

Argyll Bute COUNCIL

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ARGYLL AND BUTE DRAFT STRATEGIC FLOOD RISK ASSESSMENT

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Introduction

The Strategic Flood Risk Assessment (SFRA) is a high-level, primarily map based overview of the scope and nature of all known sources of existing and future flood risk within the Local Development Plan area. The SFRA is designed to inform the Development Plan process, aiming to reduce overall flood risk by avoiding areas of flood hazard.

The Argyll and Bute SFRA has been produced in accordance with Scottish Environment Protection Agency (SEPA) Guidance for Planning Authorities on Strategic Flood Risk Assessment (Version 2, May 2025) and with consultation from flood risk specialists within Argyll and Bute Council, and with JBA Consulting, the Council's partner on flood risk in determining planning applications. The SFRA seeks to provide a strategic overview of existing and future flood risk across Argyll and Bute.

Argyll and Bute Council Strategic Flood Risk Assessment 2026 (SFRA) has been prepared to accompany the Planning Authority's Evidence Report for the Argyll and Bute Local Development Plan 3 (LDP3).

Methodology

This SFRA has been prepared using the methodology set out in SEPA's guidance document for planning authorities, following the four key steps.

Step 1: Gathering available information

Step 2: Gap analysis, in which gaps in the evidence are identified

Step 3: Prepare the outputs, in which all the collated information is presented and a report drafted

Step 4: Consult with Scottish Environment Protection Agency, in which the assessment material is reviewed prior to publishing the final draft of the report

The objectives of the SFRA area to:

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- Identify where flood (pluvial, fluvial and coastal) and coastal erosion risk exists in the plan area at the Evidence Report stage, and therefore areas where new development should be located or avoided at the Proposed Plan stage in accordance with Policy 22. The SFRA can act as a screening tool to help identify whether flood risk is fully understood, and therefore whether further and more detailed analysis of flood risk will be needed beyond the Evidence Report stage in the form of site-specific flood risk assessment (FRA). More information on this is provided below.
- Identify areas where climate change is resulting in unmanageable flood exposure, and so where alternative land use is needed, in accordance with NPF4 Policy 22.
- Identify where and how actions contained in the local flood risk management plan (including future flood protection schemes) and Coastal Change Adaptation Plans affect the location of new development.
- Inform blue and green infrastructure audits and/or strategies in support of NPF4 Policy 20.
- Inform the Strategic Environmental Assessment (SEA) of the LDP.

The guidance SEPA has published sets out relevant data sources that are required to be taken into consideration when preparing the SFRA. These are listed below:

- SEPA Flood Hazard Maps
- Information on past flooding events in Argyll and Bute
- Local Authority Flood Study outputs
- Information on flood protection schemes (existing and proposed)
- SEPA guidance on climate change allowances for flood risk assessment in land use planning
- Local Flood Risk Management Plans and Flood Risk Management Plans
- Surface Water Management Plans
- Adaptation Plans and Coastal Change Adaptation Plans (Shoreline Management) Plans (CCAP)

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- Dynamic Coast
- SEPA Natural Flood Management Maps
- Section 16 Sewer Maps
- SEPA Observed Flood Events database
- Historic River Flood Events database

Local Context

Argyll and Bute has an estimated population of 87,690 (NRS, 2024) and is the second largest local authority by geographical area, covering around 9% of the total land area. There are 28 inhabited islands in Argyll and Bute (Scottish Government, 2022), more than any other local authority in Scotland, that account for around 17.5% of the population. Almost 80% of Argyll and Bute's population live within 1km of the coast, with approximately 97% of the population living between 0 and 10km of the coast (Scottish Coastal Forum, 2002).

Argyll and Bute's water assets not only play a key role in connecting rural and island communities through transportation but also are important contributors to the area's outstanding natural beauty, promoting biodiversity, contributing to a sustainable economy and supporting the health and well-being of residents

The area covered within this SFRA contains all of Argyll and Bute with the exception of Loch Lomond and The Trossachs National Park Authority area. Argyll and Bute is bounded by the urban areas of Helensburgh and Dunoon along the Firth of Clyde, Loch Lomond to the east, the Mull of Kintyre to the south, Atlantic Islands to the west, and the Sound of Mull and Appin to the north. The area borders the waters of the Atlantic Ocean and North Channel. The area is also home to Loch Awe, the longest freshwater loch in Scotland, and several long sea lochs, which bisect the landscape.

. Due to the geography and wetter climate of Argyll and Bute, there is an increased risk of flooding and storms which can cause vulnerability to transportation to, from, and around the area. Therefore, these factors will also be taken into consideration during the

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production of Local Development 3 to ensure that resilience is promoted and encouraged through the plan.

Policy Context and Legislation

The Flood Risk Management (Scotland) Act 2009

The Flood Risk Management (Scotland) Act 2009 was introduced to provide a more sustainable approach to flood risk management. The Act places a duty on Scottish Ministers, SEPA and the responsible authorities to reduce overall risk, by developing and implementing Flood Risk Management Plans and Local Flood Risk Management Plans. It creates a holistic and co-ordinated approach to managing flood risk at both national and local level in an integrated and sustainable way.

National Planning Framework 4

The statutory development plan for Argyll and Bute consists of National Planning Framework 4 (NPF4) and the adopted Local Development Plan 2. Policy 22: Flood risk and water management of NPF4 seeks to strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding. Local Development Plans should strengthen community resilience to current and future impacts of climate change, by avoiding development in areas at flood risk as a first principle. LDP's should also consider the probability of flooding from all sources and consider relevant flood risk and river basin management plans for the area. For areas where climate change is likely to result in increased flood exposure that becomes unmanageable, consideration should be given to alternative sustainable land use.

The SFRA will promote avoidance as a first principle and will help reduce the vulnerability of existing and future development to flooding, supporting LDP3 in responding to the spatial implications of Policy 22 of NPF4. This SFRA will also be used as evidence to support the delivery of other policy areas of NPF4.

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River Basin Management Plan

SEPA, on behalf of the Scottish Government, publish a River Basin Management Plan (RBMP) to ensure that water bodies do not decline in quality, and that over time they reach good or excellent environmental status. Scotland's third RBMP was adopted in 2021 and runs to 2027.

The plan focuses on improving water quality in Scotland's water bodies, making communities more resilient to flooding and drought, promoting sustainable land management and improving the nations water infrastructure. The overall aim is to reach good or better condition across 81% of Scotland's water environment.

The third cycle of the RBMP aims to deliver 51 restoration projects across Scotland to improve the ecological condition of rivers in the Country's towns and cities. No restoration projects have been put forward in Argyll and Bute.

SEPA National Flood Risk Assessment

SEPA published the NFRA in 2025 which provides a strategic, national overview of flood risk in Scotland. The NFRA works alongside Local Flood Risk Management Plans to identify vulnerable areas, evaluate flood hazards, and to assist with informing policy decisions that reduce the impact of flooding to communities, the economy and environment. The NFRA acts as a high-level approach combining historical flood data, climate projections and property and infrastructure information to determine areas of vulnerability. In the report, Argyll and Bute is considered to have 12,200 properties at risk, with approximately two thirds of this figure accounting for residential properties. This equates to 18% of the total number of properties that are considered at risk to flooding in the region. In SEPA's 2100 medium projections, this figure rises to 17,700 properties that are at risk of flooding.

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Flood Risk in Argyll and Bute

Flood Risk Management Plans

In preparing the LDP it is a regulatory requirement for Argyll and Bute Council to have regard to any flood risk management plan. Flood Risk Management Plans (FRMP) coordinate efforts to tackle flooding in Scotland. Flooding in Scotland is being managed through 14 Local Plan Districts (LDP) which are based on river catchments and coastal areas which cross administrative and institutional boundaries. The plans identify main flood hazards and impacts in each area, setting out objectives for reducing risk and detailing the best combination of actions to achieve those objectives. Each of the FRMP are published by SEPA. Argyll and Bute Council's Planning Authority area traverses two Local Plan Districts:

- LDP1 Highland & Argyll
- LDP11 Clyde and Loch Lomond

A map of the makeup of the LDP areas are shown in figure 1.

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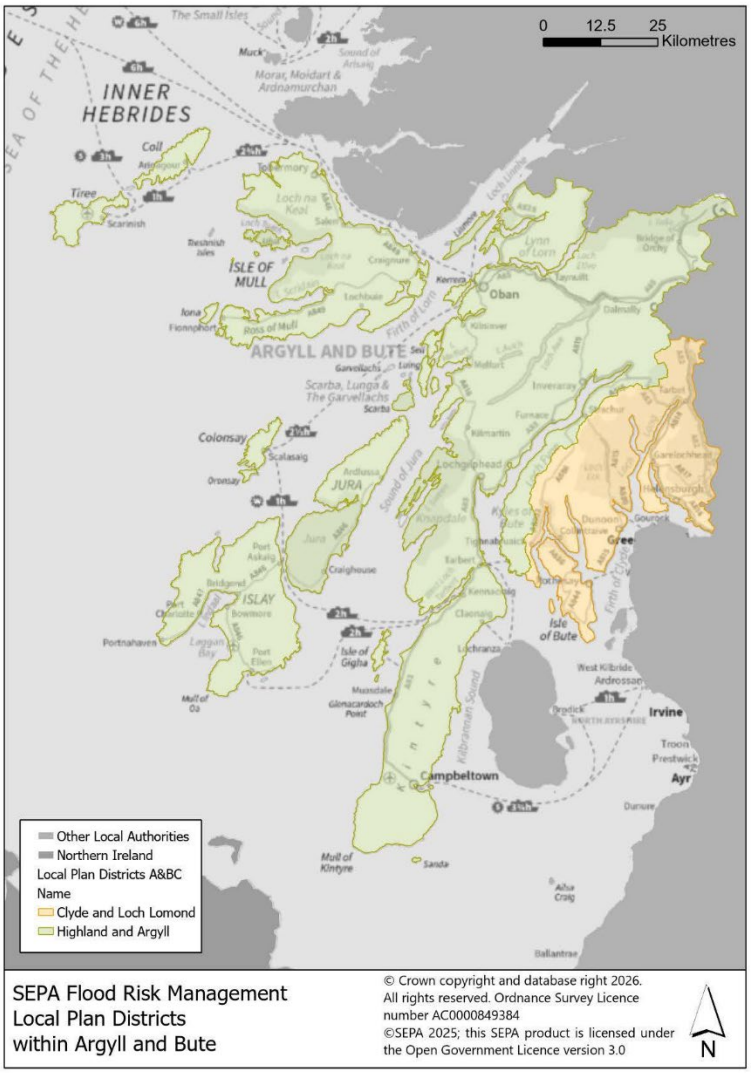


Figure 1: FRMP Local Plan Districts within Argyll and Bute

Across the two plans, they identify 11 Potentially Vulnerable Areas (PVAs) within the Planning Authority Area. Four of these are situated in the Clyde and Loch Lomond District, with seven identified in the Highland & Argyll District. Figure 2 shows the location of each of the PVA's and target areas across the Argyll and Bute planning authority area.



Figure 2: PVA's within Argyll and Bute planning authority area

Potentially Vulnerable Areas are where significant flood risk exists now or is likely to occur in the future. Identifying the PVAs helps Argyll and Bute Council and key agencies including SEPA, to protect communities, including people, homes and businesses, infrastructure, communities and the environment from flooding. The PVA's allow Argyll and Bute to prioritise investment and flood management actions in areas where there is significant risk to communities and infrastructure.

The table (figure 3) below summarises each of the identified target areas within the region of the potentially vulnerable areas and the objectives and the actions proposed to help address flood risk.

Reference	Name	Target Areas in Argyll and Bute Council area	LFRMP	People and Properties at risk of flooding	People and Properties at risk of flooding by 2080's due to climate change
PVA 02/11/01	Helensburgh to Loch Long	Helensburgh Kilcreggan Garelochhead	Clyde and Loch Lomond	390 people and 269 homes	890 people and 310 homes
PVA 02/11/02	Loch Lomond and Vale of Leven	Cardross	Clyde and Loch Lomond	330 people and 180 homes	420 people and 230 homes and businesses
PVA 02/11/22	Dunoon	Sandbank Dunoon	Clyde and Loch Lomond	860 people and 540 homes and businesses	1230 people and 770 homes

Reference	Name	Target Areas in Argyll and Bute Council area	LFRMP	People and Properties at risk of flooding	People and Properties at risk of flooding by 2080's due to climate change
					and businesses
PVA 02/11/23	Isle of Bute	Rothesay and Port Bannatyne Kilchattan Bay	Clyde and Loch Lomond	1610 people and 1060 homes and businesses	2120 people and 1400 homes and businesses *
PVA 02/01/22	Oban	Oban	Highland and Argyll	1200 people and 940 homes and businesses	1500 people and 1200 homes and businesses
PVA 02/01/23	Inveraray	Inveraray	Highland and Argyll	130 people and 110 homes and businesses	140 people and 120 homes and businesses
PVA 02/01/24	Lochgilphead	Lochgilphead	Highland and Argyll	240 people and 220 homes and businesses	400 people and 330 homes and businesses

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Reference	Name	Target Areas in Argyll and Bute Council area	LFRMP	People and Properties at risk of flooding	People and Properties at risk of flooding by 2080's due to climate change
PVA 02/01/25	Tarbert	Tarbert	Highland and Argyll	30 people and 50 homes	70 people and 80 homes and businesses
PVA 02/01/26	Clachan	Clachan	Highland and Argyll	50 people and 30 homes	60 people and 40 homes
PVA 02/01/27	Campbeltown	Campbeltown	Highland and Argyll	840 people and 650 homes and businesses	970 people and 760 homes and businesses
PVA 02/01/28	Taynuilt	Taynuilt and Brochroy	Highland and Argyll	150 people and 90 homes and businesses	180 people and 110 homes and businesses

**Based on a projected 30% increase of homes and businesses at risk as per Clyde and Loch Lomond FRMP.*

Figure 3: Details of PVA's within the Argyll and Bute planning authority area

SEPA Flood Hazard Maps

The Flood Risk Management Plan (Scotland) Act 2009 requires SEPA to prepare flood hazard maps and to update them regularly. SEPA's Flood Map layers show current low, medium and high likelihood of flooding from fluvial, surface water and small watercourses, and coastal, as well as future medium likelihood of flooding from the same sources.

National Planning Framework 4 states that "For planning purposes, at risk of flooding or in a flood risk area means land or built form with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for future climate change". Figure 4 details the probability of flood risk and the categories used to determine the likelihood of flooding.

Likelihood of Flooding	River and Coastal Flooding	Surface Water Flooding
Low	0.1% chance of flooding each year (1 in 1000 year event)	0.1% chance of flooding each year (1 in 1000 year event)
Medium	0.5% chance of flooding each year (1 in 200 year event)	0.5% chance of flooding each year (1 in 200 year event)
High	10% chance of flooding each year (1 in 10 year event)	10% chance of flooding each year (1 in 10 year event)

Figure 4: Likelihood of Flood Risk (SEPA)

The flooding data used in this SFRA is sourced from Flood Map Version 3.0 (2025) which is the most recent data published by SEPA. Access to the Flood Hazard Maps can be found on the Strategic Flood Risk Assessment Map. The present-day flood maps are generated using meteorological, rainfall, river flow and sea level data and are broadly representative of current climate conditions.

The mapping identifies large areas of high-risk river flooding across the Argyll and Bute SFRA area; however, those that possess the greatest danger to homes, infrastructure and life are situated in the main settlements across the area. This includes, Oban, with flood risk from the River Black Lynn and smaller watercourses in and around the town, and Campbeltown, from watercourses running through the town entering Campbeltown Loch. Other key rural settlements or main towns at risk of river flooding include areas within Ardrishaig and Lochgilphead, Garelochhead, and Tobermory on the Isle of Mull.

High risk areas prone to flooding outwith settlements include the River Aray immediately north of Inveraray, and the Machrahanish Water, particularly the stretch of course located between the settlements of Campbeltown and Machrahanish, to the south of Campbeltown Airport. Watercourses across the Kintyre and Cowal peninsulas feeding into both Sea and Fresh Water lochs cause flooding concern for low lying land.

Coastal flooding perhaps presents the highest risk within the Argyll and Bute planning authority area, with most of the population living in close proximity to the coast. The Potential Vulnerable Areas (PVAs) identified through the Local Flood Risk Management Plans show that all of the six main towns in Argyll and Bute are affected in some way from coastal flooding. Campbeltown, Lochgilphead and Helensburgh suffer from low lying land adjacent to the coast, making them especially vulnerable to coastal flooding. Dunoon is susceptible to coastal flooding, particularly in extreme tidal events and storm surges. Rothesay's (Isle of Bute) seafront contains areas at high risk from tidal inundation, with the promenade and harbour particularly exposed to flooding and Oban is identified as having vulnerable locations around the Oban Bay, which has the potential to impact the transport infrastructure on the waterfront.

Argyll and Bute planning authority are aware of the Tidal Clyde Model, which assesses tidal and fluvial flood risk on the River Clyde within Glasgow. The modelling does also contain information relating to Argyll and Bute, specifically the section of the River Clyde between the administrative boundary with West Dunbartonshire to Ardmore. This layer has not been included within the SFRA interactive map, however, may be taken into consideration as an additional data source for coastal flood map verification for site appraisals and development proposals within these areas.

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Surface water and small watercourses can contribute to Argyll and Bute, and the geography of the area plays a role in this, with steep hills causing run-off to lower lying land or settlements. Generally, surface water only affects urban areas where rainfall can exceed drainage capacity, or where there is a greater percentage of impermeable surface. Oban is one of the main towns that suffer from significant concentrations of surface water, with the steep hills surrounding the town generating rapid run-off from rainfall. Similar to coastal flooding, most of the settlements within Argyll and Bute are identified as having some risk to flooding due to surface water.

Freshwater lochs, particularly Loch Awe, present specific flood risk assessment challenges that may not be captured within the content of flood mapping. Development proposals in proximity to loch shores may require site-specific hydrological and hydraulic modelling to fully understand flood levels and flood risk. This is particularly relevant where loch water levels may be influenced by artificial controls which can alter flood behaviour and water levels in extreme weather events. The flood risk area shown in the mapping should indicate areas of flood risk, though detailed modelling may be required to support development proposals in these areas.

SEPA Future Flood Maps

SEPA also produce future flood maps for medium likelihood flooding across all categories. These maps were developed using the same modelling and mapping approaches as the present-day flood maps but with revisions to the peak river flow, rainfall intensity and sea levels each based on projections for one future scenario for time periods towards the end of this century. These maps have been included in the SFRA and allow for a comparison against current day projections to determine areas that may experience a change in flood risk probability over time.

All six of Argyll and Bute's main towns (Campbeltown, Dunoon, Helensburgh, Lochgilphead, Rothesay and Oban) show signs of increased risk to coastal flooding. Tarbert and West Tarbert in particular are extreme examples at flood risk within the future scenarios should no mitigation be put in place.

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Future flood maps identify that almost all urban areas within Argyll and Bute are vulnerable to flood risk from surface waters and small watercourses. This is likely due to the connection between heavy rainfall and sewer management capacity issues within settlements. Campbeltown as an example shows signs of increased risk of flooding due to surface water, sewer exceedance and watercourse flooding.

In terms of river flooding, the north of Lochgilphead appears to be at future flood risk from river sources, as evidenced in figure 5. The future flood maps identify settlements such as Oban, Dunoon and Clachan of areas at greatest risk, with flood studies capturing the current effects, and future projections of flooding.



Figure 5: SFRA Future Flood Map – River Flooding Medium Likelihood in the Lochgilphead Area

Climate Change Allowances

Climate Change Allowance is a prediction of anticipated change in peak river flow, peak rainfall intensity or sea level rise caused by future climate change. SEPA produce Climate Change Allowances for Flood Risk Assessment in Land Use Planning, which was last updated in 2022. SEPA have also published guidance on this subject, last updated in February 2025 (Version 6). Allowances vary across Scotland and are separated regionally through River Basin regions. Argyll and Bute is located within two separate regions; the Clyde River Basin Region and the Argyll River Basin Region. Figure 6 and Figure 7 provide the allowances for Argyll and Bute across both regions.

Clyde River Basin Region

Type of Allowance	Value of allowance
Peak River Flow Allowance Total change to 2100	49%
Sea Level Rise Allowance Cumulative rise from 2017 to 2100 in metres	0.85m
Peak Rainfall Intensity Allowance Total change to 2100	41%

Figure 6: Climate Change Allowance for the Clyde River Basin Region

Argyll River Basin Region

Type of Allowance	Value of allowance
Peak River Flow Allowance Total change to 2100	59%
Sea Level Rise Allowance Cumulative rise from 2017 to 2100 in metres	0.86m
Peak Rainfall Intensity Allowance Total change to 2100	46%

Figure 7: Climate Change Allowance for the Argyll River Basin Region

Argyll and Bute Council have published the draft 'A climate change strategy for Argyll and Bute' (2024). The strategy has been developed through an engagement process managed by the Argyll Countryside Trust (ACT) on behalf of Argyll and Bute's Community Planning Partnership Climate Working Group.

The strategy seeks to address the climate crisis by making Argyll and Bute Climate Friendly, Climate Ready and Climate Just. The strategy sets out that there is an increased flood risk from warmer, wetter winters, meaning increased rainfall volume and intensity, which will contribute to flooded water courses and more surface water. Sea level rise and storm surges can contribute to an increased risk in coastal flooding from coastal erosion and damage to coastal assets and infrastructure.

The strategy is a relevant piece of evidence showing the effects of climate change on flood risk and sets out possible actions to mitigate and alleviate climate and flood risk across Argyll and Bute.

Past Flooding Events

Historic Flood Event data across Argyll and Bute Council is available internally. Each incident is plotted on a GIS map, with information provided by SEPA through the Observed Flood Event data (OFE) and Historic River Flood Extents (HRFE) database. These layers have not been included within the SFRA map; however, it is available internally for site screening, providing planners with an understanding of historic flood events on potential development sites.

Analysis of the OFE and HRFE show high concentrations of flood events in the two of the largest towns in Argyll and Bute; Helensburgh and Oban. Both flood studies for Helensburgh (Appendix A contains information relating to historic flood events) and Oban refer to historic flood events that have occurred within each town. Helensburgh suffers from coastal flooding, primarily from wave overtopping at the esplanade running from Helensburgh to Rhu. Oban flood study refers to flooding from the Black Lynn River which has caused flooding instances over decades, including multiple reports within

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the supermarket car park located on Lochavullin Drive. The study also refers to coastal flooding, and that different sources can combine to compound flood risk, citing extreme weather can cause coastal surge and heavy rainfall affecting river water levels.

OFE and HRFE show that main coastal towns are impacted by coastal flooding, or compounding flood sources from extreme weather events. This is particularly relevant in the case of Dunoon and Rothesay. Hotspots within rural areas include Kilmartin, Clachan and to the north of Lock Eck in Cowal, where there have been multiple reports of historic flood events in these areas.

Figure 8 provides an extract of historic flood events in Helensburgh from Appendix A of the Helensburgh Flood Study. The table shows that storm surge is one of the biggest sources of flood risk in the area.

Date	Location	Details	Source
Jan 2008	Helensburgh	Gale force winds, pouring rain and giant waves destroyed he walkway and seating area, leaving the beach littered with concrete blocks.	http://www.helensburghadvertiser.co.uk/news/13974492.Seafront___039_like_a_bomb_site__039_/
28/01/2002	Eastbay esplanade	High waves at Eastbay.	SEPA historical database[3]
	Helensburgh Pier	Flooding of Helensburgh pier car park. Water level up to undercarriage of cars.	SEPA historical database[3]
Nov 1999 to Nov 2001	154 East Clyde Street	Flooding of carriageway and property.	SEPA historical database[3]
Jan 1999	Helensburgh	Inundation of East Clyde Street	Photographs supplied by local resident via Argyll & Bute Council
05/01/1991	Sailing club	4.5 feet of water reported in club house. Area was raised ~2m following this event.	Verbal - sailing club member met on site visit
	A814 - Clyde Street, West Clyde Street and William Street	Highest tide since 1907 - tide was 5 meters, 1.2 meters above its expected height. Wind-savaged, very severe storms from the south west, gusts of up to 90 miles per hour.	SEPA historical database[3]
	Helensburgh and Craigendoran	Tide 1.2m above expected height. Waterfront submerged and train services suspended. Waves breaches sea wall at Craigendoran.	Sniffer report[1]
	Helensburgh	Skew surge of 1.31m at Millport. Overtopping of defences at many locations, particularly in the Firth of Clyde. Helensburgh waterfront was completely submerged and some streets flooded to a level of up to 1m.	https://www.surgewatch.org/events/1991-01-05/
16/02/1950	Helensburgh	Shops on seafront flooded.	Sniffer report[1]
26/11/1912	East and West Clyde Street	Storm isolated Helensburgh from the outside world. In additional to local road and railway closures there was flooding within the town along East and West Clyde Street. "the water lay about 18 inches deep in some of the shops in West Clyde Street, and in many dwelling houses the water surged through the lower flats. Here and there great breaches were made in the sea walls"	"Helensburgh isolated", The Scotsman (1860-1920), 28 November 1912. www.proquest.com

Figure 8: Historic flood events in Helensburgh (Source: JBA Consulting, 2018)

In terms of recent, major-wide disruption two named storms caused damage to infrastructure and homes in Argyll and Bute. October 2023 brought heavy rainfall across Scotland, with Argyll and Bute one of the worst affected areas in the country. After days of heavy rainfall, Storm Babet caused further damage to infrastructure, including road

closures, notably the A816 between Oban and Lochgilphead. Similarly, Storm Aiden in Autumn 2020 seen heavy rainfall cause landslides closing the A83 at Rest and be Thankful. Whilst this is outwith the jurisdiction of the planning authority, this had a knock-on effect on communities in Argyll and Bute, particularly connecting Mid Argyll and Cowal to the central belt.

Flood Studies

Argyll and Bute Council have published five flood studies relating to settlements within Argyll and Bute. Details on each of the flood studies, including the output are listed below. Links to the flood studies below can be found here, or alternatively, on the interactive map.

Oban

The study covers primarily the centre of the town, highlighting that the town suffers from coastal, surface water, and river flooding from the Black Lynn. The study identifies Lochavullin as a high-risk flood area, particularly the car park area which has been prone to flooding in the past. The study also notes that storm surges and extreme tides have an effect on the Corran Esplanade, causing the A85 trunk road to close due to flooding.

Actions to alleviate flood risk set out in the study look at a combined flood scheme, including upstream flood storage at Lon Mor and Mossfield, upgrading the culvert at Miller Road, the widening of Market Street bridge, and look at new flood walls at Lochavullin to protect against river flooding from Black Lynn. The study concludes that major coastal engineering, including seawalls are not economically viable at this stage, with the other works having a projected cost of £8.2m.

Lochgilphead

Study covers the area covered in PVA: 01/38 and focuses on the town of Lochgilphead. The study looks at areas at risk from tidal and fluvial flooding, including potential inflow from the Crinan Canal. The study primarily focuses on the Badden Burn catchment, Cuilarstich Burn, the Meadows area and the Front Green on the Loch Gilp waterfront. Flood risk arises at Badden and Cuilarstich Burn when combining into Loch Gilp

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through high river flows and limited channel capacity, and the Front Green is prone to flooding from coastal flooding and tidal inundation and rising sea levels.

The study sets out the highest priority of improving the management of Crinan Canal, including the strengthening of canal embankments. Other measures mentioned in the study include upstream flood storage to the north of Lochgilphead, increasing culvert capacity and seeking to implement coastal defences on the front green.

Tarbert

A study was conducted by AECOM on behalf of Argyll and Bute Council to investigate flood risk in the village of Tarbert. The main source of flood risk is from coastal flooding, as a result of still water levels which is affecting properties on Harbour Street and Barmore Road frequently. The report projects that climate change is expected to significantly worsen the impact of flooding on the town, with around a 600mm sea-level rise by 2100.

The preferred option set out by AECOM includes a combination of permanent and demountable flood defences, as well as Property Flood Protection (PFP). This includes a permanent flood wall along the harbour front, demountable barriers that can be installed during severe weather conditions, and flood gates at access points. The preferred hybrid scheme is anticipated to cost in the region of £4.3m.

Clachan

The village of Clachan has been struck by past flooding events, causing Argyll and Bute Council to commission AECOM to undertake a flood study in 2019. The main objectives of the study were to reduce overall flood risk in Clachan, and to reduce river flooding in the village. Secondary objectives were set out including improving wider catchment practices, including making the public more aware of the causes of flood risk, and to allow the environmental enhancement of waterbodies. The key areas at risk of flooding in the village include properties along the Clachan Burn corridor, and the A83 trunk road that runs through the Clachan.

AECOM set out 10 options to reduce flood risk, with the removal of Clachan Burn Weir and Property Flood Protection the most economical option. However, the most holistic approach to reducing flood risk was Option 4, implementing natural flood management

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measures and removing the Weir. This is anticipated to reduce flood risk of 23 properties in the village, whilst delivering sustainable flood prevention measures that have high environmental benefits. The project is anticipated to cost in the region of £230k – £336k depending on the preferred option taken forward by Argyll and Bute Council.

Helensburgh Coastal Flood Protection Study

JBA were commissioned by Argyll and Bute Council in April 2018 to undertake a coastal flood study for Helensburgh, Craigendoran and Rhu. The flood study identifies a preferred set of interventions that offer sustainable flood risk management. JBA undertook modelling including the assessment of still water levels, local wave characteristics, joint probability analysis, wave overtopping, and flood inundation modelling. The modelling identified a number of potential flood protection options was developed, with a select few short-listed options taken forward to a concept design level and economic assessment undertaken on each option.

The preferred option prioritised is for an initial cycle of Property Flood Resistance and Resilience (PFR) measures, followed by the construction of direct defences to respond to climate change. Figure 9 highlights the preferred option (medium and long term) for each zone, along with the number of properties directly protected.

Benefit Zone	Initial Option	Adapted Option
Rhu	PFR – 5 properties	New sloped revetment
Sailing Club	PFR – 7 properties	New set-back walls
West Clyde Street	PFR – 26 properties	New set-back walls
East Clyde Street	PFR – 39 properties	New rock revetment
Craigendoran	PFR – 9 properties	New set-back walls

Figure 9: Preferred options for PFR measures covered in the Helensburgh FPS

Flood Defences and Schemes

The Scottish Government's Flood Defence Asset Database (SFDAD) provided a record of protection schemes constructed by local authorities under flood legislation.

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However, the SFDAD is no longer available and has not been used as a source for the flood defence schemes in Argyll and Bute. SEPA have advised that the SFDAD will be replaced by another database in the future.

This section covers the Council's promoted Flood Protection Schemes, as well as listing defence works covered under the Flood Risk Management Act 2009 (Scotland), and defence improvement works covered under Section 2 of the 1961 Flood Prevention (Scotland) Act.

Promoted Flood Protection Schemes

Dunoon

The Dunoon Flood Protection Scheme (FPS) is one of the largest flood protection works completed in Argyll and Bute to address recurring flood risk associated with Milton Burn. Measures implemented through the scheme include flood defence walls between 1.0m – 1.5m located along sections of the eastern bank, as well as repairing and replacement training walls were implemented where possible. The flood scheme was responsible for the construction of a weir in Milton Burn. Other works completed as part of the scheme include the implementation of an overflow chamber and outfall pipe, replacement of two pedestrian footbridges and new earth bunds near St Mun's Bridge were created to prevent floodwater overtopping the channel. The flood protection scheme does not include a description of the return period standard, and this can be considered a data gap in the planning authority's evidence. The project was completed in 2010 with an approximate budget of £4m.

Rothesay

From 2001 – 2004, a flood defence scheme was implemented in response to repeated tidal flooding along the Rothesay seafront. The principal works included the construction of a flood defence wall along the Esplanade, and repairs and reconstruction of the Ladeside tidal defence walls. Work was completed in September 2004, consisting of approximately 900 metres of a 1.5m flood defence wall along the

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seafront intended to protect against a 1-in-100-year coastal flood event. The projected cost of completion is around £1.7m.

Campbeltown

Completed in 2026, the Campbeltown FPS is delivered by Argyll and Bute Council under the Flood Risk Management (Scotland) Act 2009 to protect properties from 1 in 200-year flood events. A number of schemes have been developed across the town to reduce the risk of flooding in the north of the town, and to reduce surface water flooding in the south of the town, including the town centre. Works include creating a flood storage dam at Millknowe, Detention Ponds at Meadows and the installation of an attenuation tank at Burnside Square. The scheme cost around £15-£16m, with the Scottish Government providing 80% of the funding.

Flood Protection Works carried out under Section 56 of the Flood Risk Management (Scotland) Act 2009 (Figure 10)

Location	Year Completed	Description of Works
Sommerville Place	2011	Install grid to culvert inlet
A814 Westburn Cottage	2011	Drainage channels at Auchinfroe Bridge
Milton Burn, Eton Avenue	2012	Rebuild training/ flood wall
Steel Houses, Succoth	2016	Upgrade existing pipe with inlet, box culvert, diversion pipe and ditch.
A846, Antrim View	2020	600 mm dia surface water drain and outfall
Tigh Dearg Road	2025	600 mm dia surface water drain and outfall

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Flood Defence Improvement Works carried out under Section 2 of the Flood Prevention (Scoltand) Act 1961 (Figure 11)

Location	Year Completed	Description of Work
Glenarn Road, Rhu	2000	Construction of culvert and manholes
Lovely Cottage, Ardbeg	2001	Replace stone cundy with box culvert
The Avenue, Inveraray	2001	Construction of new intake and 900mm diameter culvert
A814, Stuckenduff	2001	Upgrade culvert
Lochavullin Flood Prevention Works	2001	Installation of three electric pumps in Council car park
Sommerville Place, Sandbank	2001	Bank strengthening and construction of inlet chamber at rear of Sommerville Place
Ardnadam Farm, Sandbank	2001	Construction of headwall and diversion pipe at Arnadam Farm.
Camis Eskan Burn, The Birches, Craigendoran	2002	Construction of new intake and 900mm diameter culvert
Craigowlet House, Cove	20004	Construction of 300mm diversion pipe
Alexander St Dunoon Flood Alleviation Works	2004	Construction of new intake to the rear of No 81and No 121
Cowal Garage, Dunoon	2004	Clearance work and new chamber at Cowal Garage

Location	Year Completed	Description of Work
Duncan Cottages, Kilmun	2004	Construction of 600mm dia surface water drain.
Hillview Drive, Helensburgh	2005	Construction of new inlet chamber
Dalintart, Oban	2006	Construction of 600mm dia culvert. Regrade and reprofile existing ditch. Connect 300mm dia pipe from school into system.
Redhouse, Tarbert	2008	Widen ditch and construct 300mm dia drainage outlet
Machrie Drive, Helensburgh	2008	Construction of new inlet and 300 dia surface water drain.
Rear of 10 Muirend Road, Cardross	2008	Replace section of 225 mm dia SWD and construct new manhole.
Tigh Na Darroch Church Road Cardross	2008	Replace section of 225 mm dia SWD and construct new manhole.
Clashmore, Toward, Dunoon	2008	Construct 2 new access chambers on existing SWD and reconstruct outfall
Armadale Road, Cove	2008	Widen ditch, construct new chamber with 300mm dia SWD and outfall
Land to the rear of Roslyn Cottage, Garelochhead	2009	Construct new inlet headwall, clear vegetation and blockages to existing system.

All of the locations for the existing flood protection schemes have been mapped in the SFRA mapping.

Exploratory work has been undertaken by the Council on a number of proposed flood defence works. These are listed below. Further information on the progress of these schemes is available on the council website. Although no work has started, LDP3 will take these flood protection schemes into consideration with regards to site selection and potential safeguarding. Until then, these defence schemes are considered a gap in flooding information available to the Council.

- Oban
- Lochgilphead
- Tarbert
- Clachan
- Helensburgh

Surface Water Management Plans

Two Surface Water Management Plans (SWMP) have been published under the Flood Risk Management Act (2009). Each of the SWMP's have been prepared during Cycle 1 LMFRMP.

Kilcreggan SWMP

The SWMP was prepared by JBA Consulting on behalf of Argyll and Bute Council in 2019 to understand the current risk of surface water flooding in Kilcreggan and ways to reduce flood risk. Surface water flooding in Kilcreggan is caused primarily by intense rainfall and run off from Aiden Hill above the settlement. The plan states that 11 residential properties are considered at risk in the 1-in-200 year event, with estimated average damages sitting at £20,000. The study identified three areas prone to higher flood risk:

- KIL_HS01- Argyll Road East (B833)
- KIL_HS02 – Tigh Dearg Road (highest priority area)

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- KIL_HS03 – School Road

Options to reduce surface water flood risk include natural flood management through planting higher up Aiden Hill reducing runoff at the source, and Property Level Protection including flood doors and barriers. School Road has been identified as having improved protection through Scottish Water works as noted in the study, with the risk at Argyll Road East not an imminent priority for the Council to deliver flood protection works.

Dunoon SWMP

Similar to the Kilcreggan SWMP, JBA published the report in 2019 under the 2009 Act. The report focuses primarily on flood risk from pluvial run off, overflowing drainage systems and the impact of small watercourses, ditches and culverts. Two flooding hotspots are singled out in the report. These are:

- SND_HS01 – Eagle Court
- SND_HS02 - A885 High Road

The report sets out a number of actions to reduce flood risk, including a better understanding of flood mechanisms through investigation work such as topographic modelling and hydrological studies. In addition, the mention identifies watercourse and drainage maintenance and asset management improvement as ways to reduce surface water flood risk in Dunoon.

Dynamic Coast

The Dynamic Coast project provides evidence of coastal erosion, shoreline change and sea level rise impacts in Scotland. The tool provides interactive maps showing projected shoreline change, supporting coastal adaptation planning for Local Authorities.

The Dynamic Coast project states that it *aims to provide the strategic evidence base on the extent of coastal erosion in Scotland by:*

1. *Improving the evidence on coastal change*

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2. *Improving the awareness of coastal change*
3. *Supporting decision-makers to ensure Scotland's coast and assets can adapt to our future climate.*

The project allows Argyll and Bute Council to identify areas vulnerable to coastal erosion at a regional scale, and under climate change scenarios, highlight areas most at risk of future shoreline erosion. Areas around the Rosneath, Cowal and Kintyre peninsulas are at the greatest risk of coastal erosion. Tiree is also a high-risk area, being labelled a 'Super Site'. As such, a report establishing Adaptation and Resilience Options for Central Tiree has been prepared by Scotland's Centre of Expertise for Waters.

Natural Flood Risk Management

Natural Flood Management looks at where natural features or nature-based solutions can be used, restored or altered to slow or store floodwater. SEPA have published the Natural Flood Management (NFM) maps that identify areas where the alteration or restoration of natural features could be most effective in storing or slowing the flow of water, or in managing the stream sediment. Five maps have been published by SEPA that identify opportunities for NFM techniques. Each map provides a high-level assessment of areas within catchments that NFM measures could be most effective. The five maps produced by SEPA, and a short summary on the potential of each measure are detailed below:

NFM measure	Opportunity Areas in Argyll and Bute
Runoff reduction	Significant potential across Argyll and Bute. High potential areas prominent on the Cowal Peninsula and Kintyre Peninsula. All island communities have some medium or high potential for runoff reduction

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NFM measure	Opportunity Areas in Argyll and Bute
Floodplain storage	Medium and high potential opportunities spread across Argyll and Bute in areas around lochs, rivers and watercourses. Biggest potential area by surface is Loch Awe, the longest freshwater loch in Scotland.
Sediment management	Greatest opportunity for sediment management is located in Mid-Argyll and Lorn, between the settlements of Lochgilphead and Oban.
Estuarine surge attenuation	Medium and high potential located in Helensburgh and Lomond, including up to the administrative boundary with West Dunbartonshire, over to the Rosneath Peninsula.
Wave energy dissipation	Medium and High potential for wave energy dissipation is distributed fairly evenly across Argyll and Bute. Areas with high potential include the coastline from Cardross to Helensburgh, and sections in Cowal and the Kintyre Peninsulas'.

Figure 12: NFM measures and opportunities in Argyll and Bute.

Reservoir Inundation

The reservoir inundation maps are published by SEPA and primarily assist SEPA in assigning a low, medium or high-risk designation to all registered reservoirs in Scotland. The maps identify the area of land that is likely to be flooded in the event of an uncontrolled release of water from a reservoir. High risk areas do not necessarily mean that these areas have a higher risk of flooding but instead may contain features that

could be impacted in the case of an uncontrolled water release, such as homes or infrastructure.

SEPA's version 2 of the Strategic Flood Risk Assessment Guidance removes Reservoir Inundation Maps as a source of information in the SFRA. However, mapping is useful for consideration to new infrastructure in existing settlements. Mapping can be found on SEPA's website here.

Information Gaps

Whilst the SFRA seeks to provide a comprehensive overview of flood risk in Argyll and Bute, data and information gaps exist. As the SFRA only covers a snapshot in time, should any of the information below become available, these will be included in the final draft or revised iteration of the SFRA.

The location of flood protection schemes have been provided using point data, and do not provide analysis of the standard of protection or area which benefits. However, the Council does have an internal map displaying technical details, including drawings for each of the flood defence schemes.

The Council is yet to publish any Shoreline Management Plan or Coastal Change Adaptation Plans, though work is beginning to progress on the latter. Argyll and Bute Council recognises the importance of these documents and will include any published plans in a later revision of the SFRA should these become available. Work on the CCAP is being done by the Council's flooding team.

The Council holds records extending back many decades relating to observed flood events. Due to the lack of information on the internal GIS mapping and the time elapsed since these events, the accuracy of these flood events cannot be fully verified.

Beyond SEPA's OFE and HRFE data, the planning authority does not keep an internal record of historic flood event data that can be included as evidence for this Strategic Flood Risk Assessment.

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