Dumfries and Galloway Council

Strategic Flood Risk Analysis

Introduction

The Strategic Flood Risk Assessment (SFRA) for Dumfries and Galloway follows the Guidance for Planning Authorities on Strategic Flood Risk Assessment v2 (May 2025) produced by the Scottish Environmental Protection Agency (SEPA) and aims to provide a strategic overview of existing and future flood risk in the region. The SFRA will inform the third Local Development Plan (LDP3) by collating existing information to support the allocations of land for development which will not increase overall flood risk.

The SEPA guidance recommends the following methodology to form the SFRA:

1. **Gather available information** – The sources listed in the table in the SEPA guidance form the basis of this SFRA with additional local input from the Dumfries and Galloway Council Flood Risk Management Team.
2. **Gap analysis** – The Flood Risk Management Team aided in identifying and filling the gaps in the initial sweep for information, which included surface water management information, a statement regarding natural flood management and clarification of proposed and ongoing work, as well as information regarding existing flood defences.
3. **Prepare the outputs** – As pointed out in the SEPA guidance, this SFRA is a snapshot in time and will be kept under review as new and improved data becomes available.
4. **Discuss with SEPA** - Early draft discussion with SEPA highlighted areas where the inclusion of additional weblinks to published studies or scheme proposals could provide further spatial context. Engagement with SEPA has also highlighted that the SFRA could be a useful tool after submission of the Evidence Report, in the next stage of the Local Development Plan (LDP3) and beyond.

This SFRA will support the policy intent of National Planning Framework 4 (NPF4), in particular Policy 22: Flood Risk and Water Management to "*strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding*" by enabling the Council to:

- Identify areas of flood risk in the region
- Identify areas where climate change results in unmanageable flood exposure, resulting in the need for alternative land use
- Inform blue/green infrastructure strategy
- Inform the Strategic Environmental Assessment of the LDP

Flood Hazard Maps

Areas of land at risk of flooding from rivers (fluvial), surface (pluvial), and coastal water sources have been mapped by SEPA. SEPA supplies the latest data available to planning authorities in a format that is compatible with local authority GIS systems and released Flood Map Version 3.0 in March 2025. These maps are intended as an initial screening tool to identify areas at risk from flooding.

The river flooding risk map layer shows flooding from watercourses with catchment areas over 3km² and includes hydraulic structures and defences such as bridges, culverts and flood storage areas where appropriate information was available.

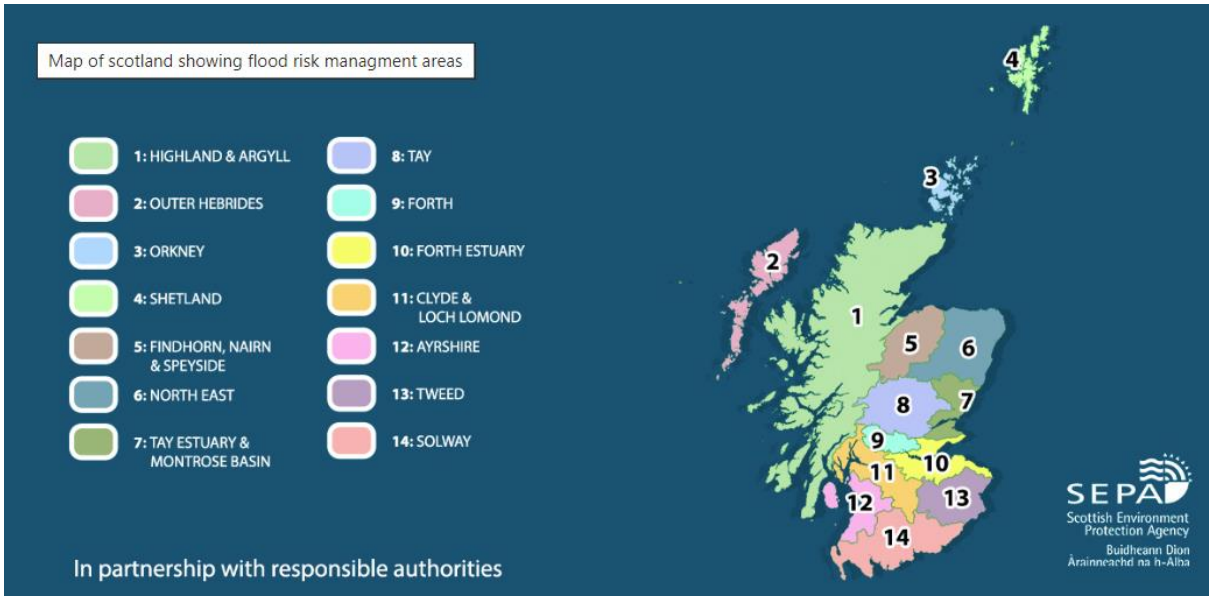
The coastal flooding risk map layer is based on the Coastal Flood Boundary dataset developed by the Environment Agency and Department for Environment, Food and Rural Affairs (DEFRA). This provides sea levels for a range of flood conditions around the coast of the UK. SEPA extended this dataset for those sections of Scottish estuaries and islands not covered by the Coastal Flood Boundary dataset. Flood extents for several return periods were then derived by projecting these water levels inland onto the maps. This map does not consider the effect of waves.

The surface water flood risk map layer 2025 update shows flooding that could be expected from heavy rain, and flood risk that may also result from small watercourses. It incorporates data from a consistent, national 2D modelling approach, updated rainfall data and climate projections, and new ground model data to more accurately represent the ground surface. This updated mapping can now show the extent of flood risk from small watercourse catchments under 3km².

The future flood risk hazard maps now also include surface water and small watercourses. The maps can be used as a screening tool at a strategic level for identifying areas at risk of flooding and show areas that may have a 0.5% chance of flooding each year, by the 2080's. The latest Climate Change Allowances for Flood Risk Assessment in Land Use Planning document should be used for flood risk assessment, with the allowances for the Solway River Basin Region shown below.

Flood Risk Management Plans

Under the Flood Risk Management (Scotland) Act 2009, SEPA are to prepare a Flood Risk Management Plan for each of the 14 catchment based districts, in consultation with Local Authorities, and other key Stakeholders. The Plans identify areas where significant flood risk exists now or is likely to occur in the future (Potentially Vulnerable Areas) and are to be updated every six years. They have been developed to ensure all efforts to reduce flood risk are coordinated, outlining the long term ambition by setting objectives for a risk based, plan led approach and identify actions to aid in reduction of flood risk. Dumfries and Galloway lies within the Solway Plan District.



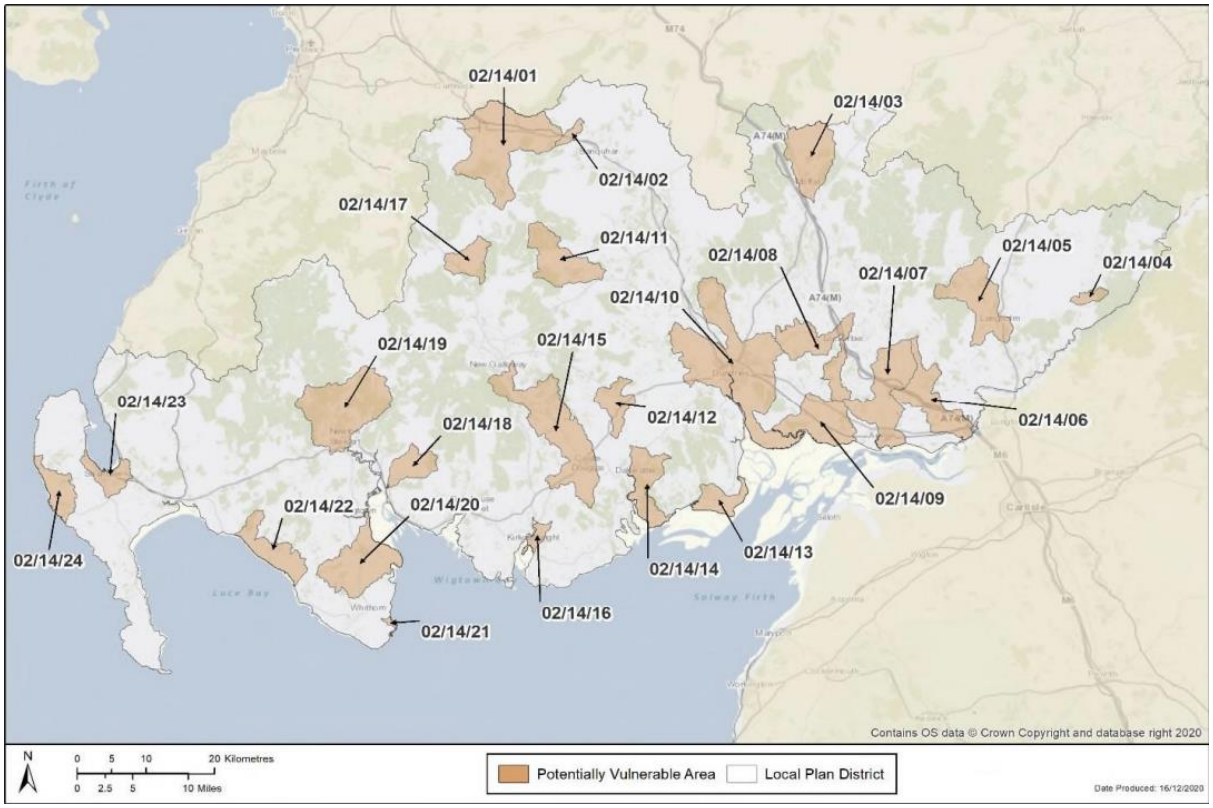
Map of Scotland's Local Plan Districts. Flood Risk Management Plans | SEPA

Dumfries and Galloway Council, as Lead Local Authority for the Solway region, have published their complementary Local Flood Risk Management Plan (LFRMP), for Cycle 2 covering period from 2022-2028, which provides more detail on how and when the actions set out the Flood Risk Management Plan will be delivered. Cycle 1 of the Solway LFRMP was published in 2015 and covered the period 2016-2022. The LFRMP covers an area of around 7,000km² extending from Drummore and Portpatrick in the west, to beyond Langholm in the east, and a coastal length of around 625km covering from Downan Point to Gretna, with many bays including Wigtown Bay and Luce Bay. It also estimates that there are currently around 16,000 people and 10,000 homes and businesses at risk from flooding, which may increase to 20,000 people and 13,000 homes and businesses by the 2080s due to climate change. The expected annual cost of flooding is around £15 million.

SEPA, and other responsible authorities, carry out key aspects of flood risk management across all areas of the Local Plan District to help manage current and future flooding for the duration of the LFRMP. The actions are related to the following topics:

- Awareness raising
- Data to support climate resilience
- Emergency plans
- Flood forecasting
- Flood warning development framework
- Future flood risk management planning
- Guidance development
- Hazard mapping updates
- Land use planning
- Maintenance
- Natural flood management mapping
- National flood risk assessment
- National surface water mapping
- Reservoirs
- Scottish flood defence asset database
- Self help

Potentially Vulnerable Areas (PVAs) are based on the potential current or future risk from all sources of flooding and were informed by the national flood risk assessment, carried out by SEPA. There are 235 PVAs throughout Scotland, and 24 in the Solway Local Plan District, as shown below, with 22 of these in the region of Dumfries and Galloway, 1 in East Ayrshire, and 1 in the Scottish Borders.



Map of Potentially Vulnerable Areas in the Solway Local Plan District

Potentially Vulnerable Areas show where the risk from flooding is highest, and the benefits of flood risk management can be maximised. PVAs account for approximately 90% of the flood risk in Scotland.

Potentially Vulnerable Areas (PVAs)	**Main source of flood risk**	**People / properties at risk from flooding (2022)**	**People / properties at risk from flooding (2080s due to climate change)**
02/14/01 **New Cumnock** East Ayrshire	River and surface water	550 people and 300 properties	610 people and 330 properties
02/14/02 **Kirkconnel** Dumfries and Galloway	River and surface water	190 people and 110 properties	230 people and 140 properties
02/14/03 **Moffat** Dumfries and Galloway	River and surface water	178 properties	228 properties
02/14/04 **Newcastleton** Scottish Borders	River and surface water	410 people and 260 properties	510 people and 320 properties
02/14/05 **Langholm** Dumfries and Galloway	River and surface water	450 people and 260 properties	720 people and 410 properties
02/14/06 **Gretna and Kirtle Water catchment** Dumfries and Galloway	River, surface water, and coastal	Eaglesfield - 20 people and 20 properties	Likely to remain the same for both settlements regardless of climate change
		Gretna – 30 people and 20 properties	
02/14/07 **Ecclefechan – Annan** Dumfries and Galloway	River, surface water, and coastal	Ecclefechan – 200 people and 140 properties	Ecclefechan - 230 people and 160 properties
		Annan – 860 people and 530 properties	Annan – 1,100 people and 670 properties
02/14/08 **Lochmaben – Lockerbie** Dumfries and Galloway	River and surface water	Lockerbie – 180 people and 120 properties	Lockerbie – 250 people and 160 properties
		Lochmaben – 110 people and 60 properties	Lochmaben – 150 people and 90 properties
		Heck and Greenhill – 40 people and 30 properties	Heck and Greenhill – 50 people and 40 properties

02/14/09 **Powfoot and Cummertrees** Dumfries and Galloway	River, surface water, and coastal	100 people and 50 homes	170 people and 90 homes
02/14/10 **Dumfries and Lower Nith catchment** Dumfries and Galloway	River, surface water, and coastal	Kirkton – 60 people and 40 properties	Kirkton - 140 people and 70 homes
		Cargenbridge – 20 people and 20 properties	Cargenbridge - Likely to remain the same regardless of climate change
		Locharbriggs – 240 people and 160 properties	Locharbriggs – 380 people and 240 properties
		Dumfries – 3,800 people and 2,300 properties	Dumfries – 5,000 people and 2,900 properties
02/14/11 **Moniaive** Dumfries and Galloway	River and surface water	60 people and 40 properties	70 people and 50 properties
02/14/12 **Springholm** Dumfries and Galloway	River – small burns within the catchment	70 people and 40 properties	100 people and 50 properties
02/14/13 **Southerness and Carsethorn** Dumfries and Galloway	River, surface water, and coastal	Southerness – 90 people and 50 properties	Southerness – 140 people and 70 properties
		Carsethorn – 30 people and 20 properties	Carsethorn – 80 people and 50 properties
02/14/14 **Dalbeattie** Dumfries and Galloway	River, surface water, and coastal	790 people and 510 properties	1,100 people and 660 properties
02/14/15 **River Dee catchment** Dumfries and Galloway	River and surface water	Bridge of Dee – 60 people and 30 properties	Bridge of Dee – 80 people and 40 properties
		Castle Douglas – 640 people and 390 properties	Castle Douglas – 850 people and 520 properties
02/14/16 **Kirkcudbright** Dumfries and Galloway	River, surface water, and coastal	610 people and 380 properties	780 people and 500 properties

02/14/17 **Carsphairn** Dumfries and Galloway	River	31 properties	32 properties
02/14/18 **Creetown** Dumfries and Galloway	River and coastal	180 people and 130 properties	220 people and 150 properties
02/14/19 **Newton Stewart** Dumfries and Galloway	River	510 people and 350 properties	650 people and 430 properties
02/14/20 **Garlieston** Dumfries and Galloway	River, surface water, and coastal	Sorbie – 40 people and 20 properties	Sorbie – 50 people and 30 properties
		Garlieston – 180 people and 100 properties	Garlieston – 230 people and 140 properties
02/14/21 **Isle of Whithorn** Dumfries and Galloway	River and coastal	110 people and 70 properties	130 people and 75 properties
02/14/22 **Port William** Dumfries and Galloway	River, surface water, and coastal	40 people and 40 properties	Likely to remain the same regardless of climate change
02/14/23 **Stranraer** Dumfries and Galloway	River, surface water, and coastal	1,000 people and 630 properties	1,300 people and 820 properties
02/14/24 **Portpatrick** Dumfries and Galloway	River, surface water, and coastal	40 people and 40 properties	Likely to remain the same regardless of climate change

Flood Defences, Schemes and Studies

There are several vulnerable areas across the region that is at risk from flooding. With continual improvements in flood modelling, updated data gathering and understanding of future flood risk, previously commissioned flood protection schemes, surveys and studies may not account for the full extent of the risk from flooding or include the most up to date Climate Change allowance requirements. These should not be considered as justification for site proposals as they are not designed for any further development protection.

Existing Defences

The **Dalbeattie** Flood Protection Scheme was completed in 1981 and consisted of flood banks, flood walls, and channel improvements to Kirkgunzeon Lane, Dalbeattie Burn and Drumjohn Burn.

The **Kirkconnel** Flood Protection Scheme was constructed in 1984 on the Polbower Burn and consisted of the installation of a concrete channel, culvert and reinforcing gabions.

The **Kirkcolm** Flood Protection Scheme was constructed in 1981 and involved channel improvements and culvert up-grades. Installation of a new headwall and trash screen occurred in 2012 along with the installation of a water level gauging station at the site of the 1981 Flood Protection Scheme.

A Flood Protection Scheme was constructed on Well Road, **Moffat** in 1989 which consisted of replacing an old mill piped scheme on the banks of the Birnock Water.

Moniaive Flood Protection Scheme (1963) consists of the realignment and widening of bed of Dalwhat Water, construction of a steel sheet pile wall and masonry wall along Dalwhat Water, and installation of pipes.

The **Portpatrick** Flood Protection Scheme was constructed in 2004 and consisted of upstream attenuation areas, channel improvements, bridge raising, a storm bypass pipe and walls.

As part of Dumfries and Galloway's Shoreline Management Plan, which is explored further below, an assessment was carried out on the region's coastal defences to aid in the further understanding of the distribution and condition of the existing assets. Shoreline Management Plan Appendix B also includes structures that protect tidally influenced river channels.

Schemes in Progress

The **Dumfries** Flood Protection Scheme and Public Realms Improvements (Whitesands) consists of a raised walkway design incorporating walls and embankments, glass panels and flood gates, looks to protect the Whitesands from flooding from the River Nith to the 1 in 25 year flood event, with additional barriers added when required to provide a 1 in 75 year flood event level of protection. As of October 2024, the project is approaching the detailed design stage.

A flood protection scheme has been developed to the outline design stage to protect properties at risk from flooding from the River Cree in **Newton Stewart**. The proposed scheme consists of walls and embankments to provide direct defences for a 1 in 200 year event standard of protection.

Studies

The **Castle Douglas** flood study from 2013 confirmed that the use of the Blackpark Pumps are most effective when the upstream water levels are kept low to enable agricultural operations to continue, and that passive water control on the Gelston Burn and the A75 may result in the stabilisation of the peak level of Carlingwark Loch.

The **Carsphairn** flood study from 2015 identified 31 properties that are at risk from flooding from the Water of Deugh. The study found that 500m of flood walls around 1m high, and 850m of flood embankments up to 1.5m high would be required to protect the flood risk areas from a 1 in 200 year event. 10 year protection would require defence heights of only around 0.2m less.

The **Dalbeattie** flood study from 2016 identified 16 properties that are at risk from flooding from the Kirkgunzeon Lane and Edingham Burn. The study recommends further work to increase the height of the Colliston Park wall/embankment and the construction of new defences along Edingham Burn to provide flood protection for 1 in 200 years plus climate change events.

The **Kirkconnel** flood study from 2016 identified 93 properties that are at risk from flooding from the River Nith and Polbower Burn. Options for providing flood defences range from property level protection, the removal of the Old Road Bridge, to the construction of direct defences. The Study includes a cost/benefit analysis which concludes that the property level protection option is the only cost-effective route to mitigate flood risk to Kirkconnel.

The **Gelston** flood study from 2013 recommended increasing the size of an existing culvert on the Gelston Burn at Rose Cottage, although there is no statutory duties to so, and the alteration of the level of the bed of the burn at this area, along with the overflow height of the connection to the former Mill Lade.

The **Moffat** flood study from 2018 identified 102 properties that are at risk from flooding from the River Annan and Birnock Water and around 50 properties were at risk of flooding from surface water from Gallow Hill. Direct defences including culverts and walls/embankments were found to provide the most effective and sustainable flood mitigation measures although, due to the possibility of the extensive works required to prevent seepage, the cost-benefit analysis did not return a favourable estimate.

The **Moniaive** flood study from 2016 identified 24 properties that are at risk from flooding from Dalwhat Water and Craigdarroch Water. The study found that the cost of the works to provide 1 in 200 year flood event protection would be significantly greater than the cost of damages from such an event.

The **Stranraer** flood study from 2011 shows that the shore front and harbour area are at risk of coastal inundation. The study's recommendations were mainly based on a masterplan for the development of the harbour area.

Natural Flood Management

Natural flood management (NFM) involves working with natural landscape features to manage the sources and routes of flood water, these techniques focus on natural features and characteristics such as storage ponds, forming wetlands, tree planting, and sediment traps. This does not include construction of flood defences with man-made materials although they may be used in tandem, for example, to reduce the height required for walls or embankments.

The five natural flood management maps provided by SEPA are intended to identify strategic areas of opportunity where natural features can be altered or restored, and to support flood risk management planning decisions. The maps can be found here and are based on the following topics:

- Run-off reduction
- Floodplain storage
- Sediment management
- Estuarine surge attenuation
- Wave energy dissipation

Dumfries and Galloway's Flood Risk Management Team have, as part of studies undertaken in support of schemes in Cycle 1 of the Solway Local Flood Risk Management Plan, looked at areas where NFM could be utilised and resultant study has shown that NFM is not considered an effective measure for reducing risk of flooding, when compared to man-made features such as walls and embankments with large areas of land take and significant funding required.

Flood Events

There have been several large floods, including in Storms Desmond and Frank in December 2015 where flooding was experienced region wide with notable incidents in Newton Stewart, Carsphairn, and Dumfries. Storm Georgina in January 2018 caused considerable damage through river flooding. In February 2019, Storm Erik caused significant damage throughout the area. Flooding in an unnamed storm in December 2022 saw the worst river flooding on record for Dumfries, Kirkton, Moniaive and other settlements linked to the River Nith catchment. Dumfries and Galloway Council holds spatial evidence of historic flood events across the local authority area, although many of these reports are anecdotal and are not verified.

Surface Water Management Plans

The Solway Local Flood Risk Management Plan (LFRMP) Cycle 1 identified the need for Surface Water Management Plans (SWMP) in Annan and Dumfries. Scottish Water have undertaken an assessment of sewer flood risk within the highest priority sewer catchments, which included the **Annan** sewer catchment, and completed a major capital investment project within Newington Park area to install flood storage tanks to reduce flood risk.

LFRMP Cycle 2 sets out that Dumfries and Galloway Council is to develop and implement a surface water management plan for **Dumfries**, working with Scottish Water as appropriate, to gain an understanding of the hotspots of flooding and potential interaction with coastal and river flooding. The impacts of climate change on flood risk should be assessed. The results of the sewer flood risk assessment of the **Troqueer** sewer catchment that is to be carried out by Scottish Water should also be considered for this SWMP.

Cycle 2 of the LFRMP also identified that Eaglesfield may benefit from a Surface Water Management Plan, but recent works have demonstrated that a SWMP is not a feasible or cost-effective method for reducing flood risk in Eaglesfield.

Shoreline Management Plan

The Dumfries & Galloway Shoreline Management Plan (SMP), which was updated as an action from the first cycle (2016-2022) of the LFRMP, establishes a robust, evidence-based and long-term sustainable approach for managing the coastal flooding and erosion risk to people and the developed, historic and natural environment along the Dumfries and Galloway coast. It further develops an understanding of coastal issues, identifies where further work may be required to mitigate flooding and erosion through the establishment of constraints and opportunities for sustainable use of the coastal zone.

The SMP was adopted by Dumfries and Galloway Council on 28 April 2023. It divides the coastline into 6 Coastal Process Units (CPU) and sub-divides it into 35 Policy Units (PU). The SMP recommends management policies and actions to be undertaken over the short (0-20 years), medium (20-50 years), and long term (50-100 years) for each Policy Unit (PU).

Extent of the Dumfries and Galloway Shoreline Management Plan

Each Policy Unit has been studied and assessed using local knowledge from the people who live in the areas and up to date scientific data, including coastal change information provided by Dynamic Scotland and coastal flood information provided by SEPA. This has allowed the key issues associated with the coast to be identified and the development of the SMP's Shoreline Management Policies, which aims to sustainably manage the shoreline into the future. Each of the 35 sections of the coast (Policy Units) has been attributed a preferred Shoreline Management Policy, (for the short, medium, and long term), which are as follows:

- **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 requires active management and construction. It should be noted that setting this policy for a section of shoreline does not represent a requirement that actions must be taken to advance the defence line, rather it indicates that these actions are considered acceptable, however it is important to note that lesser actions which will hold the existing defence line or indeed allow the coastline to retreat are also acceptable.
- **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 and may require maintenance or improvement of the standard of protection presently afforded. In addition to covering situations where the existing defence structures need to be maintained, this policy also covers those situations where work or operations are carried out in front of the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on) to improve or maintain the standard of protection provided by the existing defence line. This policy also includes other policies that involve operations to the rear of existing defences (such as

building secondary floodwalls) where they form an essential part of maintaining the current coastal defence system.
- **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. This approach has also been termed as managed retreat and setback.
- **No Active Intervention (NAI)** - No action is taken and natural uninterrupted coastal processes, including erosion and accretion continue.

Policy Units (PU), or sections of coast, that have been recommended for managed realignment (or managed retreat as it is also known) as the preferred policy for the medium and long term include:

- PU2 – Browhouses to Dornock Burn
- PU24 – Chapel Rossan to Drummore
- PU25 – Drummore
- PU33 – Innermessan to Bankhead

As the Dumfries and Galloway Shoreline Management Plan meets the requirements for a Climate Change Adaptation Plan with its policy approach and action plan, the next step will be to identify an area to apply the approach set out in the SMP.

Dynamic Coast

It has been recognised that some of the early indicators of climate change will include increased erosion and flooding of our coastlines. The Dynamic Coast project's aims include the provision of a strategic evidence base detailing Scotland's coastal erosion by:

- Improving the evidence available on coastal change
- Increasing the awareness of coastal change
- Supporting Scottish Government and the Scottish Public Sector to ensure Scotland's coast and assets can adapt to our future climate.

As relative sea levels continue to rise and the impact from storms increases, it has become apparent to the United Nations' Intergovernmental Panel on Climate Change (IPCC) that continuing to extend and raise artificial coastal defences is becoming unsustainable, and that in place of the traditional 'hold the line' stance, the practice of 'avoidance and adaptation' will become the norm.

The Dynamic Coast website provides webmaps that show artificial coastal defences, flood levels and high emissions scenarios, current levels of erosion in comparison with historic data, future erosion predictions, and areas of erosion disadvantage. The basic webmap can be found here and the map showing erosion disadvantage here.

Reservoir Inundation Map

SEPA developed reservoir inundation maps to primarily aid in assigning risk to registered reservoirs in the unlikely event of an uncontrolled release of water, which show the area of land likely to be flooded. The reservoirs are designated as a high, medium, or low risk dependant on the impacts on receptors in the inundation zone, such as homes, transport links, and ancient scheduled monuments.

Due to the extremely low probability of failure of a reservoir structure, SEPA has deemed reservoir inundation beyond the scope of National Planning Framework 4 (NPF4) as it is unlikely to contribute to flood risk, although consideration is to be given to reservoir inundation mapping for major new infrastructure or new town masterplans.

The reservoir inundation maps are therefore unlikely to have a bearing on the next Local Development Plan except for the considerations above. The reservoir inundation map can be found here.