



Glasgow City Council
City Development Plan 2

Background Report

Water Management Infrastructure Audit

February 2025



Section 1 - Introduction (Post September 2024 Gate Check)

This Water Management Infrastructure Audit has been produced to support the following NPF4 policies:

- Policy 10: Coastal development. This Audit clarifies the Council's position regarding coastal flooding and erosion such that those aspects of the policy as they pertain to GCC will be managed through overlapping requirements in policy 22.
- Policy 18: Infrastructure First. This Audit provides evidence regarding the capacity, condition, needs and deliverability of water management infrastructure as is available to GCC. Additional information is held by key actors such as Scottish Water or Clyde Port Authority. The information in this Audit provides the information on infrastructure needed to inform the Proposed Plan and development of the spatial strategy as well as to inform the site appraisal methodology and related SFRA. As required through developing the spatial strategy and directed by an emerging understanding of development proposals, additional information may be requested as necessary.
- Policy 20: Blue and green infrastructure. This Audit provides references to a separate but related Blue / Green Infrastructure Audit (CD006) and additional blue / green datasets provided by SEPA to the [CDP2 Mapping Hub](#) (CD002)
- Policy 22: Flood risk and water management is a key focus of this Audit in providing evidence in support of delivering CDP2 in accordance with policy requirements.

1.1 Requirement for an updated Water Management Infrastructure Audit

This Water Management Infrastructure Audit was first produced for submission as part of the CDP2 Evidence Report in 2024 and dated March 2024. This updated audit has been produced in response to the Scottish Minister's appointed Reporter's findings that the evidence report submitted by Glasgow City Council contained insufficient information to enable the planning authority to prepare its local development plan. The Reporter's recommendations related to engagement with SEPA and Marine Directorate. Further engagement with SEPA, Marine Directorate, Scottish Water and the Clyde Marine Planning Partnership has taken place and updates made as a result.

1.2 Updates

The following key changes have been made to update this Audit:

- It is noted that SEPA's primary interest is in the sufficiency of evidence provided relating to flood risk and relevant aspects of the water environment. The Council agrees with SEPA in highlighting the importance that LDPs should be informed by relevant, up-to-date audits and/or strategies, covering the multiple functions and benefits of blue and green infrastructure. (CD006) A number of links to data sets were provided and these have been added to the [CDP2 Mapping Hub](#) and will be assessed through SEA. The Audit presents the evidence base deemed appropriate including the policy framework and supporting documentation and the most up to date baseline

suite of mapping in order to best manage flood risk, provided by an up-to-date Strategic Flood Risk Assessment, the updated Tidal River Clyde Flood Model policy framework and River Basin Management Planning.

- The previously submitted list of issues for CDP2 is expanded into a more comprehensive reflection on policy implications for CDP2 based on the up-to-date water environment baseline (Section 10 - Overview of all the evidence and what it means for CDP2) including the Stage 1 Strategic Flood Risk Assessment (SFRA), and the Tidal Clyde Development Masterplan Principles.
- The SFRA Stage 1 has been completed (CD003).
- A new section on the coastal / tidal Clyde environment alignment and the implications for CDP2 is included.
- The practicality of connecting surface water drainage to a surface water sewer or watercourse (in support of Scottish Water's [Surface Water Management policy](#)) and potential identification of strategic routes for new surface water conduits will be provided by Scottish Water beyond the Gate Check stage. At this stage, Scottish Water has indicated no capacity issues for WWTW or WTW installations serving the Glasgow Local Authority area.
- As per SEPA's request to signpost relevant resource pack elements informing the CDP2 evidence base, this is included in Appendix 1 for SEPA guidance and a complete list is provided in Evidence Report Chapter 11 Infrastructure – Water Management.

Section 2 - General Introduction – infrastructure context

2.1 The ubiquity of water

It may be useful before considering Glasgow’s Water Management Infrastructure Audit, to provide an overview of broad typological areas as a means of delineating responsibilities – 1) water supply, 2) sewerage provision and disposal functions, 3) river basin functions, 4) environmental regulation and 5) drainage and flood prevention. Additionally, to these broad definitions, legacy and new infrastructure aligned with navigation such as the Clyde and Forth Canal, legacy marine infrastructure and new crossing points are also briefly discussed as part of the Audit.

Table 1 - Water management functions and responsible bodies

	Local Authorities	SEPA	Scottish Water
Water supply	<p>In Scotland, private water supplies are defined as those that are not provided by Scottish Water.</p> <p>Private water supplies are the responsibility of owners and users and are regulated by local authorities and the Drinking Water Quality Regulator for Scotland. Issues with private water supplies should be discussed with the environmental health department of the relevant local authority.</p> <p>Approximately 3% of the Scottish population uses a private water supply for drinking water. Many more people encounter private supplies when they stay in holiday accommodation in the more remote parts of Scotland.</p>	<p>The Scottish Environment Protection Agency (SEPA) is responsible for ensuring that Scottish Water meets environmental requirements and advises ministers on future investment in environmental improvements.</p>	<p>Scottish Water supplies most of the drinking water in Glasgow. They regularly test water to make sure it's clean and safe to drink.</p> <p>Scottish Water is a public corporation accountable to Scottish Ministers and the Scottish Parliament. Its performance is subject to scrutiny by the Parliament and the Auditor General.</p> <p>The Scottish Water Governance Directions 2023 set out the principles by which Scottish Water should conduct its business.</p>
Sewerage / drainage	Local Authorities are responsible for the drainage of local roads and public	SEPA is responsible for providing flooding advice and flood warnings that can be	Water using appliances such as washing machines are all connected and waste

	Local Authorities	SEPA	Scottish Water
	<p>highways. They are responsible for strategic flood risk management. They are also responsible for providing and maintaining public flood defences, inspecting watercourses and maintaining watercourses that run through (or below) Council land.</p> <p>The Scottish Government is responsible for motorway and major trunk roads drainage through Transport Scotland. The Government is responsible for making national policy on planning, flood prevention and flood warning.</p>	<p>found on their website: www.sepa.org.uk/flooding</p> <p>The complex nature of flooding, with many agencies responsible for different aspects of sewer and drainage systems in communities, means that a partnership approach is needed to tackle this problem.</p>	<p>and waste water is carried from a private pipe to the main sewer.</p> <p>In general, from the point that the drain leaves the curtilage of a property, or joins up with drains coming from within a separate curtilage of another property, it becomes a public sewer. Some curtilages can contain a number of properties (for example a block of flats) and the common drainage systems within that curtilage will remain private.</p> <p>Additionally, Scottish Water helps to protect homes from flooding caused by sewers either overflowing or becoming blocked.</p>
Environmental regulation	<p>Some rural parts of Glasgow operate on a private water supply. This means that their water comes from a spring, borehole, well, river or loch rather than Scottish Water. A number of properties in Glasgow are on a private water supply, some of which are known as Regulated Supplies, providing water to residential properties of over 50 occupants, Airbnbs, factories and rented cottages.</p> <p>New Scottish legislation states that landlords who rent out entire properties or single rooms within a house that uses a private water supply, have a legal duty to ensure the health and safety of their tenants by testing their water supply.</p>	<p>Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR). The following activities are included within the scope of CAR:</p> <ul style="list-style-type: none"> • Discharges • Diffuse pollution • Abstractions • Engineering works in inland waters • Groundwater 	<p>Scottish Water's <i>Scientific Services Management Team</i> is committed to Scotland's Sustainable Future and its role in achieving Scotland's ambitious Water Sector Vision.</p>

	Local Authorities	SEPA	Scottish Water
	The quality and quantity of the water provided is monitored by the local council .		
River basin management	Wherever possible, and with reference to the Scotland River Basin Management Plan, new development proposals should take opportunities to reinstate natural flood management measures, including the removal of culverts, to maintain and, where possible, improve the quality and biodiversity of the water environment.	<p>River basin management aims to protect and improve the condition of Scotland's rivers, lochs, estuaries, coastal waters and groundwater. Taking action to reduce flood risk provides opportunities to deliver joint objectives for restoration and flood risk management. Coordination between river basin management and flood risk management can reduce flood risk, while also improving water quality and biodiversity.</p> <p>SEPA works to ensure that there is integration and coordination between the river basin management plan and the SEPA Flood Risk Management Plan which informs the Local Flood Risk Management Plan. This coordination, particularly in regard to consultation and engagement, is important for stakeholders who have an interest in the objectives of the various plans.</p>	Due to the scale of river basin catchments a multitude of functions including – regulating drainage (surface water management), flood protection, fisheries, recreation, environmental protection and conservation are included.
Roads drainage and flood prevention	Local Authorities are responsible for the drainage of local roads and public highways and for providing strategic flood risk management and inspecting watercourses. This includes inspection, clearing and repair of watercourses to reduce flood risk and routine maintenance of road gullies on public roads and highways.	SEPA is Scotland's national flood forecasting, flood warning authority and strategic flood risk management authority. SEPA produces Scotland's Flood Risk Management Plans and works closely with other responsible organisations to ensure that a nationally consistent approach to flood risk management is adopted.	Scottish Water has the public drainage duty and is responsible for the drainage of rainwater run-off (surface water) from roofs, and any paved ground surface within the property boundary. Scottish Water can help protect homes from flooding caused by overflowing or blocked sewers.

	Local Authorities	SEPA	Scottish Water
	Local authorities are responsible for producing Scotland's Local Flood Risk Management Plans and work in partnership with SEPA, Scottish Water and other responsible authorities to develop these.		

2.2 What is water management infrastructure and how is it used?

Water management is the control and movement of water resources to minimise damage to life and property and to maximise efficient beneficial uses including health and hygiene, residential and economic growth, recreation, transport and environmental protection. Management is provided through engineered and green infrastructure. Green infrastructure is commonly referred to as Sustainable Drainage Systems (SuDS), blue-green infrastructure (BG) or nature-based solutions (NcS). Engineered infrastructure will include watercourses (open and culverted), infrastructure for the drainage of roads, sewers – including foul, surface water and combined, and flood defences, treatment works and reservoirs.

2.3 Scope of the natural / semi-natural water environment

Glasgow's main water bodies

The main waterbodies within Glasgow are the River Clyde (which is tidal up to the weir at Glasgow Green), the Forth and Clyde Canal, the White Cart Water and the River Kelvin. Smaller tributaries include the Molendinar Burn, the Camlachie Burn, the Light Burn, the Carntyne Burn, the Mallsmire / Polmadie Burn, the Tollcross Burn, the Yoker Burn, the Garscadden Burn, the Battle Burn, the Bothlin Burn, the Brock Burn, the Levern Water and the Auldhouse Burn – many of which are culverted for most, if not all, of their lengths.

Daylighted (de-culverted water courses)

As the city developed over the past 100 years, many watercourses were culverted to either facilitate construction of roads / buildings, or due to their heavily polluted nature and were often over time subsumed within the formal sewer network (hence sewers such as the 'Possil Burn sewer' in the north of Glasgow). This has led to a lack of natural watercourses in many areas of the city, and consideration of the costs / benefits of daylighting (de-culverting) appropriate sections to bring suitable elements of these water bodies to the surface on the existing line of the culvert or a new line, either of which may be the historic route of the watercourse. There are many benefits associated with daylighting culverted watercourses, but there are also significant challenges, costs and risk in urban areas.

Aquatic / Riparian Environments

In addition to rivers, streams (burns) and canals, a number of open water bodies exist within the Glasgow. Only three form large areas exceeding 9 ha (Bishop Loch, Hogganfield Loch and Frankfield Loch) but a further seven exceed 1 ha. Many of the smaller sites are managed in formal public parks and can support a range of aquatic species and have an actual or potentially high local nature conservation value. All of these open water bodies have some degree of 'engineering' to manage water levels and outflows for a variety of reasons linked to previous industrial or recreational use of water.

1. Possil Loch (1.5ha)
2. Hogganfield Loch (22 ha)
3. Frankfield Loch (9ha)
4. Bishop Loch (23ha)
5. Gartloch Pool (2ha)
6. Millerston Wetland (0.2ha)
7. Provanhall (1.4ha)
8. Darnley Mill LNR (0.5ha)
9. Pollok Country Park (0.5ha)
10. Glen Park, Castlemilk (0.2ha)
11. Springburn Park (1.5ha)
12. Queen's Park (0.8ha)
13. Maxwell Park (0.3ha)
14. Alexandra Park (1ha)
15. Rosshall Park (0.2ha)
16. Knightswood Park (0.7ha)
17. Bingham's Pond (2ha)
18. Kelvingrove Park (0.1ha)
19. Victoria Park (1ha)
20. Elder Park (0.1ha)
21. Richmond Park (1.1ha)

Sustainable Drainage Systems (SuDS)

Both large and small actions are required to better manage rainwater, and to reduce the risk of flooding and spills from combined sewer overflows into the water environment. This means more “grey infrastructure” where necessary, but also installing water butts, building raingardens, ponds, basins, wetlands (SuDS) and increasing the areas of green spaces within the built environment that can absorb rainfall and prevent it from ever entering the wastewater system, as well as providing attractive features that enhance public amenity and support greater biodiversity. These networks of natural and semi-natural features are often known as “blue-green infrastructure”.

Since 2003, all new developments must install basins and ponds to drain rainwater, more commonly known as SUDS. In addition, to protect the current combined sewer network, Scottish Water does not allow new rainwater drainage connections to be made to it unless there is no alternative. After 20 years of experience the need to improve how we deliver and maintain SuDS and make these parts of blue-green infrastructure networks so they can serve a bigger area and manage more rainwater is recognised.

Sustainable urban drainage not only reduces the amount of diffuse pollution but also improves the environmental quality of development to the benefit of the local community. The design and management of SuDS should be considered for development at an early stage in project design in order to determine its applicability.

2.4 Scope of physical / engineered water management assets

Water supply infrastructure

Water is taken from lochs, rivers, aquifers and reservoirs and piped to water treatment works. Harmful bacteria, plant material, minerals, natural or synthetic chemicals, and dirt are removed by screening (removal of debris), clarification (removal of mud and silt), filtration (removal of small grit and colour), disinfection (removal of bacteria) and pH correction (reduction of acidity). The treated water is stored in large tanks and service reservoirs. The clean water is then taken by trunk water mains and distributed to properties via local water mains and service pipes.

Water quality infrastructure

Drinking water that contains lead can have a negative impact on human health. Much has been removed from water systems today, but some still remains. Scottish Water adds a chemical, known as *orthophosphate*, to stop the lead dissolving in drinking water. Whilst orthophosphate is safe for human health it is a scarce resource, is not an environmentally friendly approach, and it will become more expensive as chemical supplies are limited. Replacing lead pipes, fixtures and fittings would fix this problem but it is expensive and disruptive. Opportunities to remove lead from the water distribution system should be taken when significant redevelopment / renovation is being undertaken.

Drainage of rainwater infrastructure

In Scotland wastewater from homes and businesses is collected by a network of public sewers (also known as sewerage) and is treated at wastewater treatment works where it is cleaned, treated and returned safely to the environment (rivers, lochs and the sea). Some of the sewer pipes are 'combined sewers.' This means that one pipe collects sewage from homes and businesses (toilets, sinks, showers, baths etc) and rainwater from roofs and paved areas around properties. Many roads, especially in our towns and cities, also drain into the combined sewer network. In some parts of Scotland there are separate systems for sewage and drainage.

The changing climate means more periods of heavy and/or intense rainfall which can lead to spills from drainage systems to the environment and/or cause flooding to homes and businesses.

The increased area of 'hard surfaces' from new developments, roads and pavements, plus paving over of gardens for driveways and patios, as well as replacing grass with artificial alternatives (urban creep), means when it rains more rainwater runs off these hard surfaces and down the drains more quickly than it would on natural surfaces like grassed areas.

Overflows (Combined Sewer Outlets)

During heavy or prolonged rainfall, more rainwater can get into the combined sewers than they can cope with, so they have been designed with an overflow mechanism which acts to safely relieve the pressure on the network and reduce the risk of flooding homes and businesses. These overflows allow storm water (a mix of rainwater and dilute toilet waste (usually less than 1% of the total volume)) to enter the environment. SEPA checks the water quality of our rivers, lochs and seas and has found that 87% of Scotland's water environment can be classed as being in good or better condition.

Filtration infrastructure

Substances / matter not to be discharged into a sewer or drain include items incorrectly flushed down the toilet such as wet wipes, cotton buds, nappies and sanitary products, or fats and oils poured down the sink can block sewer pipes. They result in over 36,000 blockages every year. Blockages can lead to sewage spilling into the environment or into people's homes. If the blockage causes the sewers to spill, then sewage and other items can spill into a river, loch, or the sea. These then wash up on beaches, along riparian edges and get caught in trees and plants that grow on the edges of the water environment. It is expensive to pick up this litter.

Treatment infrastructure

Wastewater is treated at a wastewater treatment works (WWTW), to remove items such as wipes and plastics, solids and pollutants so that the remaining water (called effluent) is safe to put back into a river, loch or the sea. The amount of treatment depends on the

numbers of people who live in a catchment area that the treatment works serves, and the sensitivity/ classification of the river, loch or sea where the treated water will be discharged. Wastewater treatment requires energy and can involve the dosing of chemicals depending on the standards that the treated wastewater must meet, the requirements for which are set out in law.

In addition to human waste, wastewater contains cosmetics, soaps, disinfectants, fabrics, coatings from pans and much more. It also includes medicines that our bodies haven't managed to absorb and germs from illnesses, like flu, that people may have. Some chemicals found in wastewater are potentially hazardous because they don't breakdown in, or are harmful to, the environment such as microplastics and medicines.

Wastewater treatment works are not designed to remove some of these chemicals, so new techniques need to be devised to manage them. Monitoring at WWTWs can improve understanding of the types and extent of contaminants that are making their way into the wastewater system including pathogens that indicate diseases, such as COVID. The Glasgow City Council area is served by four main WWTWs at Dalmuir, Dalmarnock, Daldowie and Shieldhall. Much of the sewer network operates by gravity, but there are also numerous large and small wastewater pumping stations that are required to convey flow where gravity operation is not possible. The pumping and treatment of sewage has a significant energy and carbon cost.

Foul water infrastructure

Foul water (sewage) from properties passes through the drains into the local wastewater sewers and from there into the trunk wastewater sewers to be directed to wastewater treatment works. In the past the wastewater network was used to capture both surface water runoff and foul water in one pipe. Since the 1950s the conventional approach to drainage has been to take the rainfall runoff from buildings, roads and pavements and directly discharge to a watercourse. For all new developments SuDS are now required for surface water systems which provides attenuation and treatment prior to return, by natural dissipation where possible, to the water environment. Having separate systems frees capacity for wastewater and reduces emergency overflows. Wastewater is transported to treatment works where gross solids and grit are removed and the remaining water is treated. The organic solids which are removed from the water in the form of sludge are utilised in recycling outlets. Once the water is treated to an acceptable standard it can be discharged back to the river or the sea.

Surface and Sewer Flood Risk

As noted above, the capacity for surface water discharges to the combined sewer network is, in many areas of Glasgow, a constraint on development. Scottish Water's [Surface Water Policy](#) has a strong presumption against any new surface water draining into the combined sewer network, and it aims to remove surface water from the existing combined sewer network where possible. This is supported by a hierarchy of options for managing surface water from new development.

GCC is a key partner in the development of the [Metropolitan Glasgow Strategic Drainage Partnership](#) (MGSDP). The MGSDP is a multi-agency partnership working to deliver a range of projects addressing existing drainage infrastructure, water issues and flooding throughout metropolitan Glasgow. These projects include flood alleviation, river water quality improvement, and environmental improvement schemes.

The MGSDP advocates sustainable approaches to managing flood risk and unlock development potential while improving water quality. Multiple different types of intervention will deliver this aim, including awareness raising, flood warnings, discouraging loss of existing permeable surfaces/ land, new and retrofit blue-green infrastructure, property flood resilience measures, and safeguarding areas of land important to flood attenuation to allow flooding to be managed in an appropriate location.

[North Glasgow Integrated Water Management Project \(NGIWMS\)](#)

The NGIWMS innovatively combines 18th century infrastructure (Forth & Clyde Canal – a scheduled monument) with 21st century technology (weather forecasting, real-time hydraulic simulation, automated sensors/controls and remote operator interface) to dynamically manage surface water and flood risk in a carbon efficient manner, enabling the sustainable regeneration of 110 hectares of North Glasgow, and delivering ~3,000 new homes with a blue-green, placemaking approach.

Remotely operated control and telemetry stations were established at two main feeder locations (Papermill / Kilsyth and Woodhall / Airdrie) and three discharge locations (Ruchill, Shirva / Lenzie and Craigmarloch / Kilsyth). Remote flow monitoring and relay stations were also established at a number of smaller feeder locations, along with flow and water quality stations for each of the 5 key development sites. Lowering the water level of the canal by up to 100mm across the 19km Forth and Clyde Canal summit pound, creates capacity for 55,000m³ of surface water in advance of the forecast rainfall, and thus keeps the surface water out of the combined sewer network.

The Smart Canal control levels in the Forth & Clyde summit pound i.e. from Maryhill Lock 21 in the west to Wyndford Lock 20 in the east, and Glasgow Branch. There are also monitoring sites and a key site, Woodhall (an abstraction site) for the Monkland Canal, which is at its vast majority piped, and it feeds the Forth & Clyde by carrying water from Woodhall to Pinkston basin i.e. the Glasgow branch. Below is a figure showing the key sites and the extent of it.

3.3 System infrastructure

The infrastructure supporting the NGIWMS consists of 3 actuated discharge gates, 2 actuated feeders and 18 monitoring stations forming the SCADA network. Anticipated upgrades in the short term will include actuated lock sluices to maintain navigational feeds east and west of the summit pond.



Figure 3-2: Schematic of NGIWMS infrastructure

This provides a drainage system to manage rainfall events up to the 0.5% Annual Exceedance of Probability (200 year) event, including future climate change predictions. Without this scheme, there would have either remained a significant constraint to development or a retention of increasing flood risk within and downstream of the developments, which includes the Glasgow City Centre and M8 motorway.

Drained land - The main water management areas that are facilitated by the Smart Canal are:

Port Dundas ~ 9ha

Sighthill ~ 40ha

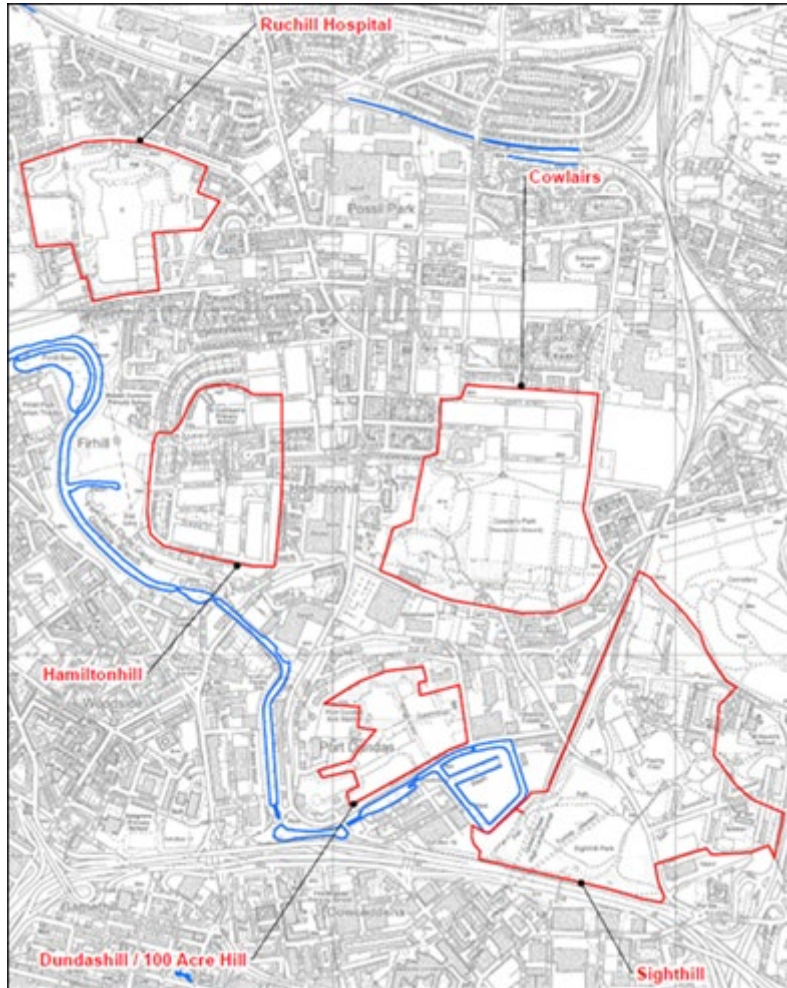
Hamiltonhill ~ 15ha

Ruchill ~ 15ha

Cowlairs ~ 31ha

Subject to agreement by all parties, other smaller sites can also be connected to the Smart Canal. One such example is a project to reduce risk for existing properties at Shieldaig Road. Below right is a figure showing where it is and where it will discharge.

5no. development areas in North Glasgow



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Additional Shieldaig Road site



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Section 3 - Identifying the Water Management policy framework and mapping

Table 2 - Flood Risk Management Framework

National	Local
<p>SEPA <u>National Flood Risk Assessment</u> Published Dec 2011</p>	<p>This is a high-level assessment used to identify (1) Potentially Vulnerable Areas where further studies, investment and actions are required.</p> <p>The assessment identified 14no. geographical areas known as (2) Local Plan Districts for which (3) 14no. Flood Risk Management Strategies* (Plans) and (4) 14no. Local Flood Risk Management Plans have been prepared.</p> <p>* Flood Risk Management Strategies were subsequently changed to Flood Risk Management Plans</p>
<p>(1) Potentially Vulnerable Areas Produced by SEPA</p> <p>7no. PVAs are partially or completely located within the Glasgow City Local Authority area.</p>	<p>SEPA <u>National map</u> identifying PVAs</p> <p>The SEPA <u>National Flood Risk Assessment</u> 2018 identified that across the Local Plan District 98,000 homes and business premises are at risk of flooding. Of these, seven areas identified as potentially vulnerable were wholly or partially within Glasgow.</p> <ul style="list-style-type: none"> • PVA 02/11/03: Yoker catchment – Clyde (Clydebank and Partick) • PVA 02/11/04: River Kelvin • PVA 02/11/17: White Cart Water catchment • PVA 02/11/06: Glasgow City North • PVA 02/11/05: Glasgow City centre • PVA 02/11/11: East of Glasgow to Strathaven. • PVA 02/11/16: Rutherglen
<p>(2) Local Plan Districts (Flood Risk Management) Produced by SEPA</p>	<p>National map identifying 14no. <u>Local Plan Flood Risk Management Districts</u> See below.</p>

National	Local
	Glasgow City Council sits within the Clyde and Loch Lomond (CaLL) Local Plan District (LPD).
<p>(3) Flood Risk Management Plans (FRMP)</p> <p>SEPA's Flood Risk Management Plans identify objectives to provide the long term vision for delivering flood risk management in Scotland, and the actions give the practical steps required to achieve those objectives. A community perspective was used to identify where flood risk management actions should target their benefits. Those areas are described as objective target areas.</p> <p>Each Local Flood Risk Management Plan has objectives and actions set for each target area within each PVA. National actions have also been identified, which apply across all Local Plan Districts including to areas that are not within PVAs.</p>	<p><u>Clyde and Loch Lomond Plan District (CaLL) Flood Risk Management Plan</u></p> <p>Published by SEPA 2021. The FRMP for the CaLL LPD sets out Actions (projects) that GCC is proposing to start (but not necessarily finish) in Cycle 2 (2022-2028) and Cycle 3 (2028-2035). These Actions are too numerous to list.</p>
<p>(4) Local Flood Risk Management Plans (LFRMP)</p> <p>A total of 14 local plans have been prepared to complement the Flood Risk Management Plans. The local plans coordinate the strategies into integrated actions to reduce the impacts of flooding. They also include specific actions on surface water management. They have been prepared by lead local authorities in consultation with SEPA, Scottish Water, and local advisory groups.</p> <p>Local Flood Risk Management Plans contain amongst other things, Surface Water Plans (SWMPs) which contain a number and combination of actions.</p>	<p>The <u>Local Flood Risk Management Plan (LFRMP)</u> - provides more detail on Actions that will start in Cycle 2.</p> <p>The CaLL LPD covers the Glasgow Local Authority Area. Co-ordinated by GCC, it provides additional detail on the responsibility for delivery, funding and coordination of actions across the Local Plan District. Cycle 1 plans were timetabled for actions between 2016 and 2021. These have now been replaced by Cycle 2 plans delivering actions between 2022 – 2028.</p> <p>PVA's identify Objective Target Areas based on reducing flood risk to an identified receptor cluster. A typical LFRM plan datasheet will identify the number of people and properties at risk and the nature of the risk and identify Actions aimed at reducing risk e.g.</p> <ul style="list-style-type: none"> • Awareness raising; • Data collection; • Emergency plans; • Flood forecasting and warning; • Guidance development;

National	Local
	<ul style="list-style-type: none"> • Hazard mapping updates; • Land use planning; • Natural flood management; • National flood risk assessment; • Self help; • Conduit or flood defence maintenance; • Condition surveys; • Assessment of sewer flooding (Scottish Water); and • Develop SWMPs
Surface Water Management Plans (SWMPs)	<p>Surface Water Management Plans (SWMPs) will be used to identify measures to reduce surface water flooding. The need for surface water management plans will be identified in Flood Risk Management Plans and Local Flood Risk Management Plans. Where required, they will be prepared by local authorities in consultation with SEPA, Scottish Water, and local advisory groups.</p> <p>The primary focus of the SWMPs is to reduce the rate and volume of surface water that enters the combined sewer network. This is done by retrofitting SuDS type measures to either disconnect surface water from the combined sewer, or attenuate (slow down) rainfall before it enters the drainage network. This reduces the strain on the drainage network during storm events, reducing the risk of CSO discharging and / or flooding occurring. (See SuDS).</p>

Table 3 - Environmental water quality

National	Local
<p>The River Basin Management Plan for Scotland 2021 - 2027 sets out a range of actions to improve the status of the water body.</p> <p>SEPA's Water Environment Hub provides details of River Basin Management Plan aspirations including overall condition of</p>	<p><u>Glasgow's Water Body Classification status</u></p> <ul style="list-style-type: none"> • The Forth and Clyde Canal is classified as good. • The Clyde Estuary (Inner) including the Carts is classified as moderate up to the Tidal Weir; beyond the weir as far as the South Lanarkshire boundary is also classified as moderate.

[bodies of surface water](#) classified under the Water Framework Directive (WFD) scheme.

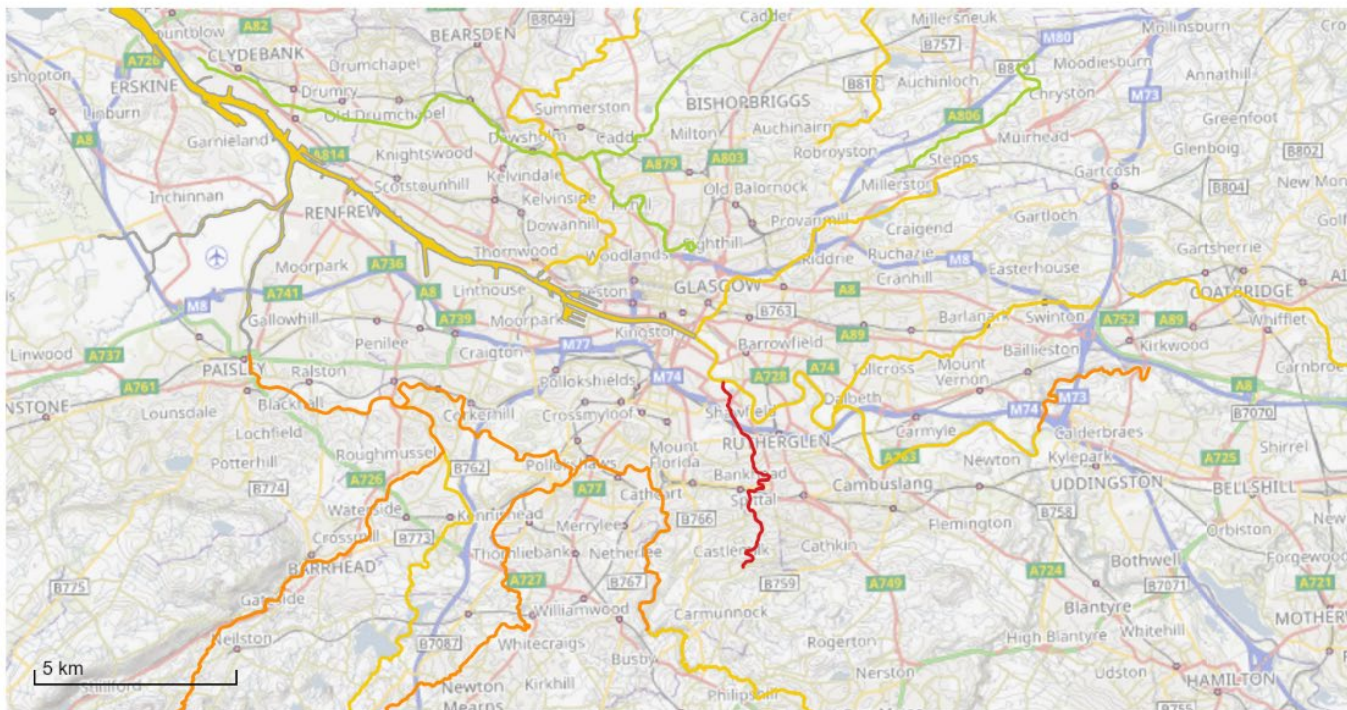
[Further information](#) is available here regarding future objectives (2027 and long term) for water bodies.

The River Kelvin, Molendinar Burn and Tollcross Burn are also classified as moderate.

- The White Water Cart (Luggie Burn to Clyde) and Kitch Water to A726 road bridge) are classified as poor, as is the Capelrig / Auldhouse Burn.
- The Mallsmire Burn/Polmadie Burn/Cityford Burn system is classified as bad.

However, the overall rating is a synthesis of water quality, ecology, chemistry, morphology and hydrology ratings which indicate a very mixed picture depending on individual water bodies. The overall situation is one of slow improvement in water quality compared with 10 years ago.

Chart: Water Classification status - surface water only 2020



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(2015).

This map displays bodies of surface waters coloured by overall status for the latest available year

Condition

- Good
- Moderate
- Poor
- Bad

3.1 Design Guidance for Glasgow's River Corridor

The River Clyde Development Corridor 2050 Strategic Development Framework

The Council's ambitions for the River Corridor place it at the scale of a major urban renewal project - balancing regeneration (and its wider social, environmental and economic benefits) with the complexities of flood management and climate change. Retreating from the river is not considered a proportionate response if the long-term objective is to create a liveable city, to support integration with existing neighbourhoods and to attract people to the waterfront.

Tidal River Clyde Flood Model

Glasgow City Council and SEPA have collaborated to produce an updated flood model for the tidal reach of the River Clyde, from Dalbeth to Greenock. The updated Tidal River Clyde Flood Model represents the best available understanding of current and future flood risk from the tidal Clyde for fluvial (river flooding) events and coastal flooding, including storm surge events and sea level rise, to the year 2100 plus an allowance for climate change. Property flood resilience (PFR) measures include:

- physical and management / operational measures for water resistance (i.e. preventing entry of water)
- water resilience / recoverability (i.e. waterproof materials, elevated utilities, etc)
- emergency flood plans (i.e. signing up to flood warnings, preparing a flood plan, identifying evacuation plans / routes, ensuring awareness of occupiers of property, etc)
- Designing with Water - Design Guidance for Glasgow's River Corridor

This non-statutory guidance should be considered as an early part of the adaptive pathways approach to help unlock vacant sites along the river, repair the urban fabric and ensure future development is able to 'resist and absorb' the impacts of sea level rise and tidal surge.

Tidal Flooding on the Clyde Options Analysis and Scoping of Adaptation Pathways

The recently published [Tidal Flooding on the Clyde Options Analysis and Scoping of Adaptation Pathways](#) supports the principle of future development in the area covered by the SDF and the preparation of locally appropriate guidance to avoid poor long-term investment decisions.

Adaptation pathways is a decision-making tool employed to adapt to climate change and the inherent uncertainties of future risk. This research sets out to explore the evidence base to help design and apply adaptation (investment) pathways to the tidal reach of the Clyde drawing on international practice and UK guidance. This research is a first for Scotland providing:

- information to help frame actions and decisions at a local, regional and national level around future flood resilience and long-term adaptation on the Clyde;
- practical insights into the application of adaptation pathways practice to the Clyde; and
- a starting point for the co-design and development of a route map and future actions.

Recommended first steps for adaptation on the Clyde include to:

- agree a framework for the application of adaptation pathways for the Clyde that fosters systems-thinking and a process for place-based decision making;
- agree what “a resilient Clyde” means, to inform design principles for investment and pathway development, and shape indicators for monitoring and evaluation;
- establish a ‘resilience zone’, a geographic boundary for decision-making;
- build an action plan (Mission Map) for the first five years of investment; and
- scope and develop a knowledge portal to support innovation, collaboration and long-term monitoring and evaluation.

Section 4 - Tidal (Marine / Coastal) Clyde

At the time of submission of the original Evidence Report no bespoke information had been provided for Marine Planning and therefore, this section can be read as an addendum. Extant work undertaken to inform the Water Management Infrastructure Audit is combined with new information referred to here. This new work (addendum) fulfils the DPEA Reporter's request to '*provide evidence of engagement with Marine Directorate and an explanation why this was not (initially) considered necessary*'.

4.1 Marine / Tidal Environment Introduction

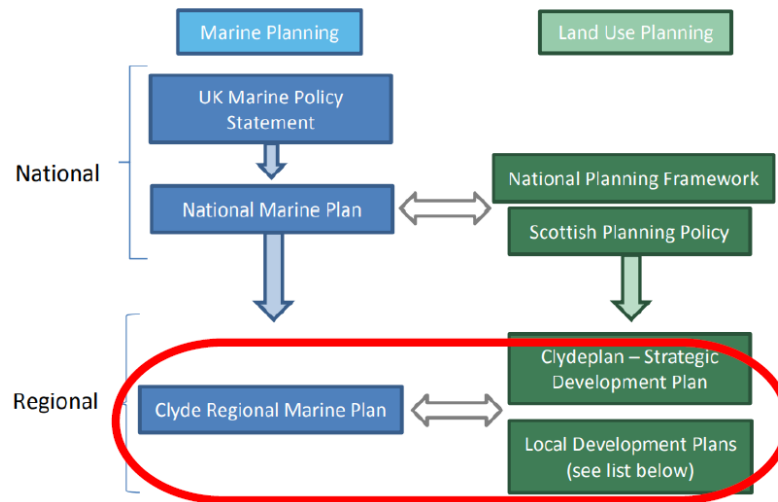
Development and other land use which takes place in the marine environment can have an onshore component or implication. Alignment between marine and terrestrial planning is therefore important and should be achieved through consistency of policy guidance, plans and decisions.

For greater detail, [CIRCULAR 1/2015](#): *The relationship between the statutory land use planning system and marine planning and licensing*, provides a useful reference.

[Scotland's National Marine Plan](#) (CD210) was published in 2015 and came into being as a result of the Marine (Scotland) Act 2010.

In addition to the National Marine Plan, as of 2024, the [National Marine Regional Plan - Clyde Regional Marine Plan Pre-Consultation Draft](#) (CD212) was also available. It should be noted that this plan is still draft, and that, notwithstanding anticipated updates from Clyde Marine Planning Partnership, much of the information provided is somewhat historic in nature and that the document has not undertaken any statutory consultation process as of 15th January 2025.

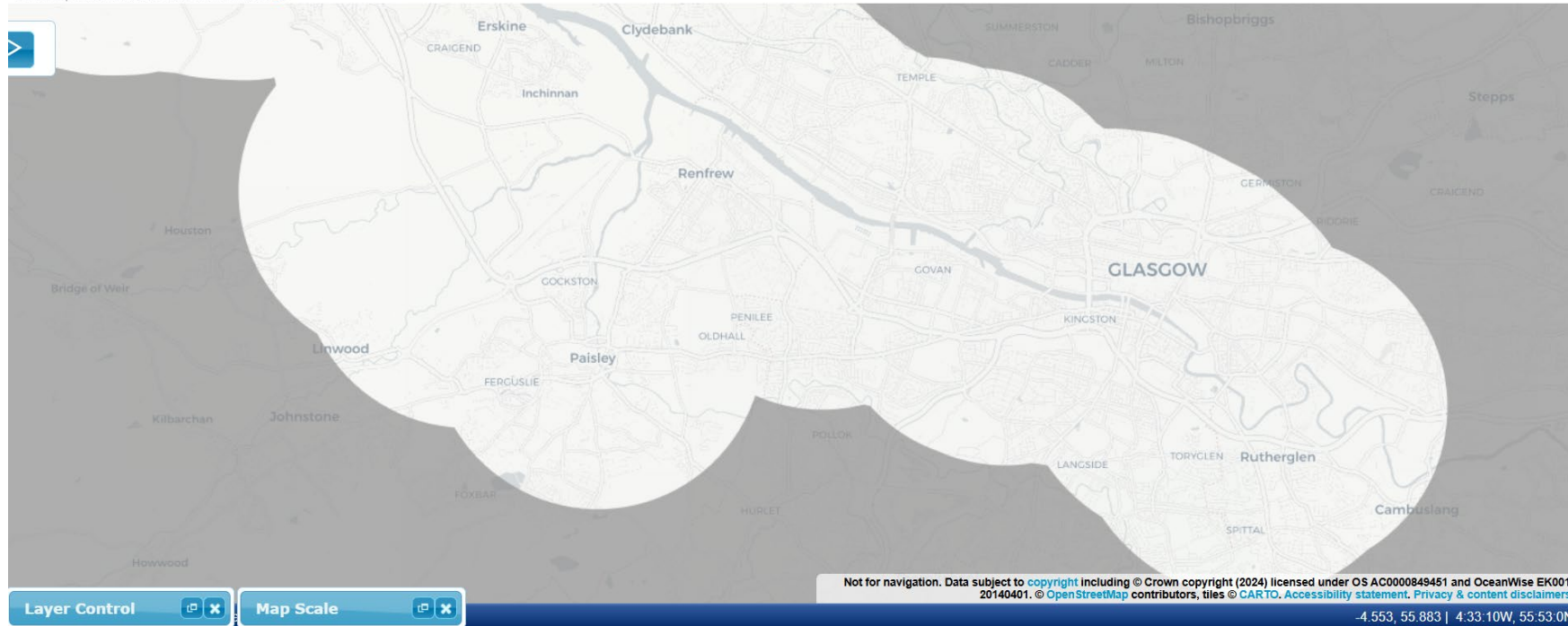
This document provides the following representation of the spatial hierarchy between marine and land use planning policy.



The strategic objectives of aligning planning strategies is most effective when integrated at all appropriate spatial levels. Alignment between national policies in Scotland’s National Marine Plan are best aligned with NPF4 – Scotland’s national planning framework. It is suggested that the high-level status of the National Marine Plan and lack of local evidence therein does not make it a particularly useful source of evidence for supporting the CDP2 Evidence Report. It is for regional marine plans to *take account of local circumstances and issues and smaller ecosystem units*. As such, alignment of the subordinate local plans, requires providing evidence at the practical plan making level.

Therefore, the appropriate level of alignment for the CDP2 Evidence Report is deemed to be the Clyde Regional Marine Plan (CMR). Whilst it is acknowledged that the regional plan is draft, this should not detract from the relevance of the information provided as evidence (unless any protracted delay in advancing the CMR towards adoption necessitates an update).

The CMR extends from the normal tidal limit of the River Clyde (Carmyle Weir), seawards to the outer firth in Argyll and Ayrshire.



Source: maps.marine.gov.scot

4.2 Policy context and alignment - the National Marine Plan (NMP), Clyde Regional Marine Plan (CMR) and the GCC's adopted CDP.

As would be expected, a high degree of conformity exists between the national and regional marine policies but a key difference is the extent of plan policy coverage being 200 nautical miles for the national plan and 12 nautical miles for the regional.

The policies contained within the Clyde Regional Marine Plan DRAFT have been assessed for consistency, subordinacy, and level of practical detail against the contents of National Marine Plan (NMP) to facilitate alignment with CDP2 as follows:

NMP Chapter 1-4 and Chapter 5 – A Guide to Sector Chapters represent a broad high-level introduction to marine planning, its aims and scope, conceptual principles and a set of broad high-level policies and goes on to lay out key marine sectors.

Marine litter is considered under National Marine Plan Chapter 4 general policies section and within the CMR - Marine Litter.

About 80% of marine litter in Scotland is identified as coming from land-based sources. This includes sewage related debris (SRD) such as cotton buds, nappies, wet wipes and sanitary products. Activities carried out at sea contribute the remaining 20% of marine litter. In UK waters around 70% of marine litter is plastic which will persist in the environment for thousands of years.

There are no Clyde specific data regarding the impact of litter deposited in the region from shipping and transport activities. Extant 'Designing for Water' Guidance does not mention the potential for flood events to wash land-based litter into the marine environment.

NMP Chapter 6-7 Commercial sea fisheries and Aquaculture operations

NMPi mapping confirms there are no commercial sea fisheries, or aquaculture operations within the CDP2 area and these policies are deemed to be non-material as such.

NMP Chapter 8 - Wild Salmon and Diadromous Fish and CMR Chapters 9 and 10.

Salmon and sea trout fishing rights in Scotland are held privately, however, Marine Directorate collects catch statistics on an annual basis. As it is classed as a recreational activity, rod fishermen cannot sell their catch. However, it should be noted that the CMR has only marginal catches of wild salmon and sea trout, comprising only 3% of the total salmon and grilse and 5% of trout and finnock catch for Scotland. This activity is regarded as a de minimis issue for CDP2. SEPA has provided mapping for [Obstacles to fish migration](#) and can be viewed in the Blue / Green Infrastructure Audit and will inform the SEA.

NMP Chapters 9 - 11 Oil and Gas, Carbon Capture and Storage (CCS), and Offshore Wind and Marine Renewable Energy

Within the National Marine Plan Chapter 9, 10 and 11 are considered to be non-material policies for CDP2 consideration due to the 'offshore' nature of these industrial activities.

NMP Chapter 12 Recreation and Tourism Chapter and CMR 11 Sports, Recreation and Tourism

Due to data gathering difficulties, CMR provides detail on Sport, Recreation and Tourism figures including wider tourism activity, not just marine activity. To provide context it is estimated that between 10% and 50% can be attributed directly or indirectly to marine activity. It should be noted that almost £1bn of the £2bn turnover is attributed to the Glasgow City local authority area – most likely from service sector activities such as restaurants and accommodation providers, and therefore unlikely to be directly attributable to marine activity.

River Clyde waterfront regeneration is delivering residential, commercial / tourism and industrial developments and climate adaptation measures supported by new infrastructure within the terrestrial / marine interface such as pedestrian and road bridges and land reclamation and quay wall remodelling to support development. Water borne activities including pleasure craft and larger vessels are supported by pontoons and berthing facilities. These activities are a clear area where effective policy alignment is necessary. [River](#)

[Clyde Corridor Strategic Development Framework](#) and [Designing with Water - Design Guidance for Glasgow's River Corridor](#) provides detailed policy and design guidance concerning Glasgow's aspirations to promote riverfront regeneration.

NMP Chapter 13 Shipping, Ports, Harbours and Ferries and CMR Chapter 12 Shipping, Ports, Harbours and Ferries

Clydeport is the controlling Port Authority for 450 square miles of the River Clyde, handling more than 15.4 million tonnes of cargo a year. Within Glasgow's boundaries KGV Docks are classified as a DfT Major Port (contributing).

Ship building is located at BAe Govan and Scotstoun yards with recent upgrades to Govan Wet Basin being approved (EIA) for land reclamation to enable the construction of a major new construction hall at Govan.

Various pontoons and berthing points are provided for pleasure craft, and ferry crossings operate at Yoker and Meadowside.

These activities require effective policy and regulatory alignment. Key likely areas will include marine construction works, including piers, slipways, land reclamation, bridge repair and construction and installation of moorings, buoys, and pontoons, as cited in Guidance for Marine Licence Applicants 2015 and potential alignment with EIA regulations. Future potential development of grey / green infrastructure also represents a key action concerning the marine / terrestrial interface.

Chapter 14 Energy, subsea cable and pipelines

Non-material policy for CDP2 as per NMPi mapping.

Chapter 15 Defence

Non-material policy for CDP2 as per NMPi mapping.

Chapter 16 Aggregates

CMR Chapter 16 confirms there is no identified aggregates activity within the CDP2 area and as such this topic is deemed to be non-material for CDP2 as per NMPi mapping.

4.3 Section Conclusion – part of implications for CDP2

The NMP and CMR policy topics strongly align with each other with a key distinction being spatial coverage and whether activities are offshore or inshore. Glasgow's location within the Clyde Inner Estuary means some aspects of marine planning environment overlap with Glasgow's aspirations for waterfront urban renewal. The relationship between water and land, the linear form, built heritage and distinct townscape provide a strong framework for successful placemaking.

In recognising that the approach to adaptation for Glasgow's stretch of urban River Clyde may need to be transformation orientated, with place making and resilience at the heart of investment decision making and integration with future adaptive pathways design, the key area for alignment with the marine environment will be through addressing the challenge posed by potential sea level rise and tidal surge as identified through Designing with Water - Design Guidance for Glasgow's River Corridor. In particular, emphasis for urban renewal is being given to the inner estuary character area – 'inner estuary' (Glasgow tidal weir to Govan).

As an early part of an adaptive pathways approach to help unlock vacant sites along the river, repair the urban fabric and ensure future development is able to 'resist and absorb' the impacts of sea level rise and tidal surge, the concept of a River Park will be progressed. The aim should be to provide a 12-metre set back from the River Clyde on both banks, in part, by the development of vacant sites and by creating new / enhancing existing open space, providing new walkways and cycleways, and SuDS etc.

Within the NMP and mirrored by the CMR the focus for policy alignment with CDP2 is as follows:

- CMR Chapter 1 - Climate Change
- CMR Chapter 2 - Historic Environment
- CMR Chapter 3 - Landscape / Seascape
- CMR Chapter 4 - Coastal processes, Coastal Flood and Storm Damage Alleviation
- CMR Chapter 5 - Natural Heritage
- CMR Chapter 6 - Non-Native Species
- CMR Chapter 7 - Marine Litter
- CMR Chapter 8 - All sectors – general policy
- CMR Chapter 9 - Sea Fisheries
- CMR Chapter 10 - Aquaculture
- CMR Chapter 11 - Sports, Recreation and Tourism
- CMR Chapter 12 - Shipping, Ports, Harbours and Ferries
- CMR Chapter 14 - Energy, subsea cable and pipelines
- CMR Chapter 15 - Marine aggregates

It is considered that development proposals within the marine / terrestrial environment (in particular CMR policies CP1-7 and 11) will be addressed through the approach spelt out within the River Clyde Development Corridor SDF, Designing with Water - Design Guidance for Glasgow's River Corridor and the updated Tidal River Clyde Flood Model policy framework.

4.4 Consultation with Clyde Regional Marine Plan (CMR) Pre-consultation Draft Plan

In May 2019, the Council responded to Clyde Regional Marine Plan (CMR) Pre-consultation Draft Plan PDF with suggested amended wording to certain draft policies and supporting comments. The scope of the response covered draft policies covering

- climate change,
- historic environment,
- landscape/seascape,
- natural heritage,
- Non-native species,
- sports, recreation and tourism,
- shipping, ports, harbours and ferries,
- coastal flooding and
- All sectors – general policy.

In November 2023, the Clyde Regional Marine Plan responded to the Council's Call for Information with the below information caveated with the CMR still being in development phase. (058)

In December 2023, clarification was sought from the Scottish Government (Dynamic Coast) regarding the alignment of flooding responsibilities between NPF4 Policy 22: Flood risk and water management and Policy 10: Coastal development with regard to Glasgow's status as a coastal area and interpreting terms such as coastal processes and coastal erosion. (060)

4.5 Provide an overview of aligning terrestrial and marine planning through preparation of CDP2 process.

City Development Plan and evolving policy framework

NPF4 was published in February 2023 and alongside City Development Plan (adopted in 2017) forms part of the current Local Development Plan. NPF4 provides a single specific reference to the National Marine Plan made in relation to aquaculture. *Policy 32 – Aquaculture - b) Development proposals for aquaculture will be supported where they comply with the LDP, the National Marine Plan and, where relevant, the appropriate Regional Marine Plan.*

City Development Plan

Only one reference explicitly refers to the National Marine Plan in CDP-8 Water Environment and no reference is in SG-8 supplementary guidance. The Clyde Regional Marine Plan DRAFT was published after CDP adoption.

CDP-2 does identify priority areas where a strategic approach is needed to co-ordinate development activity, direct investment and address emerging opportunities (SG-2 supplementary guidance).

River Clyde Development Corridor Strategic Development Framework (SDF)

The River Clyde Development Corridor SDF was adopted as Supplementary Guidance to the Glasgow City Development Plan in 2020.

It makes specific reference to the Clyde Regional Marine Plan noting support for sustainable development through this framework. In meeting the challenges of understanding future flood risk and establishing a proportionate approach to management of flood risk that recognises the River Corridor as an integral part of the future regeneration of the city and the wider region, the SDF shall - *Continue to collaborate with partners at local, regional and national level including SEPA, MGSDP, Connecting Nature, Clyde Regional Marine Plan and Climate Ready Clyde to address key issues facing the river, and to develop guidance for long term, responsive adaptation measures.*

The SDF provides a spatial vision for the River Corridor for the next 30 years:

“Our vision is for the River Corridor to become a vibrant, inclusive, liveable and well-connected place. It will be a world-class destination at the heart of the city, with an accessible waterfront and attractive spaces where people want to spend time. It will be climate-resilient and support a mix of uses. New houses and flats will be linked to existing neighbourhoods. The historic character will be protected and enhanced, while innovative design will help create a distinct identity. The River Corridor will form part of a wider network of urban waterways, will support continuous walking and cycling routes, and will be celebrated as the city’s largest, continuous open space.”

The SDF identifies the increased risk of tidal flooding driven by sea level rise as a threat to the delivery of the vision.

Scotland has been separated into 14 Local Plan Districts for flood risk management purposes (CD206). Glasgow is covered by the Clyde and Loch Lomond Local Plan District. (CD209) The City Centre has been identified as one of 16 potentially vulnerable areas within the Local Plan District. The flood risk management plan notes that surface water flooding is responsible for 68% of risk within the area. Coastal flooding is associated with 32% of risk however the report notes that “there have been no coastal floods recorded within this Potentially Vulnerable Area.”

Tidal Clyde Model 2020

In 2019, SEPA expressed concern that the extant (2003) river model was out of date. Council Officers have collaborated with SEPA to produce an updated flood model for the tidal reach of the Clyde. The model represents the best available understanding of current and future flood risk. It will be used to assess flood risk, support land-use planning decisions, and to inform the climate adaptation pathway. Predicted flood levels from the tidal model are available to download from the Council website. [Tidal River Clyde Flood Model](#).

Tidal Flooding on the Clyde - Analysis and Scoping of Adaptation Pathways

In 2021, Clyde Mission commissioned Climate Exchange to undertake an initial scoping exercise. Adaptation pathways are a decision-making tool employed to enable areas to adapt to climate change and address the inherent uncertainties of future risk.

Based on an assumed CRP8.5 scenario, the 2022 report notes that sea level rise in the long-term will gradually undermine the ability of the city to withstand tidal extremes and lower the effective standard of protection to all areas. The report recommends a range of measures to inform the development of an adaptation pathways approach to respond to this threat.

Discussions are ongoing, via the Clyde Adaptation Mission, about how to build upon this initial report including development of an Adaptation (Pathway) Investment Plan for the Clyde. [Tidal Flooding on the Clyde - Analysis and Scoping of Adaptation Pathways \(Climateexchange\)](#).

Designing with Water Non-Statutory Design Guidance

Against this backdrop, the Council have prepared [Designing with Water - Design Guidance for Glasgow's River Corridor](#). This Design Guidance reflects the results of the Tidal Clyde Model 2020 and the findings of the adaptive pathways report commissioned by Clyde Mission. It seeks to ensure that the redevelopment of vacant sites along the River Corridor is informed by a proportionate response to flood management and climate change in aligning with the requirements of Policy 22 exception clause A i-iv, and wider NPF4 policy.

Proposals will only be supported where they can demonstrate that the following have been fully taken into account:

NPF4 policy

- the SEPA guidance on Climate change allowances for flood risk assessment in land use planning, including wave overtopping impacts where possible, relevant to the full life-span of the development, including any decommissioning/remediation required,
- current [SEPA's Development Management Guidance](#) and the relevant [Flood Risk Management Plan - Clyde and Loch Lomond Local Plan District](#),
- sediment dynamics within the relevant coastal cell, including historical trends as indicated in outputs of the Dynamic Coast project and current or future anticipated dynamics,
- protection and use of natural assets for coastal and river protection, including through options for managed realignment, and allowing space for the natural assets themselves to adapt to climate change, and
- opportunities for Integrated Green / Grey Infrastructure where natural assets cannot be used for flood alleviation.

Tidal Clyde Development Masterplan Principles

The below principles are set out to help inform the preparation of development masterplans for previously used (brownfield) sites along the tidal Clyde corridor.

These principles should be considered in tandem with NPF4 and seek to balance regeneration and reuse of brownfield land as promoted by Clyde Mission, with the objective of not increasing flood risk.

The expectation is that developers will formulate masterplans that avoid locating vulnerable* land uses in a flood risk area.

1. No net loss of floodplain capacity as identified by 0.5% Annual Event Probability (AEP) (1:200yr) flood extent plus an appropriate allowance for climate change.
2. No 'highly vulnerable' uses (residential / hotel accommodation) with a finished floor level below 0.5% AEP (1:200yr) flood extent + climate change + 0.9m freeboard.
3. Emergency pedestrian access / egress routes from 'highly vulnerable' uses to be above 0.5% AEP (1:200yr) flood extent + climate change**.
4. Buildings providing accommodation for 'least vulnerable' uses shall adopt resilient design principles where the finished floor level is below 0.5% AEP (1:200yr) flood extent + climate change + 0.9m freeboard.
5. Masterplans that include proposals for buildings where the finished floor level is below 0.5% AEP (1:200yr) flood extent + climate change shall demonstrate how these spaces would be adapted for climate change.
6. The developer and any future owners, factor and occupier of the site shall sign up to the existing flood warning service. The site shall have an emergency plan to be followed when a flood warning is issued. The emergency plan may include building areas below 0.5% AEP (1:200yr) flood extent + climate change level being closed to the public during a Flood Warning for the tidal River Clyde. ***
7. Where elevated buildings are proposed, the underside of the building should be unused in perpetuity as per SEPA's position statement on elevated buildings in areas of flood risk. Where there are no alternative options for car parking, bin storage etc. within the development site, a risk-based approach may be considered. This will only apply to sites where the flood risk is tidal and flood risk events can be predicted in advance.

* marginal risk – where 25% or less of the site lies within a flood risk area.

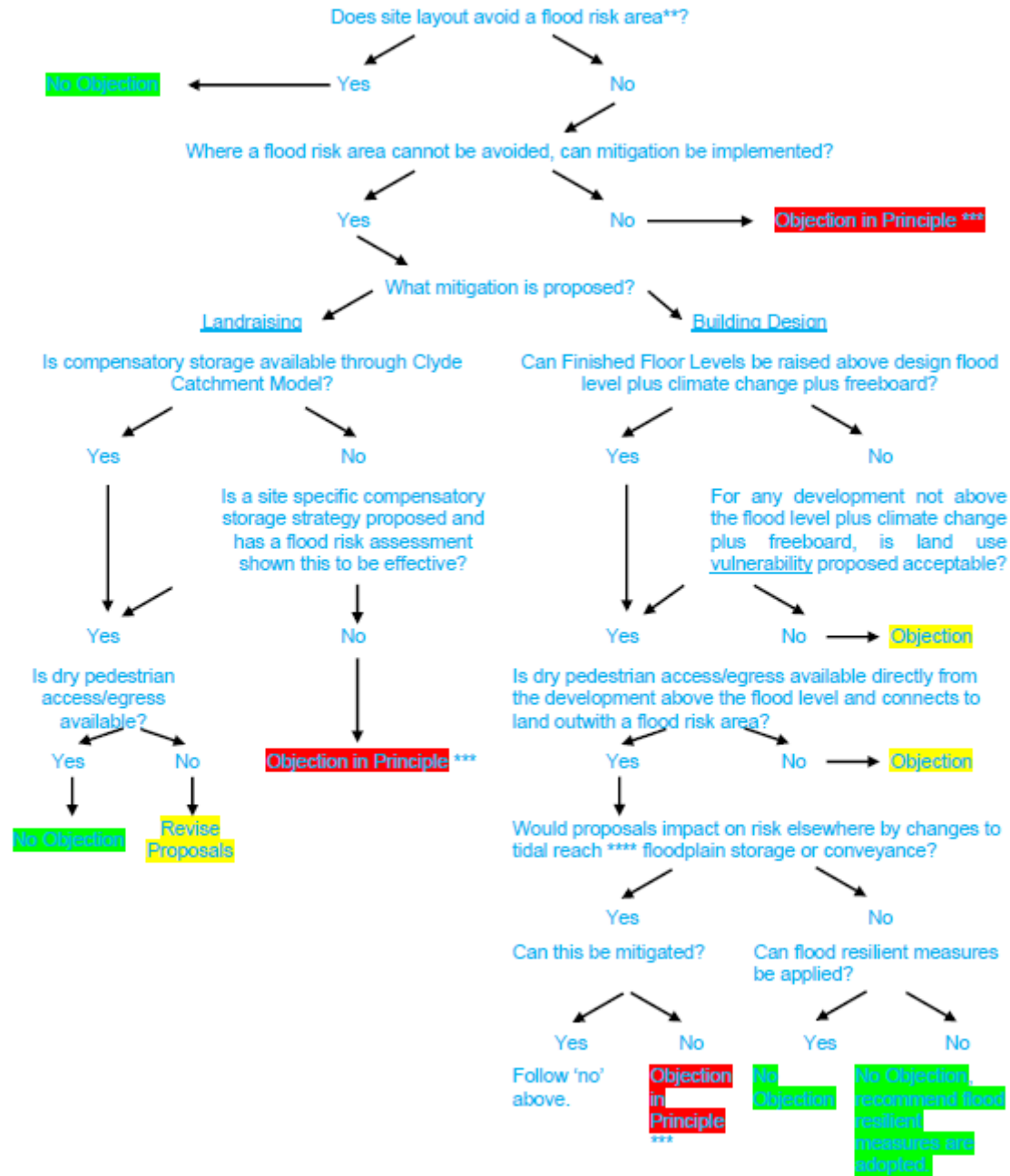
** a flood risk area – 0.5% AEP + climate change.

*** for National Development 'major' sites, a *Significant Objection* would be lodged rather than an *Objection in Principle*.

**** tidal reach – upstream limit taken as being the tidal weir at Glasgow Green.

Tidal Clyde Development Flowchart

This flow chart applies to sites within GCC effective land supply or Vacant & Derelict Land register (as determined by GCC). Until the Clyde catchment based approach is finalised, this is intended to apply to sites considered at marginal risk* of flooding. The chart reflects the key decision points and should be used as a guide.



* for designation of land use vulnerability, see the latest version of SEPA Flood Risk and Land Use Vulnerability Guidance [REF](#)

** the appropriate value for climate change should be derived from the latest Tidal Clyde Flood Model, up to a maximum value of 0.85m.

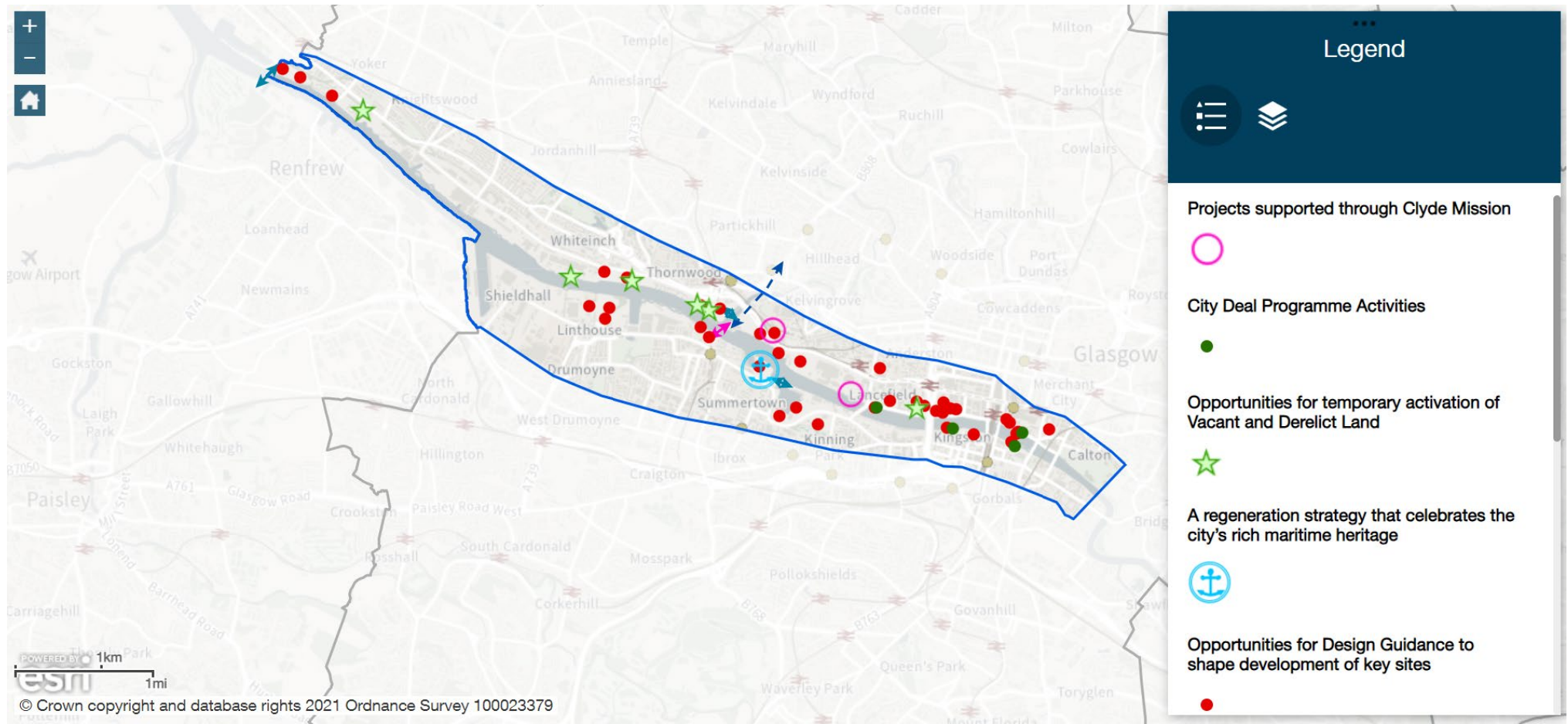
*** appropriate text to align with this principle will be included as a planning condition by the Planning Authority.

4.6 Legacy marine infrastructure

As the functional use of the River Clyde as a working port has declined over a series of decades, so too has the investment to repair and maintain the associated infrastructure. Under-investment in quay walls has led to a number of collapses in recent years. The collapse of quay walls has the potential to create severance in the area by disconnecting parts of the existing and proposed riverfront network. Additionally, the development cost / risk associated with the condition of quay walls is restricting the delivery of development on key opportunity sites within the project area.

The Glasgow City Region City Deal investment aims to release the economic potential of the river corridor by undertaking consolidation and adaptation of quay walls in order to unlock opportunity sites and improve connectivity within the project area and between the river and the city centre. The £1.13 billion City Deal fund will support twenty-one infrastructure projects across the region for new roads, bridges and improved infrastructure. This together with construction, remediation and public realm investment will help to unlock vacant sites in key locations, through amongst other things restoration and development of sections of legacy quay walls and new bridges.

As part of the Access and Integrity Waterfront funding stream, [Custom House Quay Wall](#) Development and Windmillcroft Quay Wall Development will deliver new / re-modelled quay walls, reclaimed land and public realm. More generally, the need for water management infrastructure is highlighted in the River Clyde SDF [development corridor](#).



Source: Glasgow City Council

Section 5 – Known Capacity and Condition issues

5.1 Watercourse culverts

Vary depending upon age / location. Some sections of culverts are in very poor condition either due to structural issues or partial blockages. GCC's Flood Risk Management Team has a programme of risk assessing culverts based on known condition and potential impacts of failure.

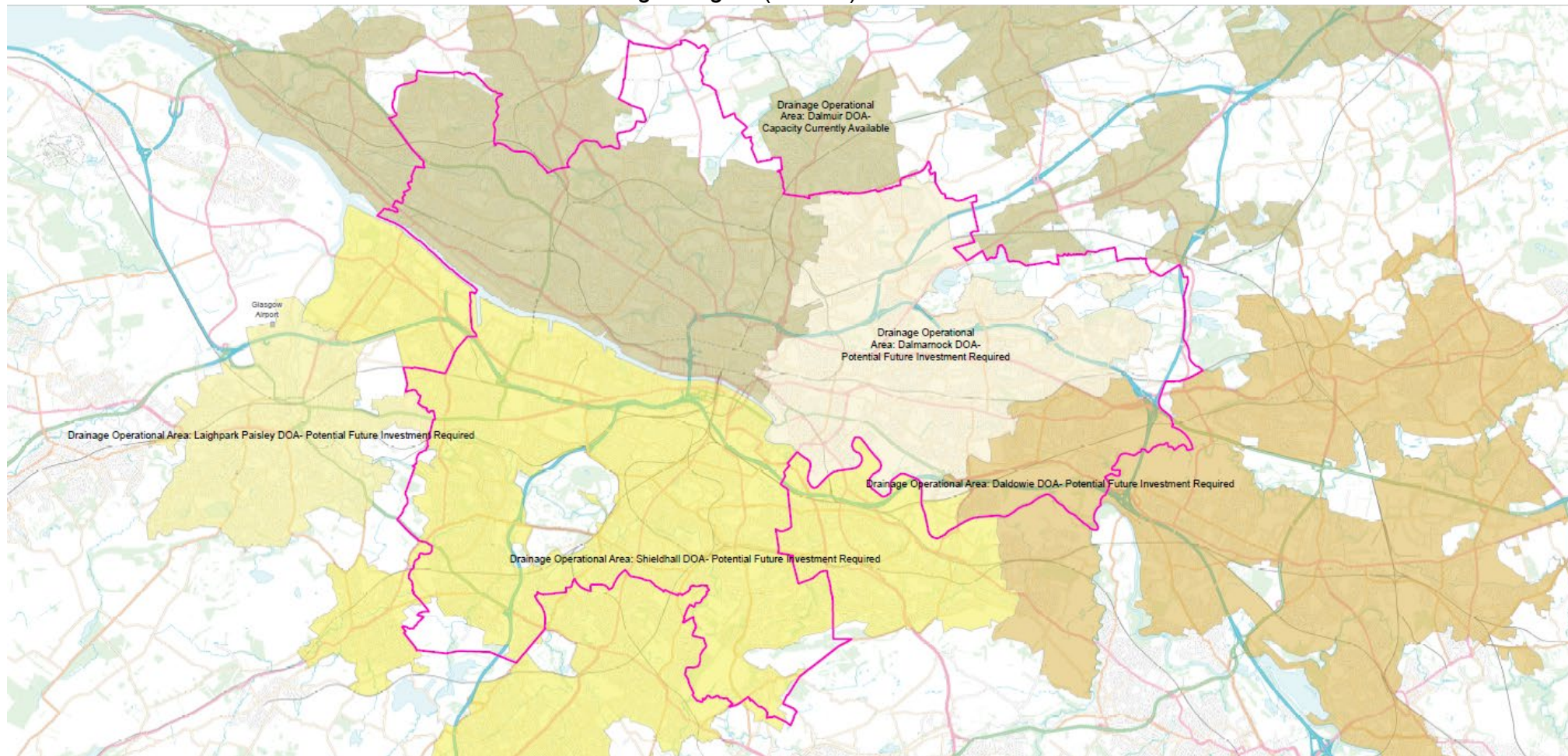
5.2 Sewer network capacity

Capacity of the combined sewer network is quickly exceeded during heavy / prolonged rainfall.

5.3 Waste-Water Treatment Works and Water Treatment Works (Scottish Water)

Four waste-water treatment works, located at Daldowie, Dalmarnock, Dalmuir, and Shieldhall, treat all of Glasgow's wastewater, as well as wastewater from neighbouring authorities. At this stage, Scottish Water has indicated no capacity issues for WWTWs or WTWs serving the Glasgow Local Authority area.

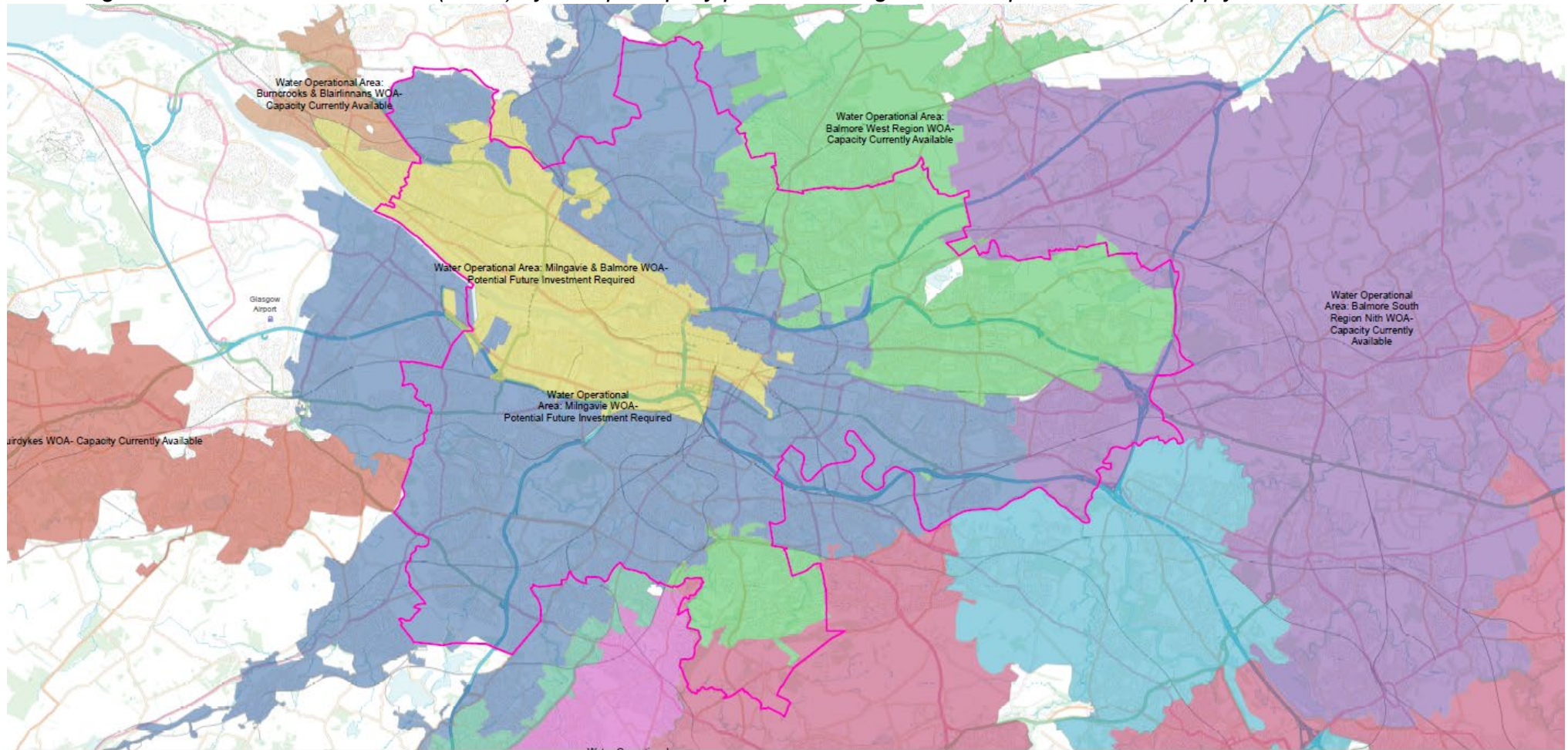
Chart: Waste-Water Treatment Works Catchments serving Glasgow (CD676)



Source: Scottish Water

Drinking Water Supply (Scottish Water) (CD677)

The Milngavie Water Treatment Works (WTW) system principally provides Glasgow with its potable water supply.



Source: Scottish Water

Prior to detailed work aimed at site assessment (spatial strategy), Scottish Water has provided a high-level snapshot (as at November 2023) of current capacity at treatment works for initial screening and development planning purposes. Factors such as the total number of

proposed developments, their scale and their distance from treatment works may impact Scottish Water's ability to service them and therefore potential future growth investment may be required.

It is a requirement that Scottish Water identify and provide new strategic capacity that will meet the demand of all new housing development and the domestic requirements of commercial and industrial development. Therefore, GCC shall engage with Scottish Water through the plan making process as a better understanding emerges of future proposed developments (scale and location) to inform strategic plans to identify where future growth investment priorities are required.

Section 6 - Accommodating future development - Strategic Flood Risk Assessment

A key tool CDP2 will employ to “strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding” is Strategic Flood Risk Assessment (SFRA).

A Strategic Flood Risk Assessment (SFRA) is required to support work for the city’s next Local Development Plan (CDP2) by delivering the intention of National Planning Framework 4 (NPF4) Policy 22 to strengthen resilience to flood risk by promoting avoidance as a first principle and reducing the vulnerability of existing and future development to flooding.

The Glasgow SFRA will inform development planning processes; ensuring that flood risk is considered in the formulation of the Council's spatial strategy; in the identification of development allocations; and in the review of land use policies, whilst contributing towards satisfying the statutory duties Glasgow City Council (GCC) has under the Flood Risk Management (Scotland) Act 2009.

Table 4 – SFRA stage 1

Scope SFRA Stage 1
The Stage 1 Strategic Flood Risk Assessment (SFRA) has been prepared (CD003). This SFRA will inform the development planning process, primarily, to avoid increasing the overall flood risk by avoiding areas of flood hazard. The SFRA will support CDP2 to respond to the spatial implications of National Planning Framework 4 (NPF4) Policy 22 – Flood risk and water management and the implementation of related NPF4 policies. The preparation of this SFRA has been informed by the Guidance for planning authorities on Strategic Flood Risk Assessment , published by SEPA in October 2023.
Scope SFRA Stage 2
The Stage 2 SFRA will assess proposals against the planning principles established by NPF4 Policy 22.

6.1 The Scottish Flood Defence Asset Database (SFDAD)

The Scottish Flood Defence Asset Database (SFDAD) provides flood risk management practitioners with access to information on Flood Prevention Schemes and their associated defence assets within Scotland. SFDAD provides a record of where flood defences exist, the level of protection provided and the general areas benefitting from these defences. SEPA hosts [SFDAD](#) on behalf of the Scottish Government and the Scottish Local Authorities. The information held is originated and owned by the Scottish Local Authorities who have given SEPA permission to hold and make available such information to Registered Users for the sole purpose of flood risk management.

Section 7 - Compatibility with Investment Hierarchies

Water management infrastructure is a cornerstone of sustainable development and therefore highly compatible with the Scottish Government Investment Hierarchy. In ensuring access to clean water and managing flood risks, infrastructure supports positive health, housing, economic, industrial, recreational, transport and ecological and climate outcomes. Water management infrastructure also manages water resources efficiently, reduces impacts on people and property at risk from flooding and so reduces damage to economic growth, and through the river basin framework approach helps improve water quality and mitigate the impacts of climate change.

Recognising the importance of SuDS (via surface water management plans) reduces the need to invest in costly physical water infrastructure by lowering flow rates, increasing water storage capacity and reducing the transport of pollution to the water environment, flood risk is managed, drainage capacity is attenuated, downstream infrastructure is protected and damage to the natural environment is reduced.

Table 5 – Compatibility with investment hierarchies

Determine Future Need	<p>GCC consults with Scottish Water regarding planned housing growth to help determine future water and sewerage services.</p> <p>GCC is responsible for producing a Local Flood Risk Management Plan and through its role as local lead authority for flooding, local planning authority and local roads authority and through building control and environmental health measures contributes to water services and flood risk management.</p>
Maximise useful life of existing assets	GCC through the consents process requires all surface water from new development (with the exception of single houses) to be treated by a SuDS before it is discharged into the water environment.
Repurpose and co-locate	<p>Surface Water Management Plans (SWMP) will assess the flood risks and identify long term, sustainable and achievable mitigation measures which can be implemented to manage the flood risk including climate change measures such as daylighting.</p> <p>Reusing legacy infrastructure such as the Smart Canal project has enabled new development in areas where a lack of drainage capacity had previously acted as a constraint to development to areas where existing flood-defences exist and promoting ‘avoidance’ as a first principle through SFRA.</p>

Replace, create or build new assets	In order to capture wider societal, environmental and economic benefits new assets are sometimes necessary such as quay wall restoration to deliver developable land, or the Shieldhall Tunnel main sewer connection to alleviate pressure on existing wastewater networks, improve water quality in the River Clyde and tackle flooding.
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Section 8 - Proposed Water Management Infrastructure - Future Needs

8.1 Glasgow City Council Flood Risk Management Team

- Address culverts where the condition increases the risk of collapse, and the impact of a collapse would be significant.
- Ensure ongoing programme of inspection.
- Identify where future strategic surface water infrastructure would help to reduce flood risk and help improve environmental.
- Deliver the Actions identified in the Local Flood Risk Management Plan.

8.2 Connection of future development to water services (Scottish Water)

The [Investment Planning and Prioritisation Group \(IPPG\)](#), which Scottish Water chairs and operates, ensures the industry is developing a sufficient programme of investment to meet the objectives that ministers set.

8.3 Programmed Improvements

Surface Water Management Plans (SWMP)

SWMPs are likely to include a range of different actions. These should be the most sustainable combination of actions necessary to manage the risk of surface water flooding. SWMPs should set out a long-term vision for sustainably managing surface water flooding in an area and the actions needed to achieve that vision. SWMPs should be monitored, reviewed and updated with timescales for reviews and updates that take into account the six-year Flood Risk Management Planning cycle.

- De-silting of the Camlachie Burn between Shettleston Road and Biggar Street to increase conveyance capacity and facilitate redevelopment in the catchment;
- Ongoing [Avenues](#) programme - The "Core Avenues" have been broadly sub-divided into 3 blocks of activity (Blocks A, B, and C), and will be delivered through City Deal investment over the period to 2027/28. In addition to the Avenues Programme, GCC has successfully secured Sustrans funding (Places for Everyone) to deliver four additional Avenues grouped together in a new Block S. The Avenues Programme will reshape the city centre to provide amongst other things flood attenuation through sustainable green infrastructure such as tree planting and rain gardens.
- Ongoing delivery of NPF4 National Development 5 - *Urban Sustainable, Blue and Green Surface Water Management Solutions*.
- Contribute to delivery of NPF4 National Development 13 – *Clyde Mission*.

Scottish Water Investment Plan (25-year strategic plan).

Scottish Water provides water to domestic and commercial properties in many parts of Glasgow. Scottish Water also provides waste-water treatment services to most of Glasgow. In some instances, wastewater is treated on site via septic tanks or other means.

Scottish Water publishes data on which areas of Scotland may require further investment in either waste-water treatment or supply. These maps only show high-level constraints and there may be localised issues in areas where no supply issues are identified.

It is not possible to say how capacity constraints may restrict development or result in a need for phasing as it depends on the use of a site and which sites in any given area are planned for development.

Scottish Water is responsible for the main carrier systems that take surface water in built up areas. The drainage capacity is being stretched by climate change so the proposed Development Plan should give guidance on the role of blue-green infrastructure and possible disconnection of surface water from existing Scottish Water systems to relieve these capacity pressures.

8.4 Further improvements required?

In order that further improvements can be assessed and prioritised based on needs, factors effecting assessment may include [Climate Change](#), scale of urban development, levels of economic growth, demographic change etc. and what this means for future flood risk management, water services availability, water ecology management and water management infrastructure capacity. Advice published by SEPA and the Met Office will be followed for water cycle level change. See SEPA's [Climate change allowances for flood risk assessment in land use planning](#).

Section 9 - Deliverability

- Capital funding remains challenging.
- Effective performance of SuDS and other blue-green infrastructure over the long term will be dependent upon adequate maintenance (revenue) funding which is a growing challenge.
- [Infrastructure Investment Plan 2021-22 to 2025-26](#) Scottish Government (CD198).
This pipeline update provides information relating to the delivery of key major infrastructure programmes included at [Annex D](#) of the Scottish Government's Infrastructure Investment Plan published in February 2021 and other ongoing key major infrastructure programmes included within previous updates.
- CDP2 s75 policy - Potential 'catchment approach' to compensatory storage as well as introduction of new green infrastructure such as naturalising of quay walls to mitigate flood risk. A scoping process would be required to assess whether the new plan could provide a mechanism to take financial contributions to assist delivery.

Section 10 - Overview of all the evidence and what it means for CDP2

Reducing flood risk and increasing drainage capacity

The primary sources of flooding in Glasgow are fluvial (river / watercourse) and pluvial (surface water) with an increasing risk of coastal (tidal / storm surge) flooding along the Tidal Clyde corridor as sea levels rise. The urban environment results in complex flooding mechanisms due to the interaction between watercourses and the Scottish Water sewer network coupled with the overland flow of surface water.

Glasgow sits within river / watercourse catchments that extend upstream into the West Dunbartonshire, East Dunbartonshire, North Lanarkshire, South Lanarkshire, East Renfrewshire and Renfrewshire Council areas. The city is served by four sewage treatment works where the sewer catchments extend to a lesser and greater extent beyond the city boundary into neighbouring authorities.

Glasgow City Council (GCC) works in partnership with neighbouring authorities, Scottish Water, SEPA, Scottish Canals, Clyde Gateway and other partners to improve understanding of flood risk and to mitigate the impacts of flood risk through the Metropolitan Glasgow Strategic Drainage Partnership (MGSDP) and the Clyde and Loch Lomond (CaLL) Local Plan District (LPD).

GCC will continue to liaise with Scottish Water (SW) regarding the provision of future water and sewerage service connections to new development. Capacity mapping submitted by SW indicates at this stage, no capacity issues for WWTW or WTW installations serving the Glasgow Local Authority area. However, factors such as the total number of proposed developments, their scale and their distance from treatment works may impact the ability to service them and therefore potential future growth investment may be required. Additionally, connecting surface water drainage to a surface water sewer or watercourse (in support of Scottish Water's surface water policy) cannot be assessed (Network Impact Assessment) until the plan making stage proper has begun and specific proposals by location and cumulative impact can be assessed in accordance with the spatial strategy and all other material considerations. Scottish Water additionally helps to protect homes from flooding caused by sewers either overflowing or becoming blocked. Potentially vulnerable areas (PVA) are mapped.

A key aspect of reducing pressure from surface water on the combined sewer system is the implementation of Surface Water Management Plans (SWMPs) to identify specific measures to reduce surface water flooding (reduce the rate and volume of surface water that enters the combined sewer network and reducing the risk of CSO discharging and / or flooding occurring). Published by SEPA in 2022, the Flood Risk Management Plan (FRMP) Cycle 2 for the Clyde and Loch Lomond (CaLL) LPD sets out Actions (projects) that GCC is proposing to start (but not necessarily finish) in Cycle 2 (2022-2028) and Cycle 3 (2028-2035). These Actions are too numerous to list and subject to funding and Objective Target Areas are used to focus available resources to best effect.

The Local Flood Risk Management Plan (LFRMP) (coordinated by GCC) identifies additional detail on the responsibility for delivery, funding and coordination of actions across the Local Plan District.

Whilst all the aims and actions within the LFRMP are important, as a planning authority, CDP2 has greatest scope to contribute through land use planning and natural flood management.

This will be achieved through assessing development proposals by adopting an avoidance first approach where an increase in net flood risk is avoided and informed by an up-to-date Strategic Flood Risk Assessment (SFRA), where additional drainage capacity aimed at reducing flood risk to the system is delivered by the Metropolitan Glasgow Strategic Drainage Partnership (MGSDP) and avoiding individual developments incrementally contributing to increasing flood risk to themselves and other properties through CDP supplementary guidance SG-8 requiring any applications of 5 or more dwellings or any new building of more than 250 sq metres ground floor area being required to be accompanied by a completed Flood Risk Screening checklist. Flood Risk Assessment (FRA) and delivery of Sustainable Drainage Systems (SuDS) to ensure that new development helps in establishing new 'conduits' to transfer surface water through Glasgow to protect drainage capacity and help keep rainfall out of the combined sewer. Supplementary guidance (SG8) will need to be transposed into CDP2 to meet legislative requirements and to reflect the fact that supplementary guidance will no longer form part of the statutory development plan.

A notable success of MGSDP is the Smart Canal project which, by reusing legacy infrastructure, has enabled new development in areas where a lack of drainage capacity had previously acted as a constraint to development.

The SFRA provides specific detail (Key Actions for SFRA Stage 2) as to how development proposals shall be assessed using SFRA applied through Strategic Environmental Assessment (SEA) and Site Appraisal Methodology (SAM). As a minimum, all sites proposed for Water Vulnerable Land use, as defined by Flood Risk and Land Use Vulnerability Guidance and published by SEPA July 2024, will be screened using the 0.5% AEP (1 in 200 yr) + climate change flood extent dataset.

CDP2 also has a role in safeguarding land earmarked for Natural Flood Management (NFM). Existing and candidate NFM flood storage areas have been submitted to the CDP2 Call for Sites process. Most catchment scale NFM opportunities are situated in the upper catchments out with the GCC administrative boundary. NFM actions have been identified in the CaLL FRMP. NFM will primarily mitigate the impacts of climate change and create capacity within the drainage network to facilitate redevelopment by diverting from sewer and / or attenuating surface water runoff rather than remove flood risk from a specific site. See the SEPA website for existing NFM data.

Coastal (Tidal) Flooding and the Tidal Clyde

CDP2 must contribute to the delivery of 2no. National Developments (NPF4 National Development 13 – Clyde Mission and National Development 5 - Urban Sustainable, Blue and Green Surface Water Management Solutions) of particular import in recognising the

challenges of accommodating economic development within the constraints presented by the water environment and requiring a more than local response.

In 2021, Clyde Mission commissioned Climate Exchange to undertake an initial scoping exercise. Adaptation pathways are a decision-making tool employed to enable areas to adapt to climate change and address the inherent uncertainties of future risk.

Based on an assumed CRP8.5 scenario, the 2022 report notes that sea level rise in the long-term will gradually undermine the ability of the city to withstand tidal extremes and lower the effective standard of protection to all areas. The report recommends a range of measures to inform the development of an adaptation pathways approach to respond to this challenge.

Glasgow city centre is recognised as being of strategic economic importance to Scotland's economy. The city centre has been identified as one of 16 potentially vulnerable areas within the Local Plan District. The flood risk management plan notes that surface water flooding is responsible for 68% of risk within the area. Coastal flooding is associated with 32% of risk despite there having been no coastal floods recorded within this Potentially Vulnerable Area.

Against this backdrop, GCC have prepared 'Designing with Water Design' Guidance for Glasgow's River Corridor. This Design Guidance reflects the results of the Tidal Clyde Model 2020 and the findings of the adaptive pathways report commissioned by Clyde Mission and relevant SEPA guidance..

CDP2 will be informed by ongoing research looking at the scope for Urban Sustainable, Blue and Green Surface Water Management Solutions to be applied at the catchment level including floodplain storage in the Clyde estuary region and SEPA guidance on Climate change allowances for flood risk assessment in land use planning.

A key area of uncertainty is in modelling future flood events and the interplay with sea level rise. Model simulations so far relate to model behaviour rather than modelling specific flood extents and tolerances of particular interventions / changes. The effects of wind shear on the progression of the tide and generation of wind waves has not been accounted for in the modelling to date, and despite some exploration of the potential for this to exacerbate flood risk, potential effects are at this stage poorly understood.

Notwithstanding the uncertainties of climate / tidal modelling, it is recognised that the approach to adaptation for the Clyde will need to be transformation orientated, with place making and resilience at the heart of investment decision making and future pathway design including deployment of grey / green infrastructure and ultimately, potentially a Clyde tidal barrier.

River Basin Management Plan

The River Basin Management Plan identifies that in GCC many waterbodies are not in good condition, especially due to legacy pollution from industry and mine-waters. The relationship between new surface water connections crossing potentially contaminated land will be

assessed through SEA. The White-Water Cart (Luggie Burn to Clyde) and Kittoch Water to A726 road bridge) are classified as poor, as is the Capelrig / Auldhouse Burn. The Mallsmire Burn/Polmadie Burn/Cityford Burn system is classified as bad.

Actions aimed at increasing the resilience of the drainage system and reducing flood risk can / should also be designed to raise the quality of SuDS to maintain and improve ecological water quality including potential areas of retrofit in existing built-up areas so that flood risk, water quality, biodiversity and amenity goals are met. Programmes delivered by the MGSDP (reinstate natural flood management measures, including the removal of culverts, to maintain and, where possible, improve the quality and biodiversity of the water environment) can be expected to contribute to improving the quality of GCC water bodies and will benefit from a supportive policy framework in CDP2.

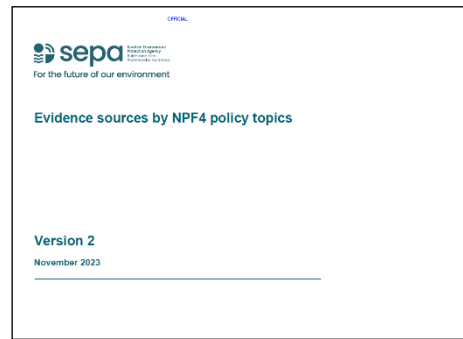
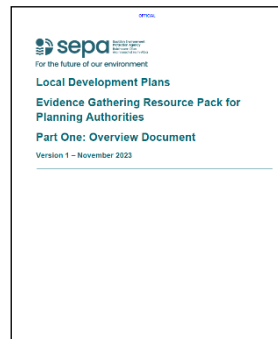
As an early part of an adaptive pathways approach GCC open space strategy is a key contributing framework by providing permeable spaces throughout the urban area. CDP supplementary guidance is aimed at directing the DM process to ensure future development is able to 'resist and absorb' the impacts of more concentrated incidences of heavy rainfall events whilst directing development to vacant sites and by creating new / enhancing existing open space and SuDS etc.

The Council has a duty to manage impact of surface water discharges to a waterbody / watercourse from new development. Within CDP supplementary guidance [SG-8](#), the applicant will require to identify to which network surface water will be discharged. If it is proposed to discharge surface water to a waterbody / watercourse (open or culverted), there will be a requirement to carry out a Drainage Impact Assessment (DIA).

This supplementary guidance (SG8) will need to be transposed into CDP2 to meet legislative requirements and to reflect the fact that supplementary guidance will no longer form part of the statutory development plan.

Appendix 1: Resource pack signposted evidence

SEPA's current evidence as well as relevant external sources of evidence are presented in the resource pack. The intention is that this will assist authorities to 'self-serve' in relation to gathering evidence SEPA holds. These documents provide links to all mapping maintained by SEPA with regards evidence including updated Guidance for planning authorities on undertaking a Strategic Flood Risk Assessment. [National Flood Risk mapping](#) is also produced by SEPA.



- [Stage 1 Strategic Flood Risk Assessment](#)
- [Water-Resilient Places A Policy Framework for Surface Water Management and Blue-Green Infrastructure](#)
- [SEPA's Development Management Guidance](#)
- [SEPA's Land use Vulnerability Guidance](#)
- [SEPA's Regulatory Method \(WAT-RM-08\)](#)
- [SEPA's Recommended riparian corridor layer.](#)
- [SEPA's riparian vegetation planting opportunities map](#)
- [SEPA's Geomorphic risk layer](#)
- [SEPA's Existing and proposed water environment fund \(WEF\) projects](#)
- [SEPA's Obstacles to fish migration](#)
- [SEPA's Scottish Wetland Inventory](#)
- [SEPA's Natural Flood Management Maps.](#)
- [SEPA's position statement on elevated buildings in areas of flood risk](#)
- [SEPA's Evidence sources by NPF4 policy topics Version 1 September 2023](#)

- [SEPA's Evidence Sources Glossary Version 1.1 September 2023](#)
- [SEPA's Guidance on Strategic Flood Risk Assessment](#)
- [SEPA's Climate Change Allowances for Flood Risk Assessment in Land Use Planning](#)

Other

- [Planning Circular 1/2015 The relationship between the statutory land use planning system and marine planning and licensing](#)
- [Scotland's National Marine Plan - A Single Framework for Managing Our Seas](#)
- [Clyde Regional Marine Plan CONSULTATION DRAFT](#)
- [Marine Scotland Topic Sheet 139](#)
- [Clyde Marine Planning Partnership \(website\)](#)
- [Clyde Marine Region Assessment 2017](#)
- [Marine Scotland Assessment \(online\)](#)
- [Marine mapping @ marine.gov.scot](#)
- [Design Guidance New Residential Areas](#)
- [City Development Plan](#)
- [CDP-8 Water Environment](#)
- [River Clyde Development Corridor SDF](#)
- [Designing with Water Non-Statutory Guidance](#)
- [Tidal River Clyde Flood Model online](#)
- [Marine Scotland Guidance for Marine Licence Applicants 2015](#)
- [Fairhurst 2019 – Characteristics of a Coastal Flooding Event PDF](#)
- [Tidal Flooding on the Clyde - Analysis and Scoping of Adaptation Pathways \(Climatexchange\)](#)
- [Predicted flood levels from the Tidal Model](#)

This report has been tested for conformity with SEPA Planning Advice Note for Planning Authorities – LDP Evidence Gathering: Achieving sufficiency of evidence relating to flood risk and the water environment.

SEPA Resource pack (CD199).