# 1.3 CLIMATE ADAPTATION

## 1.3.1 DESIGN FOR A CHANGING CLIMATE

**Design for a changing climate that includes higher volumes and greater intensities of rainfall and heatwaves.**

**Use analysis of the existing and historic water environment to inform the design concept.**

**Submit a Surface Water Management Plan demonstrating that:**

- **the first 5mm of rainfall will be managed at plot level, and**
- **rainwater run-off will be managed in stages as it drains through the site.**

**Avoid using underground tanks to store storm water.**

**Use nature-based solutions to address flood risk impacts and heatwaves.**

**Naturalise and de-culvert underground watercourses wherever possible.**

**Submit a Flood Risk Assessment where the site is identified for flood risk management.**

**City Plan 2030 policies**

**Env 6 – Green Blue Infrastructure**
**Env 29 – Waterside Development**
**Env 34 – Pollution and Air, Water and Soil Quality**
**Env 35 – Reducing Flood Risk**
**Env 36 – Designing for surface water**

**NPF4 Policies**

**Policy 2 - Climate mitigation and adaptation**
**Policy 22 – Flood risk and water management**

Edinburgh's changing climate is projected to lead to hotter temperatures, heatwaves, droughts and a greater risk of flooding. Some risks may coincide to create greater challenges, such as the combination of sea level rise and severe storm surge that causes coastal flooding.

Development needs to be resilient to a variety of possible future climate events and conditions, ranging from peak storms to extreme drought and heatwaves.

Edinburgh's *Vision for Water Management (2020)* commits to a long-term and sustainable approach to river, coastal and storm water management. The *Climate Ready Edinburgh Plan (2024)* sets out how the city will adapt to variable and extreme weather conditions.

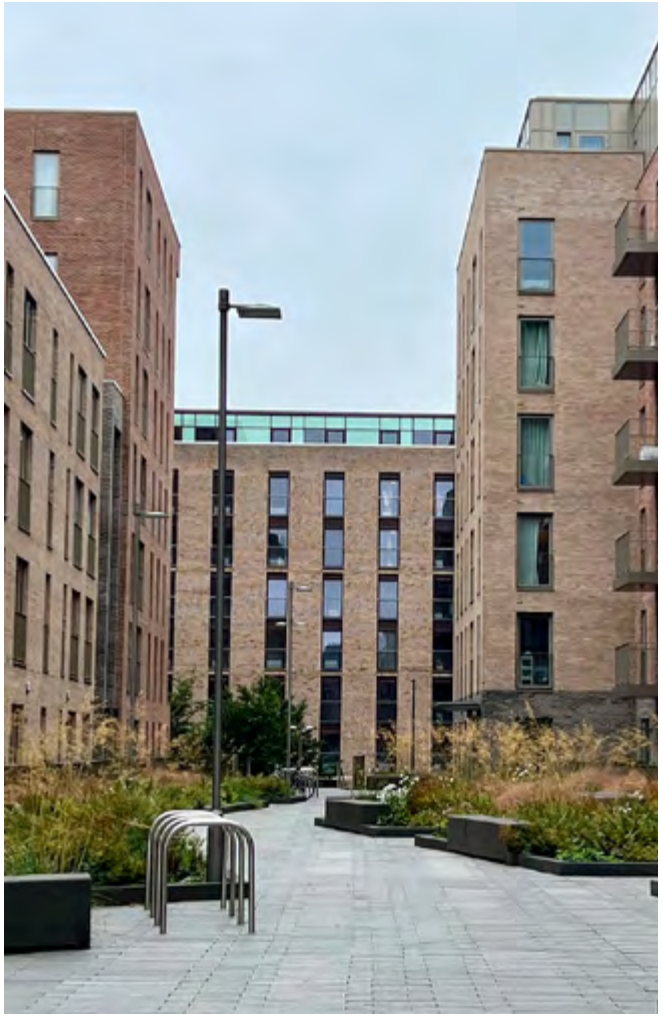
For detailed advice, refer to the Council's:

- *Flood Risk and Surface Water Management Plan Guidance*
- *Sustainable Rainwater Management Guidance*.

### Surface water management

A Surface Water Management Plan (SWMP) is required for all detailed applications involving new buildings (except householder applications and alterations).

Sustainable Drainage Systems (SuDS) are a legal requirement under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 when discharging surface water to the water environment (except for a



***Nature-based solutions: Rain Gardens*** *- McEwan Walk in Fountainbridge uses rain gardens to manage rainwater and address the risk of flooding They also enhance to the overall quality of the public realm.*

single dwelling house or discharge to coastal waters). All SuDS schemes should be designed to comply with *CIRIA C753 The SuDS Manual* and should gain agreement from Scottish Water.

Where it is proposed to discharge surface water from the site, applicants may be required to provide confirmation that this has been agreed with Scottish Water/SEPA/the relevant landowner (as applicable).

Surface water management should:

- Be considered at the outset of the design process to ensure multiple benefits are realised. For larger schemes, the Council expects the SWMP to be prepared by a multi-disciplinary team, including engineers and landscape architects, and sensitively integrated into the urban design/landscape framework.
- Manage the first 5mm of rainfall at a plot level and manage run-off in stages as it drains through the site;
- Use SuDS and nature-based solutions to create a system that is safe, reliable and effective over the lifetime of the development and avoids pumping, pinch points, blockage and long-term storage in underground attenuation tanks (see guidance below on nature-based solutions);
- Where relevant, take account of landslip risk from peak rainfall events;
- Maximise opportunities to reuse and harvest rainwater by providing, for example, smart rainwater butts /rainwater planters;
- Disconnect existing surface water outfalls into sewers wherever possible, removing redundant surface water pipework on and adjacent to the site in collaboration with the Council and Scottish Water.

***SuDS integrated from the outset*** *- Sustainable rainwater management was considered from early in the design process of Meadowfield Park in West Craigs. It forms an integral part of the wider park. The park has been designed with a raised timber walkway and wildflower meadow planting.*

## Flood Risk Assessment

Flooding can happen because of pluvial (overland) flow or fluvial (river) flow, or in certain coastal conditions.

All applications (excluding householders and alterations) must be accompanied by a Flood Risk Assessment (FRA) if one or more of the following circumstances apply:

- The online SEPA Flood Maps identify flooding at, or nearby, the site from any source.
- Historic flooding has been recorded in the area.
- The site is close to a watercourse, drainage ditch, or water body that poses a potential flood risk.
- The application is for major development, as defined under the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009.

Where a proposal involves change of use to a less vulnerable use class, the applicant should check with the Council's Flood team whether an FRA will be required.

FRA should account for contemporary climate change allowances, including heavy rainfall, fluvial flooding and sea level rise. Some coastal sites may require more detailed analysis (e.g. wave overtopping studies).

Further Information on FRA is set out in the Council's Flood Risk and Surface Water Management Plan Guidance.

## Nature-based solutions

Nature based solutions use green and blue infrastructure to address problems such as flood risk and surface water management and are key to addressing heat issues. *See Chapter "1.3.2 Green Blue Infrastructure" on page 25.* Unlike 'hard engineered' infrastructure, nature-based solutions are more resilient to climate change and offer a wider range of benefits aside from their primary purpose. Typically, they provide natural habitats, thermal regulation and attractive outdoor environments for leisure and recreation.

Nature-based solutions should be used wherever possible for all aspects of water management, to improve water quality and to help keep the urban environment cool. This includes:

- Integrating green roofs and/or green walls into building design *See Chapter "1.4.3 Green Roofs" on page 39*.
- Maximising vegetation and trees on site to provide shade and to reduce both the volume and rate at which water enters rivers and drainage systems. *See Chapter "1.4.2 Trees & Woodland" on page 34*.

Where appropriate, open space should be designed to be both usable and provide temporary, safe storage space for water, such as through the creation of a rain garden. To do so, the space should not be enclosed or fenced off and should be capable of being maintained by grass cutting machines. Grassed slopes should be no steeper than 1:6. Steeper slopes will require planting with suitable plants that do not require cutting. In some circumstances, designs may need to be agreed with Scottish Water through a waiver process.

For detailed examples refer to the *Council's Sustainable Rainwater Management Guidance.*

## Naturalising and de-culverting watercourses

The history of a site, including the presence of culverted rivers, streams or historical springs, and the risks and opportunities for water movement should be appraised very early on in the design process and used to test and inform preliminary design concepts.

Wherever possible, development should daylight culverts and naturalise modified rivers, for example through the formation of riffle and pool sequences and natural bank and riparian corridor enhancement.

This may not be appropriate where the heritage/ archaeological value of the channel is exceptionally high.

Interventions should make use of soft engineering and natural flood management techniques. Designs must take into account potential for:

- fluvial erosion;
- bank collapse;
- landslip processes due to expected increased energy in river systems; and
- washout or landslide of steep slopes due to the increased intensity of rainfall.

New river valleys should be varied in gradient and designed as an interesting, attractive, and visually diverse landscape. Public access should be restricted to one side of the river enabling establishment of a nature-rich landscape on the opposite bank.

## Further Reading

*Climate Ready Edinburgh Plan (2024)*

***SuDS providing significant additional benefits, Oxgangs*** *- This nature-based SUDS solution provides an attractive landscape setting to adjacent homes while also enhancing biodiversity.*

***Limiting potential benefits through fencing*** *- This SuDS basin limits the opportunities to maximise amenity and biodiversity benefits by being fenced off from the surroundings. This type of SuDS solution does not conform with the guidance recommended in this chapter. In general, carefully designed SUDS solutions avoid the need for fencing.*

# Technical Guidance

***The SuDS Management Train***

*A sustainable drainage system is made up of a series of different stages called the management train. Each stage of the management train will perform a function, reducing water quantity, slowing water flow and filtering sediments and pollutants.*

*Larger sites may need several management trains draining to separate locations. In locations where the final out flow from site could affect water quality in an area of high environmental sensitivity, extra treatment stages may be needed.*

*The CIRIA guidance also provides a detailed description of how and which SuDS features are most effective in treating different kinds of sediment and pollution.*

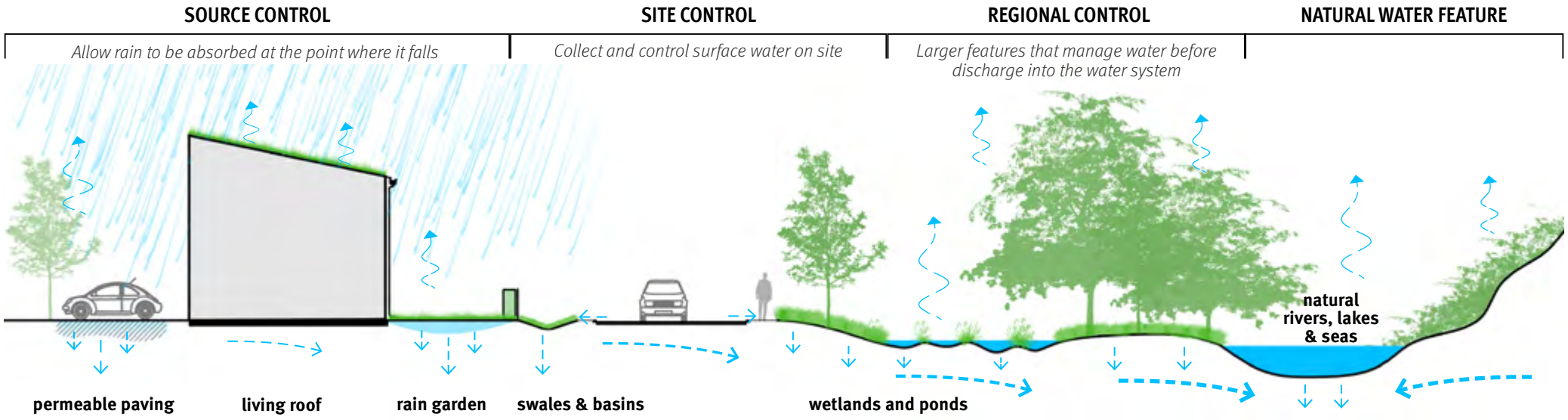
*For further information please refer to the Edinburgh Sustainable Rainwater Management Guidance*

***The number of stages and the type of SuDS features used will depend on:***

- *the location, geography and character of the site*
- *the environmental sensitivity of the surrounding area*
- *the type of waterbody or drainage system the site will discharge to*
- *the type of development*
- *the size of the site*
- *the type of activity on the site*
- *the nature of the surface water runoff*

***Designing for Water Quality***

- ☑ ***DO** use good housekeeping to prevent pollutants entering the water system wherever possible*
- ☑ ***DO** use Interception (infiltration at source into the ground and vegetation to fix pollutants in the surface layers of the soil).*
- ☑ ***DO** provide Water treatment -using SUDS to convey, filter and attenuate water (removing sediments).*
- ☑ ***DO** plan for maintenance and remedial work to remove pollutants captured in sediment*
- ☑ ***DO** create a resilient system that allows for future climate change and urban creep.*



# 1.3.2 GREEN BLUE INFRASTRUCTURE

**Show that design and layout is informed by an appraisal of green blue infrastructure on and near the site.**

**Use layout and green blue infrastructure such as SuDS and landscaping to reinforce the surrounding green blue network, forming direct connections wherever possible.**

**Make sure green blue infrastructure delivers benefits for people, wildlife, and water management, including providing resilience to climate change.**

**Submit a management and maintenance plan detailing the delivery, establishment, and long-term maintenance of green blue infrastructure, including funding arrangements.**

**City Plan 2030 policies**

**Env 6 – Green Blue Infrastructure**

**Env 20 - Protection of Trees and Woodlands**

**Env 27 – Public Realm, New Planting and Landscape Design**

**Env 29 – Waterside Development**

**Env 36 – Designing for surface water**

**Env 37 – Designing-in Positive effects for Biodiversity**

**NPF4 Policies**

**Policy 20 – Blue and green infrastructure**

Green blue infrastructure refers to natural and semi-natural components of open space such as:

- Street trees
- Hedgerows and verges
- Greenspace
- Parks, play areas and other public open space
- Active travel routes
- Green roofs/walls
- Nature habitats
- Green corridors
- Watercourses
- Woodland
- Tree belts
- Sustainable Drainage Systems (SuDS)

A green blue network is formed when components combine which can enhance and expand the benefit they provide. Network connectivity is a key priority for green blue infrastructure design.

Green blue infrastructure and networks typically fulfil a range of functions. They underpin the city's response to climate change by promoting carbon sequestration, managing water and flood risk, regulating temperature, improving air and water quality, and addressing the nature crisis.

Green blue infrastructure and networks can also make a significant contribution to:

- Promoting good mental health and healthier lifestyles by providing access to nature for people living and working in or visiting the city.
- Providing natural, attractive routes for walking, wheeling, and cycling.
- Creating opportunities for food growing and restorative outdoor activity such as socialising and play.
- Providing habitats, linkages and 'stepping stones' for biodiversity.

***Coalie Park*** *- Access and amenity improvements have been carried out at Coalie Park by the Water of Leith, east of Great Junction Street*

## Edinburgh's Strategic Green Blue Network

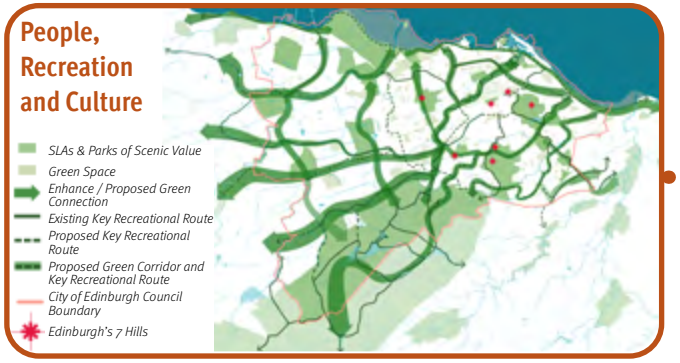
Although green blue infrastructure and networks exist at all scales, analysis has been done to better understand Edinburgh's Strategic Green Blue Network. This identifies green blue nodes and routes between that are of particular importance to Edinburgh in terms of biodiversity, water management and/or people.

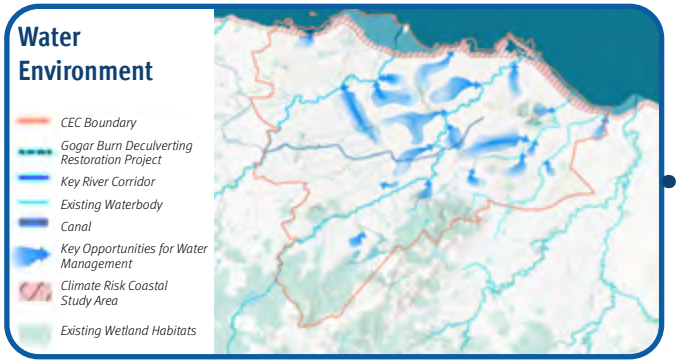
This analysis has informed initial identification of opportunities to further connect, expand and enhance the network.

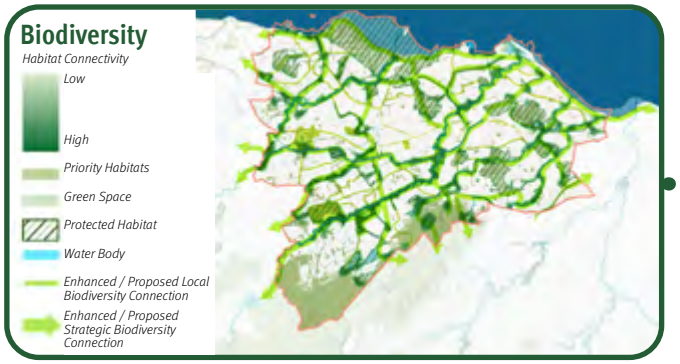
Mapping has been produced showing Edinburgh's Green Blue Network at the strategic, city-wide scale. This distinguishes between parts of the network, such as infrastructure important for water management, biodiversity and/or recreation.

It also identifies areas where these functions overlap, for example along the Water of Leith which is important for water, people, and biodiversity.

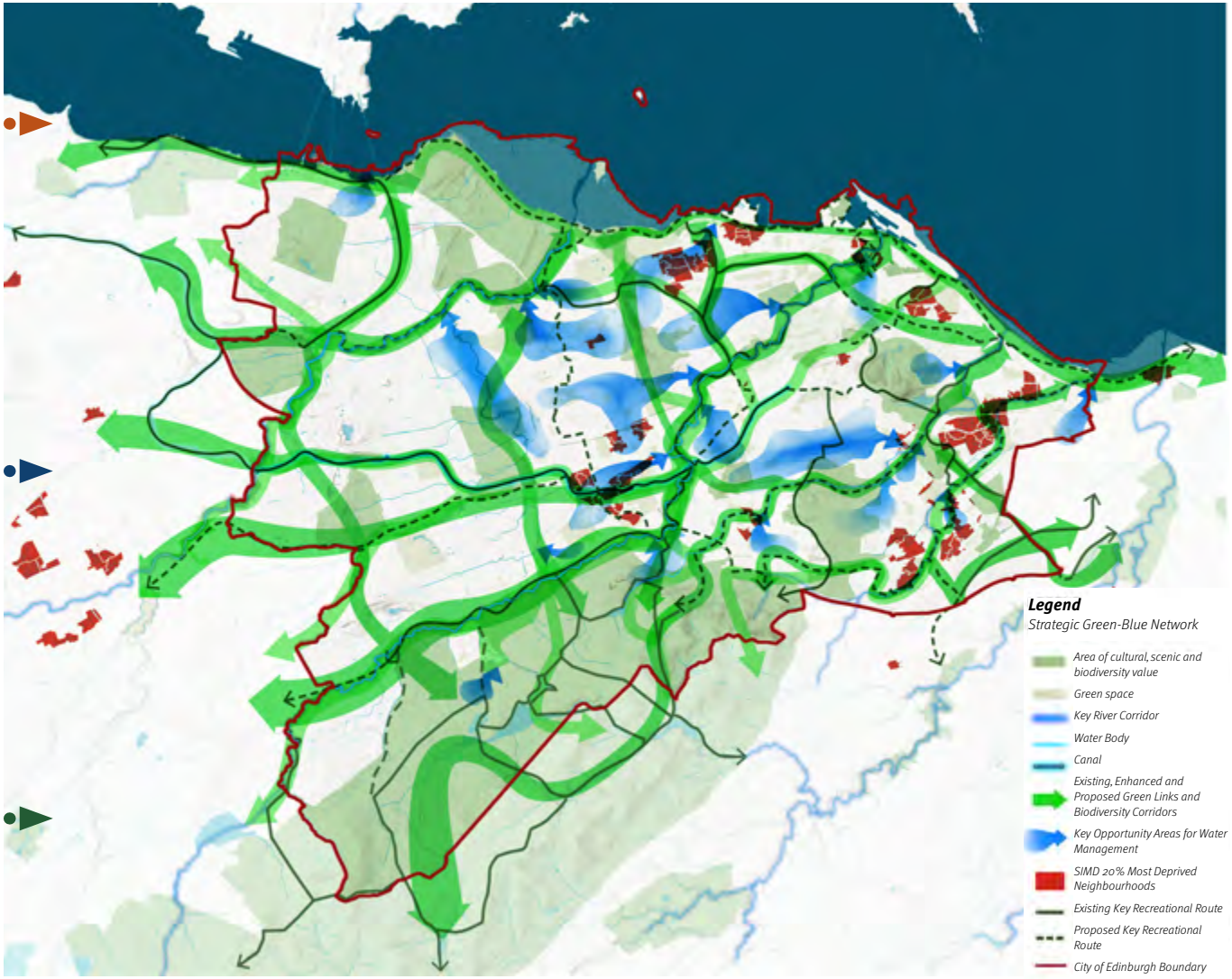
Further information on the network is available on the *Edinburgh Green Blue Network Storymaps website.*




**Edinburgh's Strategic Green Blue Network**



Development is expected to protect and reinforce the Green Blue Network, forming links wherever possible or, where this cannot be achieved (e.g. due to site location), strengthening connections to the local network of habitats, open spaces, watercourses, footways, and cycle routes.

Development within or adjacent to the network should take account of the nature of the network in the area. For example, where development sits within an area of importance for surface water management, the design of open space should include capacity for managing and attenuating run-off within the site in addition to handling incoming flows.

There is an additional requirement for tree planting on sites in and adjacent to the Green Blue Network *see Chapter "1.4.2 Trees & Woodland" on page 34.*

## Linking to the wider green blue network

Applications will be assessed on the extent to which existing and proposed green and blue features on the development site provide links and/or "stepping stones" to habitats, species, water environments and active travel routes (existing and consented) beyond the site boundary. Design should facilitate connections at:

- high level (e.g. tree canopy)
- medium level (e.g. hedges)
- low level (e.g. wildflower meadows)
- below-ground level (e.g. for temporary and permanent water storage, management, and movement).

## On-site green blue infrastructure

Development at all locations is required to integrate green blue infrastructure into design and layout. Infrastructure should be designed to serve a range of functions. Further guidance is presented in *Chapters "1.3.1 Water Environment" on page 21, "1.4.1 Biodiversity" on page 30, "1.4.2 Trees & Woodland" on page 34, "1.4.4 Landscape Design and Public Realm" on page 41, "2.3.1 Creating Safe Places" on page 94*.

Improvement and provision of green blue infrastructure must be considered at the outset of the design process and must inform the design and layout of buildings and open space. It is anticipated that this will require input from a range of specialists, such as an ecologist, hydrologist, landscape architect etc. The applicant's Design Statement should demonstrate how design and layout has been informed by contextual analysis of existing infrastructure, and collaboration between relevant specialisms. The applicant is also required to submit a Management and Maintenance Plan that identifies parties responsible for maintenance and funding.

Linear green blue features are very often required for effective connectivity between networks. This should be reflected in the design and layout of streets, footways, cycle routes, SuDS features, parks, and woodland.

Opportunities will vary according to the scale and context of development. In major development, the design and layout of streets and spaces is expected to deliver a network of multifunctional green spaces accommodating, for example, active travel routes, multi-user paths, a variety of recreational uses, and SuDS features.

The potential for the network to accommodate ground source heat pumps should be fully explored. See *"1.2.4 Sustainable Heating and Heat Networks" on page 19*

***Forthquarter Park*** *- Space for nature is incorporated into the design of this recently established park in Granton.*

***Large public open space— Figgate Park.*** *This public park is a major component of the green/blue network.*

## Technical guidance

These sketches illustrate how green/blue networks can be integrated within a range of development scenarios and at different scales.

### Framework planting

The Council supports substantial framework planting that seeks to integrate and connect multi-functional green infrastructure features as guided by site specifics and local landscape character.

Masterplans are required to provide adequate space for large growing native tree species to achieve maturity and form woodland habitat. Planting should also provide a secure setting to multi-user paths, cater for active travel, define a variety of recreational uses within open space, and incorporate SuDS, whilst allowing integration with the street layout and built form. In urban edge situations, a landscape edge will also be required to integrate development with the surrounding countryside and landscape setting of the city.

These provisions can vary in width depending on the development scenario but for some major development, spaces that are 30-50m wide may be necessary to accommodate a full range of green infrastructure functions. Any such woodland and tree belt planting would benefit from being established early so they can provide visual screening and shelter as soon as possible.

### Development in the vicinity of a watercourse

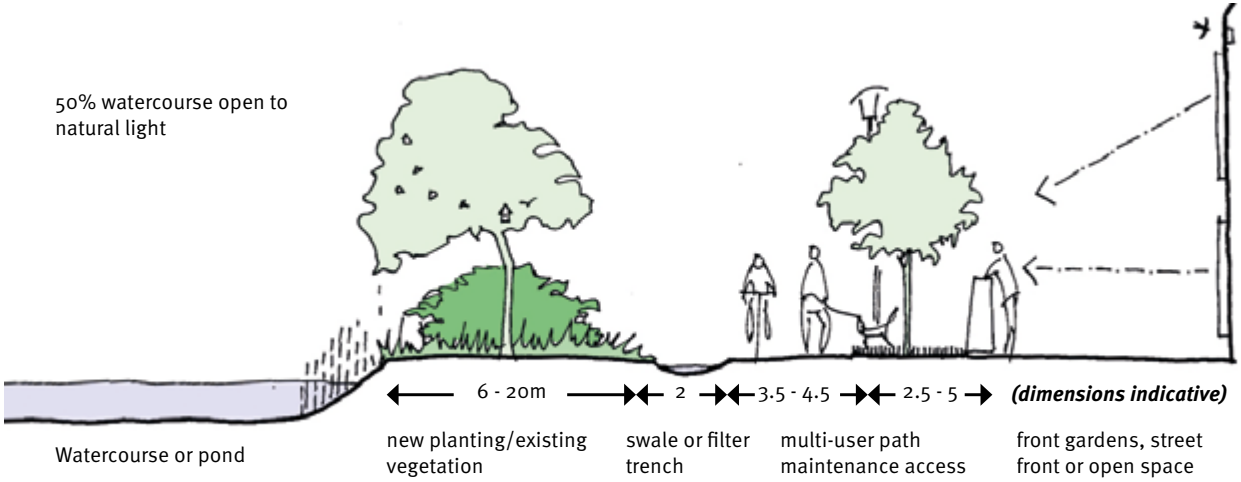
If it is proposed to locate buildings close to a watercourse, early discussions with the Council's Flood Risk Unit and a full appraisal of flooding scenarios are required *see Chapter "1.3.1 Water Environment" on page 21*.

Development should be set-back from the watercourse to reduce flood risk, allow rivers to naturally adjust over time, provide space for vegetation to stabilise banks and create habitat for wildlife, enable natural light to reach the channel, and assist in filtering surface water. A greater setback to development may be required on the outer bank of a meander.

The buffer zone should be proportionate to the width of the river as measured from the top of the bank and can range from 10m for a narrow channel to 30m for a wide river.

The recommended minimum zone widths should also reflect the site context e.g. where the site contributes to the blue green network, public access to the water's edge is required or to reflect its nature conservation or landscape interest.

| Channel width | Recommended minimum buffer zone width on each channel bank |
|---|---|
| < 2 m | 10 m |
| 2-15 m | 15 m |
| >15 m | 30 m |



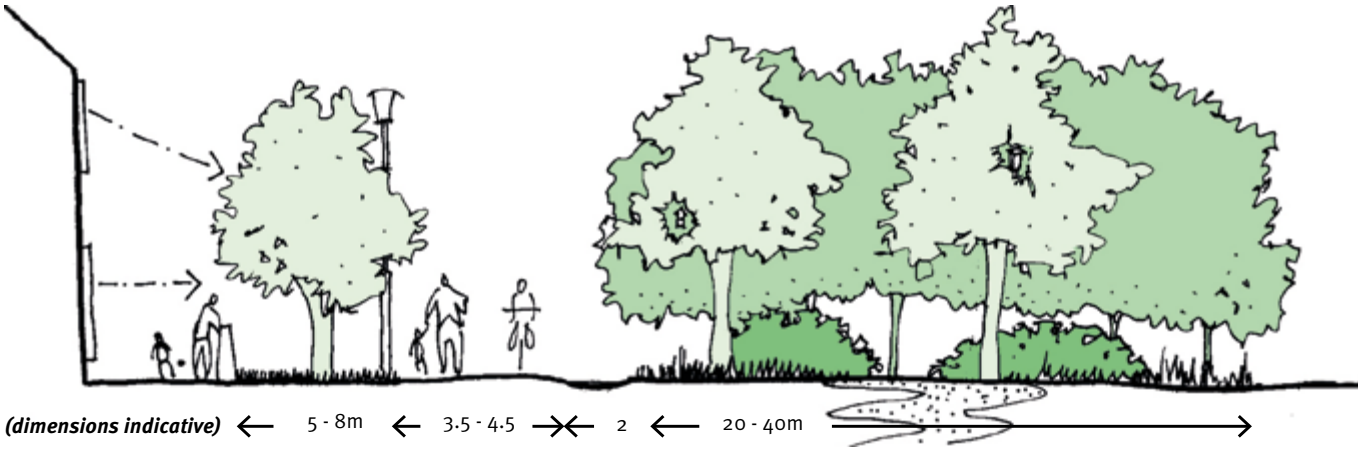

***Green/Blue Networks*** *- Green/blue networks can be aligned with watercourses or permanent (retention) ponds or detention areas providing for Sustainable Drainage, to enhance existing wildlife habitat, whilst providing for amenity, recreation and active travel. New development should provide active frontages to main path routes, open spaces and SUDs features.*

***Edinburgh Park*** *- paths, planting and artwork run along next to the watercourse*

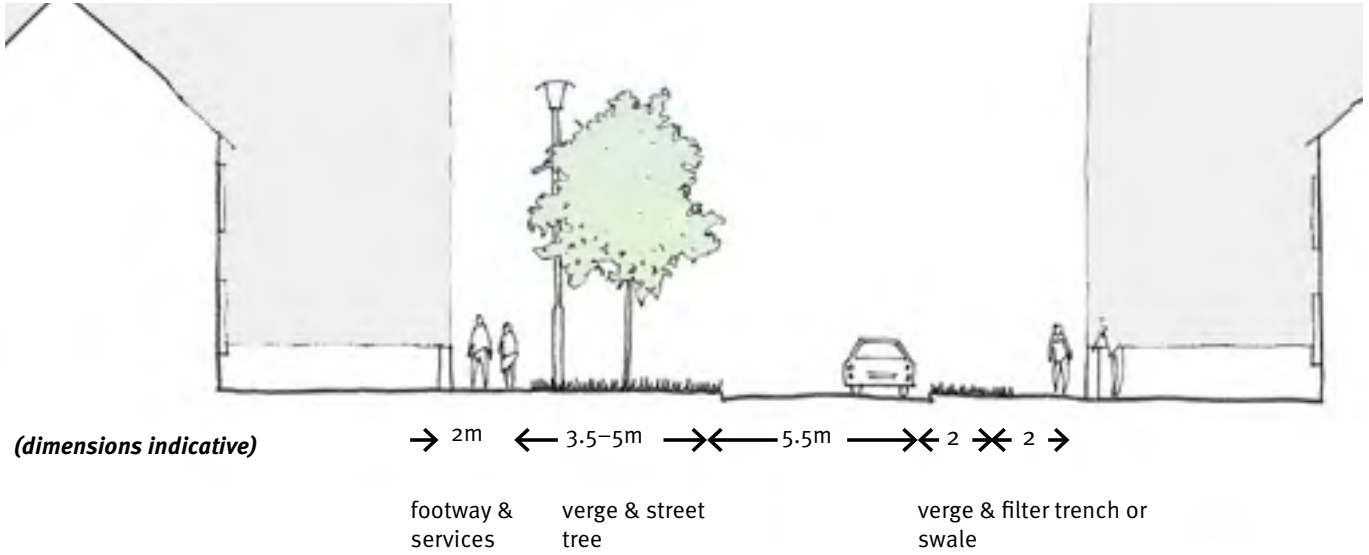
To promote natural bankside conditions, only riverside walls with significant archaeological value should be retained. Other retaining walls should generally be replaced with soft engineering solutions. In areas of historic importance mitigate the potential for natural banks using other methods such as reducing the top part of the wall to provide a wetted bank or cladding on the retaining wall to provide some riverine habitat with tree planting to provide habitat connectivity.

***North Meadow Walk*** *- the footway and cycleway provide for recreational use and active travel. The route is lined with large growing tree species, includes nesting boxes and is set within a broad grass verge. The path is lit and surveillance is provided from surrounding residential dwellings.*

***Forrest Road:*** *This street extends the tree lined avenue of Middle Meadow Walk to George IV Bridge*




***Green Corridor -*** *This density and type of planting is suited to the urban situation and parkland context. Where a rural context exists at the urban edge, native woodland may achieve a more appropriate fit with surrounding landscape character whilst providing shelter for new development.*




***Green Street -*** *The incorporation of trees and other planting within street design should be considered alongside the spatial parameters for movement and access - including visibility, services, lighting, the proposed approach to sustainable drainage and the intended density and spatial definition of the proposed built form.*