 10. The shoreline of PU 11 is rockier in nature, with areas of shingle habitat, including at Rascarrel, Barlocoo and Mullock Bays. In PU 8, the 'Mersehead Sands', an extensive area of intertidal sand exposed at low tide, is managed by the RSPB, while Southwick coastal nature reserve is managed by The Scottish Wildlife Trust. The natterjack toad is known to be present at the Mersehead coastal sand dunes.

Population & Human Health – The main population centre in this CPU is Dalbeattie in PU 9, with a population of approximately 4100 individuals, while other settlements include the villages of Sandyhills and Portling (PU 8), Rockcliffe, Kippford and Palnackie (PU 9) and Auchencairn (PU 10). The coastal flood risk to people varies within this CPU. The main area of risk to residential properties is in PU 9, where 38 residential properties, equating to approximately 84 individuals, are at risk from a medium likelihood coastal flood event. Three residential properties are at medium likelihood risk of coastal flooding within PU 8, while none are at risk in PU 10 and PU 11. There is also a risk of coastal erosion in some areas, with one residential property in the Erosional Vicinity by 2050 and Erosional Area by 2100 in PU 10, as well as erosion risk to a section of about 3km length of the Mersehead to Southerness Core Path at the RSPB Mersehead Reserve in PU 8.

Geology, Soils & Land use – The land use in the vicinity of the shoreline is primarily comprised of grasslands, improved grasslands and arable land and market gardens, as well as coastal dunes and sandy shores and woodland of various types, including coniferous, broadleaved deciduous, coppice and early stage plantation, exotic woodland and scrub, and adidophilous Quercus-dominated deciduous woodland. This CPU lies within Upper Solway Flats and Marshes and Torrs to Mason's Walk SSSIs; the shoreline has been designated for the presence of the following earth science features, respectively: Coastal geomorphology of Scotland, Lower Carboniferous [Dinantian-Namurian], Mineralogy of Scotland and Quaternary of Scotland, and Wenlock.

Water – CPU 2 is within the Solway Tweed RBD. This CPU represents the outer Solway Firth. The shoreline within this CPU comprises the WFD coastal water bodies of Southerness Point to Balcary Point and Balcary Point to Kirkcudbright Bay, as well as the WFD transitional water bodies of Auchencairn Bay / Rough Estuary and Southwick Estuary. The two coastal water bodies currently have a WFD status of Good water quality, as does Auchencairn Bay / Rough Estuary transitional water body, while Southwick Estuary has a current status of High water quality. The main river water bodies associated with the shoreline in this area are the Southwick Burn, Fairgirth Lane, Urr Water, Potterland Lane, Hass Burn, Tacher Burn / Drungans Burn, Abbey Burn, and Dunrod Bur. The Abbey Burn is currently at Poor water quality status and the Dunrod Burn at Moderate water quality status, while the other rivers are currently at Good water quality status. Within this CPU, there is a risk of coastal flooding and erosion. The greatest flood risk to properties is in the area of Dalbeattie in PU 9, as well as Sandyhills in PU 8, as well as a risk to sections of roads including a section of the A710. Significant areas of agricultural land within the CPU are also at coastal flood risk owing to the low-lying nature of much the hinterland. There are areas of both accretion and erosion within the CPU, however coastal erosion and its effects are expected to increase in the future in some areas. Future coastal erosion is anticipated to affect assets in PU 8, and the west of PU 10, particularly the shoreline of Balcary Bay. In these areas, a small number of residential properties, sections of roads, and a section of the Scottish water network will be at risk in the future; there is uncertainty regarding how the saltmarsh in PU 8 will respond to rising water levels, however in this PU, areas of designated environmental sites (899ha SAC, 911ha SPA, 899ha SSSI) and green space / golf course (202ha) will also be within the Erosional Area by 2100. Although erosion risk is generally low in PU 11, owing to the predominantly rocky nature of the shoreline, a section of road, part of the area of Scheduled Monument Castle Muir, as well as a designated environmental site, SSSI (725ha) including Abbey Burn Foot to Balcary Point and Torrs to Mason's Walk SSSI will also be within the Erosional Area by 2100.

Climatic Factors – When the predicted effects of climatic change are taken into account, there are 53 residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, equating to approximately 116 people; approximately 90 more people than are at risk from the current day medium likelihood event. There are also 25 non-residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, an increase of 6 from the current risk, as well as three additional utility assets (Scottish Water assets at Kippford and Rockcliff in PU 9 and near Auchencairn village in PU 10), additional lengths of road (including 2.5km of the A710 road in PU 9), and the port areas of Dalbeattie, Kippford and Rockcliffe in PU 9 at risk. In addition, the area of agricultural land at risk from a medium likelihood climate change coastal flood event in this CPU is expected to increase to an area of approximately 414ha, an increase of 80ha from the present day risk. Assets in PU 8 and PU 10 are anticipated to be affected by future coastal erosion, including a small number of residential properties, sections of roads, and a section of the Scottish water network.

Material Assets & Infrastructure – The principal roads within this CPU are the A710 connecting Dumfries with Dalbeattie, and the A711 running from Dalbeattie to Auchencarin and on westwards towards

Kirkcudbright. There is a risk of coastal flooding to material assets within some areas of this CPU. In total, there are approximately 19 non-residential properties and 3 utility receptors (including Scottish Water sites at Kippford and Rockcliffe in PU 9 and north of Auchencairn village in PU 10) at risk from a medium likelihood coastal flood event, as well as a risk to sections of roads including a section of the A710 as well as minor / local roads in PU 9 and 1.4km of minor / local roads in PU 8, a risk to an area of approximately 334ha of agricultural land, and risk to the port areas of Dalbeattie, Kippford and Rockcliffe in PU 9. Assets in PU 8 and PU 10 are anticipated to be affected by future coastal erosion, including a small number of residential properties, sections of roads, and a section of the Scottish water network.

Cultural, Architectural & Archaeological Heritage – Within the CPU listed buildings of special architectural or historic interest are primarily found in the population centres of Southwisk, Sandyhills, Rockcliffe, Kippford, Dalbeattie, Palnackie and Balcary. Scheduled monuments in the area include Castlehill Point, Mote of Mark, Buittle Castle, Nethertown Cottages, Heston Island manor house, Seaside forts, Castle Muir and Craigraploch fort, Abbey Burnfoot. There are also a significant number of Canmore assets within CPU 2. Within the CPU, there are a total of 4 cultural heritage features at risk from a medium likelihood coastal flood event, including two listed buildings in Dalbeattie and Kippford in PU 9, one listed building (Balcary Tower) in PU 10 and Castle Muir Scheduled Monument in PU 11.

Landscape & Visual Amenity – The landscape character types of CPU 2 comprise the following: coastal flats, coastal uplands, narrow wooded river valley, peninsula and peninsula with gorsey knolls. Within this CPU, the East Stewartry Coast, which extends upstream on the Urr Water to just north of Munches, is designated as a National Scenic Area; the entirety of PU 10 and part of PU 9 is within this area.

Potential SMP Effects

Biodiversity, Flora & Fauna – NAI is the primary policy for all PUs in CPU 2, and has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within the internationally designated sites Solway Firth SAC, Upper Solway Flats and Marshes Ramsar site and Solway Firth SPA (+3), as well as within the nationally designated site Upper Solway Flats and Marshes SSSI (+2) in PU 8, and within the Solway Firth SPA in PU 11 (+3). There is potential for a permanent loss of coastal or intertidal habitats in some areas of CPU 2 from natural coastal processes, exacerbated by climatic change, including within Solway Firth SAC and SPA in the area of Mersehead in PU 8, and areas of Abbey Burn Foot to Balcary Point and Torrs to Mason's Walk SSSIs within PU 11. HTL as a localised policy for PUs 8, 9 and 10, will primarily involve repair and maintenance of existing defences, and has potential for short term, negative effects on habitat within the existing footprint of defences, and short-term disturbance of species within the immediate area (-1). Any modifications of existing defences, depending on their nature, could have potential for moderate to significant short to long term negative effects within PU 8, which intersects Solway Firth SAC and SPA (-3), and Upper Solway Flats and Marshes SSSI (-2), and within PU 11, which intersects Solway Firth SPA (-3). HTL at Dalbeattie within PU 9 could require the improvement of existing defences in the medium term, with potential for short term temporary negative effects (-1) on local habitats and species during any construction, to long term permanent loss of local non-designated habitats in the footprint of defences. MR (relocation of at risk assets) in PU 8 has potential for long term significant positive effects on BFF, providing some opportunity for coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Solway Firth SAC, SPA, and Upper Solway Flats and Marshes Ramsar site (+3), and nationally designated Upper Solway Flats and Marshes SSSI (+2). There is also a slight risk of negative effects in the long term, including within these designated sites, from the potential risk of ruin of existing defence assets.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Solway Firth SAC, SPA, and Upper Solway Flats and Marshes Ramsar site (+3) and nationally designated site Upper Solway Flats and Marshes SSSI (+2). There is also a slight risk of negative effects in the long term, including within these designated sites, from the potential risk of ruin of existing defence assets.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with

NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for positive or negative effects on BFF as outlined for the policies of NAI and HTL for the updated SMP. The existing approach to continue to HTL for at risk assets in PU 8 is likely to be less adaptable in the long term than MR of at risk assets and would not provide for the potential positive effects on BFF in these areas.

Population & Human Health – NAI as the primary or localised policy has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion. HTL as a localised policy for PUs 8, 9 and 10, has potential for long term positive effects on PHH, through a reduction in the proportion of the population at risk of coastal flooding; in PU 9, where there may be a need to improve existing defences in the medium term, there will be a significant reduction in the proportion of the population at risk (+3), while in other PUs, where HTL will involve maintenance of existing defences, there will be a slight reduction in the proportion at risk (+1). MR (potential relocation of a road and defence assets) as a long term policy for PU 8 has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion.

SMP Alternative Policies - MR as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on PHH as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have neutral effects on PHH (0).

Geology, Soils & Land use – NAI as the primary policy for all PUs has potential for negative effects on GSL in the medium to long term, as there is likely to be a natural loss of soil or land resource from coastal flooding or erosion in these areas, with potential for a slight loss of resource in PU 11 (-1), and a moderate loss in PUs 8, 9 and 10 (-2). There is potential for some loss of designated Wenlock features within Torrs to Masons Walk SSSI, situated along the shoreline of PU 11, from natural coastal processes, exacerbated by climatic change. HTL as the primary or localised policy has potential for moderate positive effects on GSL, as coastal defences will provide for no loss of soil or land resource in these areas from coastal flooding or erosion (+2), which is likely to be short to medium term where existing defences are maintained, and short to long term where defences are improved (potentially in PU 9). There is also potential for short term disturbance or minor damage to designated earth science features (-2) of Upper Solway Fats and Marshes SSSI, such as the rock exposures around Southerness, and geomorphological features at various location within the site, from maintenance of existing defences within PU 8. MR (potential relocation of a road and defence assets) as a long term policy for PU 8 has potential for slight negative effects on GSL in the long term, as there is likely to be a slight natural loss of soil or land resource from coastal flooding or erosion in this area (-1).

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for slight negative effects on GSL in the medium to long term, as there is likely to be a slight natural loss of soil or land resource from coastal flooding or erosion in this area (-1).

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on GSL as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have potential for slight positive effects on GSL, through a slight reduction in the area of soil and land resource at risk from coastal flooding or erosion in this area (+1).

Water – NAI as the primary policy for all PUs has potential for neutral effects on W (0), as there will be no impacts on the status of coastal and transitional waterbodies or local water quality. HTL as a localised policy for PUs 8, 9 and 10 has potential for short to long term negative effects on W. There is potential for short term or infrequent negative effects on coastal or transitional water quality (-1) during the maintenance of existing defences or construction of new defences. With construction of new defences (potentially in PU 9), there is also potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of adjacent Auchencairn Bay / Rough Estuary transitional water body under the WFD (-2). MR (potential relocation of a road and defence assets) as a long term policy for PU 8 has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on W as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have potential for short term slight negative effects on W in this area (-1).

Climatic Factors – NAI as the primary policy for all PUs has potential for positive effects on CF in the medium to long term (+3), by allowing the shoreline in these areas to react naturally to an increase in coastal flooding or erosion risks. HTL as the primary or localised policy has potential for positive or negative effects on CF. In the case of HTL involving the maintenance of existing defence assets (PU 8 and PU 10), there is potential for slight positive effects on CF (+1), as this policy will allow the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. Where HTL could require improvement or expansion of existing defences (PU 9), there is potential for slight negative effects on CF in the medium to long term (-1), as defences will be adaptable to climatic change but with a cost: benefit that is marginal and will require a moderate level of engineering. MR (relocation of at risk infrastructure) as a long term policy for PU 8 has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline to be more adaptable to climatic change at minimal cost.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline to be adaptable to climatic change at minimal cost.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on CF as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have the same potential for slight positive effects on CF (+1) should minimal maintenance be required for this asset, or slight negative effects (-1) should improvements in this defence asset be required.

Material Assets & Infrastructure – NAI as the primary policy for all PUs has potential for neutral effects on MA (0), as there will be no change in the number of assets at risk of flooding or erosion. In the medium to long term, areas of agricultural land, sections of roads, utilities and a small number of isolated properties will remain at risk of coastal flooding or erosion within these areas. HTL as the primary or localised policy has potential for positive effects on MA, through a reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion; in PU 9, where there may be a need to improve existing defences in the medium term, there will be a significant reduction in the number of assets at risk (+2) in the long term, while in other PUs, where HTL will involve maintenance of existing defences, there will be a slight reduction (+1) in the number of assets or infrastructure at risk in the short to medium term. MR (potential relocation of a road and defence assets) as a long term policy for PU 8 has potential for long term positive effects on MA (+1), through a slight reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for long term positive effects on MA due to a slight reduction in the number of assets or infrastructure at risk of coastal flooding (+1) within this area.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on MA as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have the same potential for long term positive effects on MA due to a slight reduction in the number of assets or infrastructure at risk of coastal flooding (+1) within this area.

Cultural, Architectural & Archaeological Heritage – NAI as the primary policy for all PUs has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). In the medium to long term, however, the Castle Muir Scheduled Monument will remain at risk of coastal flooding in PU 11 (-1). There may also be a loss of Canmore assets and undiscovered archaeological features from coastal flooding and erosion in areas of NAI within CPU 2. HTL as the primary or localised policy has the potential for both positive and negative effects on CH. There is potential for positive effects on CH through a slight reduction in the number of designated heritage features, comprising listed buildings within settlement areas of PU 9 and PU 10, at risk of coastal flooding and erosion (+1). Effects are likely to be long term with improved or new defences that are adaptable to climatic change, and short to medium term where existing defences are maintained. HTL involving new or improved defences in PU 9 also has potential for slight negative effects on CH, owing to the potential for adverse effects on the setting of a small number of listed buildings (-1), including short term effects during construction, or permanent effects in the vicinity of defences. MR (potential relocation of a road and defence assets) as a long term policy for PU 8 has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0), and there will be no heritage assets not afforded protection against coastal flooding or erosion in these areas (0).

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0), and there will be no heritage assets not afforded protection against coastal flooding or erosion in these areas.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on CH as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have neutral effects on PHH (0).

Landscape & Visual Amenity – NAI as the primary policy for all PUs has potential for neutral effects on L (0), as there will be no impacts on the landscape / seascape quality and visual amenity, including within the East Stewartry Coast NSA, which intersects the entirety of the shoreline in PU 10 and part of the shoreline in PU 9. HTL as the primary or localised policy has potential for short to long term negative effects on L. There is potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during the maintenance of existing defences or construction of new defences. HTL involving new or improved defences (potentially in PU 9) also has potential for localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2), or for permanent negative impacts on and deterioration of designated landscapes and views (-3), should defences at this location impact upon the landscape / seascape character or visual amenity within the East Stewartry Coast NSA, intersected by this PU. MR (potential relocation of a road and defence assets) as a long term policy for PU 8 has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in this area has potential for the improvement of local views.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PU 8 in the medium rather than long term has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in this area has potential for the improvement of local views.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with localised HTL for at risk assets across all epochs at Sandyhills Bay in PU 8, Dalbeattie, Rockclffe, and Kippford in PU 9 and Balcary Bay in PU 10. This approach has been maintained in the updated SMP, with NAI as a primary policy and HTL only where there are existing defences, however MR is now a policy, or alternative policy, for at risk assets in the medium to long term within PU 8. Continuation of the current SMP policies is likely to have the same potential for effects on L as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for a road asset in PU 8 rather than MR in the long term would have the potential for slight negative effects on L (-1).

Potential In-Combination / Cumulative Effects

Potential sources of in-combination / cumulative effects identified for CPU 2 include:

- There is potential for temporary cumulative disturbance or displacement of SCI species within the internationally designated site Solway Firth SPA from HTL policies within PUs 8, 9 and 10 of CPU 2 (-3).
- There is potential for in-combination effects with the Cumbria Coastal Strategy on Solway Firth SPA.
- There is potential for positive in-combination effects between BFF and CF whereby improving biodiversity through a NAI shoreline policy has the potential to positively affect carbon storage and sequestration which will have positive impacts for both the 2020 Challenge for Scotland's Biodiversity and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

Key Conclusions

The significantly beneficial aspects of implementing the SMP are expected to include:

- A reduction in the proportion of the population, number of businesses, and heritage features (listed buildings) at risk of coastal flooding within the main settlement areas in PU 9.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for BFF, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.
- MR as a long term policy for at risk infrastructure is likely to be more adaptable to climatic change than the current SMP policy of localised HTL.

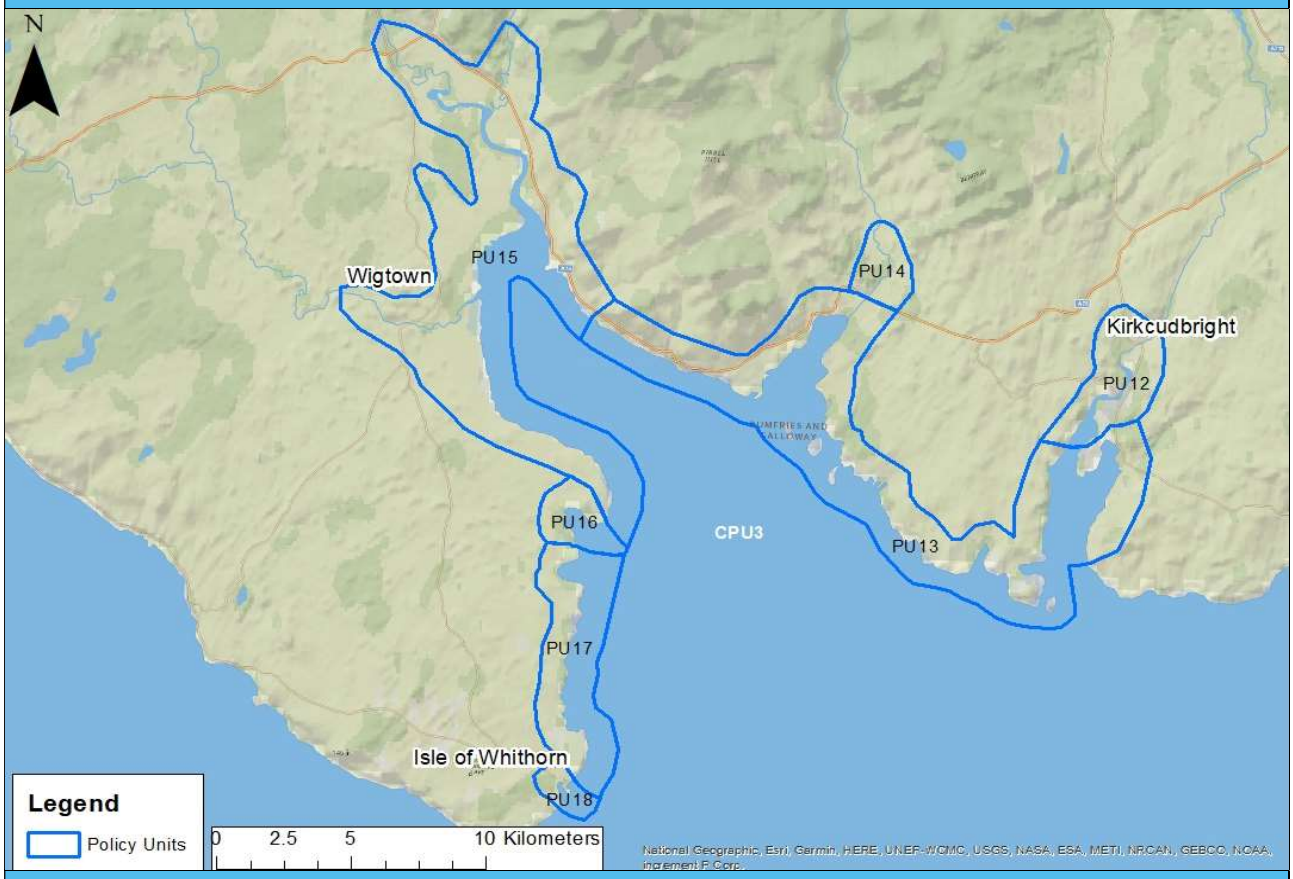
The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- Significant areas of existing agricultural land will continue to be at risk from the effects of coastal flooding or erosion, with the area at risk expected to increase in the future owing to the effects of climatic change.

6.3 Coastal Process Unit 3

CPU	CPU 3 – Torrs Point to Isle of Whithorn
CPU Information	
CPU 3 extends from Torrs Point in the east, to the Isle of Whithorn in the west. It covers Wigtown Bay and Kirkcudbright Bay, including the tidal reaches of the Rivers Tarff, Dee, Cree and the Water of Fleet. There are seven Policy Units within CPU 3.	
PU 12 - For Policy Unit 12 over the next 100 years, essentially a policy of No Active Intervention for the majority of the coastline although a localised policy of Hold the Line / Managed Realignment should be applied where there are existing coastal structures and a detailed assessment indicated this to be justified. This localised policy may also apply to the A75 at Skyburn pending the outcome of a detailed risk assessment. **PU 13 -** For Policy Unit 13 over the next 100 years, essentially a policy of Hold the Line through the urbanised areas with a localised policy of No Active Intervention for the remainder of the coastline. In recognition of the challenges associated with implementing a Hold the Line policy particularly in the longer term an alternative more sustainable policy of Managed Realignment is proposed where this would be applicable. **PU 14 -** For Policy Unit 14 over the next 100 years, essentially a policy of No Active Intervention through precluding the construction of new defences but still permitting maintenance works to manage flood risk to businesses and properties. Managed Realignment is included as an alternative as opportunities have been identified with Policy Unit 14 to potentially use this to mitigate flood risk. **PU 15 -** For Policy Unit 15 over the next 100 years, essentially a policy of No Active Intervention through precluding the construction of new defences. Hold the Line and Managed Realignment are included as a localised policy to permit maintenance works to manage flood risk to businesses and properties protected by existing defences. **PU 16 –** For Policy Unit 16 over the next 100 years, a policy of Hold the Line. Managed Realignment is included as an alternative policy over the medium to long term while for undefended section of the coastline a localised policy of No Active Intervention is identified. **PU 17 -** For Policy Unit 17 over the next 100 years, essentially a policy of No Active Intervention virtually everywhere and for all epochs due to the low level of risk. A localised policy of Hold the Line / Managed Realignment is suggested for a section of the B7063. **PU 18 -** For Policy Unit 18 over the next 100 years, essentially a policy of Hold the Line across the developed frontage for as long as this is sustainable, moving to a policy of Managed Realignment. A localised policy of No Active Intervention is suggested for undeveloped sections of the coast.	

CPU 3 policy units



Key Plan Issues

PU 13 – Coastal flood risk to properties, and other assets in the population centre of Kirkcudbright.

PU 16 – Coastal flood risk to properties, and other assets in the population centre of Garlieston.

PU 18 – Coastal flood risk to properties, and other assets in the population centre of Isle of Whithorn.

Key Environmental Issues

Biodiversity, Flora & Fauna – There are four SACs and one SPA located in the vicinity of this CPU. Galloway Oakwoods SAC is situated >1km from the shoreline in PU 14. Carsegowan Moss SAC is situated >2km from the shoreline in PU 15, while River Bladnoch SAC also intersects the shoreline in PU 15. Burrow Head SAC is situated approximately 100m inland from the shoreline, at its closest point, within PU 18. Solway Firth SPA intersects parts of the shoreline in PU 12, and PUs15-17. There are twelve SSSIs located within or adjacent to this CPU. These are Torrs to Mason's Walk SSSI, Shoulder o'Craig SSSI, Borgue Coast SSSI, Carrick Ponds SSSI, Ravenshall Wood SSSI, Cree Estuary SSSI, Lower River Cree SSSI, Carsegowan Moss SSSI, Cotland Plantation SSSI, Cruggleton Bay SSSI, Isle of Whithorn Bay SSSI, and Burrow Head SSSI. Torrs to Mason's Walk, Shoulder o'Craig, Borgue Coast, Carrick Ponds, and Ravenshall Wood SSSIs interest PU 12, while Cree Estuary intersects both PU 12 and PU 15. Carsegowan Moss and Cotland Plantation SSSIs also intersect PU 15. Cruggleton Bay SSSI lies within PU 17, while Isle of Whithorn Bay and Burrow Head SSSIs intersect PU 18. There is one Local Nature Reserve (LNR) in the area, Wigtown Bay, which intersects PU 15.

Population & Human Health – Within this CPU, the areas of highest population density are Kirkcudbright, Newton Stewart and Wigtown. In Kirkcudbright (PU 13), there are approximately 3,400 residents, while in Newtown Stewart (PU 15) the population is approximately 4,000 and Wigtown (PU 15) has a population of less than 1,000 residents. The coastal flood risk to people varies within this CPU. There is no risk from coastal flooding from a medium likelihood flood event in PU 17, and low risk in PUs12 and 14, where 4 and

5 residential properties, respectively, are at risk. There is a much greater risk around the population centres in the area, including Kirkcudbright in PU 13, where 70 residential properties are a risk, Wigtown and Creetown in PU 15, where 46 residential properties are at risk, Garlieston in PU 16, where 36 residential properties are at risk, and Isle of Whithorn, where 50 residential properties are at risk. In total, approximately 464 individuals are at risk from a medium likelihood coastal flood event in this CPU. In addition, two community facilities are anticipated to be affected in Kirkcudbright (PU 13), two in PU 15 and one in PU 16. In additional, there is also a future risk to residential properties in this CPU (PU 15 and PU 16) from coastal erosion; four residential properties will be located within the Erosion Vicinity by 2050, and 14 by 2100; these are not expected to be affected by erosion and are identified for awareness raising and future planning).

Geology, Soils & Land use – The land use in the vicinity of the shoreline is primarily comprised of improved grasslands, with arable land and market gardens, and broadleaved deciduous woodland as well as areas of mixed deciduous and coniferous woodland, buildings of cities, towns and villages, scree / inland cliffs, coastal dunes and sandy shore, temperate thicket and scrub, coastal shingle and raised and blanket bog. This CPU lies within Torrs to Mason's Walk, Shoulder o'Craig, Borgue Coast, Cree Estuary, Cruggleton Bay, and Isle of Whithorn Bay SSSIs; the shoreline has been designated for the presence of the following earth science features, respectively: Wenlock, Caledonian Igneous, Caledonian structures of the Southern Uplands and Wenlock, Coastal geomorphology of Scotland, Caledonian structures of the Southern Uplands, and Caledonian structures of the Southern Uplands.

Water – CPU 3 is within the Solway Tweed RBD. The shoreline within this CPU comprises the WFD coastal water bodies of Balcary Point to Kirkcudbright Bay and Wigtown Bay, as well as the WFD transitional water bodies of Dee (Kirkcudbright) Estuary, Fleet Estuary, Bladnoch and Cree Estuary (Outer) and Cree Estuary. The two coastal water bodies currently have a WFD status of Good water quality, as do the Fleet Estuary, and Bladnoch and Cree Estuary (Outer) transitional water bodies, while the Dee (Kirkcudbright) Estuary and Cree Estuary transitional water bodies have a current status of High water quality. Many of the river water bodies associated with the shoreline in this area are currently at Moderate water quality status (including the River Dee (Loch Ken Outlet to Tongland), Buckland Burn, Pulwhirrin Burn, Water of Fleet, Skyre Burn, Bishop Burn, Inch Burn, Pouton Burn, Ket Burn and Drummullin Burn), while the River Cree (upstream of Newton Stewart), Tarff Water and Balloch Burn are currently at Good water quality status. Within this CPU, there is a risk of coastal flooding and erosion. The greatest flood risk to properties is in the main settlement areas of Kirkcudbright in PU 13, Garlieston in PU 16, and Isle of Whithorn, and the smaller settlements of Creetown, Carsluith, Palnure, Bladnoch, and Mains of Baldoon in PU 15, as well as a risk to sections of roads including the A75 at Skyburn Bay (PU 12) and the A714 at Bladnoch (PU 15). Significant areas of agricultural land within the CPU (1,023ha in total) are also at coastal flood risk owing to the low-lying nature of much the hinterland, particularly in PU 15 and PU 12. There are areas of both accretion and erosion within the CPU; coastal erosion and its effects are expected to increase in the future in some areas, however the risk to assets is relatively low within this CPU. Future coastal erosion is anticipated to directly affect assets in PU 16, including an area of access road, and an area (427ha) of the Borgue Coast SSSI in PU 12; there is uncertainty regarding how the saltmarsh in PU 15 at Creetown and Wigtown will respond to rising water levels, however in this PU, a section of the A75 is also expected to be directly affected by coastal erosion by 2100. Elsewhere assets are expected to be within the vicinity of future erosion (e.g. the A75 at Kirkclaugh in PU 12, and road and an area of Garden and Designated Landscapes and green space within PU 17.

Climatic Factors – When the predicted effects of climatic change are taken into account, there are 293 residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, equating to approximately 645 people; 180 more people than are at risk from the current day medium likelihood event. There are also 120 non-residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, an increase of 36 from the current risk, as well as three additional utility assets, nine additional cultural heritage assets, and additional lengths of approximately 18.5km road (including A roads in PU 13, and the A714 in PU 15) are at risk. In addition, the area of agricultural land at risk from a medium likelihood climate change coastal flood event in this CPU is expected to increase from 1027ha to 1237ha, owing to the low lying nature of areas of the hinterland. Assets in PU 16 are anticipated to be affected by future coastal erosion, including a small (0.02km) section of minor access road within the Erosional Area by 2050, increasing (to 0.66km) by 2100.

Material Assets & Infrastructure – The principal roads within this CPU are the A711 and B727 in the vicinity of Kirkcudbright, the A75, which runs along the coastline from Kirkcudbright to Newton Stewart, the A714 from Newton Stewart to Wigtown, the B7004 connecting Garlieston, and the B7063 from Garlieston

to the Isle of Whithorn. There is a risk of coastal flooding to material assets within this CPU in all PUs apart from PU 17. There are approximately 84 non-residential properties, 2 community facilities, and 12 utility receptors (8 of which are Scottish Water assets) at risk from a medium likelihood coastal flood event, as well as a risk to approximately 14km of road, including sections of A roads (A75 at Skyburn Bay in PU 12 and A714 at Bladnoch in PU 15), B roads (B727 in PU 12, B796 in PU 14 and B7063 in PU 18), and minor / local roads. There is also a risk to large areas of agricultural land (approximately 1,027ha in total, with largest at-risk areas in PU 15 and PU 12).

Cultural, Architectural & Archaeological Heritage – Within the CPU there are a significant number of listed buildings of special architectural or historic interest in the main population centres of Kirkcudbright (PU 13), Gatehouse of Fleet (PU 14), Newton Stewart, Wigtown and Bladnoch (PU 15), Garlieston (PU 16) and Isle of Whithorn (PU 18); outside of these centres, A listed buildings that occur in proximity to the shoreline include Ardwell House in PU 12, and Galloway House and Cruggleton Old Parish Church in PU 17. There are also a significant number of scheduled monuments in the area, particularly castles and forts including those close to the shoreline such as Borness Batteries Fort, Muncraig Heugh Fort, Castle Haven, Kirkclaugh Mote and Carsluith Castle in PU 12, Kirkcudbright Castle in PU 13, Wigtown Castle in PU 15, Garlieston Mulberry Harbour remains, Cruggleton Castle, Dinnons two forts, Cairnhead Fort and Steinhead Fort in PU 17, and Isle Head Fort and St. Ninian's Chapel in PU 18. There are two Gardens and Designed Landscapes within this CPU; Cally in PU 14, and Galloway House, intersecting PU 16 and PU 17. There are also a significant number of Canmore assets within CPU 3, and ASA occur at Kirkcudbright, Cairnholy, Wigtown and Isle of Whithorn. Within the CPU, there are a total of 70 cultural heritage features at risk from a medium likelihood coastal flood event, including 57 listed buildings (primarily located in PU 16 and PU 18), 11 scheduled monuments (in PU 12, PU 15, PU 17 and PU 18), and one garden and designed landscape, Galloway House (in PU 16 and PU 17). When the predicted effects of climatic change are taken into account, eight additional cultural heritage assets (in PU 14 and PU 16) are at risk from a medium likelihood coastal flood event within this CPU.

Landscape & Visual Amenity – CPU 3 is characterised by a series of deeply indented bays, into which drain four major rivers including the River Cree. The landscape character types of CPU 3 comprise the following: coastal flats, peninsula, peninsula with gorsey knolls, drumlin pastures, and upland fringe. Within this CPU, the Fleet Valley, is designated as a National Scenic Area; the entirety of PU 14 and the area of Fleet Bay in PU 12 are within this area.

Discussion of Impacts

Biodiversity, Flora & Fauna – NAI as the primary or localised policy within CPU 3 has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within the internationally designated site Solway Firth SPA (PUs 12, 15 and 17) (+3), nationally designated sites Torrs to Mason's Walk SSSI (PU 12), Borgue Coast SSSI (PU 12), and Cree Estuary SSSI (PU 12 and PU 15) (+2), and locally designated site Wigtown LNR (PU 15) (+1). There is potential for a permanent loss of designated habitat within Ravenshall Wood SSSI in PU 12 from natural coastal erosional processes, exacerbated by climatic change. HTL as the primary policy in PU 16 (Garlieston) has the potential for short to long term, slight to significant negative effects on BFF, including the potential for construction phase disturbance of designated species within internationally designated site Solway Firth SPA, situated offshore of this PU (-3); the significance of effects will be dependent upon the nature and construction timing of any extended defences. HTL as the primary policy in PU 18 (Isle of Whithorn), has the potential for short to long term, slight negative effects on BFF, from disturbance or damage to local habitats or species (-1). HTL as a localised policy for other PUs, will involve repair and maintenance of existing defences, and has potential for short term, negative effects on habitat within the existing footprint of defences, and short-term disturbance of species within the immediate area, including within the internationally designated sites Solway Firth SPA (PU 12 and PU 15) (-3), nationally designated sites Borgue Coast SSSI (PU 12), Cree Estuary SSSI and River Bladnoch SSSI (PU 15) (-2). Should HTL in these areas require improvement of existing defences outside of their current footprint, there is potential for short to long term, significant direct or indirect negative effects on BFF, including within these designated sites, as well as within nearby sites Torrs to Mason's Walk SSSI (PU 12) and Wigtown LNR (PU 15), and on important habitats such as saltmarsh, particularly within PUs 14 and 15. MR has potential for long term significant positive effects on BFF, providing some opportunity for coastal or intertidal habitats to expand in response to anticipated sea level rise, including within nationally designated site Cree Estuary SSSI in PU 15 (+2), and the potential for biodiversity net gain elsewhere.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 12, 13, 14, 16, 17 and 18 has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within nationally designated site Borgue Coast SSSI in PU 12 (+2), and the potential for biodiversity net gain elsewhere. In PU 14, the alternative policy of MR involves the setting back of an embankment that currently protects reclaimed agricultural land at Cally, and in PU 13, the setting back of the Janefield defence to the north of the town as well as parkland located to the south of the town; there is potential for enhancement of local habitats and biodiversity net gain, with the potential for expansion of coastal habitats including saltmarsh within these areas (+1). There is also a slight risk of negative effects in the long term in these areas, from the potential risk of ruin of existing defence assets.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). The existing approach to continue to HTL for at risk assets in these PUs is unlikely to be sustainable in the long term without the upgrading of defences, which could adversely affect local habitats and species (-1) and would have the potential for disturbance and displacement of designated species of the Solway Firth SPA, situated a short distance offshore from PU 16 (-3).

Population & Human Health – NAI as the primary or localised policy has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion. HTL as the primary policy for PUs 13, 16 and 18, which is likely to require the improvement of existing defences, has potential for significant positive effects on PHH, through a significant reduction in the proportion of the population / communities in these areas at risk of coastal flooding or erosion (+3). HTL as a localised policy involving maintenance of existing defences for PUs 12, 14, and 15, has potential for long term positive effects on PHH, through a reduction in the proportion of the population at risk of coastal flooding, with potential for a slight reduction in the proportion of the population at risk in PU 12 and PU 14 (+1), and a moderate reduction in the proportion at risk in PU 15 (+2).

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term in PUs 14 and 15 has the potential for both positive and negative effects on PHH. There is potential for short term negative effects due to social effects on a slight proportion of the population in PU 14 (-1), and a moderate proportion in PU 15 (-2), from loss of properties and relocation. There is also potential for long term positive effects due to a slight reduction in PU 14 (+1), or a moderate reduction in PU 15 (+2) in the proportion of the population at risk of flooding following relocation outside of at risk areas. MR as an alternative policy to HTL for PU 17 in the long term has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). Continuing to HTL would have potential for significant positive effects on PHH, through a significant reduction in the proportion of the population / communities in these areas at risk of coastal flooding or erosion (+3).

Geology, Soils & Land use – NAI as the primary or localised policy has potential for negative effects on GSL in the medium to long term, as there is likely to be a natural loss of soil or land resource from coastal flooding or erosion in these areas, with potential for a slight loss of resource in PUs 13, 14, 16 and 17 (-1), a moderate loss in PU 12 (-2), and a significant loss in PU 15 (-3). HTL as the primary or localised policy has potential for moderate positive effects on GSL, as coastal defences will provide for no loss of soil or land resource in these areas from coastal flooding or erosion (+2), which is likely to be short to medium term where existing defences are maintained, and short to long term where defences are improved (PUs 13, 16 and 18). There is potential for short term disturbance or minor damage to designated earth science features (-2) of Shoulder O'Craig SSSI, from the continued maintenance of formal defence assets that fringe the shoreline of this area in PU 12. HTL of the developed frontage of Isle of Whithorn in PU 18, which is likely to require maintenance and upgrading of existing defences, has potential for indirect adverse effects on earth science features within the Isle of Whithorn Bay SSSI, situated along the western shoreline of the bay (-2). MR (relocation of at risk assets) as a medium to long term policy in PUs 14, 15 and 17 has the potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in these areas.

SMP Alternative Policies - MR as an alternative policy to HTL in the medium to long term in PUs 12, 13, 16 and 18 has the potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in these areas. MR as an alternative policy may include the realignment of defences at Janefield and parkland south of Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14; there is potential for moderate negative effects on GSL in these areas (-2), from a moderate loss of soil or land resource from coastal flooding.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). Continuing to HTL rather than MR in the long term would have potential for slight positive effects on GSL, through a slight reduction in the area of soil and land resource at risk from coastal flooding or erosion in these areas (+1).

Water – NAI as the primary or localised policy has potential for neutral effects on W (0), as there will be no impacts on the status of coastal and transitional waterbodies or local water quality. HTL as a primary policy in PUs 16 and 18, and a localised policy for all other PUs in CPU 3, has potential for short to long term negative effects on W. There is potential for short term or infrequent negative effects on coastal or transitional water quality within the Dee (Kirkcudbright) Estuary, Wigtown Bay, Fleet Estuary and Bladnoch and Cree Estuary (Outer) transitional / coastal water bodies (-1) during the maintenance of existing defences or construction of new defences. HTL in PU 13, PU 16 and PU 18 may require the improvement or extension of existing defences; in these cases, there is also potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of adjacent Dee (Kirkcudbright) Estuary transitional water body and Wigtown Bay coastal water body under the WFD (-2). MR (relocation of at risk assets) as a medium to long term policy in PUs 14, 15 and 17 has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

SMP Alternative Policies – MR (relocation of at risk assets) as an alternative policy to HTL for PUs 12, 13, 16 and 18 in the short to long term generally has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality. MR as an alternative policy may include the realignment of defences at Janefield and parkland south of Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14; there is potential for moderate positive effects on W in these areas (+2), through the removal of man-made structures for a more natural coastal morphology.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). The existing approach to continue to HTL for at risk assets in these PUs is unlikely to be sustainable in the long term without the upgrading of defences, which could have slight to moderate negative effects on W in these areas, through short term effects on local coastal water quality (-1), to adverse effects on coastal water body morphology (-2).

Climatic Factors – NAI as the primary or localised policy has potential for positive effects on CF in the medium to long term (+3), by allowing the shoreline in these areas to react naturally to an increase in coastal flooding or erosion risks. HTL as the primary or localised policy has potential for positive or negative effects on CF. In the case of HTL involving the maintenance of existing defence assets (PUs 12, 14, 15 and 17), there is potential for slight positive effects on CF (+1), as this policy will allow the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. Where HTL could require improvement or expansion of existing defences (PU 13, PU 16 and PU 18), there is potential for slight to moderate negative effects on CF in the medium to long term (-1 to -2), as defences will be adaptable to climatic change but with a cost: benefit that is marginal to significant and will require a moderate to significant level of engineering. MR (relocation of at risk assets) as a medium to long term policy in PUs 14, 15 and 17 has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline in these areas to be more adaptable to climatic change at minimal cost.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 12, 13, 16 and 18 in the short to long term has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline to be adaptable to climatic change at minimal cost.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). Continuation of the current SMP policies

is likely to have the same potential for effects on CF as outlined for the policies of NAI and HTL for the updated SMP. The existing approach to continue to HTL for at risk assets in PUs 16 and 18 is unlikely to be sustainable in the long term without the upgrading of defences, which would have potential for slight to moderate negative effects on CF in the medium to long term (-1 to -2), as defences will be adaptable to climatic change but with a cost: benefit that is marginal to significant, and will require a moderate to significant level of engineering.

Material Assets & Infrastructure – NAI as the primary or localised policy has potential for neutral effects on MA (0), as there will be no change in the number of assets at risk of flooding or erosion. In the medium to long term, areas of agricultural land, and a small number of isolated properties will remain at risk of coastal flooding or erosion within these areas. HTL as the primary or localised policy has potential for positive effects on MA, through a reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion; in PUs 13, 16 and 18, where HTL is likely to require improvement or expansion of existing defences, there will be a moderate to significant reduction in the number of assets at risk (+2 to +3) in the long term, while in other PUs, where HTL will involve maintenance of existing defences, there will be a slight reduction (+1) in the number of assets or infrastructure at risk in the short to medium term. MR (relocation of at risk assets) as a medium to long term policy in PUs 14, 15 and 17 has potential for long term positive effects on MA (+1), through a slight reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 12, 13, 16 and 18 in the short to long term has potential for long term positive effects on MA due to a slight reduction in the number of assets or infrastructure at risk of coastal flooding (+1) within this area. MR as an alternative policy may include the realignment of defences at Janefield and parkland south of Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14; there is potential for slight negative effects on MA in these areas in the medium to long term, as there will be a slight increase in coastal flooding of areas of agricultural land within these areas.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). Continuation of the current SMP policies is likely to have the same potential for effects on MA as outlined for the policies of NAI and HTL for the updated SMP.

Cultural, Architectural & Archaeological Heritage – NAI as the primary or localised policy has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). In the medium to long term, however, a moderate number of heritage features (scheduled monuments and listed buildings) will remain at risk of coastal flooding (-2). There may also be a loss of Canmore assets and undiscovered archaeological features from coastal flooding and erosion in areas of NAI within CPU 3. HTL as the primary or localised policy has the potential for both positive and negative effects on CH. There is potential for significant positive effects on CH in PU 16 and PU 18 (+3), where HTL is likely to require improvement or expansion of existing defences, through a significant reduction in the number of designated heritage features, and their settings, at risk of coastal flooding within these areas. There will also be protection to the ASA at Isle of Whithorn (PU 18). HTL through potential improvement of defences in PU 13, and maintenance of existing defences within PU 12 and PU 15 has potential for slight positive effects on CH (+1), through a slight reduction in the number of features at risk. HTL also has potential for negative effects on CH from construction or maintenance activities. There is potential for slight direct negative effects on CH in PU 12, PU 16 and PU 18 (-1), where designated features are part of the defence asset, and in PU 13, which is within a Conservation Area. There is also potential for moderate indirect negative effects on CH in PU 16 and PU 18, owing to potential for negative changes to the setting of heritage features, including short term effects during construction, and permanent effects in the vicinity of defences (-2). MR (relocation of at risk assets) as a medium to long term policy in PUs 14, 15 and 17 has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0), however one heritage feature at Creetown in PU 15 is likely to remain at risk from coastal flooding (-1).

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 12, 13, 16 and 18 in the short to long term has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). However, as these features cannot be relocated, a significant number within PU 16 and PU 18 are likely to remain at risk of coastal flooding (-3). MR as an alternative policy may include the realignment of defences at Janefield and parkland south of

Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14; there is potential for slight negative effects on CH in PU 14 from this alternative policy (-1), as an area of Cally Garden and Designed Landscape, and the setting of the Cally Palace Hotel A Listed Building, are likely to be adversely affected.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). Continuation of the current SMP policies is likely to have generally the same potential for effects on CH as outlined for the policies of NAI and HTL for the updated SMP.

Landscape & Visual Amenity – NAI as the primary or localised policy has potential for neutral effects on L (0), as there will be no positive or negative effects on the landscape / seascape quality and visual amenity within these areas. HTL as the primary or localised policy has potential for short to long term negative effects on L. There is potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during the maintenance of existing defences in PUs 12, 13, 14, 15 and 17. The Fleet Valley NSA intersects PU 12 and PU 14; no effects are expected within PU 14 from the maintenance of existing defences, however, in PU 12, should the A75 at Skyburn require a policy of HTL following assessment, any potential improvements could have potential for adverse effects on designated landscapes and views within this NSA. In PU 16 and PU 18, where HTL is likely to require improvement or expansion of existing defences, there is potential for localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2). MR (relocation of at risk assets) as a medium to long term policy in PUs 14, 15 and 17 has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 12, 13, 16 and 18 in the short to long term has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views, including within the Fleet Valley NSA in PU 12. MR as an alternative policy may include the realignment of defences at Janefield and parkland south of Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14; there is potential for significant positive effects on L in PU 14, from the potential for enhancement of designated landscapes and views within the Fleet Valley NSA.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 16 and PU 18. In general, this approach is maintained in the updated SMP, however MR is now considered as an alternative policy, for at risk assets in the medium to long term within PU 16 (Garlieston) and PU 18 (Isle of Whithorn). Continuation of the current SMP policies is likely to have generally the same potential for effects on L as outlined for the policies of NAI and HTL for the updated SMP.

Potential In-Combination / Cumulative Effects

Potential sources of in-combination / cumulative effects identified for CPU 3 include:

- There is potential for temporary cumulative disturbance or displacement of SCI species within the internationally designated site Solway Firth SPA from HTL policies within PUs 12, 15 and 16 of CPU 3 (-3).
- There is potential for in-combination effects with the Cumbria Coastal Strategy on Solway Firth SPA.
- There is potential for positive in-combination effects between BFF and CF whereby improving biodiversity through a NAI shoreline policy has the potential to positively affect carbon storage and sequestration which will have positive impacts for both the 2020 Challenge for Scotland's Biodiversity and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

Key Conclusions

The significantly beneficial aspects of implementing the SMP are expected to include:

- A reduction in the proportion of the population, number of businesses, and heritage features at risk of coastal flooding within the main settlement areas in PU 13, PU 16 and PU 18.

- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for BFF, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.
- The alternative policy of MR, involving the setting back of defences at Janefield and parkland north of Kirkcudbright in PU 13, and realignment of raised embankments at Cally in PU 14, has potential for biodiversity net gain, through the expansion of coastal habitats, allowing the floodplain to function in a more natural manner.

The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- Significant areas of existing agricultural land will continue to be at risk from the effects of coastal flooding or erosion, particularly in PU 15, with the area at risk expected to increase in the future owing to the effects of climatic change.

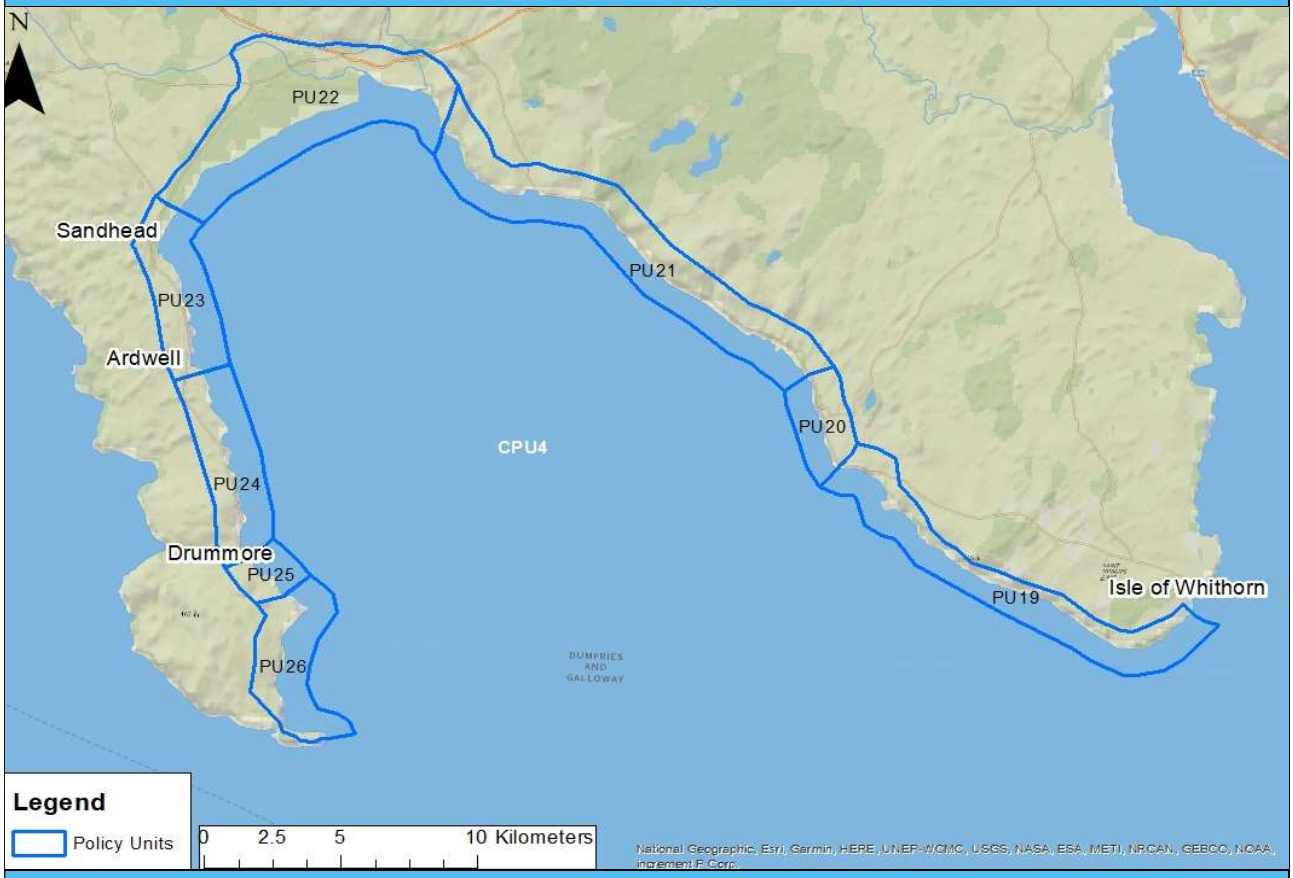
6.4 Coastal Process Unit 4

CPU	CPU 4 – Isle of Whithorn – Mull of Galloway
CPU Information	
CPU 4, covering Luce Bay, extends from the Isle of Whithorn in the east, to the Mull of Galloway in the west. There are eight Policy Units within CPU 4.	
PU 19 - For Policy Unit 19 over the next 100 years, a blanket policy of No Active Intervention for this section of the coastline. **PU 20 -** For Policy Unit 20 over the next 100 years, essentially the recommended policy is one of Hold the Line over the short to medium term, with a move towards a policy of Managed Realignment in the medium to long term for presently defended areas of the coastline. Hold the Line is retained as an alternative over the next 100 years, if Managed Realignment opportunities are limited. **PU 21** - For Policy Unit 21 over the next 100 years, essentially a policy of No Active Intervention although Managed Realignment for the A747 could be accommodated if a detailed assessment indicated this to be justified. **PU 22 -** For Policy Unit 22 over the next 100 years, essentially a policy of No Active Intervention virtually everywhere with limited intervention at the Golf Course for all epochs due to the low level of risk. **PU 23 –** For Policy Unit 23 over the next 100 years, essentially the recommended policy is one of No Active Intervention across all epochs, with Hold the Line over the short to medium term, with a move towards a policy of Managed Realignment in the medium to long term for presently defended areas of the coastline. **PU 24 -** For Policy Unit 24 over the next 100 years, Hold the Line is recommended in the short term, with a move to a Managed Realignment policy for the medium to long term, as anticipated sea level rise will make maintaining the existing Hold the Line policy increasingly challenging over time. Managed Realignment is recommended over the short term as an alternative primary policy, if the short term implementation of Hold the Line is considered impractical.	

PU 25 – For Policy Unit 25 over the next 100 years, essentially, the recommended policy is one of Hold the Line over the short term, with a move towards a policy of Managed Realignment in the medium to long term for presently defended areas of the coastline.

PU 26 - For Policy Unit 26 over the next 100 years, a primary policy of No Active Intervention.

CPU 4 policy units



Key Plan Issues

PU 23 – A significant number of properties and assets are identified to be subject to potential coastal erosion risk at Sandhead and Ardwell, due to rising sea levels, giving rise to more extensive coastal erosion than at present. Most of this shoreline is currently undefended and fronted by a wide sandy beach.

PU 24 – Wave overtopping has been identified as a key issue affecting erosion and flooding along this shoreline, and regularly results in the temporary closure of the A716.

Key Environmental Issues

Biodiversity, Flora & Fauna – There are three SACs and one SPA located in the vicinity of this CPU. Burrow Head SAC intersects PU 19, Mull of Galloway SAC intersects PU 26, while Luce Bay and Sands SAC intersects all PUs within this CPU. Loch of Inch and Torrs Warren SPA intersects PU 22 and a small section of PU 23. There are five SSSIs located within or adjacent to this CPU. These are Burrow Head SSSI, West Burrow Head SSSI, and Back Bay to Carghidown SSSI, which intersect PU 19; Torrs Warren – Luce Sands SSSI, which intersects PU 22 and parts of PU 21 and 23; and Mull of Galloway SSSI, which intersects part of PU 26.

Population & Human Health – Within this CPU, the main settlements are Port William (PU 20), Sandhead and Ardwell (PU 23) and Drummore (PU 25). The coastal flood risk to people is low within this CPU. Five

residential properties are at risk of a medium likelihood coastal flood event in Drummore (PU 25), and two properties in Port William (PU 20), while none are at risk in the other Policy Units of this CPU. However, in PU 23, residential properties are anticipated to be affected significantly by future coastal erosion at the village of Sandhead, with the shoreline receding up to 16m by 2050 and up to 63m by 2100; by 2050 it is anticipated that two residential properties will be in the Erosion Influence and 30 in the Erosion Vicinity and, by 2100, that 147 residential properties will be within the Erosional Area directly affected by erosion, six in the Erosional Influence and 27 in the Erosion Vicinity. Areas of Green Space (21ha) and Garden, Designed Landscapes (36ha) are also anticipated to be located within the Eroded Area by 2100.

Geology, Soils & Land use – The land use in the vicinity of the shoreline is primarily comprised of improved grassland, with arable land and market gardens, and areas of woodland including broadleaved deciduous woodland, coniferous woodland, non-riverine woodland, and early stage natural and semi-natural woodland, as well as some temperate scrub heathland and raised and blanket bog. There are areas of coastal shingle and coastal dunes and sandy shores, the most extensive at Luce Sands. This CPU lies within West Burrow Head, Back Bay to Carghidown, and Torrs Warren – Luce Sands SSSIs; the shoreline has been designated for the presence of the following earth science features, respectively: Caledonian structures of the Southern Uplands, Caledonian structures of the Southern Uplands, and Wenlock.

Water – CPU 4 is within the Solway Tweed RBD. The shoreline within this CPU comprises the WFD coastal water bodies of Wigtown Bay and Luce Bay, as well as the WFD transitional water body of Piltanton and Luce Estuary. These coastal and transitional water bodies currently have a WFD status of Good water quality. Of the main river water bodies associated with the shoreline in this area, the Killantrae Burn, Gillespie Burn, Water of Luce and Sandmill Burn are currently at Good water quality status, while the Monreith Burn, Milton Burn / Dergoals Burn, Piltanton Burn and Caldons Burn are currently at Moderate water quality status. Within this CPU, there is a relatively small overall risk of coastal flooding, as well as a risk of future coastal erosion. There is a risk to businesses in the settlement areas of Port William (PU 20) and Drummore (PU 25), and utilities in Port William, several cultural heritage assets throughout the CPU, as well as a risk to sections of roads including the A747 (PU 20 and PU 21) and the A716 (PU 23 and PU 24). A large area of agricultural land in PU 22 (76ha), and smaller areas in other PUs, are also at coastal flood risk in this CPU. There are areas of both accretion and erosion within the CPU; coastal erosion and its effects are expected to increase in the future in some areas, with extensive erosion expected in places. Future coastal erosion is anticipated to directly affect assets in PU 20 by 2050 (a section of the A747), and in PU 20 (Scottish Water assets and a sewage treatment site), PU 21 (section of road, residential property and a business), PU 24 (residential property and two businesses) and PU 25 (a section of road) by 2100. Many assets are also expected to be within the vicinity of future erosion.

Climatic Factors – When the predicted effects of climatic change are taken into account, there are 524 residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, equating to approximately 53 people; approximately 38 more people than are at risk from the current day medium likelihood event. There are also 23 non-residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, an increase of 8 from the current risk, as well as one additional utility asset (Scottish Water assets in PU 20), four additional cultural heritage assets (in PU 23 and PU 26), and additional length of approximately 1.8km of road (including sections of A roads in PU 20, the A747 in PU 21, and the A716 in PU 23 and PU 24) at risk. In addition, the area of agricultural land at risk from a medium likelihood climate change coastal flood event in this CPU is expected to increase to an area of approximately 139ha, an increase of 50ha from the present day risk. Assets in PU 19 and PU 23 are anticipated to be affected by future coastal erosion (see Material Assets and Infrastructure).

Material Assets & Infrastructure – The principal roads within this CPU are the A747, which runs along the eastern coastline of Luce Bay, the A75 and B7084 in the vicinity of Torrs Warren, and the A716, which runs along the western coastline of Luce Bay. There is a relatively small risk of coastal flooding to material assets within this CPU. There are approximately 15 non-residential properties, 8 cultural heritage assets, and 4 utility receptors (all of which are Scottish Water assets) at risk from a medium likelihood coastal flood event, as well as a risk to approximately 2.4km of road, including sections of A roads (A747 in PU 20 and PU 21 and A716 in PU 24 and between Ardwell and Chapel Rossan in PU 23), B roads (B7084 in PU 22), and minor / local roads. There is also a risk to areas of agricultural land (approximately 88ha in total, with the largest at-risk area in PU 22) owing to the low-lying nature of parts of the hinterland. Assets in PU 19 and PU 23 are anticipated to be affected by future coastal erosion. In PU 19, a small section of minor road, and area of golf course and green space, as well as 2ha of the Back Bay to Carghidown SSSI will be within the Erosion Vicinity by 2050; by 2100, parts of this road will be directly affected by erosion, as well as parts of

this SSSI (2.4ha) and Luce Bay and Sands SAC (10ha) and one residential property. In PU 23, the shoreline may recede by up to 16m at the village of Sandhead by 2050, with two residential and one non-residential property, and a section of road directly affected; by 2100, the shoreline at Sandhead will potentially recede by up 63m, with 147 residential properties and 25 non-residential properties, and 3.2km of road (including part of the A716 and local roads) directly affected. Within PU 23, Dynamic Coast has also identified that, by 2100, there will be areas of Green Space (21ha) and Garden, Designed Landscapes (36ha) located within the Eroded Area. There will also be designated environmental sites including SPA (22ha) and SSSI (22.6ha) affected by erosion. It is also anticipated that Scottish Water assets will be located within the Erosion Area, including rising mains, sewage treatment works, operational sewers, a sewage outfall, gravity pipes and an area of a sewage processing site.

Cultural, Architectural & Archaeological Heritage – Within the CPU there are listed buildings of special architectural or historic interest in the towns / villages of Port William (PU 20) and Drummore (PU 25); outside of these centres, A listed buildings that occur in proximity to the shoreline include Logan Windmill in PU 24, and B listed buildings in proximity include Kirkmaiden Old Church (PU 19), Chapel Rossan (PU 23), Logan Mills (PU 24) and East Tarbet Cottage and Quay (PU 26). The town of Port William is a Conservation Area. There are also many scheduled monuments in the area, including those close to the shoreline such as Burrow Head Forts, Castle Feather Fort, St Ninian's Cave, Back Bay Fort, Kirkmaiden Church in PU 19, Barsalloch Fort in PU 20, Chapel Finian, Laigh Sinniness Fort, and Stair Haven in PU 21, Killumpha standing stone in PU 24, and Mull of Galloway Farm Fort and Mull of Galloway fortifications in PU 26. There are three Gardens and Designed Landscapes within this CPU; Monreith, intersecting PU 19 and PU 20, Ardwell House intersecting PU 23, and Logan House (Balzieland) intersecting PU 24. There are also a significant number of Canmore assets within CPU 4, and areas at Chapel Finian and Torrs Warren are ASA. Within the CPU, there are a total of 10 cultural heritage features at risk from a medium likelihood coastal flood event, including 6 listed buildings (four of which are located within Port William in PU 20), 3 scheduled monuments (Castle Feather located at Burrow Head and Back Bay Fort located at Monreith in PU 19, and Stair Haven Broch in PU 21), and the coastal edge of a Garden and Designed Landscape (Ardwell House) in PU 23. When the predicted effects of climatic change are taken into account, four additional cultural heritage assets are at risk from a medium likelihood coastal flood event within this CPU (three listed buildings in Ardwell in PU 23 and St Medans Chapel & Cave in PU 26).

Landscape & Visual Amenity –CPU 4, which includes Luce Bay, is a 20km wide macro-tidal marine embayment. Luce Bay is exposed to significant waves and strong tidal currents, with a north-westerly sediment drift direction. The landscape character type of CPU 4 primarily comprises peninsula, with coastal flats in the centre. There are also areas of peninsula with gorsey knolls, and drumlin pasture in moss and moor lowland.

Potential SMP Effects

Biodiversity, Flora & Fauna – NAI as the primary or localised policy in the PUs of CPU 4 has potential for long term significant positive effects on BFF, enabling coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Luce Bay and Sands SAC and Loch of Inch and Torrs Warren SPA and Ramsar site (+3) and nationally designated sites Back Bay to Carghidown SSSI and Torrs Warren – Luce Sands SSSI (+2). There is potential for a permanent loss of land within Back Bay to Carghidown SSSI and Luce Bay and Sands SAC in PU 19 from natural coastal erosional processes, exacerbated by climatic change. HTL as the primary policy in PUs 20, 24 and 25, has the potential for short to long term, significant negative effects on BFF, including on designated habitats and species within internationally designated sites Luce Bay and Sands SAC (-3), which intersects the entirety of the shoreline of these PUs. The significance of effects will be dependent upon the nature and footprint of any upgraded or extended defences; in PU 20, HTL for Port William is likely to require upgrading of the current coastal defences and harbour structures in the short to medium term, whereas in PUs 24 and 25, the short term HTL is likely to involve maintenance of the existing defences. HTL as a localised policy for PUs 21, 22, 23 and 26 will primarily involve repair and maintenance of existing defences, and has potential for short term, negative effects on habitat within the existing footprint of defences, and short-term disturbance of species within the immediate area, including within the adjacent internationally designated sites Luce Bay and Sands SAC and Loch of Inch and Torrs Warren SPA and Ramsar site and nationally designated site Torrs Warren – Luce Sands SSSI. Should HTL in these areas require any improvement of existing defences outside of their current footprint, there is potential for short to long term, significant direct or indirect negative effects on BFF, including within these designated sites (-3 / -2), particularly at Sandhead

and Ardwell in PU 23, which are mostly undefended and under increasing risk of future coastal erosion. In the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. This has potential for long term significant positive effects on BFF, providing some opportunity for coastal or intertidal habitats to expand in response to anticipated sea level rise, including within internationally designated sites Luce Bay and Sands SAC and Loch of Inch and Torrs Warren SPA and Ramsar site (+3) and nationally designated sites Back Bay to Carghidown SSSI and Torrs Warren – Luce Sands SSSI (+2). There is also a slight risk of negative effects in the long term, including within these designated sites, from the potential risk of ruin of existing defence assets.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21-26 in the short to medium term rather than medium to long term has potential for long term significant positive effects on BFF, providing some opportunity for coastal or intertidal habitats to expand in response to anticipated sea level rise in the shorter term, including within the designated sites described above (+2 / +3), with less potential for adverse effects on coastal and intertidal habitats from the maintenance or expansion of defences. There is a slight risk of negative effects in the long term, including within these designated sites, from the potential risk of ruin of existing defence assets. HTL is an alternative to MR in the long term for defended areas in PU 20, should there be limited opportunities identified for MR; this would have more potential for adverse effects on BFF, including within Luce Bay and Sands SAC (-3), through a need to upgrade the existing defences to protect against increasing coastal flood and erosion risks.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets, and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. The existing approach to continue to HTL for at risk assets in these PUs is unlikely to be sustainable in the long term without the upgrading or extension of defences, which could adversely affect BFF directly and indirectly, including within internationally designated site Luce Bay and Sands SAC (-3).

Population & Human Health – NAI as the primary or localised policy has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion; there are no residential properties at risk of coastal flooding within these areas, but a small number at risk of future coastal erosion. HTL as the primary policy for PU 20 in the short to medium term, and PU 25 in the short term, has potential for slight positive effects on PHH, through a slight reduction in the proportion of the population / communities in these areas at risk of coastal flooding or erosion (+1). HTL as the localised policy at Sandhead and Ardwell in PU 23 in the short to medium term has potential for significant positive effects on PHH, through a significant reduction in the proportion of the population / communities in these areas at risk of coastal erosion (+3). MR as a medium to long term policy for PU 20, 23, and 25 has potential for both positive and negative effects on PHH. There is potential for short term negative effects due to social effects on a small proportion of the population in PU 20 and PU 25 (-1), and a significant proportion of the population in PU 23 (-3), from loss of properties and relocation. There is also potential for long term positive effects due to a slight reduction in the proportion of the population in PU 20 and PU 25 (+1), and a significant proportion of the population in PU 23 (+3), at risk of coastal flooding or erosion following relocation outside of at risk areas.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion in these areas. MR as an alternative to HTL in the short to medium term in PU 23, and short term in PU 25, would have the same potential for positive and negative effects on PHH in these areas as outlined for the preferred policy, however these effects would occur sooner.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. The existing approach to continue to HTL for at risk assets in these PUs would have potential for long term positive effects on PHH due to a slight reduction in the proportion of the population at risk of coastal flooding or erosion in PU 20 and PU 25 (+1), and a significant reduction in the proportion of the population at risk of coastal flooding or erosion in PU 23 (+3).

Geology, Soils & Land use – NAI as the primary or localised policy has potential for negative effects on GSL in the medium to long term, as there is likely to be a natural loss of soil or land resource from coastal flooding or erosion in these areas, with potential for a slight loss of resource in PUs 19, 20, 21, 23, 24, 25 and 26 (-1), and a significant loss in PU 22 (-3). NAI in PU 19 will allow for the natural evolution of the designated earth science features (Caledonian structures) along the shoreline within West Burrow Head SSSI and Back Bay to Carghidown SSSI. HTL as the primary or localised policy has potential for slight positive effects on GSL, as coastal defences will provide for a slight reduction in the area of existing soil and land resource in these areas from coastal flooding or erosion (+1). There is potential for short term disturbance or minor damage to designated earth science features (coastal geomorphology) of Torrs Warren – Luce Sands SSSI, from the continued limited maintenance of informal defence assets that protect a golf course in PU 22 (-2). MR (relocation of at risk assets) as a medium to long term policy for PU 20, 22, 23, and 25 has the potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in these areas; MR in the long term for PU 22 also has potential for long term positive effects on GSL (+2), by allowing for the natural evolution of designated coastal geomorphological features of the Torrs Warren – Luce Sands SSSI in this area.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 in the short to medium term, rather than medium to long term, would have the same potential for slight negative effects on GSL, as there is likely to be a slight natural loss of soil or land resource from coastal flooding or erosion in this area, however these effects would occur sooner (-1).

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. Continuing to HTL rather than MR in the long term would have potential for slight positive effects on GSL, through a slight reduction in the area of soil and land resource at risk from coastal flooding or erosion in these areas (+1). Continuing to HTL in the long term through limited intervention at the golf course in PU 22 would have potential for short term disturbance or minor damage to designated earth science features (coastal geomorphology) of Torrs Warren – Luce Sands SSSI (-2).

Water – NAI as the primary or localised policy has potential for neutral effects on W (0), as there will be no impacts on the status of coastal and transitional waterbodies or local water quality. HTL as a primary policy in PUs 20 and 25, and a localised policy for PUs 21, 22, 23, 24 and 26, has potential for short to long term negative effects on W. There is potential for short term or infrequent negative effects on coastal or transitional water quality within the Luce Bay coastal water body (-1) during the maintenance of existing defences or construction of new defences. HTL for Port William in PU 20 is likely to require upgrading of the current coastal defences and harbour structures in the short to medium term; in this case, there is also some potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of Luce Bay coastal water body under the WFD (-2). MR (relocation of at risk assets) as a medium to long term policy for PU 20, 22, 23, and 25 has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

SMP Alternative Policies – MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 in the short to medium term, rather than medium to long term, has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. Continuing to HTL rather than MR, could involve the upgrading or extension of existing coastal defences within PU 23 and PU 25, with some potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of Luce Bay coastal water body under the WFD (-2).

Climatic Factors – NAI as the primary or localised policy in CPU 4 has potential for positive effects on CF in the medium to long term (+3), by allowing the shoreline in these areas to react naturally to an increase in coastal flooding or erosion risks. HTL as a primary policy in PUs 20 and 25, and a localised policy for PUs 21, 22, 23, 24 and 26 has potential for positive or negative effects on CF. HTL as a localised policy for PUs 21, 22, 23 and 26 will primarily involve repair and maintenance of existing defences, which has potential for

slight positive effects on CF (+1), as this policy will allow the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. Should defences require upgrading in PU 23 in the short term, owing to the increased future risk from coastal erosion, there is potential for slight negative effects on CF in the medium to long term (-1), as defences are likely to be adaptable to climatic change but with a cost: benefit that is marginal, requiring a moderate level of engineering. HTL as a short term primary policy for PU 24 and PU 25, is likely to be limited to the repair and maintenance of existing defences, which has potential for slight positive effects on CF (+1), as this policy will allow the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. In PU 20, HTL for Port William is likely to require upgrading of the current coastal defences and harbour structures in the short to medium term, with potential for slight negative effects on CF, as defences will be adaptable to climatic change but with a cost: benefit that is marginal and will require a moderate level of engineering. MR (relocation of at risk assets) as a medium to long term policy for PU 20, 22, 23, and 25 has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline in these areas to be more adaptable to climatic change at minimal cost.

SMP Alternative Policies – MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 in the short to medium term, rather than medium to long term, would have the same potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline to be more adaptable to climatic change at minimal cost, however these effects would occur sooner.

Continuation of Current SMP Policies – The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. Continuing to HTL rather than MR, could involve the upgrading or extension of existing coastal defences within PU 23 and PU 25, with potential for slight to moderate negative effects on CF in the medium to long term (-1 to -2), as defences will be adaptable to climatic change but with a cost: benefit that is marginal to significant, and will require a moderate to significant level of engineering.

Material Assets & Infrastructure – NAI as the primary or localised policy in CPU 4 has potential for neutral effects on MA (0), as there will be no change in the number of assets at risk of flooding or erosion. In the medium to long term, areas of agricultural land, particularly in PU 22, and a few isolated heritage features, will remain at risk of coastal flooding or erosion within these areas. HTL as the primary policy for PU 20 in the short to medium term, and PU 25 in the short term, has potential for slight positive effects on MA, through a slight reduction in the number of assets in these areas at risk of coastal flooding or erosion (+1). HTL as the localised policy at Sandhead and Ardwell in PU 23 in the short to medium term has potential for significant positive effects on MA, through a significant reduction in the number of assets in these areas at risk of coastal flooding or erosion (+1). HTL as a localised policy in PUs 21, 22, 24 and 26, has potential for slight positive effects on MA (+1) through a slight reduction in the assets at risk, including sections of the A747 and A716 and isolated businesses. MR (relocation of at risk assets) as a medium to long term policy for PU 20, 23, and 25 has potential for long term positive effects on MA (+1), through a slight reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion in these areas.

SMP Alternative Policies – MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 in the short to medium term, rather than medium to long term, has potential for long term positive effects on MA due to a slight reduction in the number of assets or infrastructure at risk of coastal flooding (+1), which lowered risk occurring at an earlier stage.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. The existing approach to continue to HTL for at risk assets in these PUs would have potential for long term positive effects on MA due to a slight reduction in the number of assets at risk of coastal flooding or erosion in PU 20 and PU 25 (+1), and a significant reduction in the number of assets at risk of coastal flooding or erosion in PU 23 (+3)

Cultural, Architectural & Archaeological Heritage – NAI as the primary or localised policy in CPU 4 has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). In the medium to long term, however, a small number of isolated heritage features (scheduled monuments, a listed building, and an area of Ardwell GDL) will remain at risk of coastal

flooding or erosion (-1). There may also be a loss of Canmore assets and undiscovered archaeological features from coastal flooding and erosion in areas of NAI within CPU 4, including within the ASAs of Torrs Warren and Chapel Finian. HTL as the primary or localised policy has the potential for both positive and negative effects on CH. There is potential for slight positive effects on CH from HTL in PUs 20, 23, and 24 and PU 18 (+1), through a slight reduction in the number of features (listed buildings) at risk in these areas. Effects are likely to be medium to long term where improvement or expansion of defences is likely to be required PU 20 and PU 23), and short to medium term where existing defences are repaired and maintained. HTL also has potential for negative effects on CH from construction or maintenance activities, through adverse effects on the setting on a small number of features; including short term effects during construction or maintenance activities (-1), or permanent effects in the vicinity of improved defences in PU 20 and PU 23 (-2). MR (relocation of at risk assets) as a medium to long term policy for PU 20, 23, and 25 has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0), however a small number of heritage features in PU 20 and PU 23 are likely to remain at risk from coastal flooding (-1).

SMP Alternative Policies – MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 in the short to medium term, rather than medium to long term, has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). However, as these features cannot be relocated, a small number within PU 22 and PU 24 are likely to remain at risk of coastal flooding (-1).

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. Continuation of the current SMP policies is likely to have the same potential for effects on CH as outlined for the policies of NAI and HTL for the updated SMP. Continuing to HTL for road assets in PU 21 and PU 24 rather than MR in the long term would have neutral effects on CH (0).

Landscape & Visual Amenity – NAI as the primary or localised policy has potential for neutral effects on L (0), as there will be no positive or negative effects on the landscape / seascape quality and visual amenity within these areas. HTL as the primary or localised policy has potential for short to long term negative effects on L. There is potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during the maintenance of existing defences in PUs 21, 22, 24, 25 and 26. In PU 20 and PU 23, where HTL is likely to require the upgrading of existing defences, there is potential for localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2). MR (relocation of at risk assets) as a medium to long term policy for PU 20, 23, and 25 has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative policy to HTL for PUs 21, 22, 24 and 26 in the short to medium term, rather than medium to long term, has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

Continuation of Current SMP Policies - The existing SMP approach for this CPU is primarily NAI, with limited HTL for at risk assets (including selective HTL allowing the upgrading of defences in PU 23), and HTL in PU 20 and PU 25 over all epochs. In general, this approach is maintained in the updated SMP however, in the majority of PUs of CPU 4, HTL will move towards a policy of MR (relocation of at risk assets) in the medium to long term for presently defended areas of the coastline. Continuation of the current SMP policies is likely to have generally the same potential for effects on L as outlined for the policies of NAI and HTL for the updated SMP; should defences require upgrading, this would have potential for short term/disturbance impacts on local views and the local landscape / seascape (-1) during construction, to localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2) within these areas.

Potential In-Combination / Cumulative Effects

Potential sources of in-combination / cumulative effects identified for CPU 4 include:

- There is potential for in-combination or cumulative effects on BFF within the internationally designated site Luce Bay and Sands SAC from HTL policies of CPU 4 (-3).
- There is potential for in-combination or cumulative effects on water quality (W) within the Luce Bay coastal water body from HTL policies of CPU 4, including short term (-1) and permanent effects (-2).
- There is potential for positive in-combination effects between BFF and CF whereby improving biodiversity through a NAI shoreline policy has the potential to positively affect carbon storage and sequestration which will have positive impacts for both the 2020 Challenge for Scotland's Biodiversity and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

Key Conclusions

The significantly beneficial aspects of implementing the SMP are expected to include:

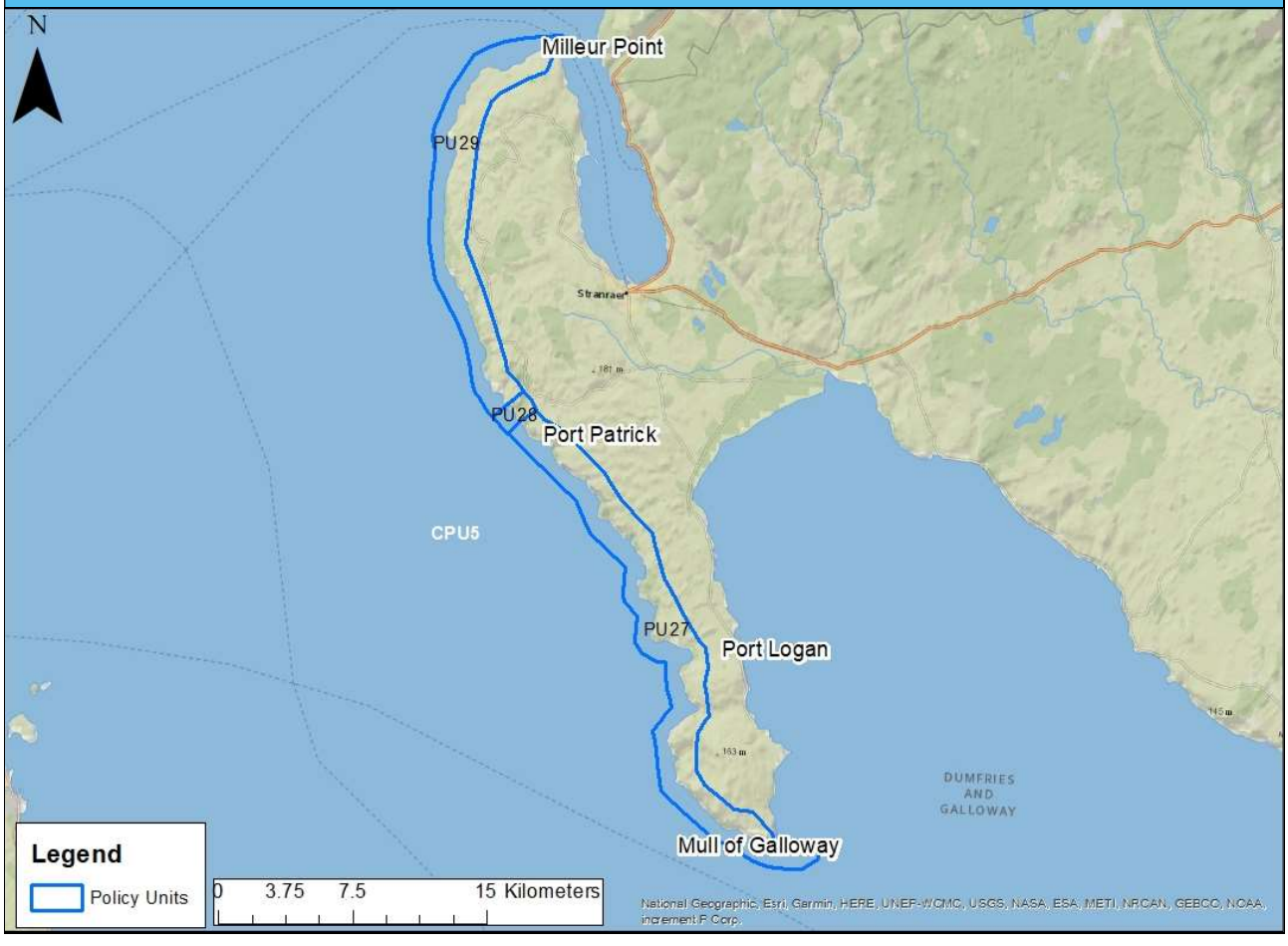
- A slight to moderate reduction in the proportion of the population, number of businesses, and heritage features at risk of coastal flooding within the main settlement areas in PU 20, PU 23 and PU 25.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for significant benefits for BFF, including designated habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area.

The potential adverse effects of implementing the SMP are expected to include:

- Potentially significant effects on internationally and nationally designated sites from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, construction phase disturbance effects, or indirect effects through morphological alteration that may have effects in adjacent areas of the shoreline. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.
- A moderate area of existing agricultural land will continue to be at risk from the effects of coastal flooding in PU 22, with the area at risk expected to increase in the future owing to the effects of climatic change.

6.5 Coastal Process Unit 5

CPU	CPU 5 – Mull of Galloway – Milleur Point
CPU Information	
CPU 5 extends from the Mull of Galloway in the south, to Milleur Point in the north. There are three Policy Units within CPU 5.	
PU 27 - For Policy Unit 27 over the next 100 years, No Active Intervention for the majority of the coastline with a localised policy of Hold the Line or Managed Realignment where there are existing defence structures at Port Logan. **PU 28 –** For Policy Unit 28 over the next 100 years, essentially a policy of Hold the Line across the developed frontage for the short term moving to a policy of Managed Realignment over the medium to long term. Hold the Line is retained as an alternative primary policy over the medium term as it is identified that Managed Realignment will be challenging to accommodate. A localised policy of No Active Intervention is suggested for undeveloped sections of the coast. **PU 29 -** For Policy Unit 19 over the next 100 years, a blanket policy of No Active Intervention for this section of the coastline.	
CPU 5 policy units	



Key Plan Issues
PU 27 – Coastal flood risk to communities in Portpatrick. **PU 28 –** Coastal flood risk to communities in Port Logan.
Key Environmental Issues
Biodiversity, Flora & Fauna – There are two SACs located in the vicinity of this CPU. Luce Bay and Sands SAC intersects a small section of PU 27, while Mull of Galloway SAC intersects PU 27.There are six SSSIs located within or adjacent to this CPU. These are Mull of Galloway SSSI, Port Logan SSSI, Grennan Bay SSSI, and Morroch Bay SSSI, which intersect PU 27; and Salt Pans Bay SSSI, and Corsewall Point to Milleur Point SSSI, which intersect PU 29. The Clyde Sea Sill Marine Protected Area (MPA) is situated off the coast from PU 29.
Population & Human Health – Within this CPU, the main settlements are at Port Logan and Portpatrick. The coastal flood risk to people is low within this CPU. Eight residential properties are at risk of a medium likelihood coastal flood event in Portpatrick (PU 28), while none are at risk in the other Policy Units of this CPU. One community facility at Port Logan (PU 27) is also at risk from a medium likelihood coastal flood event.
Geology, Soils & Land use – The land use in the vicinity of the shoreline is primarily comprised improved grassland with some arable land and market gardens, with a few areas of buildings if cities, towns and villages, fronted by littoral rock and other hard substrata. There are small areas of woodland (including broadleaved deciduous, coniferous) temperature shrub heathland, coastal shingle, coastal saltmarshes and saline reedbeds and coastal dunes and sandy shores. This CPU lies within Port Logan, Grennan Bay, Morroch Bay, and Corsewall Point to Milleur Point SSSIs; the shoreline has been designated for the presence of the following earth science features, respectively: Quaternary of Scotland, Caledonian structures of the Southern Uplands, Llandeilo, and Caradoc-Ashgill.
Water – CPU 5 is within the Solway Tweed RBD. The shoreline within this CPU comprises the WFD coastal water bodies of Mull of Galloway to Corsewall Point and Loch Ryan Offshore; these coastal water bodies currently have a WFD status of Good water quality. The main river water bodies associated with the shoreline in this area, the Pinminnoch Burn and Gadennoch Burn are currently at Moderate water quality status. Within this CPU, there is a relatively small overall risk of coastal flooding or future coastal erosion. There is a risk to a utility, a section of roads (including the A77 in PU 28 and areas of agricultural land in (primarily in PU 27) from coastal flood risk in this CPU. There are areas of both accretion and erosion within the CPU; coastal erosion and its effects are expected to increase in the future in some areas, with extensive erosion expected in places. Future coastal erosion is anticipated to directly affect a section of road in PU 27 by 2050, and further assets in this PU by 2100 (17 residential properties, a further length of road, green space, Scottish Water assets and an area of Gardens and Designed Landscapes). Other assets are also expected to be within the vicinity of future erosion in this PU.
Climatic Factors – When the predicted effects of climatic change are taken into account, there are 12 residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, equating to approximately 26 people; approximately 9 more people than are at risk from the current day medium likelihood event. There are also 13 non-residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, an increase of 5 from the current risk, as well as a small amount of additional lengths of (minor / local) roads at risk. In addition, the area of agricultural land at risk from a medium likelihood climate change coastal flood event in this CPU is expected to increase slightly to an area of approximately 22.8ha, an increase of 2ha from the present day risk. A small number of assets in PU 27 are anticipated to be affected by future coastal erosion (see Material Assets and Infrastructure).
Material Assets & Infrastructure – The principal roads within this CPU are the A77, which connects Portpatrick with Stranraer the B7065, of which a short section runs along the coastline at Port Logan, and the B738, inland from the coastline. There is a relatively small risk of coastal flooding to material assets within this CPU. There are no non-residential properties, and 1 utility receptor at risk from a medium likelihood coastal flood event, as well as a risk to approximately 0.68km of road, including a small section of A road (A77) in PU 28 and minor / local roads. There is also a risk to areas of agricultural land

(approximately 20ha in PU 27 and 0.65ha in PU 29). Assets in PU 27 are anticipated to be affected by future coastal erosion. A section of road will be within the Erosional Area by 2050, while 17 residential properties (primarily located in Port Logan), a longer section of road (including part of the B7065), area of green space, Garden and Designed Landscape and Scottish Water Assets will be within the Erosional Area by 2100.

Cultural, Architectural & Archaeological Heritage – Within the CPU there are several B listed buildings of special architectural or historic interest in the town of Portpatrick (PU 28); outside of this town, two A listed buildings occur in proximity to the shoreline, namely Mull of Galloway Lighthouse (PU 27) and Corsewall Lighthouse (PU 29), while B listed buildings in proximity include Port Logan lighthouse Tower and Pier, and Logan Fish Pond, Cottage and Bathing Hut (in PU 27), and Dunskey Cable House, Killantringan Lighthouse and Keeper's Cottage, and House of Knock (in PU 29). There are also many scheduled monuments in the area (primarily comprising hilltop forts), including those close to the shoreline such as Grennan Point Fort, Float Bay Fort and Dunskey Castle in PU 27, Fort Cottage in PU 28, and Meikle Labrax Fort and Farmstead, High Auchreel Forts and Caspin Fort in PU 29. There is one Garden and Designed Landscape within this CPU; Logan House (Balzieland), intersecting PU 27. There are also a significant number of Canmore assets within CPU 5. Within the CPU, there are a total of 31 cultural heritage features at risk from a medium likelihood coastal flood event, including 21 listed buildings (located in Port Logan in PU 27, and Portpatrick in PU 28), 10 scheduled monuments (including Clanghie Point Fort & Doon Castle at Ardwell in PU 27, and ancient fortifications and a farmstead in PU 29). The seaward edge of a Garden and Designed Landscape (Logan House) is also at medium likelihood coastal flood risk in PU 27. Portpatrick is a designated Conservation Area, and approximately 0.2km² of this area is at risk of medium likelihood coastal flooding, with a larger area (0.3km²) but no additional heritage assets at future risk when the predicted effects of climatic change are taken into account.

Landscape & Visual Amenity – The coastline of CPU 5 is remote and sparsely populated. The Rhinns peninsula (PU 27) is fronted by rocky cliffs, with pocket beaches and bays. The shoreline of PU 28 is mainly rocky or defended with some sand and gravel exposed during low-tide, and PU 29 is also dominated by rocky cliffs, wide rocky platforms, and intermittent sandy beaches, with small areas of low coastal dune located at the back of some bays. The entirety of CPU 5 comprises the landscape character type of peninsula.

Potential SMP Effects

Biodiversity, Flora & Fauna – NAI as the primary policy for PU 27 and PU 29, and the localised policy for PU 28, has potential for long term slight positive effects on BFF, enabling coastal habitats to adapt in a natural manner in response to anticipated sea level rise (+1), including within internationally designated site Mull of Galloway SAC, and nationally designated site Mull of Galloway SSSI in PU 27, and Salt Pans Bay SSSI in PU 29. HTL as the primary short term policy for the settlement of Portpatrick in PU 28 is likely to involve maintenance of the existing defences and harbour structures. This has potential for short term temporary negative effects (-1) on local habitats and species during any construction, with potential for long term permanent loss of local non-designated habitats in the footprint of defences should there be a requirement for these to be expanded. HTL as a localised policy for Port Logan in PU 27 will involve continued maintenance through a patch and repair of existing defences over all epochs; this has potential for short term temporary negative effects (-1) on local habitats and species during these activities. MR as the medium to long term policy for Portpatrick in PU 28 has potential for long term slight positive effects on BFF, enabling coastal habitats to adapt in a more natural manner in response to anticipated sea level rise (+1).

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs, has potential for long term slight positive effects on BFF, enabling local coastal habitats to adapt in a natural manner in response to anticipated sea level rise (+1). HTL as an alternative to MR in the medium term at Portpatrick in PU 28 has potential for slight negative effects on BFF (-1), as continued maintenance of defences has potential for disturbance of local habitats and species.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with potential for short term temporary negative effects (-1) on local

habitats and species during any construction, with potential for long term permanent loss of local non-designated habitats in the footprint of defences.

Population & Human Health – NAI as the primary or localised policy has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion; however, there is currently no risk to residential properties outside of the settlements of Portpatrick and Port Logan. HTL as the short term primary policy for Portpatrick in PU 28 has potential for slight positive effects on PHH, through a slight reduction in the proportion of the population at risk (+1). MR (relocation of at risk properties) as the primary policy in the medium to long term has potential for both positive and negative effects on PHH; there is potential for short term negative effects due to social effects on a small proportion of the population from loss of properties and relocation (-1), and potential for long term positive effects due to a slight reduction in the proportion of the population at risk of coastal flooding or erosion following relocation outside of at risk areas (+1). HTL as the localised policy for Port Logan over all epochs will have moderate positive effects on PHH (+2), through a moderate reduction on the proportion of the population at future risk of coastal flooding or erosion.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs, has potential for both positive and negative effects on PHH; there is potential for short term negative effects due to social effects on a moderate proportion of the population from loss of properties and relocation (-2), and potential for long term positive effects due to a moderate reduction in the proportion of the population at risk of coastal flooding or erosion following relocation outside of at risk areas (+2).

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with potential for slight positive effects on PHH in the long term, through a slight reduction in the proportion of the population at risk (+1).

Geology, Soils & Land use – NAI as the primary or localised policy has potential for slight negative effects on GSL in the medium to long term, as there is likely to be a slight natural loss of soil or land resource from coastal flooding or erosion in these areas (-1), albeit limited by the rocky nature of the coastline of the majority of CPU 5. NAI will allow for the natural evolution of the designated earth science features along the coastline of CPU 5 within Grennan Bay SSSI, Morroch Bay SSSI, and Corsewall Point to Milleur Point SSSI. HTL as the primary or localised policy has potential for slight positive effects on GSL, as coastal defences will provide for a slight reduction in the area of existing soil and land resource in these areas from coastal flooding or erosion (+1). HTL as the localised policy for Port Logan in PU 27 has potential for indirect effects on designated earth science features of Port Logan SSSI (quaternary geology), from the continued limited maintenance of existing defences over all epochs (-2). MR as the medium to long term policy for Portpatrick in PU 28 has potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in this area.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs, has potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in this area.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with potential for slight positive effects on GSL, through a slight reduction in the area of existing soil and land resource in this area from coastal flooding (+1).

Water – NAI as the primary or localised policy has potential for neutral effects on W (0), as there will be no impacts on the status of coastal water bodies or local water quality. HTL as the short term primary policy for Portpatrick in PU 28, and the localised policy for Port Logan over all epochs through maintenance (patch and repair) of existing defences, has potential for short term or infrequent negative effects on local coastal water quality within the Mull of Galloway to Corsewall Point coastal water body (-1). MR (relocation of at risk assets) as the medium to long term policy for Portpatrick in PU 28 has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with some potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of Mull of Galloway to Corsewall Point coastal water body under the WFD (-2).

Climatic Factors – NAI as the primary or localised policy in CPU 5 has potential for positive effects on CF in the medium to long term (+3), by allowing the shoreline in these areas to react naturally to an increase in coastal flooding or erosion risks. HTL as the short term primary policy for Portpatrick in PU 28, and the localised policy for Port Logan over all epochs will involve maintenance of existing defences; this has potential for slight positive effects on CF (+1), by allowing the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. MR (relocation of at risk assets) as the medium to long term policy for Portpatrick in PU 28 has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline in this area to be more adaptable to climatic change at minimal cost.

SMP Alternative Policies – MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline in this area to be more adaptable to climatic change at minimal cost.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with potential for slight to moderate negative effects on CF in the medium to long term (-1 to -2), as defences will be adaptable to climatic change but with a cost: benefit that is marginal to significant and will require a moderate to significant level of engineering.

Material Assets & Infrastructure – NAI as the primary or localised policy in CPU 5 has potential for neutral effects on MA (0), as there will be no change in the number of assets at risk of flooding or erosion; in the medium to long term, an area of agricultural land in PU 27, and a single non-residential property in PU 29, will remain at risk of coastal flooding within these areas. HTL as the short term primary policy for Portpatrick in PU 28, and the localised policy for Port Logan over all epochs, has potential for slight positive effects on MA, through a slight reduction in the number of assets in these areas at risk of coastal flooding or erosion (+1). MR (relocation of at risk properties) as the primary policy for PU 28 in the medium to long term has potential for long term positive effects due to a slight reduction in the number of assets at risk of coastal flooding or erosion following relocation outside of at risk areas (+1).

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs, has potential for slight positive effects on MA (+1), through a slight reduction in the number of assets in these areas at risk of coastal flooding or erosion following relocation outside of at risk areas.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with potential for slight positive effects on MA in the long term, through a slight reduction in the number of assets at risk (+1).

Cultural, Architectural & Archaeological Heritage – NAI as the primary or localised policy in CPU 5 has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). In the medium to long term, however, a moderate number of heritage features (scheduled monuments and the coastal edge of Logan House GDL) will remain at risk of coastal flooding in PU 27 and PU 28. There may also be a loss of Canmore assets and undiscovered archaeological features from coastal flooding and erosion in areas of NAI within CPU 5. HTL as the primary or localised

policy has the potential for both positive and negative effects on CH. HTL as the short term primary policy for Portpatrick in PU 28, and the localised policy for Port Logan over all epochs, has potential for moderate positive effects on CH (+2), through a moderate reduction in the number of designated heritage features (listed buildings), and their settings, at risk of coastal flooding within these areas; HTL will also protect part of the designated Conservation Area of Portpatrick. There is potential for slight direct negative effects on CH in PU 27 from maintenance of the existing defence assets (-1), as Port Logan Quay is designated as a listed building. There is also potential for moderate short term indirect negative effects on CH in PU 27 and PU 28 (-2), owing to potential for negative changes to the setting of heritage features during maintenance activities. MR (relocation of at risk properties) as the primary policy for PU 28 in the medium to long term has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0); however, as these features cannot be relocated, a moderate number are likely to remain at risk from coastal flooding in this area.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs, has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0). However, as these features cannot be relocated, a moderate number are likely to remain at risk of coastal flooding in this area.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, would have potential for moderate positive effects on CH (+2), through a moderate reduction in the number of designated heritage features (listed buildings), and their settings, at risk of coastal flooding within this area, but also potential for moderate indirect negative effects on CH (-2), owing to potential for short term negative changes to the setting of heritage features during construction, or permanent effects in the vicinity of improved defences.

Landscape & Visual Amenity – NAI as the primary or localised policy in CPU 5 has potential for neutral effects on L (0), as there will be no positive or negative effects on the landscape / seascape quality and visual amenity within these areas. HTL as the short term primary policy for Portpatrick in PU 28, and the localised policy for Port Logan over all epochs will involve maintenance of existing defences; this has potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during the maintenance of existing defences. MR (relocation of at risk properties) as the primary policy for PU 28 in the medium to long term has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

SMP Alternative Policies - MR (relocation of at risk assets) as an alternative localised policy to HTL for Port Logan in PU 27 over all epochs, has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views.

Continuation of Current SMP Policies - The existing SMP approach for CPU 5 is primarily NAI, with limited HTL for Port Logan, and HTL for Portpatrick in PU 28 over all epochs. In general, this approach is maintained in the updated SMP however, for Portpatrick, a short term HTL policy will move towards one of MR in the medium to long term. Continuing to HTL at Portpatrick in the medium to long term would likely require upgraded or extended defences, with potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during construction, to localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2) within these areas.

Potential In-Combination / Cumulative Effects

Potential sources of in-combination / cumulative effects identified for CPU 5 include:

- There is slight potential for in-combination short term effects on water quality (W) within the Mull of Galloway to Corsewall Point coastal water body from HTL policies within PU 27 and PU 28 (-1).

Key Conclusions

The significantly beneficial aspects of implementing the SMP are expected to include:

- A slight reduction in the proportion of the population and number of businesses, and moderate reduction in the number of heritage features at risk of coastal flooding within Port Logan in PU 27 and Portpatrick in PU 28.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for slight benefits for BFF, including local habitats and species, as well as associated indirect benefits on the local landscape and seascape.

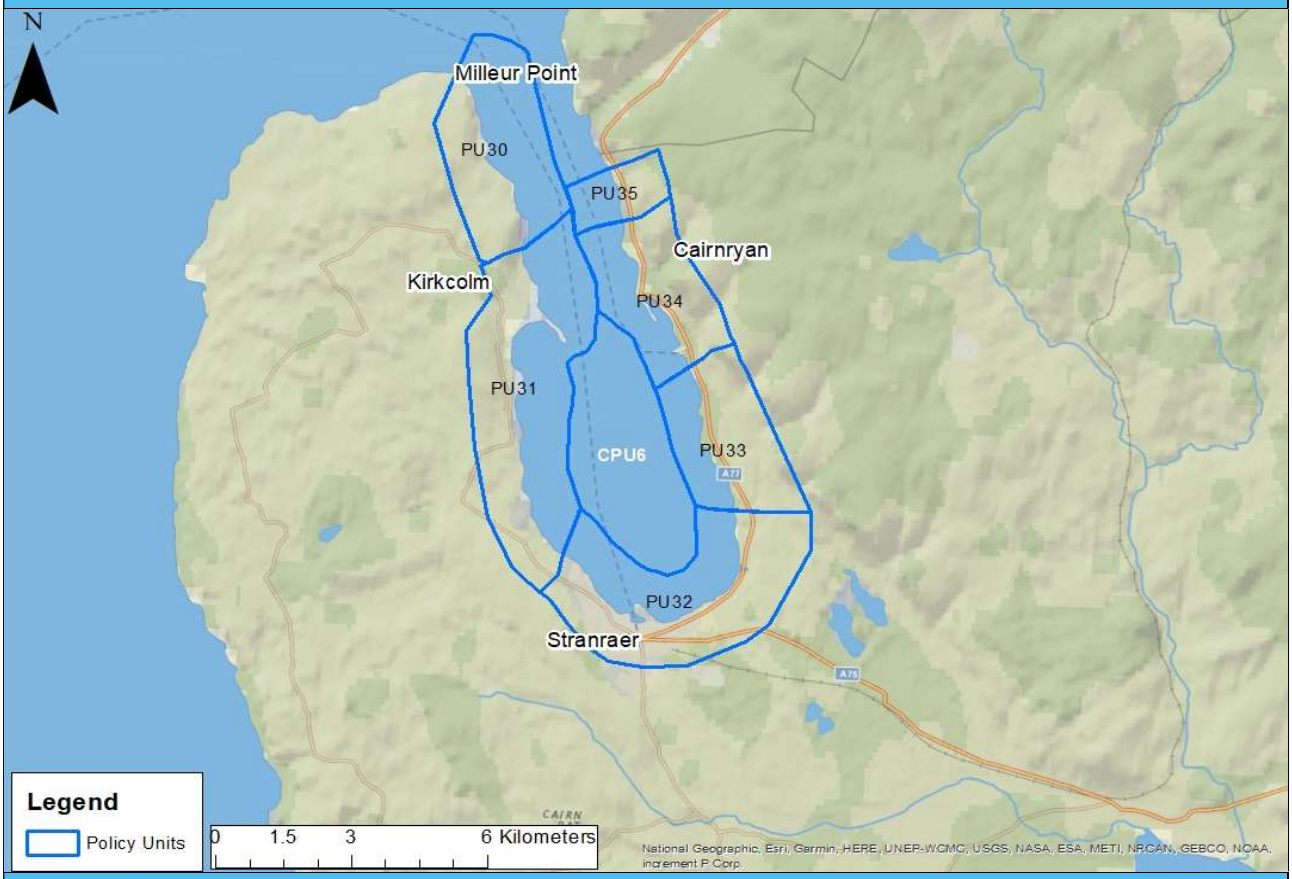
The potential adverse effects of implementing the SMP are expected to include:

- Potential for adverse direct or indirect effects on heritage features (listed buildings) within Port Logan in PU 27 and Portpatrick in PU 28 from HTL maintenance activities, and for a moderate number of heritage features to remain at risk of coastal flooding in Portpatrick in the medium to long term under the policy of MR.

6.6 Coastal Process Unit 6

CPU	CPU 6 – Milleur Point – Galloway Burns
CPU Information	
CPU 6, within Loch Ryan extends from Milleur Point in the west, to Galloway Burns in the east. There are six Policy Units within CPU 6.	
PU 30 - For Policy Unit 30 over the next 100 years, a general policy of No Active Intervention. A localised policy of Hold the Line moving towards Managed Realignment is also proposed to allow local landowners to maintain existing private defences. **PU 31 -** For Policy Unit 31 over the next 100 years, a policy of No Active Intervention through precluding the construction of new defences. Hold the Line and Managed Realignment are included as a localised policy to permit maintenance works to manage risk to the A718 and properties protected by existing defences. **PU 32 -** For Policy Unit 32 over the next 100 years, essentially the recommended policy is one of Hold the Line possibly in combination with Managed Realignment (landward movement of roads in the future) for the majority of the coastline. Managed Realignment was also considered as part of the Waterfront Masterplan, involving the relocation of the railway. **PU 33 -** For Policy Unit 33 over the next 100 years, Hold the Line over the short term, with a move towards a policy of Managed Realignment in the medium to long term for presently defended areas of the coastline. This acknowledges the challenge of anticipated sea level rise in maintaining a Hold the Line policy thus the move to a primary policy of Managed Realignment for the medium and long term. **PU 34 -** For Policy Unit 34 over the next 100 years, Hold the Line or Advance the Line, to allow for the flexibility of continual maintenance / upgrade of defence assets at the Ferry Ports. **PU 35 -** For Policy Unit 35 over the next 100 years, a blanket policy of No Active Intervention.	

CPU 6 policy units



Key Plan Issues

PU 31 – Coastal flooding and erosion risk to the A718, which provides a vital local transport link between Kirkcolm and Stranraer).

PU 32 – Significant risk to residential and non-residential properties, and infrastructure at Stranraer.

PU 33 – Coastal erosion risk to sections of the A77, which serves the ferry ports at Cairnryan and Old House Point.

Key Environmental Issues

Biodiversity, Flora & Fauna – There are two SPAs located in the vicinity of this CPU; Glen App and Galloway Moors SPA intersects PUs 33 and 34, while Loch of Inch and Torrs Warren SPA lies approximately 2km inland from the shoreline of PU 32. There are two SSSIs located within or adjacent to this CPU. These are Corsewall Point to Milleur Point SSSI, which intersects PU 30; and Glen App and Galloway Moors SSSI, which intersects PU 33 and 34. Loch Ryan Marine Conservation Area (MCA) intersects the entirety of the shoreline in this CPU.

Population & Human Health – Within this CPU, the area of highest population density is the town of Stranraer (PU 32), with a population of over 10,500 individuals, followed by the village of Kirkcolm (PU 31). The coastal flood risk to people varies within this CPU. There is a significant risk to people within the area of Stranraer (PU 32) from coastal flooding with 78 residential properties (corresponding to 172 individuals) at risk from a medium likelihood coastal flood event. Three community facilities, which provide emergency and rescue services, are also at risk within this area. Elsewhere in this CPU there is no risk to residential properties from a medium likelihood coastal flood event. In additional to the risk to residential properties, there is also a risk to community amenities from coastal erosion in some areas of this CPU; this includes

small sections of Core Paths, including the Loch Ryan Coastal path (50m) and Rotary Club Path (150m) in PU 33.

Geology, Soils & Land use – The land use in the vicinity of the shoreline is primarily comprised of improved grassland, with areas of arable land and market gardens, fronted in PU 30 by littoral rock and other hard substrata. There are areas of buildings of cities, towns and villages, transport networks and other constructed hard surfaced areas, and road networks, and small areas of woodland (broadleaved deciduous and coniferous), coastal dunes and sandy shores and extractive industrial sites / waste deposits. This CPU lies within Corsewall Point to Milleur Point SSSI; the shoreline has been designated for the presence of the following earth science features: Caradoc-Ashgill.

Water – CPU 5 is within the Solway Tweed RBD. The shoreline within this CPU comprises the WFD coastal water body of Loch Ryan, which currently has a WFD status of Good water quality. Of the main river water bodies associated with the shoreline in this area, the Sole Burn and Messan Burn are currently at Good water quality status, while the Water of App is currently at Moderate, and the Black Stank at Poor, water quality status. Loch Ryan is also a designated shellfish area. Within this CPU, there is a risk of coastal flooding and future coastal erosion. There is a significant risk to assets at Stranraer (PU 32), and to sections of roads (including the A718 in PU 31 and PU 32) and relatively small areas of agricultural land, from coastal flood risk in this CPU. There are some areas of both accretion and erosion within the CPU; outside of the heavily defenced Stranraer area in PU 32, coastal erosion and its effects are expected to increase in the future in some areas, with extensive erosion expected in places, particularly in PU 33 where the shoreline is generally soft. Future coastal erosion is anticipated to directly affect sections of roads in PU 30, PU 31 (including the A718) and PU 33 by 2050, with further assets in these PUs directly affected by 2100 (one residential property, green space, and golf course in PU 31, and further lengths of road and a length of the Clean Water Network in PU 33), as well as assets within PU 32 (a section of the A77). Other assets are also expected to be within the vicinity of future erosion in this CPU.

Climatic Factors – When the predicted effects of climatic change are taken into account, there are 192 residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, equating to approximately 422 people; approximately 172 more people than are at risk from the current day medium likelihood event (this increase in risk is almost exclusively within PU 32). There are also 75 non-residential properties at risk from a medium likelihood climate change coastal flood event in this CPU, an increase of 35 from the current risk (this increase in risk is exclusively within PU 32), as well as three additional cultural heritage assets (in PU 32 and PU 34), an additional lengths of approximately 2.2km of road (including a significant length of A roads in PU 32, and the A718 in PU 31), and an additional 1.2km of railway line (in PU 32) at risk. In addition, the area of agricultural land at risk from a medium likelihood climate change coastal flood event in this CPU is expected to increase to an area of approximately 47ha, an increase of 11.5ha from the present day risk. Assets in this CPU are also anticipated to be affected by future coastal erosion (see Material Assets and Infrastructure).

Material Assets & Infrastructure – The principal roads within this CPU are the A718 connecting Kirkcolm with Stranraer, and the A77 running from Stranraer northwards to Cairnryan then further north to Glasgow. A railway line connects Stranraer to Ayr and Glasgow to the north. The risk of coastal flooding to material assets varies within this CPU, with highest risk within PU 32 and (to major road) within PU 31. In total, there are 40 non-residential properties, 3 utility receptors (Scottish Water assets) and 3 cultural heritage assets at risk from a medium likelihood coastal flood event, as well as a risk to approximately 7.3km of road, including a section of A road (A718, which provides a vital local transport link between Kirkcolm and Stranraer) in PU 31, and in PU 32 (A718), as well as minor / local roads ad a section of railway (0.69km) within PU 32. There is also a risk to areas of agricultural land (approximately 37ha), primarily in PU 31 and PU 32. Future coastal erosion is expected to increase in the future in some areas of this CPU, and is anticipated to directly affect sections of roads in PU 30, PU 31 (including the A718) and PU 33 by 2050, with further assets in these PUs directly affected by 2100 (1 residential property, green space, and golf course in PU 31, and further lengths of road and a length of the Clean Water Network in PU 33), as well as assets within PU 32 (a section of the A77). Other assets are also expected to be within the vicinity of future erosion in this CPU, including residential and non-residential properties, green space, and Scottish Water assets.

Cultural, Architectural & Archaeological Heritage – Within the CPU there are many listed buildings of special architectural or historic interest in the main population centre of Stranraer (PU 13), as well as several in Kirkcolm (PU 31) and Cairnryan (PU 34); outside of these areas, no listed buildings occur in close proximity to the shoreline. There are also several scheduled monuments in the area; with the exception of

Innermessan Mote in PU 32, these are not in very close proximity to the shoreline. There are two Gardens and Designed Landscapes within this CPU; Castle Kennedy, which intersects PU 32 and PU 33, and Lochryan, which intersects PU 34. There are also a significant number of Canmore assets within CPU 6, and part of Stranraer is an ASA. Within the CPU, there are a total of 12 cultural heritage features at risk from a medium likelihood coastal flood event, all of which are listed buildings (9 of which are located in Stranraer in PU 32). When the predicted effects of climatic change are taken into account, the coastal edge of Lochryan Garden and Designed Landscape is also at risk from a medium likelihood coastal flood event within this CPU.

Landscape & Visual Amenity – The western shoreline of Loch Ryan is an important natural harbour for shipping, with regular ferry services to Northern Ireland operating from it and a designated shellfish area. This shoreline is mainly composed of rocky cliffs with some areas of pocket beach. At low-tide a relatively wide area of sand and gravel beach is exposed along almost the entire frontage of PU 31, while landward of the existing shoreline, the coast is characterised by raised beaches. Stranraer is an artificial coast that has historically been developed to accommodate harbour infrastructure and other transport facilities with the area heavily defended with seawalls, revetment and harbour jetties. Two ferry ports on the eastern shoreline of Loch Ryan (PU 34) provide a vital trade link between Northern Ireland and the UK, with the area having a history of military usage. At the northern extent of this CPU (PU 35), the shoreline is steep and rocky, exposed to waves from the open sea, with small beaches dominated by gravel and boulders. The landscape character type of CPU 6 primarily comprises the following: peninsula, coastal flats and upland fringe, with a small area of plateau moorland at the northern extent of PU 35.

Potential SMP Effects

Biodiversity, Flora & Fauna – NAI as the primary policy for PUs 30, 31 and 35 has potential for long term slight positive effects on BFF, enabling coastal habitats to adapt in a natural manner in response to anticipated sea level rise (+1). HTL as a localised policy will involve continued maintenance of existing private defences in the short to medium term in PU 30, and maintenance of existing private defences and defences benefitting the A718 in the short term; this has potential for short term temporary negative effects (-1) on local habitats and species during these activities. HTL as the short term primary policy for PU 33 is likely to involve maintenance of the existing defences protecting the A77 through patch and repair, while HTL as the primary policy for PU 32 and PU 34 over all epochs is likely to involve the upgrading and potential expansion of existing defences. There is potential for a direct loss of local habitats in the footprint of any expanded defences, and indirect effects on local habitats and species (-1). There is also potential for disturbance of the designated bird species, Hen harrier, of internationally designated site Glen App and Galloway Moors SPA (-3) and nationally designated site Glen App and Galloway Moors SSSI (-2) during construction or maintenance activities within these PUs. MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for a direct loss of local habitats in the footprint of the relocated road. There is also potential for direct or indirect effects, including disturbance or displacement effects on the designated bird species, Hen harrier, within the internationally designated site Glen App and Galloway Moors SPA (-3) and nationally designated site Glen App and Galloway Moors SSSI (-2) from the implementation of MR in this PU.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for slight negative effects on local intertidal habitats and supported species (-1), through a permanent loss in the footprint of expanded structures, and potential for indirect adverse effects on adjacent habitat through alternation of coastal processes. Owing to the proximity to the internationally designated site Glen App and Galloway Moors SPA and nationally designated site Glen App and Galloway Moors SSSI, there is potential for adverse effects on the designated bird species, Hen harrier from implementation of ATL (-3). MR (relocation of at risk assets) in the medium term rather than long term in PU 30 is not likely to have any effects on BFF (0). MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term would involve the landward movement of roads and railway; this would have potential for a direct loss of local habitats in the footprint of relocated infrastructure, and potential for disturbance of the designated bird species, Hen harrier, of internationally designated site Glen App and Galloway Moors SPA (-3) and nationally designated site Glen App and Galloway Moors SSSI (-2) during construction.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general this approach is maintained in the updated SMP, however HTL is now the preferred

primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement a policy of ATL at PU 34 would have potential for slight negative effects on local intertidal habitats and supported species (-1), through a permanent loss in the footprint of expanded structures, and potential for indirect adverse effects on adjacent habitat through alternation of coastal processes. Continuing to implement localised HTL in PU 31 and PU 33, could involve the need for upgraded or expanded defences, with potential for light negative effects on local habitats and species in the footprint of defences, potential for disturbance of the designated bird species, Hen harrier, of internationally designated site Glen App and Galloway Moors SPA (-3) and nationally designated site Glen App and Galloway Moors SSSI (-2) during construction.

Population & Human Health – NAI as the primary or localised policy in CPU 6 has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion. HTL as a localised policy for PU 30 and PU 31, and primary policy for PU 33 and PU 34, also has potential for neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion, as no homes are currently at risk in these areas. HTL as the primary policy for Stranraer in PU 32, which will require the upgrading of existing defences, has potential for significant positive effects on PHH, through a significant reduction in the proportion of the population at risk in this area (+3). MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, is expected to have neutral effects on PHH (0).

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34, MR (relocation of at risk assets) in the medium term rather than long term in PU 30, and MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term, are expected to have neutral effects on PHH (0), as there will be no change in the proportion of the population at risk of flooding or erosion from implementation of these alternative policies in these areas.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement the current SMP policies in these areas would have neutral effects on PHH (0), as there would be no change in the proportion of the population at risk of coastal flooding or erosion.

Geology, Soils & Land use – NAI as the primary or localised policy in CPU 6 has potential for slight negative effects on GSL in the medium to long term, as there is likely to be a slight natural loss of soil or land resource from coastal flooding or erosion in these areas (-1). NAI will allow for the natural evolution of the designated earth science features along the northern coastline of PU 30 within Corsewall Point to Milleur Point SSSI. HTL as the primary or localised policy has potential for slight positive effects on GSL, as coastal defences will provide for a slight reduction in the area of existing soil and land resource in these areas from coastal flooding or erosion (+1). MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in this area.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for significant positive effects on GSL (+3), through a gain of new soil or land resource that is protected from coastal flooding and erosion. MR (relocation of at risk assets) in the medium term rather than long term in PU 30 has potential for slight negative effects on GSL (-1), from a slight natural loss of soil or land resource from coastal flooding or erosion in this area. MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term, is expected to have neutral effects on GSL (0), as there would be no change in the area of existing soil and land resource at risk from coastal flooding or erosion in this area.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement a preferred policy of ATL in PU 34 would have potential for significant positive effects on GSL (+3), through a gain of new soil or land resource that is protected from coastal flooding and erosion. Continuing to implement a localised policy of HTL rather than MR in the medium to long term in PU 31 and PU 33 would have potential for slight positive effects on GSL,

as coastal defences would provide for a slight reduction in the area of existing soil and land resource in these areas from coastal flooding or erosion (+1).

Water – NAI as the primary or localised policy for CPU 6 has potential for neutral effects on W (0), as there will be no impacts on the status of coastal water bodies or local water quality. HTL as a primary short term policy in PU 33, a primary policy over all epochs for PU 32 and PU 34, and a localised policy for PU 30 and PU 31, has potential for short to long term negative effects on W. There is potential for short term or infrequent negative effects on coastal water quality within the Loch Ryan coastal water body (-1), and Loch Ryan designated shellfish waters, during the maintenance of existing defences or construction of new defences. HTL for Stranraer in PU 32, and potentially the ferry ports in PU 34, is likely to require upgrading or extension of the current coastal defences; in these cases, there is also potential for moderate negative effects on W, as there is some potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of Loch Ryan coastal water body under the WFD (-2). MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for neutral effects on W (0), as is not anticipated to have any significant effects on water quality.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for significant negative effects on W (-3), through a potential deterioration of the overall WFD status of Loch Ryan coastal water body. MR (relocation of at risk assets) in the medium term rather than long term in PU 30, and MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term, have potential for neutral effects on W (0), as they are not anticipated to have any significant effects on water quality.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement a preferred policy of ATL in PU 34 would have potential for significant negative effects on W (-3), through a potential deterioration of the overall WFD status of Loch Ryan coastal water body. Continuing to implement localised HTL in PU 31 and PU 33, could involve the need for upgraded or expanded defences, with potential for short term or infrequent negative effects on coastal water quality within the Loch Ryan coastal water body (-1), and Loch Ryan designated shellfish waters, and some potential for permanent negative effects on coastal morphology, with implications for achieving water body objectives of Loch Ryan coastal water body under the WFD (-2).

Climatic Factors – NAI as the primary or localised policy in CPU 6 has potential for positive effects on CF in the medium to long term (+3), by allowing the shoreline in these areas to react naturally to an increase in coastal flooding or erosion risks. HTL as the primary or localised policy has potential for positive or negative effects on CF. In the case of HTL involving the maintenance of existing defence assets (PUs 30, 31 and 33), there is potential for slight positive effects on CF (+1), as this policy will allow the shoreline in these areas to be adaptable to climatic change without any significant costs or engineering. Where HTL could require improvement or expansion of existing defences (PU 32 and PU 34, there is potential for slight to moderate negative effects on CF in the medium to long term (-1 to -2), as defences will be adaptable to climatic change but with a cost: benefit that is marginal to significant and will require a moderate to significant level of engineering. MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline in these areas to be more adaptable to climatic change at minimal cost.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for moderate negative effects on CF in the medium to long term (-2), as defences will be adaptable to climatic change but with a cost: benefit that is significant and will require a significant level of engineering. MR (relocation of at risk assets) in the medium term rather than long term in PU 30, and MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term, have potential for moderate positive effects on CF in the medium to long term, (+2) enabling the shoreline in these areas to be more adaptable to climatic change at minimal cost.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will

move towards a policy of MR. Continuing to implement a preferred policy of ATL in PU 34 would have potential for moderate negative effects on CF in the medium to long term (-2), as defences will be adaptable to climatic change but with a cost: benefit that is significant, and will require a significant level of engineering. Continuing to implement localised HTL in PU 31 and PU 33, could involve the need for upgraded or expanded defences, with potential for slight to moderate negative effects on CF in the medium to long term (-1 to -2), as defences will be adaptable to climatic change but with a cost: benefit that is marginal to significant, and will require a moderate to significant level of engineering.

Material Assets & Infrastructure – NAI as the primary or localised policy for CPU 6 has potential for neutral effects on MA (0), as there will be no change in the number of assets at risk of flooding or erosion. In the medium to long term, small areas of agricultural land, will remain at risk of coastal flooding or erosion within these areas. HTL as the primary or localised policy has potential for positive effects on MA, through a reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion. HTL as the primary policy for Stranraer in PU 32, which will require the upgrading of existing defences, has potential for significant positive effects on MA (+3), as there will be a significant reduction in the number of assets at risk in this area in the long term (+2). HTL as the primary policy for PU 34, and as a localised policy for PUs 30, 31 and 33, involving the maintenance of existing defences has potential for slight positive effects on MA, as there will be a slight reduction (+1) in the number of assets or infrastructure at risk in the short to medium term in these areas. MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for long term slight positive effects on MA (+1), through a slight reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion in this area.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for slight positive effects on MA, as there will be a slight reduction (+1) in the number of assets or infrastructure at risk in the short to medium term in this area. MR (relocation of at risk assets) in the medium term rather than long term in PU 30, and MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term, have potential for long term slight positive effects on MA (+1), through a slight reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion in these areas.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement a preferred policy of ATL in PU 34 would have potential for slight positive effects on MA, as there will be a slight reduction (+1) in the number of assets or infrastructure at risk in the short to medium term in this area. Continuing to implement localised HTL in PU 31 and PU 33, could involve the need for upgraded or expanded defences, with potential for long term slight positive effects on MA (+1), through a slight reduction in the number of material assets or infrastructure at risk of coastal flooding and erosion in these areas.

Cultural, Architectural & Archaeological Heritage – HTL as the primary or localised policy has the potential for both positive and negative effects on CH. There is potential for neutral effects on CH (0) from localised HTL within PU 30 and PU 31 and a primary policy of HTL within PU 33, as no heritage features are at risk of coastal flooding or erosion within these areas. HTL as the primary policy for PU 34 has potential for slight positive long term effects on CH (+1), as there will be a slight reduction in the number of designated heritage features (listed buildings and the coastal edge of Loch Ryan GDL) at risk of coastal flooding or erosion in this area. HTL as the primary policy for PU 32 has the potential for moderate positive effects on CH (+2), as there will be a moderate reduction in the number of designated heritage features (listed buildings) at risk of coastal flooding or erosion in this area; there will also be protection to the ASA within Stranraer. HTL involving new or improved defences also has potential for slight (for PU 34) to moderate (for PU 32) negative effects on CH (-1 / -2), owing to potential for negative changes to the setting of these features, including short term effects during construction, and permanent effects in the vicinity of defences. NAI as the primary or localised policy has potential for neutral effects on CH, as there will be no loss or damage to heritage features from construction of measures under this policy (0), and there are no heritage features at risk of coastal flooding or erosion within these areas. There may be a loss of Canmore assets and undiscovered archaeological features from coastal flooding and erosion in areas of NAI within CPU 6 (-1). MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for neutral effects on CH (0), as no heritage features are at risk of coastal flooding or erosion within this area.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for slight positive and slight negative effects on CH; there will be a slight reduction in the number of designated heritage features (listed buildings and the coastal edge of Loch Ryan GDL) at risk of coastal flooding or erosion in this area (+1), but also slight negative effects on CH (-1), owing to potential for negative changes to the setting of a small number of features, including short term effects during construction, and permanent effects in the vicinity of defences. MR (relocation of at risk assets) in the medium term rather than long term in PU 30, and MR in combination with HTL as an alternative primary policy for PU 32 in the medium and long term, have potential neutral effects on CH (0), as no heritage features are at risk of coastal flooding or erosion within these areas.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement a preferred policy of ATL in PU 34 would have potential for slight positive and slight negative effects on CH; there will be a slight reduction in the number of designated heritage features (listed buildings and the coastal edge of Loch Ryan GDL) at risk of coastal flooding or erosion in this area (+1), but also slight negative effects on CH (-1), owing to potential for negative changes to the setting of a small number of features, including short term effects during construction, and permanent effects in the vicinity of defences. Continuing to implement localised HTL in PU 31 and PU 33, could involve the need for upgraded or expanded defences, with potential for neutral effects on CH (0), as no heritage features are at risk of coastal flooding or erosion within these areas.

Landscape & Visual Amenity – NAI as the primary or localised policy in CPU 6 has potential for neutral effects on L (0), as there will be no positive or negative effects on the landscape / seascape quality and visual amenity within these areas. HTL as the primary policy for Stranraer in PU 32, and potentially the ferry ports in PU 34, is likely to require upgrading or extension of the current coastal defences; this has potential for localised negative impacts on and deterioration of the landscape / seascape and visual amenity (-2). HTL as a localised policy involving the maintenance of existing defences has potential for short term / disturbance impacts on local views and the local landscape / seascape (-1) during maintenance activities. MR as the medium to long term policy for PU 33, involving the possible rerouting of the A77 inland, has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views, but also for slight negative effects on L (-1) through short term / disturbance impacts on local views and the local landscape / seascape (-1) during construction of the rerouted road.

SMP Alternative Policies – ATL as an alternative primary policy to HTL for PU 34 has potential for moderate negative effects on L (-2), through a deterioration of the landscape / seascape and visual amenity (-2). MR (relocation of at risk assets) in the medium term rather than long term in PU 30 has potential for slight positive long term effects on L (+1), as allowing the natural evolution of the shoreline in these areas has potential for the improvement of local views, but also for slight negative effects on L (-1) through short term / disturbance impacts on local views and the local landscape / seascape (-1) during construction of the rerouted road.

Continuation of Current SMP Policies - The existing SMP approach for CPU 6 is for NAI where assets are not at risk, with limited HTL where there are existing defences benefitting roads in PU 31 and PU 33, ATL for the medium to long term in PU 34 to allow for expansion at the ferry ports, and HTL at PU 32 over all epochs. In general, this approach is maintained in the updated SMP, however HTL is now the preferred primary policy for PU 34 and, in PU 31 and PU 33, localised HTL to manage risks to sections of A roads will move towards a policy of MR. Continuing to implement a preferred policy of ATL in PU 34 would have potential for moderate negative effects on L (-2), through a deterioration of the landscape / seascape and visual amenity (-2). Continuing to implement localised HTL in PU 31 and PU 33, could involve the need for upgraded or expanded defences, with potential for moderate negative effects on L (-2), through a deterioration of the landscape / seascape and visual amenity (-2).

Potential In-Combination / Cumulative Effects

Potential sources of in-combination effects identified as part of this assessment include:

- There is potential for in-combination or cumulative effects on BFF within the internationally / nationally designated site Glen App and Galloway Moors SPA / SSSI from HTL policies of CPU 6 (-3).
- There is potential for in-combination or cumulative effects on water quality (W) within the Loch Ryan coastal water body from HTL policies of CPU 6, including short term (-1) and permanent effects (-2).
- There is potential for positive in-combination effects between BFF and CF whereby improving biodiversity through a NAI shoreline policy has the potential to positively affect carbon storage and sequestration which will have positive impacts for both the 2020 Challenge for Scotland's Biodiversity and the Climate Change (Emissions Reduction Targets) (Scotland) Act 2019.

Key Conclusions

The significantly beneficial aspects of implementing the SMP are expected to include:

- A significant reduction in the proportion of the population and number of businesses, and moderate reduction in the number of heritage features and transport infrastructure at risk of coastal flooding within Stranraer in PU 32.
- Where NAI or MR (relocation of at-risk assets) are the policy, this will enable the shoreline to function in a natural manner, with potential for slight benefits for BFF, including local habitats and species, as well as associated indirect benefits on the local landscape and seascape.
- Continued protection of transport routes through either localised HTL or MR will allow for the maintenance of connectivity between settlements in the area, and operation of ferry ports.

The potential adverse effects of implementing the SMP are expected to include:

- Potential for adverse direct or indirect effects on heritage features (listed buildings) within Stranraer in PU 32 from HTL.
- Potentially significant effects on internationally and nationally designated sites Glen App and Galloway Moors SPA / SSSI from implementation of schemes that could arise from HTL policies including temporary or permanent direct effects, or construction phase disturbance effects. Any schemes that are progressed from the SMP will need to be undertaken in consultation with NatureScot and will require appropriate monitoring and mitigation.

6.7 Cumulative / In-Combination Development Impacts

The SMP is proposing shoreline management works within all CPUs in the study area. In the majority of cases, these are maintenance works to existing defences, while in some situations there is likely to be a need to upgrade the existing defences. The implementation of all of these works would provide for the most significant cumulative and in-combination, medium and long term, positive effects for the population and material assets along the Dumfries & Galloway coastline, by providing future-proofed protection to receptors at risk of flooding and erosion. However, the simultaneous implementation of all proposed works would give the most significant, cumulative and in-combination, negative, short term adverse effects to the wider environment, unless a well phased and well planned approach is developed that can minimise or eliminate the potential for any negative construction / maintenance works effects.

No significant cumulative and / or in-combination effects with other Plans or Programmes have been identified. The Dumfries & Galloway Local Development Plan (LDP2) was adopted in 2019 and sets out how and where land and property will be used in Dumfries & Galloway to realise the vision for the next 20 years. An HRA was undertaken for the Dumfries & Galloway LDP2 and determined that only two aspects of the Plan (Policy ED3 Crichton Quarter and Policy ED4 Chapelcross) had potential, either individually or cumulatively, to lead to minor residual effects on Solway Firth SAC. This related to the potential for water quality effects from run off during or post-construction of development. There is therefore some potential for in-combination effects on BFF at this site. However, the LDP2 has been taken into consideration in the development of the SMP, and the SMP should complement the LDP2 by protecting zoned areas. Future iterations of the LDP should have regard to the SMP for future planning zones and proposed development areas, to minimise the potential for cumulative and in-combination effects with the implemented works from the SMP.

The need for the SMP arose from the Flood Risk Management (Scotland) Act 2009. The SMP will feed into and support the Solway Local Plan District (LPD14) draft Flood Risk Management Plans 2022-2028, by informing how to best manage risk in the coastal areas of the Plan.

There will continue to be a need for external bodies such as Transport Scotland, Network Rail and Scottish Water to manage their assets within the area covered by the SMP. The information provided by the SMP will influence the actions to be taken by these bodies at a local level in the management of their assets.

Current climate change predictions anticipate sea level rise to occur. Where there are existing hard shoreline defences in place this may act, in combination with sea level rise, in a loss of intertidal habitats through a ‘coastal squeeze’ against the hard defences. Continuing to HTL in areas of the Dumfries & Galloway coastline where there are significant populations or assets at risk of coastal flooding or erosion, may increase the effects of intertidal habitat loss with sea level rise.

7 MITIGATION AND MONITORING

7.1 Mitigation

Mitigation measures have been recommended where potential negative impacts are likely to result from a proposed measure for shoreline management. These mitigation measures aim to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to the implementation of the Plan.

7.1.1 General Mitigation

The principal mitigation recommendation is that the predicted negative effects should be considered further during the next stage of policy development, when details of the physical shoreline management measures (e.g. visual appearance and alignment of any hard engineering works) can be optimised through detailed feasibility studies and design in order to limit identified impacts on sensitive receptors. Where feasible, natural flood management and soft / green engineering methods should be incorporated into the detailed planning to reduce the negative environmental impacts of a scheme.

Further environmental studies based on the detailed design and construction methodology should be undertaken as appropriate. These studies may involve, but are not limited to marine, aquatic and terrestrial ecology surveys, ornithological and bat surveys, fish surveys, landscape and visual assessments, WFD assessments, geotechnical investigations and heritage surveys. Further Appropriate Assessment, to meet the requirements of the Habitats Directive, of the detailed design and construction methodology for implementing the preferred policy will be required at the project level, where potential impacts have been identified in this SEA and accompanying HRA for the SMP.

Before any works are carried out, detailed method statements and management plans (construction and environmental) should be prepared, to provide information on timing of works, the specific mitigation measures to be employed for each works area, and mechanisms for ensuring compliance with environmental legislation and statutory consents.

The timing of construction and maintenance works should be planned to avoid any potential for negative cumulative effects or inter-relationships with other schemes, plans or projects, yet should look to optimise any potential positive cumulative effects or inter-relationships.

Contractors should be required to prepare Construction Environmental Management Plans (CEMPs), which would include a requirement for related plans to be prepared, as appropriate, for project implementation, such as Erosion and Sediment Control, Invasive Species Management, Emergency Response, Traffic and Safety Management, Dust and Noise Minimisation and Stakeholder Communication Plans.

Works should only be carried out once the method statements have been agreed with competent authorities such as the NatureScot, Historic Environment Scotland and SEPA. At the project level it will not be sufficient to defer the production of construction method statements. These should be completed at the detailed design stage and may be subject to further Appropriate Assessment where potential impacts have been identified in this SEA and accompanying HRA for the SMP. Where there may be unavoidable impacts on protected habitats and / or species the necessary derogation licences should be applied for prior to seeking planning permission or approval for a scheme.

Marine construction and in stream works, such as sea wall refurbishment, groynes or dredging have the greatest potential for negative impacts during spawning / breeding and early nursery periods for aquatic and marine protected species. No marine or instream works should occur during restricted periods for relevant species and consultation should be undertaken with the appropriate authorities in this regard.

Monitoring of project level mitigation measures should be undertaken during and after works, to ensure effectiveness.

All works and planning of works should be undertaken with regard to all relevant legislation, licensing and consent requirements, and recommended best practice guidelines. An ecological clerk of works should be appointed for environmental management of each scheme, and where specific sensitive species may be impacted, an appropriate expert should also be appointed.

In areas of the coastline where the policy is to take no action and allow natural uninterrupted coastal processes, including erosion and accretion, to continue (NAI), there is potential for loss or damage to cultural heritage features or their settings from these processes. Owners of designated heritage assets should continue to monitor the risk to these assets, and follow advice provided by HES Managing Change in the Historic Environment Guidance Notes[29] and 'A Guide to Climate Change Impacts on Scotland's Historic Environment (2019)'[30].

7.1.2 Mitigation by Environmental Effect

Table 7-1 demonstrates environmental effect specific mitigation measures that should be adopted within the SMP to minimise the potential for any negative effects on the wider environment of implementing the preferred policies. These mitigation measures should be implemented and further developed at the next detailed design stage and project level study stage.

Effect	Proposed Mitigation
Temporary disturbance and destruction of existing habitats and flora, and the displacement of fauna, along the shoreline and river corridors.	Good planning and appropriate timing of works to minimise adverse effects. Where applicable, prior to any vegetation clearance an appropriately qualified ecologist should be contracted to undertake a 'pre-vegetation clearance' survey for signs of nesting birds and protected and important species e.g. otters, kingfisher etc. Should important species be found during surveys the sequential approach of avoid, reduce or mitigate should be adopted to prevent significant adverse effects with advice from appropriately qualified professionals. Vegetation and tree clearance should be minimised and only occur outside the main bird nesting season from February to August. Where there are over-wintering birds, to avoid disturbance, works should be avoided between September and March. Following construction, replanting and landscaping, or natural revegetating, should be undertaken in line with appropriate guidelines that aim to improve local biodiversity. This will provide medium and long term benefits to the biodiversity, flora and fauna of the working areas. Where possible, original sediment / soil should be reinstated to original levels to facilitate natural restoration and recolonisation of habitat. Consider integration of design as part of blue / green infrastructure plans and habitat enhancement where possible.
Temporary displacement of otters, birds, fish and other fauna during the construction period.	Good planning, appropriate timing of works and sensitive construction methods are essential. Adherence to best practice construction guidelines.
Adverse effects on European sites, habitats and species from construction or operation of shoreline management scheme.	Good planning and appropriate timing of works, and good construction and management practices will keep adverse effects to a minimum. There should be timely consultation with NatureScot. Site and species specific mitigation provided in HRA for the SMP including site specific surveys, timing of works etc. Provide local, connected, compensatory habitat if loss of area of European site is unavoidable.
Spread of invasive species during construction.	Pre-construction survey for invasive species. Effective cleaning of equipment and machinery along with strict management protocols to combat the spread of invasive species. Preparation of invasive species management plan for construction and maintenance-related activities if invasive species are recorded during the pre-

[29] https://www.historicenvironment.scot/advice-and-support/planning-and-guidance/legislation-and-guidance/managing-change-in-the-historic-environment-guidance-notes/

[30] https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=843d0c97-d3f4-4510-acd3-aadf0118bf82

Effect	Proposed Mitigation
	construction surveys. Any imported materials will need to be free from alien invasive species. Post-construction survey for invasive species.
Dredging impacts on biodiversity, flora and fauna.	Minimise requirement for in-water works through good planning. Good dredging practices should be implemented, along with consultation with environmental bodies on methodology and appropriate timing to cause the least amount of damage, habitat loss, and sedimentation. Scoping or relevant specialist ecological surveys during the planning stage and prior to any construction works.
Construction disturbance to the local population.	Disturbances can be kept to a minimum with good working practices, planning and timing. Adoption of Construction Best Practice and measures outlined in the CEMP and implementation of traffic and pedestrian management during construction.
Health and Safety risk to the local population during construction works.	Good construction management practices and planning of works. Adoption of Construction Best Practice and measures outlined in the CEMP.
Loss of access to agricultural soil resource.	Consultation and agreement with local landowners on detailed designs and residual impacts of flooding. Potential for requirement for compensation.
Removal of soil and rock material via dredging and excavation works during construction.	Re-use material where possible on site for either embankments or landscaping.
Temporary disturbances of water quality during the construction phase	Good management and planning to keep water quality disturbance to a minimum. Any potential water quality issues from construction should be contained and treated to ensure no damage to natural water bodies. Dredging and construction will have to be planned appropriately, using Best Available Techniques / Technology (BAT) at all times, to ensure water quality issues are kept to a minimum, with no significant adverse effects. Adherence with guidelines such as CIRIA Document C532 - Control of Water Pollution from Construction Sites. Development and consenting of environmental management plan prior to commencement of works.
Potential for pollution incidents during the construction phase.	Minimise requirement for in-water works through good planning. Strict management and regulation of construction activities. Provision of appropriate facilities in construction areas to help prevent pollution incidents. Preparation of emergency response plans. Good work practices including; channelling of discharges to settlement ponds, construction of silt traps, construction of cut-off ditches to prevent run-off from entering waterbodies, hydrocarbon interceptors installed at sensitive areas, appropriate storage of fuel, oils and chemicals, refuelling of plant and vehicles on impermeable surfaces away from drains / waterbodies, provision of spill kits, installation of wheel wash and plant washing facilities, implementation of measures to minimise waste and ensure correct handling, storage and disposal of waste and regular monitoring of surface water quality.
Potential requirement for maintenance dredging.	Design should aim to ensure WFD objectives are not compromised. All options to be subject to a WFD Assessment. Any negative effects on the status of a water body will only be permitted under the WFD if the strict conditions set out in WFD Article 4 are met. Adhering to good work practices including; diversion of discharges to settlement ponds, construction of silt traps, construction of cut-off ditches to prevent run-off from entering excavations, granular materials placed over bare soils. If a channel is maintained on an as-required basis, using good planning, timing and BAT, there

Effect	Proposed Mitigation
	should be only minimal temporary disturbance to the local water quality.
Alterations to coastal processes.	Detailed surveys and hydrodynamic modelling to inform detailed design of coastal works to ensure no negative effects on coastal processes.
Disturbances to local infrastructure during the construction phase, e.g. traffic, water and electricity.	Good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all adverse effects to be kept to a minimum over a short timescale. Adoption of Construction Best Practice.
In the short term construction period there is the potential for damage to heritage features.	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features to feed into detailed design. Consultation and agreement with Historic Environment Scotland in advance of any works taking place in respect of protected archaeological or architectural features. Construction supervision by qualified project archaeologists, combined with sensitive construction methods and restoration would mean this damage could be kept to a minimum. Heritage features damaged could be restored / preserved. Statutory consents and notices may be required prior to works taking place.
Medium and long term effects on the setting of heritage features.	Adverse effects could be kept to a minimum through sensitive design and planning. Planning and design advice from qualified archaeologists. Statutory consents may be required prior to works.
Potential for undiscovered heritage to be adversely affected during construction and dredging operations.	Interpretation of side-scan sonar and bathymetry information, along with supervision of construction and dredging operations by qualified archaeologists will minimise any adverse effects or the possibility of destruction of underwater and undiscovered heritage features in areas of heritage potential.
Extent and severity of short term negative effects on landscape from construction.	Adverse effects could be kept to a minimum through good site practice and planning (e.g. screened laydown areas and traffic management). Adoption of Construction Best Practice.
Extent and severity of medium to long term negative effects on landscape from preferred policies.	Adverse effects could be kept to a minimum through sensitive design and planning (e.g. vegetative screening and landscape management planning). Landscape and visual assessment and advice during detailed design. Public consultation on draft designs.
Restricted access to waterbodies for recreational activities due to preferred policies.	Sensitive design of the shoreline management measures. Potential to improve recreational access, safety of access and improve local recreational and ecological linkages considered in the detailed design. Public and stakeholder consultation on draft designs.
Disturbances to local amenity, community and social infrastructure during the construction phase, e.g. shops and amenity areas.	Good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all adverse effects to be kept to a minimum over a short timescale. Adoption of Construction Best Practice.

Table 7-1 Proposed Mitigation Measures

7.1.3 HRA Mitigation

Where the potential for adverse effects on European site integrity cannot be excluded at this strategic plan level, the HRA has outlined mitigation to ensure the avoidance of adverse effects. This is shown in *HTL was the preferred Primary Policy for PU 2 at the Public Consultation Stage, however the Preferred Policy was subsequently changed to MR, with localised HTL, based on confirmation from the MoD that potential for contaminated ground at Eastriggs was low. The HRA Record was subsequently updated to reflect this change.

Table 7-2. The mitigation provided is considered appropriate at this strategic Plan level, as the details regarding required defence maintenance works, the scale or nature of potential alterations to existing defences and / or new defences are not known. The next stage of SMP implementation will be further study, and this will inform the nature of the policy implementation.

The Plan level mitigation outlined in *HTL was the preferred Primary Policy for PU 2 at the Public Consultation Stage, however the Preferred Policy was subsequently changed to MR, with localised HTL, based on confirmation from the MoD that potential for contaminated ground at Eastriggs was low. The HRA Record was subsequently updated to reflect this change.

Table 7-2 states that any maintenance works or coastal flood and erosion protection schemes should be designed appropriately at the outset to avoid any direct losses, minimise the potential for damage to designated habitats, and avoid significant effects on European Sites. It stipulates that work areas should be minimised to avoid disturbance of habitats, and that best practice guidance should be followed during any maintenance or construction works in order to avoid the potential for pollution and the spread of invasive species.

Any projects that arise from the implementation of the policies identified in the SMP will themselves be required to conform with the regulatory provisions of Environmental Impact Assessment (EIA), Habitats Regulations Appraisal (HRA), Ecological Impact Assessment (EcIA), Consent under the Nature Conservation (Scotland) Act 2004, environmental risk assessments, and planning regulations / requirements, as appropriate. The Plan-level mitigation outlined includes the requirement for consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 (for SSSIs) and / or project-level HRA, which should prescribe appropriate project-level mitigation measures, when specific details regarding the scale and nature of any works are known.

PU	European Site	Proposed Mitigation
PU 20: Primary HTL **PU 21: Localised HTL** **PU 22: Localised HTL** **PU 23: Localised HTL** **PU 24: Primary HTL** **PU 25: Primary HTL** **PU 26: Localised HTL**	Luce Bay and Sands SAC	The details regarding any maintenance works, alterations of existing defences or new defences are not known at this strategic plan stage. A HTL policy in these areas will be subject to further study. The following plan-level mitigation is proposed: Maintenance works / coastal flood and erosion protection schemes will be designed appropriately to avoid footprint losses, reduce any damage to dune / intertidal habitats, avoid potential for intertidal narrowing, and avoid significant effects on the SAC. Mitigation for works will include: - works area minimised and traffic routed to avoid sensitive dune habitats; - Best practice guidance followed to avoid pollution and the introduction of invasive species; - Any works should ensure that they do not interfere with natural coastal processes, including sediment transport; and - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures e.g. dune / intertidal habitat surveys and monitoring, great-crested newt surveys and monitoring (if required) when specific details of the scale and nature of the maintenance works / coastal flood and erosion protection scheme are known. At project level, the potential for in-combination effects from implementation of SMP policies in other areas of the CPU should be examined, as well as other projects that could affect the coastal / intertidal habitats. The HRA should conclude 'no adverse effects' on site integrity.
PU 15: Localised HTL	River Bladnoch SAC	The details regarding any maintenance works are not known at this strategic plan stage. A HTL policy in this area will be subject to further study. The following plan-level mitigation is proposed:

PU	European Site	Proposed Mitigation
		Maintenance works will be designed appropriately to avoid significant effects on the SAC. Mitigation for works will include: - Best practice guidance followed to avoid pollution and the introduction of invasive species; and - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures when specific details of the scale and nature of the maintenance works are known. The HRA should conclude 'no adverse effects' on site integrity.
PU 1: Localised HTL **PU 2: Primary HTL*** **PU 3: Localised HTL** **PU 4: Localised HTL** **PU 6: Primary HTL** **PU 7: Localised HTL** **PU 8: Localised HTL**	Solway Firth SAC	The details regarding any maintenance works, alterations of existing defences or new defences are not known at this strategic plan stage. A HTL policy in these areas will be subject to further study. The alternative MR policy for PU 2 should be considered should further study indicate that there is no contamination risk*. The following plan-level mitigation is proposed: Maintenance works / coastal flood and erosion protection schemes will be designed appropriately to avoid footprint losses, reduce any damage to coastal / intertidal habitats, avoid potential for intertidal narrowing, and avoid significant effects on the SAC. Mitigation for works will include: - works area minimised and traffic routed to avoid sensitive coastal habitats; - Best practice guidance followed to avoid pollution and the introduction of invasive species; - Any works should ensure that they do not interfere with natural coastal processes, including sediment transport; and - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures including coastal / intertidal habitat survey and monitoring (if required) when specific details of the scale and nature of the maintenance works / coastal flood and erosion protection scheme are known. At project level, the potential for in-combination effects from implementation of SMP policies in other areas of the CPU should be examined, as well as other projects that could affect the coastal / intertidal habitats. The HRA should conclude 'no adverse effects' on site integrity.
PU 30: Localised HTL **PU 31: Localised HTL** **PU 32: Primary HTL** **PU 33: Primary HTL short-term, MR medium to long-term** **PU 34: Primary HTL**	Glen App and Galloway Moors SPA	The details regarding any re-routing of the A77, maintenance works, alterations of existing defences or new defences are not known at this strategic plan stage. A HTL or MR policy in these areas will be subject to further study. The following plan-level mitigation is proposed: Any scheme to re-route the A77 road will be designed appropriately to avoid footprint losses and identify and reduce any damage to suitable / sensitive habitat used by this species and avoid significant effects on the SPA. Mitigation for works arising from implementation of MR and HTL policies will include: - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures including

PU	European Site	Proposed Mitigation
		timing of works to avoid periods of key bird usage in the identified locations, bird surveys / monitoring (if required) when specific details of the scale and nature of the works are known. At project level, the potential for in-combination effects from implementation of SMP policies in other areas of the CPU should be examined, as well as other projects that could affect the intertidal habitats. The HRA should conclude 'no adverse effects' on site integrity.
PU 20: Primary HTL **PU 21: Localised HTL** **PU 22: Localised HTL** **PU 23: Localised HTL**	Loch of Inch and Torrs Warren SPA / Ramsar	The details regarding any maintenance works, alterations of existing defences or new defences are not known at this strategic plan stage. A HTL policy in these areas will be subject to further study. The following plan-level mitigation is proposed: Maintenance works / coastal flood and erosion protection schemes will be designed appropriately to avoid footprint losses, identify and avoid any damage to suitable / sensitive habitat used by these species, avoid potential for intertidal narrowing and avoid significant effects on the SPA. Mitigation for works will include: - works area minimised; - Best practice guidance followed to avoid pollution and the introduction of invasive species; - Any works should ensure that they do not interfere with natural coastal processes, including sediment transport; and - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures including timing of works to avoid periods of key bird usage in the identified locations, bird surveys / monitoring (if required) when specific details of the scale and nature of the maintenance works / coastal flood and erosion protection scheme are known. At project level, the potential for in-combination effects from implementation of SMP policies in other areas of the CPU should be examined, as well as other projects that could affect the intertidal habitats. The HRA should conclude 'no adverse effects' on site integrity.
PU 9: Localised HTL **PU 13: Localised HTL**	Loch Ken and River Dee Marshes SPA / Ramsar	The details regarding any maintenance works, alterations of existing defences or new defences are not known at this strategic plan stage. A HTL policy in these areas will be subject to further study. Following the precautionary principle, the following plan-level mitigation is proposed: - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures including timing of works to avoid periods of key bird usage in the identified locations, bird surveys / monitoring (if required) when specific details of the scale and nature of the maintenance works / coastal flood and erosion protection scheme are known. The HRA should conclude 'no adverse effects'.
PU 1: Localised HTL **PU 2: Primary HTL*** **PU 3: Localised HTL**	Solway Firth SPA / Upper Solway Flats and Marshes Ramsar	The details regarding any maintenance works, alterations of existing defences or new defences are not known at this strategic plan stage. A HTL policy in these areas will be subject to further study. The following plan-level mitigation is proposed: Maintenance works / coastal flood and erosion protection schemes will be designed appropriately to avoid footprint losses, identify and avoid any damage to suitable / sensitive habitats

PU	European Site	Proposed Mitigation
PU 4: Localised HTL PU 6: Primary HTL PU 7: Localised HTL PU 8: Localised HTL PU 9: Localised HTL PU 10: Localised HTL PU 12: Localised HTL PU 13: Localised HTL PU 14: Localised HTL PU 15: Localised HTL PU 16: Primary HTL PU 17: Localised HTL PU 18: Primary HTL		used by the species, avoid potential for intertidal narrowing and avoid significant effects on the SPA. Mitigation for works will include: - works area minimised; - Best practice guidance followed to avoid pollution and the introduction of invasive species; - Any works should ensure that they do not interfere with natural coastal processes, including sediment transport; and - consultation with NatureScot to confirm the need for consent under the Nature Conservation (Scotland) Act 2004 and / or HRA which will prescribe project-level mitigation measures including timing of works to avoid periods of key bird usage in the identified locations, bird surveys / monitoring (if required) when specific details of the scale and nature of the maintenance works / coastal flood and erosion protection scheme are known. At project level, the potential for in-combination effects from implementation of SMP policies in other areas of the CPU should be examined, as well as other projects that could affect the supporting habitats. The HRA should conclude 'no adverse effects' on site integrity.

*HTL was the preferred Primary Policy for PU 2 at the Public Consultation Stage, however the Preferred Policy was subsequently changed to MR, with localised HTL, based on confirmation from the MoD that potential for contaminated ground at Eastriggs was low. The HRA Record was subsequently updated to reflect this change.

Table 7-2 Proposed Plan-Level HRA Mitigation Measures

7.2 Monitoring

The SEA Directive requires that the significant environmental effects of the implementation of the SMP are monitored in order to identify, at an early stage, unforeseen adverse effects and in order to undertake appropriate remedial action. Proposed monitoring indicators, data and potential data sources are given in Table 7-3, based on the Targets and Indicators established in the SEOs (given in Section 5.3). This proposed monitoring has been incorporated in Section 6 of the SMP and will be undertaken during the feasibility, design and construction phases of any resulting works. This monitoring will report the positive and negative effects on the environment of implementing the SMP, enabling early mitigation for any unwanted adverse effects and improving future iterations of the SMP.

Detailed monitoring for specific policies proposed should be re-scoped in consultation with the appropriate authorities at the detailed feasibility and design stages. This agreed detailed monitoring should then be undertaken before, during and after construction, where and when appropriate.

It should be noted that monitoring of the condition of assets, as well as the risk to assets from future flooding and erosion, will remain the responsibility of individual asset owners as detailed in Section 5 of the SMP.

Criteria	Objective		Sub-Objective		Indicators	Proposed Data Sources
Biodiversity, Flora & Fauna	**1**	Avoid damage to, and where possible enhance, the biodiversity, flora and fauna in the vicinity of the shoreline.	**A**	Avoid detrimental effects to, and where possible enhance, International and European designations for protected species and their key habitats.	Area and condition of SAC, SPA, and Ramsar designation. Numbers of protected species.	NatureScot & Marine Scotland reporting and action plans.
			B	Avoid damage to or loss of, and where possible enhance, national and local nature conservation sites and protected species, or other known species of conservation concern such as Priority Marine Features.	Area and condition of SSSI, LNRs, MCAs, MPAs and local conservation designations. Numbers of protected species.	NatureScot & Marine Scotland reporting and action plans. Dumfries & Galloway Council – Local Development Plans.
Population & Human Health	**2**	Protect the public from risk of flooding and coastal erosion and avoid significant social effects on the population.	**A**	Protect the public from risk of flooding and coastal erosion.	Population at risk from flooding and erosion.	SEPA reporting. Dumfries & Galloway Council – Flood Risk Management Plans. Scotland Census Data.
			B	Avoid significant negative social effects on the public.	Population displaced by flooding and erosion.	Scotland Census Data. SMP Data.
Geology, Soils & Land Use	**3**	Avoid damage to, and where possible enhance, areas of geological importance and existing functional soil and land resource.	**A**	Maintain or improve areas of existing functional soil and land resource.	Areas of functional soil and land resource at risk from flooding and erosion.	NatureScot erosion reporting. NatureScot landcover mapping. Dumfries & Galloway Council – land use zoning in Local Development Plans.
			B	Avoid damage to or loss of, and where possible enhance, national geological conservation sites.	Areas of Geological SSSI.	NatureScot reporting.
Water	**4**	Protect and enhance the state of the water environment.	**A**	Protect and enhance the state of the water environment.	Coastal morphology and waterbody status.	SEPA – River Basin Management Plans / WFD reporting.
Climatic Factors	**5**	Adaptation to potential climatic change.	**A**	Adaptation of shoreline management to potential climatic change.	Interaction with potential climate change influenced flood extents / wave	SEPA reporting. Dumfries & Galloway Council – Flood Risk Management Plans.

Criteria	Objective		Sub-Objective		Indicators	Proposed Data Sources
					overtopping and severe weather events.	
Material Assets & Infrastructure	**6**	Protect material assets and infrastructure from risk of flooding and coastal erosion.	**A**	Protect material assets and infrastructure from risk of coastal flooding and erosion.	Material assets and infrastructure at risk from flooding and erosion.	SEPA reporting. Transport Scotland. Scottish Water. Dumfries & Galloway Council reporting.
Cultural, Architectural & Archaeological Heritage	**7**	Protect or, where appropriate, enhance historic environment features and their settings.	**A**	Avoid loss of, or damage to, heritage features.	International, National and local designated heritage structures, sites and monuments.	Dumfries & Galloway Council reporting. Historic Environment Scotland reporting, including Field Officer condition reports for Scheduled Monuments. Canmore Database.
			B	Minimise effects on the setting of heritage features		
Landscape & Visual Amenity	**8**	Protect, and where possible enhance, the landscape and seascape character and visual amenity of the Dumfries & Galloway shoreline.	**A**	Protect, and where possible enhance, the landscape and seascape character and visual amenity of the Dumfries & Galloway shoreline.	Landscape character assessments. Seascape assessments. Designated landscapes and views, such as NSAs	Dumfries & Galloway Council – Local Development Plans. NatureScot landcover mapping.

Table 7-3 Environmental Monitoring of the SMP

8 SUMMARY AND CONCLUSIONS

This SEA Environmental Report has been prepared to provide a formal and transparent assessment of the likely significant effects on the environment arising from implementation of the SMP, including consideration of reasonable alternatives. As the SMP has the potential to affect European sites, the requirement exists under the EU Habitats Directive to carry out an HRA.

This SEA Environmental Report has identified the potential positive and negative effects on the wider environment of the proposed policies to manage the Dumfries & Galloway shoreline. This report is designed to help support the decision making with regard to the SMP, to ensure that Dumfries & Galloway Council are fully aware of the environmental constraints and opportunities associated with these proposed policies, and to help the future sustainable development of projects and schemes which are the result of the SMP.

Section 6 of this SEA Environmental Report details the environmental assessment of the preferred policies, as set out in the SMP, as well as an assessment of any alternative approaches. Generally, there was found to be the potential for slight to moderate negative environmental effects from policies comprising the maintenance or upgrading of coastal defences on the wider environment. There is potential for more significant effects on BFF from HTL policies in some areas, including within CPU 2, owing to the presence of designated and sensitive habitats that could be affected either directly or indirectly, or for disturbance of designated species during any potential construction / maintenance phases. In CPU 4, a policy of MR through relocation of at-risk properties has potential for significant positive effects (through protection) but also significant negative social effects on the population. In the medium to long term, there is generally potential for moderate to significant positive effects from implementation of SMP policies, owing to the increased management of flood and erosion risk for the protection of people, property, water quality, heritage features and infrastructure, as well as through enabling natural coastal processes to continue for the shoreline through a policy of NAI, or MR involving relocation of assets at risk.

Section 7 of this SEA Environmental Report recommends environmental mitigation measures to avoid or minimise any potential negative effects of implementing the SMP policies. It is recommended that these measures are adopted in full at the next detailed stage of design and assessment of these preferred options.

A Habitats Regulations Appraisal (HRA) for the SMP has been carried out in parallel with the SEA process. The Stage 1 screening appraisal assessed the potential for the SMP to result in Likely Significant Effects (LSEs) on any European site, either alone or in-combination with other plans and projects. This concluded that a Stage 2 HRA should be undertaken as the SMP is not directly connected with or necessary to the management of any European site and LSE on 7 European sites could not be excluded at the screening stage, alone or in-combination with other Plans and projects.

A Stage 2 appraisal for HRA of the policies comprising the SMP on the European sites that were screened in at Stage 1 was undertaken. This recognised that the SMP, as a strategic-level plan, does not determine the precise location or nature of any development project, and that implementation of the preferred policies of the SMP will be subject to further study. At this strategic level, implementation of the preferred SMP policies in a number of locations was considered to have the potential to result in significant effects on European sites, and it was therefore necessary to outline mitigation for these. For each European site, avoidance and mitigation measures were outlined to prevent potential adverse effects on the integrity of the European sites concerned. The HRA record concluded that, subject to securing the prescribed mitigation, the SMP will not adversely affect the integrity of any European site, either alone or in-combination with other relevant plans or programmes. Further assessment should be undertaken at project level, when detailed information on preferred shoreline management measures are known. The findings of the HRA have been integrated into this SEA Environmental Report and subsequently into the SMP.

Section 7 also details environmental monitoring to be undertaken during development of the next iteration of the SMP. This should identify at an early stage any unforeseen adverse effects due to implementation of the SMP. This environmental monitoring has been adopted into Section 6 of the draft SMP.

9 NEXT STEPS

Consultation on the draft Plan, SEA Environmental Report and HRA record are anticipated to commence in April 2022. The consultation activities will take the form of Public Consultation Days, Key Stakeholder Group meetings and Elected Member briefings, with documents made available for viewing at Dumfries & Galloway Council premises, and the same documents made available digitally the Council's website.

Following completion of the consultation period, all comments will be collated and the Plan, SEA Environmental Report and HRA Record will be reviewed and revised as necessary. Provided that there are no objections or comments that will significantly alter the Plan, the final version of the Plan can be drafted and adopted. This is anticipated to be in October 2022. Following release of the adopted SMP, an SEA Statement will be drafted to summarise the process undertaken and identify how environmental considerations and consultations have been integrated into the final Plan. Table 9-1 demonstrates the proposed upcoming time stages for the Plan, SEA and HRA.

SMP	Dates	Strategic Environmental Assessment / Habitats Regulations Appraisal
Development of SMP	March 2020 – March 2022	SEA and AA. Writing of SEA Environmental Report and HRA Record.
Public and statutory consultation on draft SMP	June – August 2022	Statutory, non-statutory and public consultation on SEA Environmental Report and HRA record.
Release of final SMP	October/November 2022	SEA Environmental Statement.

Table 9-1 Draft Anticipated Milestones

The contact for any information regarding the Strategic Environmental Assessment of the proposed SMP is as follows:

By post	Richard Bingham RPS 74 Boucher Road Belfast BT12 6RZ Tel: +44 (0)28 90667914
By email	richard.bingham@rpsgroup.com

APPENDIX A

SEA Screening Responses

APPENDIX B

SEA Scoping Responses

APPENDIX C

SEA Guidance

Scottish Government guidance on Strategic Environmental Assessment. August 2013. Scottish Government. http://www.gov.scot/Publications/2013/08/3355/0

Strategic Environmental Assessment DRAFT Practical Guidance for Practitioners on How to Take Account of Soil. June 2008. Scotland & Northern Ireland Forum for Environmental Research.

Strategic Environmental Assessment DRAFT Practical Guidance for Practitioners on How to Take Account of Water. June 2008. Scotland & Northern Ireland Forum for Environmental Research.

Strategic Environmental Assessment Toolkit (Version 1). September 2006. Scottish Executive. http://www.scotland.gov.uk/Publications/2006/09/13104943/0

Strategic Environmental Assessment Website. Guidance on Air, Soil and Water. September 2009. SNIFFER. http://www.seaguidance.org.uk/1/Homepage.aspx

APPENDIX D

Plans and Programmes

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
International / European				
Birds Directive [2009/147/EC]	Protects all wild birds, their nests, eggs and habitats within the European Community. It gives EU member states the power and responsibility to classify Special Protection Areas (SPAs) to protect birds which are rare or vulnerable in Europe, as well as all migratory birds which are regular visitors.	• Preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Annex I. • Preserve, maintain and establish biotopes and habitats to include the creation of protected areas (Special Protection Areas); ensure the upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones, re-establish destroyed biotopes and creation of biotopes • Measures for regularly occurring migratory species not listed in Annex I is required as regards their breeding, moulting and wintering areas and staging posts along their migration routes. The protection of wetlands and particularly wetlands of international importance.		The SMP should ensure that European Sites are suitably protected from loss or damage. The SMP will require a screening for Habitats Regulations Appraisal, following which there may be a requirement for full Habitats Regulations Appraisal to ensure that any strategies proposed do not adversely affect SPAs and SACs.
Habitats Directive [92/43/EEC]	Builds on the Birds Directive (see above) by protecting natural habitats and other species of wild plants and animals. Together with the Birds Directive, it underpins a European network of protected areas: Special Protection Areas (SPAs, classified under the Birds Directive) and Special Areas of Conservation (SACs, classified under the Habitats Directive). In the UK these sites now form part of the UK Site Network of European sites following the UK's exit from the European Union.	• Propose and protect sites of importance to habitats, plant and animal species. • Establish a network of Natura 2000 sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, to enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range. • Carry out comprehensive assessment of habitat types and species present. • Establish a system of strict protection for the animal species and plant species listed in Annex IV.		The SMP should ensure that European Sites are suitably protected from loss or damage. The SMP will require a screening for Habitats Regulations Appraisal, following which there may be a requirement for full Habitats Regulations Appraisal to ensure that any strategies proposed do not adversely affect SPAs and SACs.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
(Ramsar) Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971)	Framework for international cooperation in relation to the conservation and wise use of wetlands through local and national actions as a contribution towards achieving sustainable development throughout the world.	Contracting parties commit to: • Work towards the wise use of all their wetlands; • Designate suitable wetlands for the list of Wetlands of International Importance (the 'Ramsar' list) and ensure their effective management; and • Cooperate on international and transboundary wetlands, shared wetland systems and shared species.	The Fourth Ramsar Strategic Plan 2016 - 2024.	The SMP will have regard for the protection of wetlands and shall seek to, at the very least, prevent adverse effects to wetlands.
EU Biodiversity Strategy to 2020 [COM(2011)244]	Aimed at reversing biodiversity loss and speeding up the EUs transition towards a resource efficient and green economy. Primary objectives of the strategy include: • conserving and restoring nature; • maintaining and enhancing ecosystems and their services; • ensuring the sustainability of agriculture, forestry and fisheries; • Ensuring the sustainable use of fisheries resources • combating invasive alien species; and • addressing the global biodiversity crisis.	• To mainstream biodiversity in the decision making process across all sectors. • To substantially strengthen the knowledge base for conservation, management and sustainable use of biodiversity. • To increase awareness and appreciation of biodiversity and ecosystems services. • To conserve and restore biodiversity and ecosystem services in the wider countryside. • To conserve and restore biodiversity and ecosystem. • services in the marine environment • To expand and improve on the management of protected areas and legally protected species. • To substantially strengthen the effectiveness of International governance for biodiversity and ecosystem services.		The SMP should have regard for this strategy and look for opportunities to conserve, and, where possible, restore or enhance biodiversity.
(Bonn) Convention on the Conservation of Migratory Species of Wild Animals [L210, 19/07/1982 (1983)]	The Bonn Convention focuses on preserving the habitats used by migratory species and aims to enhance the conservation of terrestrial, marine and avian species on a global scale throughout their range.	• Establishes a legal foundation for internationally coordinated conservation measures throughout a migratory range. • Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS Parties strive towards strictly protecting these animals,		The SMP should have regard for any implications on migratory species from adapting the shoreline.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
		conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. • In Europe, legislation to ensure that the provisions of the Bonn convention are applied includes the Birds Directive and the Habitats Directive.		
SEA Directive [2001/42/EC]	Seeks to integrate environmental considerations into the preparation of plans and programmes as a means of ensuring a high level of protection for the environment whilst also promoting sustainable development.	• Requires a Strategic Environmental Assessment (SEA) to be undertaken for plans / programmes which are prepared for agriculture, forestry, fisheries, energy, industry, transport, waste / water management, telecommunications, tourism, town and country planning or land use and which set the framework for future development consent of projects listed in the EIA Directive.		The SMP is required to go through the SEA process, including preparation of this Environmental Report.
EIA Directive [85/337/EEC] [2014/52/EU]	• Requires the assessment of the environmental effects of public and private projects which are likely to have significant effects on the environment. • Aims to assess and implement avoidance or mitigation measures to eliminate environmental effects, before consent is given of projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects.	• All projects listed in Annex I are considered as having significant effects on the environment and compulsorily require an EIA. • For projects listed in Annex II, a "screening procedure" is required to determine the effects of projects on the basis of thresholds / criteria or a case by case examination. The competent authority may give a decision on whether a project requires EIA. • Requirement for identification, description and assessment in an appropriate manner, in the light of each individual case, on the direct and indirect effects of a project on the following factors: human beings, fauna and flora, soil, water, air, climate and the landscape, material assets and the cultural heritage, the interaction between each factor.		The SMP will need to have regard to the EIA requirements in relation to the development of any future proposed measures.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
		• Requirement for consultation with relevant authorities, stakeholders and public allowing sufficient time to make a submission before a decision is made. • Establishment of a recognised structure and content for the Environmental Impact Statement, which is the document submitted as a written account of the EIA. • Inclusion of proposed flood risk management schemes in EIA screening process		
Environmental Liability Directive [2004/35/EC]	• Establishes a framework for environmental liability based on the 'polluter-pays' principle, to prevent and remedy environmental damage. • Relates to environmental damage caused by occupational activities (listed in Annex III), and to any imminent threat of such damage occurring by reason of any of those activities; damage to protected species and natural habitats caused by any occupational activities other than those listed in Annex III, and to any imminent threat of such damage occurring by reason of any of those activities, whenever the operator has been at fault or negligent.	• Describes procedures for circumstances where environmental damage has occurred. Requires the polluter to take all practicable steps to immediately control, contain, remove or otherwise manage the relevant contaminants and / or any other damage factors in order to limit or to prevent further environmental damage and adverse effects on human health or further impairment of services and the necessary remedial measures. • Establishes measures for cases where environmental damage has not yet occurred, but there is an imminent threat of such damage occurring. • The regulations make the polluter financially liable and allow the competent authority to initiate cost recovery proceedings where appropriate.		The SMP will be obliged to comply with the requirements of the Directive and to prevent environmental damage. Maintenance and construction of any flood defence infrastructure should aim to cause no damage and to enhance the wider environment.
Environmental Quality Standards Directive (Directive 2008/105/EC) (also known as the Priority Substances Directive), as amended by	• Establishes environmental quality standards (EQS) for priority substances and certain other pollutants as provided for in Article 16 of the Water Framework Directive and aims to achieve good surface water chemical status in accordance with the provisions and	• Apply the EQS laid down in Part A of Annex I to this Directive for bodies of surface water. • Determine the frequency of monitoring in biota and / or sediment of substances. • Monitoring shall take place at least once every year, unless technical knowledge		The SMP will be obliged to comply with the requirements of the Directive and to prevent environmental damage. Maintenance and construction of any flood defence infrastructure should aim to

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
Directive 2013/39/EU.	objectives of Article 4 of the Water Framework Directive.	and expert judgment justify another interval. • Notify the European Commission if the substances for which EQS have been established if a deviation of the monitoring is planned along with the rationale and approach. • Establish an inventory, including maps, if available, of emissions, discharges and losses of all priority substances and pollutants listed in Part A of Annex I to this Directive for each river basin district.		cause no damage and to enhance the wider environment.
Bathing Water Directive (2006/7/EC)	The overall objective of the revised Bathing Water Directive remains the protection of public health whilst bathing. It: • Imposes stricter standards for water quality and the implementation of new methods of assessment. • Establishes a more pro-active approach to the assessment of possible pollution risks, and to the management of bathing waters; and • Places considerable emphasis on promoting increased public involvement, and for improved dissemination of information on bathing water quality to the general public.	• Updates the way in which water quality is measured, focusing on fewer microbiological indicators, and setting different standards for inland and coastal bathing sites. • Reduces the health risks linked to bathing by setting scientifically based minimum water quality standards. • Makes changes to monitoring and sampling frequency. • Allows a limited number of water samples to be disregarded during short term pollution incidents, if the event is predicted and the public warned beforehand. • Provides better information to the public, allowing more informed choices to be made about the risk of bathing. • Improves the overall management of bathing water quality by requiring an assessment of potential sources of pollution. • Is compatible with other EU water related legislation, in particular the Water Framework Directive.		The SMP will be obliged to consider the requirements of the Directive, and ensure that it does not compromise its objectives, and that it contributes to achieving its aims.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
Water Framework Directive (2000/60/EC), (as amended by Decision 2455/2001/EC and Directives 2008/32/EC, 2008/105/EC and 2009/31/EC.	Aims to improve water quality and quantity within rivers, estuaries, coasts and aquifers. Aims to prevent the deterioration of aquatic ecosystems and associated wetland by setting out a timetable until 2027 to achieve good ecological status or potential. Member States are required to manage the effects on the ecological quality of water which result from changes to the physical characteristics of water bodies. Action is required in those cases where these "hydro-morphological" pressures are having an ecological impact which will interfere with the ability to achieve WFD objectives. The following Directives have been subsumed into the Water Framework Directive : • The Drinking Water Abstraction Directive • Sampling Drinking Water Directive • Exchange of Information on Quality of Surface Freshwater Directive • Shellfish Directive • Freshwater Fish Directive • Groundwater (Dangerous Substances) Directive • Dangerous substances Directive	• Identification and establishment of individual river basin districts. • Preparation of individual river basin management plans for each of the catchments. These contain the main issues for the water environment and the actions needed to deal with them. • Establishment of a programme of monitoring water quality in each RBD. • Establishment of a Register of Protected Areas (includes areas previously designated under the Freshwater Fish and Shellfish Directives which have become sites designated for the protection of economically significant aquatic species under WFD and placed on the Protected Areas register). • Promotion of sustainable management of the water environment by carefully considering current land use and future climate scenarios, minimising the effects of flooding and drought events and facilitating long term improvements in water quality, including the protection of groundwater near landfill sites, as well as minimising agricultural runoff.		The SMP will be obliged to consider the requirements of the WFD, and ensure that it does not compromise its objectives, and that it contributes to achieving its aims.
Marine Strategy Framework Directive (2008/56/EC).	• Establishes a framework whereby the necessary measures are undertaken to achieve or maintain good environmental status in the marine environment.	• Preparation of an assessment of the current environmental status of the waters concerned and the environmental impact of human activities.		The SMP will have regard to this Directive and seek to contribute, where possible, towards the achievement of its objectives.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
	• Requires the development and implementation of marine strategies in order to protect and preserve the marine environment, prevent its deterioration or, where practicable, restore marine ecosystems in areas where they have been adversely affected. • It aims to prevent and reduce inputs in the marine environment, with a view to phasing out pollution as defined in Article 3(8), so as to ensure that there are no significant impacts on or risks to marine biodiversity, marine ecosystems, human health or legitimate uses of the sea.	• Establishment of a series of environmental targets and associated indicators. • Development of a programme of measures designed to achieve or maintain good environmental status. • Establishment of a monitoring programme for ongoing assessment and regular updating of targets. • Cooperation with transboundary Member States to implement these measures.		
Floods Directive (2007/60/EC)	This Directive provides a framework for the assessment and management of flood risks, aiming to reduce the adverse consequences associated with flooding for human health, the environment, cultural heritage and economic activity.	Member States must: • assess the risk of flooding of all water courses and coast lines, • map the flood extent and assets and humans at risk in these areas at River Basin level and in areas covered by Article 5(1) and 13(1); and • implement flood risk management plans and take adequate and coordinated measures to reduce this flood risk. Member States were required to first carry out a preliminary assessment by 2011 to identify the river basins and associated coastal areas at risk of flooding. For such zones they were then required to draw up flood risk maps by 2013 and establish flood risk management plans focused on prevention, protection and preparedness by the end of 2015. The public were informed and allowed to participate in the planning process. This process must then be repeated on a 6 year cycle.		The SMP will need to be aware of areas identified as being at risk of flooding, and should not contribute to flood risk. Through the Flood Risk Management (Scotland) Act 2009, the SMP will feed into and support the Solway Local Plan District (LPD 14) draft Flood Risk Management Plans 2022-2028, by informing how to best manage risk in the coastal areas of the Plan.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
EU Maritime Spatial Planning Directive [2014/89/EU]	Establishes a framework for Marine Spatial Planning (MSP), aimed at promoting the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources.	• Requires the 22 coastal Member States to develop a national maritime spatial plan at the latest by 31 March 2021, with a minimum review period of 10 years. These maritime spatial plans must identify all existing human activities and the most effective way of managing them, and must include the following, as a minimum requirement: • Take into account interactions between the sea and land; • Establish appropriate cross-border cooperation between Member States; • Establish means of public participation for stakeholders, authorities and the public concerned; • Use of the best available data and organise the sharing of information between stakeholders.		The SMP should have regard to this Directive and to Scotland's National Marine Plan for any flood defence infrastructure options proposed within the marine environment.
EU Thematic Strategy for Soil Protection [COM(2006) 231]	Highlights a need for action to prevent the ongoing deterioration of Europe's soils. The Soil Thematic Strategy would seek to: • Establish common principles for the protection and sustainable use of soils; • Prevent threats to soils, and mitigate the effects of those threats; • Preserve soil functions within the context of sustainable use; and • Restore degraded and contaminated soils to approved levels of functionality.	• Objective of integrating soil protection into other EU policies, including agriculture and rural. • Promotion of rehabilitation of industrial sites and contaminated land.		The SMP should take into account the provisions for soil protection set out in the framework.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
World Heritage Convention [WHC-2005/WS/02]	Objectives seek to ensure the identification, protection, conservation, presentation and transmission to future generations of cultural and natural heritage and ensure that effective and active measures are taken for these. The Convention recognises the way in which people interact with nature and encourages signatories to integrate the protection of cultural and natural heritage into regional planning programmes, set up staff and services at their sites, undertake scientific and technical conservation research and adopt measures which give this heritage a function in the day-to-day life of the community.	• Establishment of measures for the protection of monuments of national importance by virtue of the historical, architectural, traditional, artistic or archaeological interest attaching to them. Includes the site of the monument, the means of access to it and any land required to preserve the monument from injury or to preserve its amenities. • World Heritage Sites in Scotland are specific locations that have been included in the UNESCO World Heritage Programme list of sites of outstanding cultural or natural importance to the common heritage of humankind. Six such sites in Scotland have been designated.		The SMP should consider sites of cultural and natural heritage and ensure they are protected from loss or damage resulting from flood defence infrastructure.
Granada Treaty (1985)	Convention for the Protection of the Architectural Heritage of Europe (Granada, 1985). The main purpose of the Convention is to reinforce and promote policies for the conservation and enhancement of Europe's heritage. It also affirms the need for European solidarity with regard to heritage conservation and is designed to foster practical co-operation among the Parties.	• Conservation of European architectural heritage.		The SMP should consider architectural heritage and ensure it is protected from loss or damage resulting from any flood defence infrastructure plans. The SMP should look to enhance architectural heritage where possible.
Valletta Treaty (1992)	Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valletta, 1992), known informally as the Valletta Treaty. This Treaty aims to protect European archaeological heritage "as a source of European collective memory and as an instrument for historical and scientific study".	The Treaty: • Sets guidelines for the funding of excavation and research work and publication of research findings; • Deals with public access, in particular to archaeological sites, and educational actions to be undertaken to develop public awareness of the value of archaeological heritage;		The SMP should consider archaeological heritage sites and ensure they are protected from loss or damage resulting from any flood defence infrastructure plans.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
		• Constitutes an institutional framework for pan-European co-operation on archaeological heritage, entailing a systematic exchange of experience and experts among the various States; • The Committee responsible for monitoring the application of the Convention assumes the role of strengthening and co-ordinating archaeological heritage policies in Europe.		
European Landscape Convention [ETS No. 176]	• Promotion of the protection, management and planning of European landscapes and organising European co-operation on landscape issues. • Applies to the entire territory of the Parties and covers natural, rural, urban and peri-urban areas. • Inclusion of landscapes that might be considered outstanding as well as everyday or degraded landscapes. • Aimed at the protection, management and planning of all landscapes and raising awareness of the value of a living landscape. • Complements the Council of Europe's and UNESCO's heritage conventions.	• Respond to the public's wish to enjoy high-quality landscapes and to play an active part in the development of landscapes. • Each administrative level (national, regional and local) should draw up specific and / or sectoral landscape strategies within the limits of its competences. These are based on the resources and institutions which, when co-ordinated in terms of space and time, allow policy implementation to be programmed. The various strategies should be linked by landscape quality objectives.		The SMP could potentially have implications on landscapes and visual amenity. Any flood defence infrastructure should be planned to avoid sensitive landscapes.
Waste Framework Directive [2008/98/EC]	• Sets the basic concepts and definitions related to waste management, such as definitions of waste, recycling, recovery. • Explains when waste ceases to be waste and becomes a secondary raw material (so called end-of-waste criteria), and how to	The Directive requires that: • Waste is managed without endangering human health • Waste is managed without harming the environment. • Waste is managed without harming water, air, soil, plants or animals.		The SMP should consider the implications of this Directive with developmental infrastructure options within the Plan which are likely to result in waste being generated.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
	distinguish between waste and by-products.	• Waste does not cause a nuisance a nuisance through noise or odours, or to countryside or places of special interest.		
National				
The 2020 Challenge	• Focuses on the desired outcomes for 2020, and is Scotland's response to the European Biodiversity Strategy for 2020 and the UN 'Aichi' targets	• Shows how the Scottish Government, its public agencies, Scottish business and others can contribute to the Strategy's aims as well as supporting sustainable economic growth.	European Biodiversity Strategy for 2020. UN 'Aichi' targets.	The SMP should have regard for the strategic aims of this document and, wherever possible, seek to preserve and protect Scotland's biodiversity.
Scotland's Biodiversity: It's in Your Hands	• Sets out how the government will conserve biodiversity for the health, enjoyment and wellbeing of the people of Scotland, now and in the future.	• The Strategy set out a vision for 2030, as well as objectives and desired outcomes to achieve this.	UN Convention on Biological Diversity (1992) Strategic Plan 2011 to 2020 "Living in Harmony with Nature". European Biodiversity Strategy for 2020.	The SMP should have regard for the objectives of this strategy, and seek to contribute towards its desired outcomes, where possible.
The Wildlife and Natural Environment (Scotland) Act 2011	• Modernises existing legislation and extends the regime for controlling non-native and invasive species.	• Introduces new regime for regulating invasive and non-native species. • Makes changes to the licencing system for protected species. • Makes operational changes to the management of Sites of Special Scientific Interest. •	Wildlife and Countryside Act 1981 The Deer (Scotland) Act 1996	The SMP will have regard for this legislation, taking heed, in particular, of its regulation regarding protected sites and species.
The Nature Conservation (Scotland) 2004	• National strategy for the maintenance and enhancement of biological diversity, which should be integrated across other policy sectors. • Provides for a greater degree of protection for Scotland's	• Places duties on public bodies in relation to the conservation of biodiversity. • Increases protection for Sites of special Scientific Interest. • Amends legislation of Nature Conservation Orders.	UN Convention on Biological Diversity (1992) Strategic Plan 2011 to 2020 "Living in Harmony with Nature".	The SMP will be developed so as to comply with this legislation, seeking, where possible, to preserve and protect Scotland's natural environment to the greatest extent possible.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
	biodiversity and sites of conservation.	• Strengthens wildlife enforcement regulations. • Requires the government to report on progress with the strategy every three years.		
The Habitats Regulations 1994 and amendments	• Implement the species protection requirements of the Habitats Directive in Scotland on land and inshore waters (0-12 nautical miles).	• Details, and designates for protection, a number of European animal and plant species. • Introduces designated Special Areas of Conservation.	EU Habitats Directive	The SMP will have regard for the protection afforded to the species and sites designated as a result of this legislation.
Flood Risk Management (Scotland) Act 2009	• Transposes the EU Floods Directive into Scottish law, and brings Scottish flooding legislation up to date.	• The purpose of the EU Floods Directive is to establish a framework for the assessment and management of flood risk. It aims to reduce and mitigate the adverse consequences of flooding on human health, environment, cultural heritage, and economic activity.	EU Floods Directive	The SMP will seek to comply with the objectives of this legislation. The SMP will feed into and support the Solway Local Plan District (LPD 14) draft Flood Risk Management Plans 2022-2028, by informing how to best manage risk in the coastal areas of the Plan.
Natural Flood Management Handbook 2015	• A practical guide to flood risk management measures which work with natural features and processes to manage the sources and pathways of flood waters (natural flood management).	• To provide guidance in relation to an approach to flood risk management which is more sustainable than traditional methods such as hard defences. To encourage investment into natural flood management measures.		The objectives and policies of the SMP will seek to support natural coastal processes and deliver projects that include NFM measures.
Scotland's National Marine Plan 2015	• Provides a consistent framework for the continued operation of existing marine regulatory and legislative requirements. It covers the management of both Scottish inshore and offshore waters (12 to 200 nautical miles) and was prepared in accordance with the EU Directive 2014/89/EU.	• To ensure that increasing demands for the use of the marine environment are managed, that the economic development of marine industries is encouraged and that environmental protection is incorporated into marine decision making.	Marine (Scotland) Act	The SMP will have regard for the principles and objectives of the National Marine Plan and will aspire to contribute towards their achievement.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
A Guide to Managing Coastal Erosion in Beach / Dune Systems	• Provides guidance in relation to the options available for managing coastal erosion.	• To assist in the practical management of marine erosion along dunes and beaches.		The SMP will have consideration for this guidance and will seek to adhere to best practice where applicable.
Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended)	• Applies regulatory controls over activities which may affect Scotland's water environment, including rivers, lochs, transitional waters (estuaries), coastal waters, groundwater and groundwater-dependent wetlands.	• Aims to control impacts on the water environment, including mitigating the effects on other water users.		The SMP will have regard for these regulations and will seek to comply with their objectives to limit adverse impacts upon the water environment.
Water Environment and Water Services (Scotland) Act 2003	• Transposes the EU Water Framework Directive into Scottish law. • The Act gives Scottish Ministers powers to introduce regulatory controls over certain activities in order to protect and improve Scotland's water environment.	• Part 1 relates to protection of the water environment and to the implementation of the WFD to protect and improve the water environment, to promote sustainable water use, reduce discharges of priority substances and cease discharges of priority hazardous substances, and to contribute to mitigating the effects of floods and droughts. • Part 2 covers issues relating to the provision of water and sewerage services. • Part 3 deals with the making of orders and regulations under the Act.	EU Water Framework Directive	The SMP will seek to comply with the objectives of this legislation.
The Marine (Scotland) Act 2010	• Introduces a duty to protect and enhance the marine environment and includes measures to help boost economic investment and growth in areas such as marine renewables.	• Introduces new marine planning system • Minimises the number of licences required for development within the marine environment. • Introduced new powers to protect and manage areas of importance for marine life.		The SMP will seek to comply with the objectives of this legislation.
The River Basin Management Plan for the Scotland	• Scotland's route map for protecting and improving the water environment of the Scotland river basin district.	• To provide an understanding of the present condition of the Scotland River Basin District.		The SMP will have consideration for the Plan and will seek, where possible, to protect and enhance the quality

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
River Basin 2015 - 2027				of the Scottish River Basin District.
Scottish Planning Policy 2014	• A statement of Scottish Government policy on how nationally importance land use planning matters should be addressed across the country.	• Sets out national planning policies that reflect Scottish Ministers' priorities for operation of the planning system and for the development and use of land.	Town and Country Planning (Scottish) 1997 Act National Planning Framework for Scotland	The SMP will have regard for the principles of this policy document relating to climate change and flood risk. It will seek to adhere to said principles to the greatest extent possible.
Low Carbon Scotland: Meeting our Emissions Reduction Targets 2013-2027	• Sets out how Scotland can deliver its statutory annual targets for reduction in greenhouse gas emissions for the period 2013-2027 set through the Climate Change (Scotland) Act 2009.	• Seeks to achieve the objectives of the Climate Change (Scotland) Act 2009 and related polices in a manner which is just and sustainable and which promoted good governance and the responsible use of sound science.	Climate Change Scotland) Act 2009	The SMP will have regard for national and international objectives featured and referred to within this document. It will seek to contribute towards the achievements of these objectives; supporting, where possible, the measures which have been developed and set out within this document.
Climate Ready Scotland: climate change adaptation programme 2019-2024'.	Presents a national, co-ordinated approach to climate change; setting out the risks and opportunities associated with such. It further provides an overarching framework for the Sector Action Plans.	Aims to lead planned adaptation across all sectors to increase the resilience of Scotland's communities, and the natural and economic systems on which they depend, to the impacts of climate change.	Climate Change (Scotland) Act 2009	The SMP will have regard for the risks and opportunities addressed within this framework. It will seek, where possible, to contribute towards its objectives and those to which it refers.
Climate Change (Scotland) Act 2009	• Establishes the statutory framework for greenhouse gas emissions reductions in Scotland.	• Seeks to reduce GHG emissions in Scotland by 42% by 2020 and 80% by 2050.		The SMP will have regard to this climate change strategy to contribute towards the achievement of the objectives of the regulatory framework.
The Climate Change (Annual Targets) (Scotland) Order 2010	• Sets the first batch of annual emissions reduction targets, for the period 2010-2022.	• Sets the first batch of annual emissions reduction targets, for the period 2010-2022.	Climate Change (Scotland) Act 2009	The SMP will have regard to the targets outlined within this order and will remain conscientious of the need to limit the emission of

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
				CO_2 with regard to the measures it proposes.
The Scottish Soil Framework 2009	• Sets out the vision for soil protection in Scotland.	• Seeks to promote the sustainable management and protection of soils consistent with the economic, social and environmental needs of Scotland.	The EU's Seventh Environmental Action Programme.	The SMP will have regard for the implications of any proposed measures upon the soils within the Study Area. It will seek, where possible, to minimise any detrimental impact(s) which proposed measures may have upon soil quality.
The Land Reform (Scotland) Bill 2015	• Seeks to enhance the relationship between the people of Scotland and the land by way of enhancing Scottish land rights.	• Requires the Scottish Government to publish a statement on land rights and responsibilities every five years. • Established the Scottish Land Commission. • Aims to promote better collaboration and engagement between landowners and communities.		The SMP will respect the land rights of the local community.
Land Use Strategy 2016-2021	• A strategic policy framework for land use.	• Land-based businesses working with nature to contribute more to Scotland's prosperity. • Responsible stewardship of Scotland's natural resources. • Urban and rural communities better connected to the land.	Climate Change (Scotland) Act 2009	The SMP will be developed in accordance with the objectives of this framework.
The Planning etc. (Scotland) Act 2006	• Establishes the foundations for the National Planning Framework. • Expands upon and amends existing planning legislation.	• Provides for the designation of National Scenic Areas (NSAs).	Town and Country Planning (Scotland) Act 1997	There are several NSAs within the Study Area. The SMP will have regard to these, and will seek to minimise any such negative impacts which might occur as a result of the Plan.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
The National Planning Framework 2015	• Sets the context for development planning in Scotland, and provides a framework for the spatial development of Scotland as a whole.	• To support economic growth, regeneration and the creation of well-designed places. • To reduce carbon emissions and adapt to climate change. • To protect and enhance Scotland's natural cultural assets.	The Town and County Planning (Scotland) Act 1997 The Planning etc. (Scotland) Act 2006	The SMP will have regard to the Framework, and will seek to contribute towards the achievement of its objectives.
Planning Advice Notes and Circulars	• PANS provide advice in relation to various subjects relating to planning.	• To provide guidance in relation to planning and environmental issues / subjects.	Scottish Planning Policy	The SMP will seek to adhere to the good practice guidelines set out within PANs and circulars.
Equally Well 2008	• A public health strategy for Scotland with a focus on health inequalities.	• Aims to reduce people's exposure to factors in the physical and social environment that cause stress, damage health and wellbeing and lead to inequalities.		The SMP will have regard for the health of the population, both locally and on a regional scale. It will seek, wherever possible, to improve the health of the population and reduce any associated inequalities.
Good Places, Better Health: A New Approach to Environment and Health in Scotland 2008	• The Scottish Government's strategy on health and the environment.	• Aims to create environments free from significant hazards and to create positive physical environments which nurture better health and wellbeing.		The SMP recognises the need to create safe and positive environments for health. It will endeavour to provide for such environments, wherever possible.
Our Place in Time: The historic environment strategy for Scotland 2014	• Overarching strategy for the protection and promotion of the historic environment in Scotland.	• To provide ambition and direction for Scotland's historic environment.		The SMP will seek to provide for the conservation of relevant historic environment assets and areas of cultural significance.
Historic Environment Scotland Policy Statement (HEPS, 2016)	• Sets out how Historic Environment Scotland fulfils its regulatory and advisory roles and how it expects others to interpret and implement Scottish Planning and Policy.	• Highlights the necessity, and approach, of HES in relation to the preservation of Scotland's historic environment. • Identifies principles of conservation of Scotland's historic environment.		The SMP will seek to provide for the conservation of relevant historic environment assets and areas of cultural significance in line with the advice given as part of this statement.

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		• Emphasises the approach to be taken by relevant bodies with responsibilities for any aspect of the historic environment.		
Managing Change in the Historic Environment Guidance Notes	• A series of guidance notes from HES regarding the making of changes to the historic environment.	• These guidance notes help to guide changes to the historic environment, in line with HEPS and SPP. • Each Managing Change guidance note looks at a different theme in terms of: • The key issues that might arise • How best to deal with such issues • The reasons behind our advice.		The SMP will seek to provide for the conservation of relevant historic environment assets and areas of cultural significance in line with the advice given as part of this guidance.
Tourism Scotland 2020	• The national tourism strategy for Scotland, aiming to make Scotland a "first-choice destination for a high quality, value for money and memorable customer experience delivered by skilled and passionate people".			The SMP will have regard to this strategy and will aim to (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.
Regional / Sub-Regional				
Ayrshire Shoreline Management Plan 2018	• Established a robust, evidence-based and long-term sustainable approach for managing the risk of coastal flooding and erosion along each part of the Ayrshire coast.	• To develop an understanding of coastal issues and identify where further work may be required to mitigate flooding and erosion by highlighting constraints and opportunities for sustainable use of the coastal zone.		The SMP will have regard to this plan and will aim to (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.
Dumfries & Galloway Local Development Plan 2 (LDP2) 2019	• Statutory document which provides detailed planning policies to ensure proper planning and sustainable development of area. • Sets out objectives for future planning and development.	• Identifies issues of relevance to the area and outlines principles for future development of area. • Is consistent with relevant Development Plans, Spatial Strategies and Planning Guidelines.		The SMP will have regard to this plans and will (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
				Future iterations of the LDP should have regard to the SMP for future planning zones and proposed development areas.
Dumfries & Galloway Shoreline Management Plan Study: Stage 1 2005	• Established a robust, evidence-based and long-term sustainable approach for managing the risk of coastal flooding and erosion along each part of the Dumfries & Galloway coast.	• To develop an understanding of coastal issues and identify where further work may be required to mitigate flooding and erosion by highlighting constraints and opportunities for sustainable use of the coastal zone.	Flood Risk Management (Scotland) Act 2009	The SMP being assessed in this SEA Environmental Report is an update to the 2005 SMP, with the aim of further developing the understanding of flooding, coastal erosion, wave overtopping and the current coastal protection along the Solway coastline.
Cumbria Coastal Strategy 2020	• Established a robust, evidence-based and long-term sustainable approach for managing the risk of coastal flooding and erosion along each part of the Cumbria coast.	• To develop an understanding of coastal issues and identify where further work may be required to mitigate flooding and erosion by highlighting constraints and opportunities for sustainable use of the coastal zone.	Flood Risk Regulations 2009	The SMP will have regard to this plan and will aim to (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.
Solway Local Plan District (LPD 14) Draft Flood Risk Management Plans 2022-2028	• As a response to the Flood Risk Management (Scotland) Act 2009, local authorities are working to prepare localised flood management plans and flood risk assessments. Draft plans for 2022-2028 have been developed for the Solway Local Plan District.	• The flood risk management plan has been developed in collaboration with other public agencies to present flood risk management objectives. Actions needed to meet these objectives are identified for target communities and infrastructure.	Flood Risk Management (Scotland) Act 2009	The SMP will reflect and contribute to this draft FRMP.
Dumfries & Galloway Local Biodiversity Action Plan 2009	• Aims to protect, conserve, enhance and restore biodiversity and ecosystem services across all spectrums.	• Outlines the status of biodiversity and identifies species of importance. • Outlines objectives and targets to be met to maintain and improve biodiversity. • Aims to increase awareness.		The SMP will have regard to this plans and will (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.
Dumfries & Galloway Council	• Brings together background information, statistics and trends in	• Provides a foundation for predicting and monitoring environmental and other		The assessment of the SMP in this SEA Environmental Report

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
State of the Environment Report 2017	respect of the region of Dumfries & Galloway and includes the most up-to-date information available on the environment	effects and helps to identify problems and alternative ways of dealing with them.		will have regard for the baseline environmental data and statistics presented in this report.
Dumfries Conservation Area Character Appraisal and Management Plan (2018)	• Aims to highlight the importance of heritage at a strategic level.	• Manage and promote heritage as well as increase awareness. • Aim to conserve and protect heritage.		The SMP will have regard to these plans, and will (in combination with other users and bodies) cumulatively contribute towards the achievement of their objectives.
Stranraer Conservation Area Character Appraisal and Management Plan (2018)				
Whithorn Conservation Area Character Appraisal and Management Plan (2018)				
Kirkcudbright Conservation Area Character Appraisal (2014)				
Gatehouse of Fleet Conservation Area Character Appraisal (2014)				
Annan Conservation Area				

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
Character Appraisal (2014) **Crichton Conservation Area Character Appraisal (2016)**				
Caring for the Built Environment – Conservation Area Guidance, Dumfries & Galloway Council (2001)	• The primary aim of this guidance is to help ensure that new development and work to older buildings in the conservation area enhance or preserve the character or appearance of the area.	• Provides guidance and advice on how development within conservation areas should proceed. • Sets out the approach that the Council will adopt in its stewardship of conservation areas, through the planning control process or by direct investment in road and other schemes.		The SMP will seek to provide for the conservation of relevant historic environment assets and areas of cultural significance in line with the advice given as part of this guidance.
Dumfries & Galloway Regional Tourism Strategy 2016-2020	• Aims to guide, change and grow the value, volume and resilience of the tourism sector in Dumfries & Galloway.	• The strategy aims to make Dumfries & Galloway the destination of choice for quality, value and memorable experiences, delivered by skilled and passionate hosts. This will be delivered through three core themes: • Providing authentic Experiences through all year events and hospitality • Improving the customer journey by providing a consistently high customer experience • Building our capabilities by developing a resilient, advised and collaborative network of businesses and organisations.		The SMP will have regard to this strategy and will aim to (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.
Dumfries & Galloway Carbon Management Plan 2 (CMP2) and Climate Change Action Plan 2012	• The aim of the CMP2 is to reduce the Council's carbon footprint by integrating carbon and energy management into its strategies and operational procedures.	• Areas targeted for reducing emissions include: • Council buildings including schools • Street lighting • Transport		The SMP will have regard to this Plan to contribute towards the achievement of the objectives.

Plan / Programme	High Level Description	Key Objectives, Actions etc.	Relevant Legislation	Relevance to the Plan
		• Waste • Water • In line with the Climate Change (Scotland) Act 2009 the council have pledged to reduce carbon emissions.		
Draft North West Inshore and North West Offshore Marine Plan 2020	• Provides a framework that will shape and inform decisions over how the areas' waters are developed protected and improved over the next 20 years.	• One of four marine plans developed for English waters, which covers an area of around 7,100km^2 of inshore and offshore waters from the Solway Firth border with Scotland to the River Dee border with Wales.		The SMP will have regard to this strategy and will aim to (in combination with other users and bodies) cumulatively contribute towards the achievement of its objectives.

APPENDIX E

SEA Scoring Guidelines

Topic	Objective	Score	Score Description	Example of Effects
Biodiversity, Flora and Fauna	Avoid damage to, and where possible enhance, the biodiversity, flora and fauna in the vicinity of the shoreline.	+3	Significant Positive Effects	Potential for increased protection for, or enhancement of, internationally designated sites.
		+2	Moderate Positive Effects	Potential for increased protection for, or enhancement of, nationally designated sites.
		+1	Slight Positive Effects	Potential for enhancement of, or increased protection for, locally protected sites / species. Potential for biodiversity net gain.
		0	Neutral / No Effects	No effects on protected international, national or local sites / species.
		-1	Slight Negative Effects	Potential for disturbance or damage to locally protected sites / species, or other known species of conservation concern.
		-2	Moderate Negative Effects	Potential for disturbance or damage to nationally protected sites.
		-3	Significant Negative Effects	Potential for disturbance or damage to internationally protected sites.
Population and Human Health	Protect the public from risk of flooding and coastal erosion and avoid significant social effects on the population / community.	+3	Significant Positive Effects	Significant reduction in the proportion of the population / community at risk of flooding / erosion.
		+2	Moderate Positive Effects	Moderate reduction in the proportion of the population / community at risk of flooding / erosion.
		+1	Slight Positive Effects	Slight reduction in the proportion of the population / community at risk of flooding or erosion / erosion.
		0	Neutral / No Effects	No change in the proportion of the population / community at risk of flooding / erosion. No social effects on the population / community.
		-1	Slight Negative Effects	Slight increase in the proportion of the population / community at risk of flooding / erosion. Social effects on a small proportion of the population / community.
		-2	Moderate Negative Effects	Moderate increase in the proportion of the population / community at risk of flooding / erosion. Social effects on a moderate proportion of the population / community.
		-3	Significant Negative Effects	Significant increase in the proportion of the population / community at risk of flooding / erosion. Social effects on a significant proportion of the population / community.
Geology, Soils and Land Use	Avoid damage to, and where possible enhance, areas of geological importance and existing functional soil and land resource.	+3	Significant Positive Effects	Gain of new soil or land resource that is protected from coastal flooding / erosion. Protection of nationally designated earth science features.
		+2	Moderate Positive Effects	No loss of existing soil and land resource from coastal flooding / erosion. Protection of areas of soil and land resource that are contaminated.
		+1	Slight Positive Effects	Reduction in the area of existing soil and land resource at risk from coastal flooding / erosion.
		0	Neutral / No Effects	No change in the area of existing soil and land resource at risk from coastal flooding / erosion. No effects on designated earth science features.
		-1	Slight Negative Effects	Slight loss of soil or land resource from coastal flooding / erosion.

Topic	Objective	Score	Score Description	Example of Effects
		-2	Moderate Negative Effects	Moderate loss of soil or land resource from coastal flooding / erosion. Potential for mobilisation of contaminated soils from coastal flooding / erosion.
		-3	Significant Negative Effects	Significant loss of soil or land resource from coastal flooding / erosion. Potential for damage to nationally designated earth science features.
Water	Protect and enhance the state of the water environment.	+3	Significant Positive Effects	Potential improvement of coastal / transitional water body overall WFD status.
		+2	Moderate Positive Effects	Potential for regional improvement of coastal / transitional water quality or removal of man-made structures for natural coastal morphology. Decreased potential impediment to the achievement of waterbody objectives under the WFD.
		+1	Slight Positive Effects	Potential for localised improvement of coastal / transitional water quality.
		0	Neutral / No Effects	No effects on local water quality or the status of coastal / transitional water bodies.
		-1	Slight Negative Effects	Potential for short term or infrequent adverse effects on coastal / transitional water quality.
		-2	Moderate Negative Effects	Potential for permanent or frequent adverse effects on coastal / transitional water quality. Adverse effects on water body morphology with increased man-made structures. Increased potential impediment to the achievement of water body objectives under the WFD.
		-3	Significant Negative Effects	Potential deterioration of coastal / transitional water body overall WFD status.
Climatic Factors	Adaptation to potential climatic change.	+3	Significant Positive Effects	Shoreline allowed to react naturally to climatic change, with no impact on receptors.
		+2	Moderate Positive Effects	SMP policies adaptable to climatic change at minimal cost.
		+1	Slight Positive Effects	SMP policies adaptable to climatic change and benefit outweighs cost.
		0	Neutral / No Effects	No interaction with climatic change
		-1	Slight Negative Effects	SMP policies adaptable to climatic change but with cost: benefit that is marginal. Likely to require moderate engineering.
		-2	Moderate Negative Effects	SMP policies adaptable to climatic change but with cost: benefit that is significant. Likely to require significant engineering.
		-3	Significant Negative Effects	SMP policies not adaptable to climatic change in the long term. Technically unfeasible.
Material Assets and Infrastructure	Protect material assets and infrastructure from risk of	+3	Significant Positive Effects	Significant reduction in the number of material assets / infrastructure at risk of flooding / erosion.
		+2	Moderate Positive Effects	Moderate reduction in the number of material assets / infrastructure at risk of flooding / erosion.

Topic	Objective	Score	Score Description	Example of Effects
	flooding and coastal erosion.	+1	Slight Positive Effects	Slight reduction in the number of material assets / infrastructure at risk of flooding / erosion.
		0	Neutral / No Effects	No change in material assets / infrastructure at risk of flooding / erosion.
		-1	Slight Negative Effects	Slight increase in the risk of flooding / erosion to material assets / infrastructure.
		-2	Moderate Negative Effects	Moderate increase in the risk of flooding / erosion to material assets / infrastructure.
		-3	Significant Negative Effects	Significant increase in the risk of flooding / erosion to material assets / infrastructure.
Cultural, Architectural and Archaeological Heritage	Protect or, where appropriate, enhance historic environment features and their settings.	+3	Significant Positive Effects	Significant reduction in the number of designated heritage features, or their settings, at risk of coastal flooding / erosion.
		+2	Moderate Positive Effects	Moderate reduction in the number of designated heritage features, or their settings, at risk of coastal flooding / erosion.
		+1	Slight Positive Effects	Slight reduction in the number of designated heritage features, or their settings, at risk of coastal flooding / erosion.
		0	Neutral / No Effects	No change in the number of designated heritage features, or their settings, at risk of coastal flooding / erosion. No loss or damage to designated heritage features from construction / operation of SMP policies.
		-1	Slight Negative Effects	Slight increase in the number of designated heritage features at risk of coastal flooding / erosion. Potential for adverse effects on a small number of designated heritage features, or their settings, from construction / operation of SMP policies.
		-2	Moderate Negative Effects	Moderate increase in the number of designated heritage features at risk of coastal flooding / erosion. Potential for adverse effects on a moderate number of designated heritage features, or their settings, from construction / operation of SMP policies.
		-3	Significant Negative Effects	Significant increase in the number of designated heritage features at risk of coastal flooding / erosion. Potential for adverse effects on a significant number of designated heritage features, or their settings, from construction / operation of SMP policies.
Landscape and Visual Amenity	Protect, and where possible enhance, the landscape and seascape character and visual amenity of the Dumfries & Galloway shoreline.	+3	Significant Positive Effects	Permanent enhancement of designated landscapes and views, the landscape / seascape and visual amenity of the Dumfries & Galloway shoreline. Many receptors.
		+2	Moderate Positive Effects	Potential localised improvement of landscape / seascape and visual amenity. Several receptors.
		+1	Slight Positive Effects	Potential improvement of local views. Few receptors.
		0	Neutral / No Effects	No effects of SMP policies on landscape / seascape quality and visual amenity.
		-1	Slight Negative Effects	Short term / disturbance effects on local views and the local landscape / seascape. Few receptors.
		-2	Moderate Negative Effects	Potential localised adverse effects on, and deterioration of, the landscape / seascape and visual amenity. Several receptors.

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Topic	Objective	Score	Score Description	Example of Effects
		-3	Significant Negative Effects	Permanent adverse effects on, and deterioration of, designated landscapes and views, the landscape / seascape quality and visual amenity of the Dumfries & Galloway shoreline. Many receptors.