# Green–Blue

## Infrastructure Guide

A guide for small towns in Victoria's Central Highlands region

# Acknowledgements

**This Guide results from a joint initiative of the Shires of Golden Plains, Central Goldfields, Pyrenees and Moorabool, Central Highlands Water and the Department of Environment, Land Water and Planning.**


The partners would like to thank the staff from across each organisation who participated in the workshops, which formed the basis of this Guide.

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- David Collins – Project Manager (Golden Plains Shire)
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**Acknowledgement of Victoria's Aboriginal communities**

The Victorian Government proudly acknowledges Victoria's Aboriginal communities and their rich culture and pays its respects to their Elders past and present. The government also recognises the intrinsic connection of Traditional Owners to Country and acknowledges their contribution to the management of land, water and resources.

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VICTORIA State Government | Environment, Land, Water and Planning

# Contents

# Green-blue infrastructure can help improve the liveability and resilience of small towns.

# Introduction

The Central Highlands Water region in Victoria includes almost 60 small towns, which vary in population from 100 to 10,000.

Many factors contribute to how these small towns function, look and feel; community, geography, vegetation, landscape, heritage and urban infrastructure.

There are three categories or 'colours' of infrastructure in small towns:

- 'Grey-black' infrastructure includes buildings and structures, roads, paths, car parks and paved areas.
- 'Green' infrastructure refers to living vegetation such as gardens, nature strips, trees, parks and green open spaces.
- 'Blue' infrastructure are the assets associated with managing stormwater, such as gutters, pits, pipes and drains, ponds, wetland and waterways.

Green-blue infrastructure (GBI) is not a new idea, but it is a new term. It is a term designed to help us understand that these green and blue infrastructure assets are as critical to a town's liveability and resilience as are roads, buildings and carparks. GBI techniques aim to protect and enhance a town's natural assets, combined with better retention, treatment and use of rainwater where it falls.

Most communities want to protect and enhance the amenity and liveability of their small towns, and there is a growing awareness of the value of GBI to these broader aspirations.

Local government has a significant role in promoting and facilitating GBI solutions in small towns. They work closely with local communities to improve liveability through placemaking; lead planning, design and operation of urban infrastructure, and make decisions that support community benefits for small towns.

# Aim

## This Guide aims to provide introductory level information on the concepts and techniques for green-blue infrastructure in small towns.

Whilst the Guide was developed for application across the Central Highlands region of Victoria; it may apply to other areas.

The intention is to help raise awareness of the benefits of GBI for more liveable and resilient small towns in Local Governments and encourage the conversations and collaborations necessary to plan, design and implement practical solutions. The Guide is entry-level – links to detailed technical resources are provided in Section 5.

## Who should use this Guide?

Planning for GBI is complex and will involve staff from various departments within Local Government. Whilst the information in this Guide relates specifically to the roles of local Government in GBI solutions; it is acknowledged that other parties are likely to be involved and may find it helpful, such as:

- Water Corporations
- Catchment Management Authorities
- Government departments such as DELWP and DHS
- Local communities
- Traditional Owners

## Outline

- Background introduces GBI as a concept and potential benefits for small towns.
- Techniques provides an overview of GBI techniques suitable for different types of urban infrastructure found in small towns.
- Opportunities presents the principles for GBI and opportunities to apply these in Local Government processes.
- Case Studies provides a process for developing GBI options and some practical examples.
- Resources includes links to more detailed technical information.

## Developing the Guide

Since the Millennium Drought, the Victorian Government has encouraged all water-related agencies to integrate and coordinate their urban water system management activities.

Local Governments (stormwater, green spaces), Water Corporations (drinking water, recycled water and Sewerage) and Catchment Management Authorities (waterway health) have come together through an Integrated Water Management (IWM) approach.

IWM acknowledges that fragmented management of the water cycle system can lead to lost opportunities and conflicts. It emphasises a holistic, systems-based approach to build a common understanding of the issues and commitment to shared outcomes for improved liveability and resilience of cities and towns.

This Guide emerged from an initiative in 2019 by the Shires of Golden Plains, Central Goldfields, Pyrenees and Moorabool, Central Highlands Water and Department of Environment, Land Water and Planning (DELWP) through the Central Highlands Integrated Water Management (IWM) Forum.

The partners recognised the potential benefit of IWM for towns across the region but acknowledged that small towns were unlikely to attract the resources or support for IWM Plans. The intent was to develop an introductory guide for local government staff on green-blue infrastructure (GBI) in small towns.

The project's first phase involved a review of current GBI technical information and three place-based workshops in Ballan, Smythesdale and Moonambel with over 40 staff from local government, water corporations, CMAs, and DELWP. Using this information, the consultants (Encader Consulting and Foresight Advisory) developed a Draft GBI Guide and a GBI Plan to support potential opportunities across the region.

The second phase of the project was funded by the Regional Climate Adaptation Group for the Grampians Region (RCAG) in 2021. Phase Two involved three online workshops (conducted by Encader Consulting and Foresight Advisory) with 50 staff from similar agencies. The aim was to re-engage the target audience and refine the Guide to make it more accessible and applicable to a broader audience beyond the Central Highland's region. Paul Kelly Creative did the graphic design of the Guide.

## Feedback

The partners acknowledge that GBI is a relatively new and evolving concept for small towns across regional Victoria. We welcome feedback on the Guide's content, function, and form to help improve its accessibility and applicability to a broader audience.

Please send your feedback to the IWM team at the Department of Environment, Land, Water and Planning.

# Background

**Green-Blue Infrastructure refers to natural and built assets within urban landscapes that are living (‘green’) and which manage water (‘blue’).**

Imagine what our small towns would be like if they didn't have tree-lined streets, parks and gardens, where most exposed surfaces were asphalt, concrete or paving.

Where buildings and structures provide the only protection from the sun or rain. Where any water that falls is rapidly swept away to underground pipes as quickly as possible. Without green-blue infrastructure, our small towns wouldn't be great places to live.

Green-Blue Infrastructure refers to natural and built assets within urban landscapes that are living ('green') and which manage water ('blue').

Soil and the moisture it holds are essential for healthy green infrastructure such as turf, plants, trees and open spaces. These types of 'green infrastructure assets' are critical for the amenity and liveability of small towns.

Of course, these living assets need water to survive and thrive. Much of this water comes in the form of rain that falls on the urban area.

'Blue infrastructure' is another term for what was traditionally called 'Water Sensitive Urban Design'.

It includes the urban infrastructure assets that manage the conveyance, storage, and treatment of urban stormwater, such as downpipes and water tanks, gutters, pits and drains, ponds, wetlands and waterways.

By improving the way we convey, store and use urban stormwater, we can make the most of the water that falls in a town. The combination of green and blue infrastructure provides the space we need to retain stormwater close to where it falls and use it to irrigate the living assets we value for liveability while improving downstream water quality.

**Green infrastructure assets:** living vegetation (turf, grasses, shrubs, trees) the soils that grow them & the places we find them (gardens, nature strips, road edges, parks, public open spaces).

**Blue infrastructure assets:** those associated with collection, movement, retention & use of water in urban landscapes (tanks, gutters, swales, drains, ponds, wetlands, waterways).

Figure 1 Green and Blue Infrastructure

# Techniques

**Green-blue infrastructure can take various forms and be applied at different scales, from the lot scale to whole-of-township.**

# Lot scale

## Gardens

Gardens, both private and public, are an essential green asset in small towns. Plants are grown in soil and need water to thrive. Stormwater can be a valuable source of irrigation water to offset the use of drinking water.

## Water Tanks

Rainwater tanks store water from a building roof for use. They are the primary source of water for most properties outside areas with a potable water supply system. Rainwater can also be used for irrigating smaller lot scale green assets.

## Green Roofs

Green roofs are roofs on buildings that are wholly or partially covered in living vegetation. The plants grow in a particular medium above a waterproof membrane and are irrigated with stormwater or greywater.

## Raingardens

Raingardens are vegetated (or rock-filled) depressions adjoining buildings (and roads) that collect, infiltrate and filter stormwater runoff from the building. They have a special filter media to treat the water and retain sediment passing through the rain garden.

## Green Walls

A Green Wall is where the wall of a building or structure is covered with living plants. Some green walls have a framework supporting pots for plants, whereas others might have a structural façade that allows plants to climb up the wall.

# Streetscape scale

## Nature Strips

Nature strips are the area of public land between the property boundary and the road kerb or shoulder. They are typically grass or gravel but can also be full of plants and trees. Whilst public land is part of the road reserve, nature strips generally are maintained by the adjacent resident. They often include footpaths and often house utility services such as electricity, gas, water and telephone cables.

## Footpaths

Footpaths provide safe active travel routes through towns. They are also often used to house utility services and tend to be paved with concrete or asphalt in larger towns and more highly trafficked areas. However, many footpaths in small towns are gravel or even dirt tracks, providing more significant infiltration than concrete or asphalt.

## Roadside Raingardens

Raingardens along roadsides are becoming a more common form of GBI in larger towns. They use the same design principles as rain gardens at a lot scale, with a vegetated or rock-filled depression that collects, infiltrates and filters stormwater runoff from the road. They have a special filter media to treat the water and retain sediment passing through the rain garden and can be very effective at reducing pollutant and sediment loads from road surfaces.

## Street Trees

Street trees are a highly prominent form of green infrastructure, providing shade, vistas and habitat for biodiversity. Tree-lined main streets and side streets offer a high degree of 'kerbside appeal' in small towns.

## Swales

Swales are shallow, vegetated open channel that conveys and treat stormwater. They are typically planted with grass or sometimes more dense vegetation to filter runoff.

# Precinct scale

## Parks

Parks are open space areas that support passive and active recreational activities. They can include play areas, botanic areas and open space, providing a range of opportunities for people to enjoy living, green places. Some parks can be irrigated using an alternative water supply or designed to provide stormwater detention and infiltration.

## Green Links

Green links or corridors are linear green spaces that provide active travel pathways, often located along drainage easements or waterways.

## Open drains

Open drains are exposed water channels (not underground) and convey stormwater to receiving waters, such as wetlands, streams, creeks, and rivers.

## Wetlands

Wetlands are shallow water bodies permanently or periodically inundated. Natural wetlands are rare in urban landscapes. However, many new wetlands are being constructed as part of urban subdivisions. These wetlands retain much of the stormwater flow before slowly discharging it through natural aquatic vegetation to reduce sediment and improve water quality.

## Detention Basins

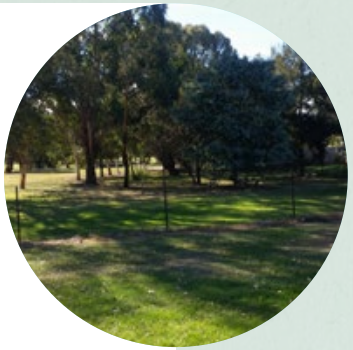
Detention (or 'retarding') basins are dam-like depressions designed to detain large stormwater flows immediately after a storm then release it slowly downstream. They are often grassed but can also be rock-lined and include inlet sediment ponds gross pollutant traps.

## Sport Grounds

Sports grounds are large open space areas that support organised sport and associated recreational activities. These could be irrigated using an alternative water supply or designed to provide stormwater detention and infiltration.

# Township scale

## Urban forests



An 'Urban Forest' is a term used to include all the living vegetation (trees, shrubs and grasses) within a city or town. Urban forestry is the practice of planning and managing these living assets more strategically and systematically to optimise the benefits to the local community and the natural environment. Many Local Government's across Australia now have urban forest strategies and teams.

## Expansive open spaces

Expansive open spaces refer to large areas of open space land within or on the edge of a city or town's boundaries. Examples for small towns could include broad areas of public land along rivers and creeks, forest and mining reserves and even former racecourses. Due to their large size, these open space areas are often less manicured and accessible than smaller areas of public open space.

## Waterways

Waterways are the natural creeks, streams and rivers that collect and covey flows from water catchments. Many urban waterways have been highly modified and have lost many of their aquatic and riparian ecological values.

## Lakes

Lakes are permanent open water bodies that are not flowing. They are often fed by stormwater and provide significant amenity value in small towns.

# The case for GBI in small towns

**There are over 60 small towns across the Central Highlands Water region in Victoria, varying in population from 100 to 10,000.**

## Major challenges for small towns

**Each small town has its unique character and features, including its community, geography, vegetation, landscape, heritage, and urban infrastructure.**

Many external factors contribute to how these small towns function, look and feel.

Population decline, unemployment, ageing demographics and loss of services are substantial issues across rural Australia.

Climate change is likely to impact small towns significantly, given their geographic location, remoteness and exposure to climatic conditions. The Central Highlands region is expected to have increased maximum and minimum daily temperatures, declining winter and spring rainfall, and increasing intensity of extreme rainfall events.

These types of climate changes could be incrementally challenging for the region's small towns, contributing to localised issues such as infrastructure disruption, declining community health and productivity, increased migration to larger centres and increased demand for emergency services, community fatigue.

These challenges could cause reduced viability and resilience of small towns.

Figure 2 Historic Echuca Wharf Main Street demonstrates green-blue infrastructure characteristics

In many small towns existing infrastructure assets are ageing, have a single purpose and may no longer fit for purpose or 'modern use'. The cost of maintenance, renewal and upgrade of these assets is a significant financial challenge for smaller regional Councils.

Consequently, there is increasing demand for urban infrastructure that provides 'multifunctional benefits', that is, assets that better contribute to the values inherent in small towns and the vitality of the local community.

As cities and towns develop, they experience a general 'hardening' of the urban landscape, with increased 'grey-black' infrastructure such as paved roads, car parks, kerb and channels and underground stormwater.

Road pavements expand, causing road edges become more rigid to cope with increased vehicular traffic; pedestrian areas become progressively paved to cope with increasing foot traffic. Stormwater transitions from surface-based swale systems to underground pipes, while urban waterways are primarily channels for increased runoff and pollution.

This general 'hardening' of urban landscapes usually comes at the expense of green infrastructure features, particularly open space, plants and trees.

## Green-blue infrastructure often makes the most significant contribution to the feel or amenity of a city or town.

Historically we have failed to recognise the value of green-blue infrastructure to the social vitality, liveability and economic prosperity of cities and towns. Green open spaces, trees and parks have not been considered 'infrastructure assets' the same as roads, buildings, kerb and channel and drainage pipes.

It is not possible nor desirable to return to a time when grey-black infrastructure didn't exist (Figure 2). However, there is growing recognition that good urban design should feature green-blue and grey-black infrastructure elements.

The critical challenge in the future will be ensuring a systematic approach and commitment to co-designing integrated solutions which offer multiple benefits.

# Social Benefits

GBI is becoming more important as a fundamental feature of small towns for many reasons, primarily due to the range of environmental, social and economic benefits it can help achieve.

## Social benefits

### *Improved township amenity and liveability*

By improving the quality, extent and connectivity of public open spaces and green areas, GBI can enhance the amenity and liveability of small towns.

### *Reducing urban heat for cooler streets*

One of the most significant climate change risks facing small towns is the problem of the Urban Heat Island effect. Hard, heavily paved surfaces such as bitumen and concrete collect and store significantly more solar radiation than living, green areas. Larger areas of heat absorbing surfaces leads to a faster heating rate during the day and quicker drying conditions than surrounding rural areas. By contrast, areas of shaded green open space and parks within the same immediate vicinity can be significantly cooler.

Small towns do not have as much grey-black infrastructure as larger towns and cities, but they have still experienced significant landscape hardening. They also often have broad, grid-based street layouts and extensive paved areas, sometimes with limited street tree canopy cover, exposing them to much greater urban heat risk. The temperature moderating effect of green infrastructure can be significant; - shaded green parks can be up to 20C cooler than adjacent major street intersections on hot days (above 35C) in summer.

### *Improved community physical and mental health*

These extremes at the streetscape level can contribute to adverse health and wellbeing issues, including heat distress, dehydration and heatstroke, especially for vulnerable community segments such as the elderly. This can be an elevated risk in small towns with ageing populations.

A growing body of evidence demonstrates the positive links between green infrastructure assets and public health and wellbeing benefits, both for physical and mental health. Place matters to people - where we live and how we feel about our lives affects our state of mind and shape our experiences.

Green spaces, trees, parks and gardens help improve overall health, are restorative and help reduce mental fatigue and stress. These issues are critical in smaller towns where communities are often ageing, generally more closely interlinked and featuring strong cohesion through shared experiences. External pressures, including a warmer, drier climate, make this link even more critical.

# Environmental benefits

### *Enhanced urban and aquatic biodiversity*

GBI is critical to maintaining biodiversity in cities and towns; the flora and fauna help connect us with nature despite living in constructed, modified landscapes. Blue infrastructure will help protect and enhance drains and creeks, forming green-blue corridors linking people with place and the natural environment. Providing access and connectivity to these green-blue corridors in the landscape can enhance community connectedness and promote active travel.

### *Increased tree canopy and decreased air pollution*

We are rapidly increasing our understanding of the incredible values of trees for people and nature in urban landscapes. Trees provide canopy cover, which helps increase natural shading, enhance biodiversity, improve air quality, reduce stormwater runoff, and carbon sequestration and storage. The amenity or replacement value of urban trees is becoming so crucial that many Councils now value these assets in their capital asset registers.

### *Increased stormwater/ rainwater infiltration & moisture retention in soils*

Stormwater management techniques have been traditionally designed to convey high flows of water rapidly away from our buildings and streets. GBI techniques seek to retain as much water as possible in the urban landscape, allowing for more significant infiltration to the soil and improved water quality into creeks and rivers.

## Economic benefits

### *Improved township entrances' kerbside appeal' for visitors*

As metropolitan and regional centres grow, more people seek to visit and sometimes stay in small towns. This growing interest in all things rural is a source of new energy and investment in small towns. To better attract new visitors, small towns need a certain level of 'kerbside appeal' and the ability to provide some unique experiences. Green-blue infrastructure assets like treed streetscapes, attractive public open spaces, and help give that kerbside appeal.

### *Better public open spaces - more significant usage and patronage*

Better looking streetscapes and open spaces are more attractive to visitors and community alike, enhancing visitation and usage rates, which could have flow-on economic benefits. A more attractive main street or shopping centre creates improved opportunities for tourism and increases residential property values.

### *Increased use of alternative water*

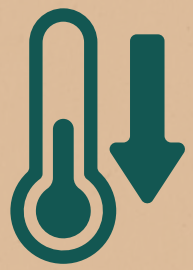
In smaller towns, many public open spaces and treed streetscapes declined in quality during the Millennium drought due to overall water scarcity and a dependency on potable water for irrigation. Water security remains a significant issue for small towns, but the value of quality, accessible green infrastructure assets is now much more prominent for local communities.

As climate change contributes to warmer, drier towns, there is a growing recognition of the need to retain and utilise as much stormwater as we can. Rather than quickly taking it away in underground stormwater networks, towns can use this water for passive irrigation of green spaces, plants and trees.

# Benefits of GBI

## Social benefits

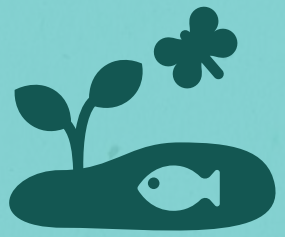
Improved urban amenity and liveability



Cooler landscapes reduce the urban heat island effect

Improved community physical and mental health

## Environmental Benefits



Enhanced urban and aquatic biodiversity

Increased tree canopy and decreased air pollution

Increased stormwater/ rainwater infiltration & moisture retention in soils

## Economic benefits


Improved township entrances' kerbside appeal' for visitors

Better public open spaces - more significant usage and patronage

Increased opportunity for the use of alternative water

## Local government's role

Local government has a crucial role in working with local communities to enhance the liveability and amenity of these small towns.

They lead planning, design, delivery and operations of most of a towns' infrastructure assets, making decisions that support social, economic and environmental benefits for those towns.

In practice, GBI is a network of both natural and semi-natural features and spaces in our towns. It spans departments and sectors and requires a collaborative, integrated approach.

Past experiences show that adopting the principles of GBI is not easy for Local Government. Typically, attempts to apply GBI are ad-hoc, fragmented and made at the wrong time or too late in the decision-making process.

Whereas conventional infrastructure planning might be regarded as engineering-led, GBI requires various departments across a local council.

Some of the barriers to the adoption of GBI in Local Government include:

- low levels of awareness of the concepts, techniques and opportunities
- the complexity of the approach relative to conventional options
- perceptions of higher Capex and Opex costs than traditional approaches
- limited internal capacity
- lack of coordination and communication early in townscape planning and design processes.

# Techniques

**This section provides some GBI techniques suitable for different types of urban infrastructure found in small towns.**

# Principles of GBI

## A green-blue infrastructure approach aims to better utilise natural processes to control the quantity, velocity, and quality of water emanating from the urban landscape and improve living assets.

As the hardening of our urban landscape has come at the expense of green infrastructure assets, critical principles for the green components of GBI primarily focus on ensuring the protection, enhancement and restoration of green assets in the urban landscape and improving the connectivity of those assets.

Urban stormwater runoff has traditionally been regarded as a hydrological problem to be dealt with to avoid localised flooding and wet areas.

The proliferation of hard-surfaced roads and edges to convey, cater for and control vehicular traffic has dramatically reduced the ability of urban landscapes to retain, infiltrate and utilise water where it falls.

Over time, this has led to ever-increasing piped stormwater networks to dispose of the excess water rapidly. As towns get larger, stormwater networks expand in scale and scope to cope with the increasing water flows, which is costly and pushes the problem downstream, contributing to erosion, pollution and localised flooding of waterways.

Over time, a loss of GBI leads to hotter, dryer and more 'hydrophobic' or water repellant cities and towns.

GBI principles emphasise the need to consider stormwater as an opportunity to help green cities and towns. This includes making greater use of stormwater where it falls through infiltration and irrigation, conveying it safely and more slowly to reduce velocity and improve water quality.

# Principles of GBI

**Ensure responsive and integrated design**

Ensure infrastructure needs are evidence based, service focused and integrated with other planning and service delivery functions.

**Increase multifunctionality**

Enhance the ability to allow different functional uses and activities within the same site to maximise the benefits to people and nature.

**Apply holistic, systems thinking**

Adopt whole of life cycle and systems-based thinking in planning and design, spanning water, land, biodiversity and social systems and their interactions and consideration of environmental, social and economic values.

**Protect, enhance and restore natural green features**

Where possible, protect the extent of natural green assets within the urban landscape and enhance the quality of those assets, or restor green assets where appropriate.

**Increase green-blue connectivity**

Improve connectivity of green and blue spaces to promote movement of people and biodiversity and strengthen connections between people and nature.

**Increase stormwater detention, retention and reuse**

Increase detention, retention, treatment and reuse of water that falls on the urban landscape close to its source and reduce velocity and volume of discharge.

**Diversify water supplies**

Where possible, use fit for purpose alternative source of water to reduce pressure on potable supplies .

# Roads and transport

## Sealed Roads

Sealed roads occupy a significant footprint in small towns, often being the main street and route for through traffic. The sealed pavement does not absorb any water, and therefore they are a source of a considerably increased volume of stormwater runoff and increased temperatures.

### *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

### *Potential techniques -*

- **The extent of the paved area.** For sealed roads, a minimum road pavement width will be needed forw transport movements. But many road pavement widths become larger over time, sometimes much more expansive than they need to be. Consider keeping the impermeable paved width to a minimum to meet the functional requirements of the road, thereby reducing runoff and temperature impact.
- **The permeability of the pavement –** consider a pavement finish that allows for increased infiltration than concrete or bitumen, such as gravel or paving.
- **The colour of the pavement –** darker colours absorb heat and increase road contribution to the heat island effect.

### *Benefits of GBI -*


Road shoulders can be softened with low edges to grassed swales

# Road shoulders

Road shoulders are the areas between the edge of the paved road and the surrounding land. They can vary in width depending on the road type and purpose and can be sealed, gravel or grass.

### *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

### *Potential techniques -*

- **The extent of the shoulder area –** consider minimising the extent of the shoulder area.
- **The permeability of the shoulder –** consider a shoulder that allows for increased retention, infiltration and treatment such as gravel or grassed surface.
- **The tree canopy –** whilst some roads cannot have trees on the shoulder for safety reasons, trees planted in the shoulder can provide protection and shade for smaller residential roads.
- **The ability to use runoff water for passive irrigation –** road shoulders can be a source of passive irrigation for turf, plants and trees.

### *Benefits of GBI -*

# Car Parks

Car parks refer to those areas where vehicles are parked for extended periods. Whilst many small towns have extensive on-street parking, some areas of additional space are often required to cater for peak car parking demand. Many carparks are sealed with asphalt or gravel, but some small towns may also have grassed areas for overflow parking on significant traffic days.

### *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

### *Potential techniques -*

- **The extent of the paved area –** carparks are made for cars, but the paved area does not need to be excessive. Consider keeping the impermeable paved area to a minimum to meet the functional requirements of the carpark, given the expected demand. Can some of these demands be met with unpaved regions?
- **The permeability of the pavement –** bitumen paved carparks are an expansive area that generates a lot of stormwater per unity area. Consider a pavement surface that is more permeable and allows for increased infiltration such as paving, gravel, or even grass where practical.
- **The extent of vegetation and tree canopy –** consider garden beds which provide excellent vehicle separation barriers, and include trees, which provide a source of shade.
- **The ability to use runoff water for passive irrigation –** given the volume of water carparks produce following a storm event, consider design features that allow that water to be directed to the vegetated areas and trees in the carpark.

### *Benefits of GBI -*

# Pathways

Pathways connect people in urban landscapes and provide safe, active travel routes separated from vehicles. Most small towns have some formal paths such as footpaths, and there are often many more informal paths that are often unpaved and provide rapid point-to-point access.

### *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

### *Potential techniques -*

- **The extent of the paved area –** pathways are made for people, so the paved area does not need to be excessive. Consider keeping the impermeable paved area to a minimum to meet the functional requirements of the path, given the expected demand. Can the paved width of the path be smaller?
- **The permeability of the pavement –** most pathways in small towns are concrete or bitumen. Whilst they are incredibly durable, these materials shed water. Consider pathway surfaces that are more permeable and allow for increased infiltration, such as granitic sand, gravel, or designed permeable paving.
- **The extent of vegetation and tree canopy –** pathways with fringing vegetation and shade from overhead canopy trees are much more inviting and walkable than those without these features. Consider garden beds that provide excellent separation from adjacent road traffic and canopy trees, which provide a source of shade.
- **The ability to use runoff water for passive irrigation –** given that paths are a source of runoff, consider design features that allow that water to be directed to adjacent gardens and trees.

### *Benefits of GBI -*

# Kerb and channel

Kerb and channel is the edging of roads and streets. It is typically concrete but can sometimes be bluestone or paving. It performs several vital functions:

- **Structural -** to confine the paved area of the road such that it maintains its rigid structure
- **Transport safety -** to restrict vehicular traffic to the road paved area (via the kerb)
- **Hydrological –** to act as a collection point for road runoff (the channel). The road surface is sloped towards the kerb to allow flow, and the gutter slopes towards some form of the drain, either underground (via a side entry pit) or a surface drain such as a swale.

### *Principles to consider-*

- Ensure responsive and integrated design
- Increase stormwater detention, retention and reuse

### *Potential techniques -*

- **Edge treatment –** large, rigid barrier kerb is sometimes necessary for high traffic areas to ensure adequate separation of vehicles from other road users. However, there are many circumstances in small towns where there can be a 'softer' transition from the road to the adjoining areas, such as segmented barrier kerb, semi mountable kerb or even no kerb.
- **The extent of passive water use –** kerb and channel does not have to direct water into a side entry pit and drain; it could run water to an adjoining nature strip and trees via cut-outs.

### *Benefits of GBI -*


Kerb and channel can have cut outs to aid infiltration

# Stormwater and drainage

## Drains

Drains are the structures that convey stormwater safely through townships. They can be above ground and semi-natural, such as grassed swales, or underground in pipes. Drains are critical assets in the conveyance of urban stormwater and therefore provide a very high opportunity to apply GBI principles, especially when they need replacement or upgrading.

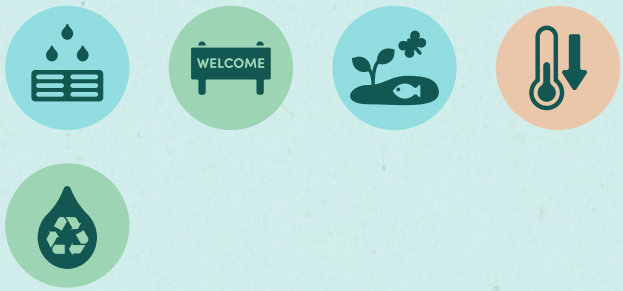
### *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

### *Potential techniques -*

- **The extent of daylighting –** traditionally, much of our stormwater drainage network has been hidden underground, so it's out of sight and mind. Yet daylighting drainage has significant benefits by keeping water in the urban landscape.
- **The extent to water management –** drains can be much more than pipes or channels to convey stormwater away from the town. GBI based drains can retain, infiltrate and treat stormwater within the landscape before discharge to receiving waters.
- **The extent of passive irrigation -** drains can be a crucial source of space, soil and water for plants and trees.
- **Connectivity –** Drains often provide important linear open spaces within the urban landscape. They can be used to offer green-blue connections for people and nature.

### *Benefits of GBI -*



# Retardation basins

Pits convey water from the kerb and channel to the drainage network. They can direct water to underground pipes or surface swales and directly connect road runoff and the surrounding landscape via the drainage system.

Drainage pits are an opportunity to restore or 'daylight' water where it falls rather than convey it underground via pipes. Trees require water to their root zone, but these zones are confined or covered by hard pavements and other structures in most streetscapes. Exposed drainage pits can help direct water to these root zones to enhance tree health and reduce active irrigation. More advanced forms can temporarily store, infiltrate and treat stormwater.

### *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

### *Potential techniques -*

- **The extent of daylighting –** traditionally, most drainage pits go straight underground to the piped stormwater network. Yet daylighting drainage pits has significant benefits by keeping water in the urban landscape.
- **The extent of water management –** drainage pits can be used to retain, infiltrate and treat stormwater within the landscape before discharge to receiving waters via the stormwater network.
- **The extent of passive irrigation –** drainage pits can be a crucial source of space, soil and water for plants and trees, such as through tree pits, kerb breaks and rain gardens.

### *Benefits of GBI -*

Retardation basins can be multifunctional and improve amenity'

Wetlands can provide valuable habitat in small towns

# Wetlands

A wetland is a shallow water body that can be permanently or periodically inundated. Natural wetlands are rare in urban landscapes and typically receive some form of stormwater discharge. Wetlands provide visible water in small towns and can be associated with recreational areas and public open space. More common than natural wetlands are constructed wetlands used to retain flows before discharge, improve water quality through sedimentation and filtration and uptake nutrients in vegetation and sediments.

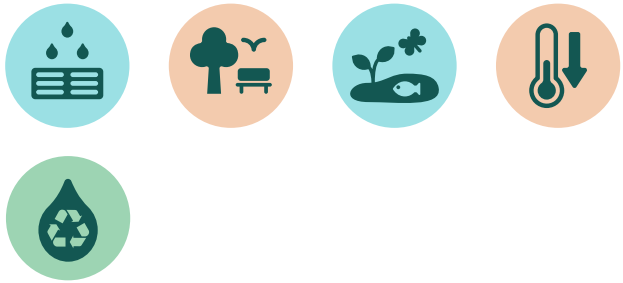
## *Principles to consider-*

- Increase stormwater detention, retention and reuse
- Protect, enhance and restore natural green features

## *Potential techniques -*

- **Retention –** the ability of the wetland to harvest and store stormwater for more extended periods than typically required for flood control or water treatment purposes. The size of the basin relative to the catchment is an issue for stormwater harvesting. Smaller wetlands fill up and discharge quickly, providing limited opportunity for reuse. Larger basins with access to a larger catchment are more likely to retain water into the summer months, where it can be used for non-potable uses such as irrigation of adjoining green assets.
- **Treatment –** the ability of the wetland to treat the stormwater to a satisfactory level before discharging it to a receiving water body.
- **Multifunctionality –** traditionally, wetlands have been closed to the public as dangerous places. But these water storages provide essential natural habitats for urban biodiversity. They are places where people can connect with nature—social infrastructure such as paths, boardwalks and seating help to maximise the community value of wetlands.
- **The extent of aquatic and riparian plants –** effective wetlands need a comprehensive range of trees, shrubs and grasses in their riparian and aquatic zones to provide the treatment function and valuable habitat.

## *Benefits of GBI -*



# Waterways

Urban waterways (rivers and creeks) and floodplains are important blue infrastructure assets in the urban landscape. Most of the region's small towns are located on a waterway of some form due to the need for a reliable freshwater supply. These waterways have typically become degraded over time as the population in towns increase. Many waterways across the Central Highlands were damaged during the Gold Rush.

Waterways are now increasingly recognised as important natural features of our regional towns but need to be protected, enhanced and restored to provide multifunctional benefits.

The broad aim concerning urban waterways and floodplains consistent with GBI principles should be to retain and restore the natural function and form of waterways and optimise their social and cultural values as linear green spaces and links through the urban landscape.

### *Principles to consider-*

- Protect, enhance and restore natural green features.
- Increase green-blue connectivity.
- Diversify water supplies.

### *Potential techniques -*

- **Multifunctionality –** the extent to which urban waterways can accommodate and invite multiple uses. Traditionally, many urban waterways have been no-go zones, rarely visited and often inaccessible to people. But our urban creeks, rivers and lakes are critical green-blue infrastructure assets that offer significant environmental and social values to small towns. They provide remnants for native biodiversity and are places where people can connect with nature; the past few decades have seen a significant shift towards a re-discovery of urban waterways. Social infrastructure such as paths, boardwalks and seating helps to improve access and amenity of waterways.
- **Connectivity –** the extent to which waterways provide green-blue corridors to promote movement of people and biodiversity and strengthen connections between people and nature.
- **Ecological health –** the extent to which the environmental health of waterways is protected, enhanced and restored.
- **Hydrology –** the extent to which waterways have sufficient water to satisfy environmental requirements.

**Waterways can be important places for people and nature**

### *Benefits of GBI -*

# Buildings and structures

## Buildings and structures

Buildings and structures are often the most visible and common form of urban infrastructure in any city or town. Many small towns are renowned for their historic buildings and architecture. A GBI approach can help soften and enhance the appeal of buildings and structures by better utilising the roofs, walls and adjoining open spaces, providing improved shade, cooling and stormwater management.

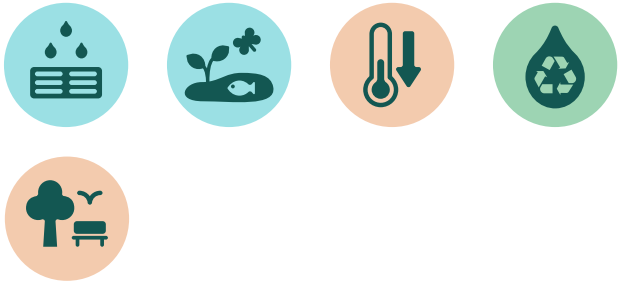
### *Principles to consider-*

- Protect, enhance and restore natural green features
- Diversify water supplies

### *Potential techniques -*

- **Multifunctionality -** the extent to which buildings and structures can accommodate and invite multiple uses.
- **Landscape integration -** the extent of integration with the landscape via green spaces.
- **Water efficiency –** the extent of water efficiency measures. The overall water efficiency of the building or structure will largely be determined by its functional purpose. Consider building design and fit-out features that increase the overall water efficiency of the building or structure during its working life. Examples include water-efficient appliances, rainwater tanks and downpipes providing passive irrigation to building surrounds.
- **Diversity of water sources –** the extent of water retained and reused on site.

### *Benefits of GBI -*



# Green spaces

## Sports fields

Sports grounds and precincts are often the most critical community amenities in small towns. They provide a shared space for people to come together and participate in many different activities, strengthening community cohesion. Keeping these valuable green-blue assets green and attractive is a significant challenge for local government and communities. The irrigation demands of sports grounds can be great, so many councils are exploring the use of alternative water sources, such as stormwater or recycled water, for irrigation purposes.

### *Principles to consider-*

- Protect, enhance and restore natural green features
- Diversify water supplies

### *Potential techniques -*

- **Multifunctionality -** the extent to which sports ovals can accommodate and invite multiple uses.
- **Water efficiency –** the extent of water efficiency measures. The overall water efficiency of the sports field will largely be determined by its functional purpose. Consider the design and fit-out features that increase the overall water efficiency of the sports ground during its working life. Examples include drought-resistant turf and drainage that makes the best use of rainfall.
- **Diversity of water sources –** the extent of water retained and reused on site. Sports ovals are substantial water users, so alternative sources such as recycled water or stormwater should be considered. Note that the viability of non-potable water sources should be greater than 50% for the alternative to be viable. Note also that educational signage could be considered where an alternative source of water is used.
- **Landscape integration -** the extent of integration with the landscape via green spaces. This could include adjacent trees and plants.

### *Benefits of GBI -*

# Parks, gardens and play spaces

Parks, gardens and play spaces are often the most utilised forms of GBI in small towns. Communities typically highly value these GBI assets, and Councils should consider engaging the community in the ongoing management and maintenance of these spaces. As demand for amenable green spaces in towns grows, the pressure on these community assets also increases, and they need to accommodate and invite multiple uses. Water-efficient horticultural practices will help reduce water use whilst alternative water sources such as rainwater or stormwater can supplement drinking water and help keep these spaces green during summer.

### *Principles to consider-*

- Protect, enhance and restore natural green features
- Increase multifunctionality
- Apply holistical, systems thinking

### *Potential techniques -*

- **Multifunctionality -** the extent to which parks, gardens and play spaces can accommodate and invite multiple uses.
- **Landscape integration -** the extent of integration with the landscape via green spaces, including natural shading from trees and vegetated buffers and edges.
- **Community involvement –** communities value their local parks, gardens and play spaces. Consider engaging the community in the ongoing management and maintenance of these spaces.

### *Benefits of GBI -*

# Street trees and nature strips

Street Trees are a highly visible form of green infrastructure. They provide shade, vistas and amenity as well as habitat for biodiversity. They enhance the liveability and kerbside appeal of townships.

Nature strips are the area of public land between the property boundary and the road kerb or shoulder. They are typically grass or gravel but can also be full of plants and trees. Whilst public land as part of the road reserve, nature strips are usually maintained by the adjacent resident. They often include footpaths and house utility services such as electricity, gas, water, phones.

These green assets largely determine the look and feel of a streetscape, and they are critical small-town opportunities for GBI approacvhes.

### *Principles to consider-*

- Protect, enhance and restore natural green features
- Diversify water supplies

### *Potential techniques -*

- **Width and extent of nature strip –** trees need space the survive and thrive, so consider wider nature strips that can provide for larger trees.
- **The number, type and regularity of trees –** streets with few, small or sparse trees provide limited shading, so consider a regular placement of larger trees that are suitable to local conditions, including several at canopy shading height.
- The extent of vegetation in nature strips is most often grassed, but it is appropriate to consider other forms of platings, such as grasses and shrubs, in some places. In some urban areas, nature strips are converted into productive spaces with fruit, herbs and vegetables.
- **The extent of contribution to native biodiversity due to species suitability –** trees are critical for native biodiversity in towns, so consider species that are likely to enhance local biodiversity.
- **The extent of passive irrigation -** street trees need water, but trees suited to the local conditions are more likely to survive with limited irrigation. The ability to passively irrigate street trees with porous surfaces out to the drip line is essential for their long term survival.

- **The extent of protection from compaction by vehicles –** compaction by cars is a significant risk for street trees so, consider some form of protection for the root zone.

### *Benefits of GBI -*

# Opportunities

This section identifies opportunities to consider GBI solutions within existing Local Government decision-making processes in small towns.

**Given that Local Governments have many different standard business/decisions making processes, it should be possible to identify nodes of opportunity to consider GBI in those processes. As a general rule, it is more productive to consider GBI approaches in the decision-making process which have strategic, long-term consequences and implications, rather than short term operational decisions.**

| Level of decision-making, time frame of consequences | Types of processes within Local Government | Examples | Opportunity for GBI to add value |
|---|---|---|---|
| **Strategic**<br>Long term | Corporate Plans | • Council Plan | **High** |
| | Community or Place-based Plans | • Whole-of-township strategies & plans<br>• Community Plans | **Very High** |
| | Statutory Planning | • Strategic Land use Plans,<br>• Framework Plans | **Very High** |
| | Infrastructure Planning | • Rolling Capital Works Plan | **Very High** |
| **Tactical**<br>Medium term | Service Plans for functional areas | • Municipal Health and Wellbeing Plan<br>• Asset Management Plans<br>• Community Health Services | **High** |
| | Statutory Planning | • Town Planning applications | **Low** |
| **Operational**<br>Short term | Service plans for specific areas | • Annual Works Programs | **Low** |

# Stakeholder Engagement

**Regardless of the level or type of decision making, GBI introduces new layers and perspectives in traditional infrastructure planning, so stakeholder engagement is critical. It requires understanding the complexity of land, water and social systems, stretching people to think beyond the functional purpose of the infrastructure asset. Social, environmental and economic outcomes from infrastructure are becoming increasingly important as climate impacts affect the function and form of assets in small towns and the general ageing of the asset base.**

A critical early task is to develop a platform for an informed discussion about GBI, so it is crucial to identify who should be involved and how they should be engaged. Typically, developing GBI options spans departments, sectors and disciplines, so internal cooperation is critical.

Looking beyond Council, GBI demands a level of community engagement that may not be required for other types of infrastructure. Bringing the right people together at the outset helps to build a shared understanding, discover critical issues and provide a platform for innovation.

In this context, a stakeholder is an individual/ group who directly influences the opportunity, either as a direct participant, decision-maker or advocate. It is crucial to discover who they are and how they could be engaged effectively, particularly beyond the 'usual suspects,. It is vital to provide enough information about the concept of GBI to get them interested and encourage them to be part of the discussion.

## *Checklist:*

- ☐ Who are the stakeholders (internally within Council)?
- ☐ What are each stakeholder's role and connection to the infrastructure in question?
- ☐ What is their level of interest in the project (expectations for involvement)?
- ☐ What is their level of influence on the project (the value they can add)?
- ☐ How could they best be engaged?

# Corporate Planning

**Building a consensus of internal support and securing high-level leadership is essential to any significant organisational behavioural or cultural change. Adopting green-blue infrastructure for a Council requires some level of buy-in and support from those responsible for corporate planning and strategic direction setting.**

In practice, this is likely to require a concerted effort to inform senior management and councillors of the value proposition of GBI, how it aligns with the organisation's strategic drivers and potential opportunities. Corporate and Council Planning processes provide an ideal opportunity to introduce GBI to a strategic discussion and inform future directions.

Ideally, a person or group with appropriate accountabilities would take responsibility and become a champion for GBI within the organisation, noting, of course, the power of a collective team approach rather than reliance on one individual.

## *Checklist:*

- ☐ What are the critical drivers for GBI in the Council?
- ☐ What is the organisation's commitment to GBI?
- ☐ How does GBI align with the organisation's strategic directions and services?
- ☐ What is the current status of GBI adoption?
- ☐ Who could help be a champion for GBI?

# Community-based Planning

**GBI solutions are not an end in themselves. Instead, they offer possible options to address an infrastructure need that affects the broader aspirational goals of the community living in that town. This more general challenge and the community's aspirations should be the starting point for understanding how a GBI approach could add value.**

Long term infrastructure needs for small towns are sometimes identified through strategic planning processes, such as master planning or community place-based planning. These processes present an ideal opportunity to consider the potential for better outcomes through GBI solutions.

Community or place-based planning is where Councils and communities work together to understand local needs and develop agreed strategies to guide community development towards meeting those needs and achieving broader community aspirations. This type of planning often focuses on the form and feel of a place and the physical and social assets inherent to those places. It aims to harness those unique features as the basis for enhancing the sustainability and resilience of communities.

Community-based planning typically occurs where there is expected to be a significant community interest in a specific change likely to occur within that community. This could be a change in the level of Council service or services, or significant infrastructure changes, including green-blue infrastructure, particularly where the community have substantial interest and influence in the process and desired outcomes.

Councils play a leading role in community-based and strategic master planning in small towns and can use these processes to provide a context for the value proposition of GBI approaches. A fundamental principle to apply at this stage is 'multifunctional', avoiding articulating infrastructure needs in a way that leads only to single-purpose assets that do not meet the needs of 'modern use'.

## *Checklist:*

- ☐ What are the broader community aspirations and goals for this town?
- ☐ What are the strategic challenges that affect these directions?
- ☐ What role could GBI play in helping to address these challenges?
- ☐ What additional benefits could GBI approaches offer concerning the broader vision?
- ☐ What additional context matters that could affect the application of GBI (e.g. funding, community support

# Statutory Planning

**Local government is responsible for statutory planning covering streetscapes, major drainage, stormwater and public open space for new developments in small towns. This includes supporting the application of GBI approaches that enhance the amenity and functionality of these developments. With infill and greenfield development beginning to occur in some small towns, there are opportunities for Councils to be more proactively ensuring that GBI is fundamental to retaining a towns amenity and character.**

The Victorian Planning Scheme provides significant guidance on what aspects of GBI should be considered in planning applications (especially Clause 56). Still, there are no minimum requirements or standards for the sub-clauses that refer to cooler, greener streetscapes.

Other barriers relate to a perceived loss of revenue from a loss of 'developable land' to wider streetscapes or more costly GBI solutions, or the inability to apportion shared benefits and shared responsibility for the asset's life. Consequently, it can be challenging for smaller Councils to achieve reasonable GBI solutions beyond the minimum.

New developments are complex to plan, design, and build, so Councils should consider bringing developers on a journey of discovery of fit-for-purpose solutions rather than seek to apply regulatory requirements rigorously.

Therefore, it is essential for the key players in Council to be clear on their preferences for streetscapes and then convey this clearly to developers. Ideally, this clear advice could be articulated to developers as early as possible in the planning process, at conceptual or pre-master planning stages. This could be facilitated through pre-development applications and a more formalised discovery process of differing views and potential tradeoffs.

## *Checklist:*

- ☐ Prepare a GBI fact sheet for developers explaining the broader community aspirations of the Shire and the role of GBI in new developments
- ☐ A simple guideline outlining Council's expectations concerning GBI solutions
- ☐ Establish regular dialogue with key users of the planning scheme and inform them of Councils requirements to consider GBI
- ☐ Develop a generic streetscape typology that includes GBI and can be included as a reference document

# Infrastructure Planning

**Many infrastructure-related decisions in small towns are unlikely to arise from the strategic planning processes mentioned above.**

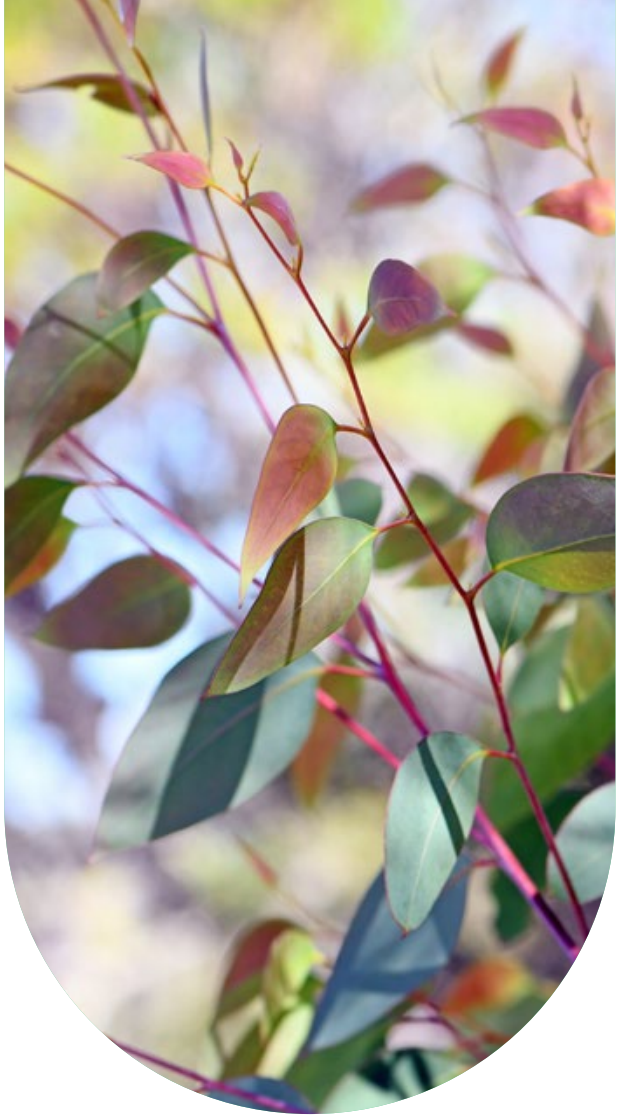
Most are likely to emerge from a rolling annual Capital Works/Infrastructure Planning process.

Regardless of the category or type of asset, all infrastructure needs must be identified, justified and planned. Therefore, the infrastructure planning process is a critical node of opportunity to consider GBI principles.

Whereas Corporate, Community and Statutory Planning may highlight potential opportunities for GBI, the Capital Works Planning Process provides a much more detailed process to identify specific GBI solutions. A good option is to review the proposals in the capital works plan and do a 'first cut' of potential specific GBI opportunities.

### *Checklist:*

- ☐ What is the infrastructure needed for each proposal?
- ☐ What is the broader community goal to which it relates?
- ☐ Do the site characteristics suit a GBI solution (e.g. underutilised space, natural sunlight, access to water, soil medium etc.)?
- ☐ Is there a potential for a GBI option to add benefits or reduce the costs?



# Infrastructure Design and Procurement

While the planning and business case phases are critical for GBI, key decisions can still be made during the design phase of many infrastructure projects. Most GBI option designs are bespoke – they must be designed for a site to suit the site context and meet the desired requirements for function and form.

It might be that you still have more than one potential GBI option which has merit, and more information is required through functional or detailed design to understand the costs and benefits of those viable options. The design stage provides the chance to consider the details for the asset better and apply the principles in a technical context.

### *Checklist:*

- ☐ What is the level of knowledge of GBI by infrastructure planners and designers?
- ☐ Is there a formal design review process to ensure GBI consideration?
- ☐ Are there standards for GBI available to help contractors in tender specifications?
- ☐ Is there a GBI guide or checklist for designers and constructors?
- ☐ Have designers and contractors been briefed on Council's GBI goals?
- ☐ Are there rewards for GBI adoption by contractors?

# Infrastructure Operations and Maintenance

The operation and maintenance of infrastructure assets provide various opportunities to consider GBI principles. Regular monitoring of asset conditions may highlight deterioration, and remedial works could consider minor modifications incorporating GBI features. A crucial part of achieving such enhancements is to match the functional need with the community need. For example, a crumbling road edge could be improved with a flat concrete protective strip rather than a kerb and channel, allowing water to irrigate adjoining trees passively.

## *Checklist:*

- ☐ What is the level of knowledge of GBI by infrastructure planners and designers?
- ☐ Is there a formal design review process to ensure GBI consideration?
- ☐ Are there standards for GBI available to help contractors in tender specifications?
- ☐ Is there a GBI guide or checklist for designers and constructors?
- ☐ Have designers and contractors been briefed on Council's GBI goals?
- ☐ Are there rewards for GBI adoption by contractors?

# Case Studies

**The following sections provide a high-level overview of a simple method following these steps that can help plan and develop a particular GBI opportunity.**

# Method for developing GBI opportunities

The process for developing GBI opportunities should be relatively straightforward and involves:

- Identifying priority opportunities that warrant a GBI approach
- Develop all the options
- Screen the options
- Develop the business case

# Identify priority GBI opportunities

Various Council processes may identify potential GBI opportunities. Practical constraints such as time, capability and resources typically force the need for some form of priority setting.

This helps people focus on the main areas where such opportunities could make a significant difference if implemented. Priorities may change over time but should consider importance, urgency, value for money and ease of implementation.

### *Checklist*

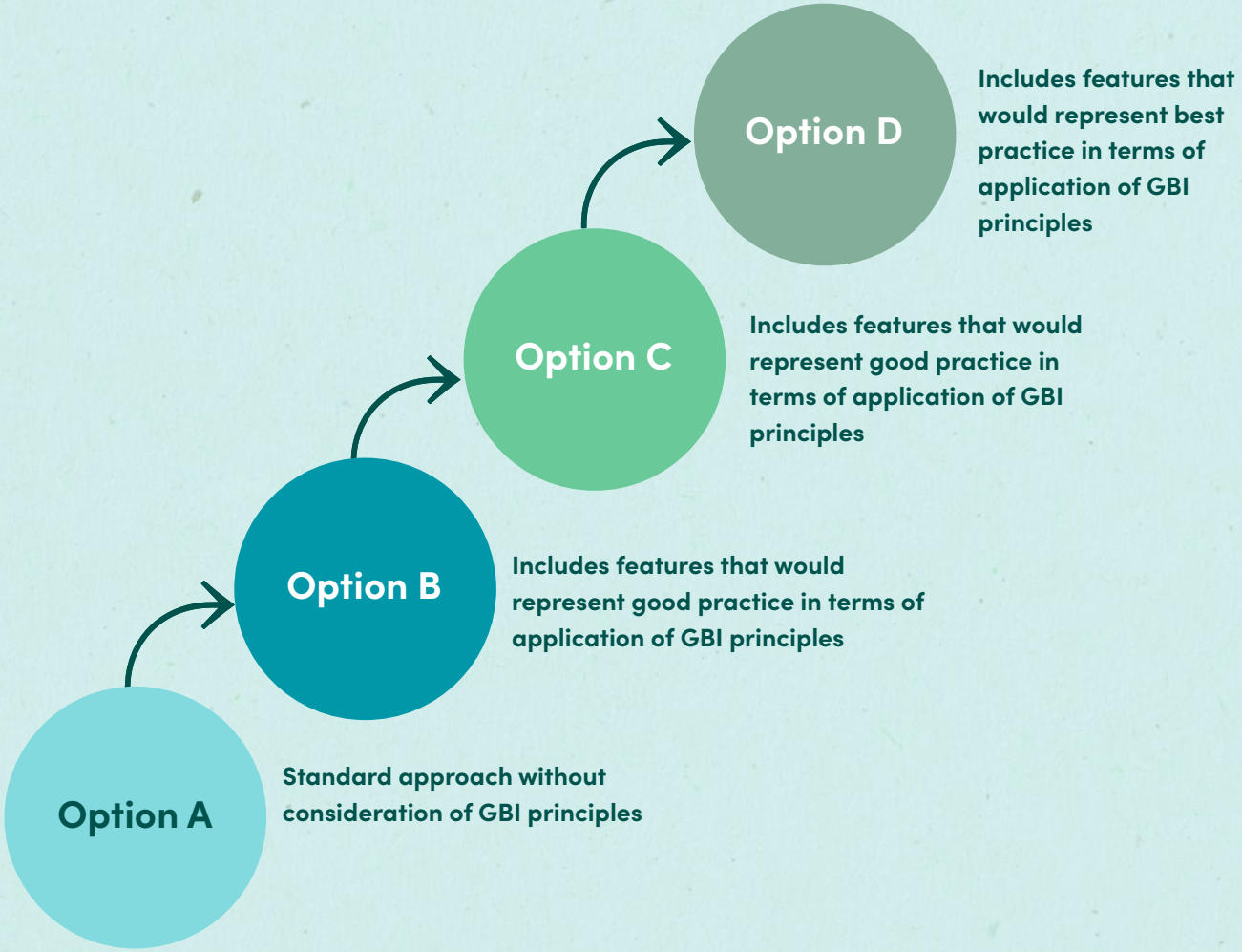
- ☐ What is the likely extent of the impact of the opportunity (social, environmental, economic outcomes)?
- ☐ What is the urgency given internal or external drivers (e.g. level of community support, funding, timing relative to other projects, such as upgrades/renewals etc.)?
- ☐ What is the value for money (cost relative to benefits over the life of the infrastructure)?
- ☐ What is the ease of implementation (based on resources, complexity, scale, capability)?

# Develop the options

## Having identified a specific GBI opportunity, it is vital to define the problem and specify the GBI principles to consider before identifying options.

These principles will be important to how the options are framed. For any opportunity, the application of GBI principles and techniques could vary on a spectrum from nil to best practice or best possible in terms of likely capacity to achieve the desired principle.

Four is a helpful number of alternatives for this step. These can be labelled simply Option A, B, C and D. Because the spectrum of adoption of GBI principles moves from left to right, Option A is always considered least in terms of GBI considerations. In contrast, Option D reflects 'best practice' in terms of achieving the stated objective.



## GBI Options spectrum

Given that this step occurs within the planning stage of the infrastructure life cycle, highlight what GBI features could be considered rather than how such features might be implemented in practice.

The spectrum of options can be then be tested and discussed to determine the degree to which the Council is willing to apply GBI in practice. This process is helpful as it provides enough options to push the boundaries, but not too many that it becomes confusing.

Each option can be framed using the apprpriate GBI principles and considering the application of each one relevant to the proposal. Some of the lesser options will have nil effort for each applicable principle, whilst the C and D options are more comprehensive.

The user can use these tactical options to develop site-specific alternatives and discuss the advantages and disadvantages. The critical thing is to consider all the possible options on the table, including those that do not attempt to incorporate GBI and those that do everything possible concerning GBI features.

Somewhere along this spectrum will be a 'sweet spot', where the functional requirements are met, and the GBI features are likely to add the most value relative to the cost. You should also clearly define the business-as-usual case and assumptions.

### *Checklist*

- ☐ What is the specific problem the GBI intervention could help address?
- ☐ What principles of GBI are relevant to this opportunity?
- ☐ What would in the standard approach, without consideration of GBI principles?
- ☐ What would be in an option that featured some application of GBI principles?
- ☐ What would be in an option that featured a significant application of GBI principles?
- ☐ What would be in an option that featured the best practice application of GBI principles?

## Screen the options

Once the options have been developed and arranged on the spectrum, it is necessary to screen out those which stakeholders believe are likely to be unacceptable for whatever reason.

The discussion should focus on any obvious 'dealbreakers, which might prevent an option from being implemented. A dealbreaker could be one of the STEEP criteria: social, technical, environmental, economic, and political.

This process will help narrow down the scope of discussion to one or two options that can be developed further and compared, providing a firm basis for the concept design and business case stages.

### Dealbreaker criteria for screening GBI options

- ☐ Social – is the option likely to be acceptable to the community at large
- ☐ Technical – is the option likely to be technically feasible given current and expected resources and technologies
- ☐ Environmental – Is the option likely to be acceptable in terms of environmental impacts
- ☐ Economic – is the option likely to be acceptable in terms of capital and operating costs
- ☐ Political – is the option likely to be acceptable based on policy, strategy and regulation.

## Develop the business case

### Most Councils require business cases and high-level concept plans to justify investment in new and upgraded infrastructure assets.

This is one of the most critical stages where GBI considerations can influence the process and significantly impact broader community outcomes.

All the options should be on the table, especially those incorporating GBI and offering additional benefits over the long term. The assessment of strategic options should consider how each alternative addresses the infrastructure need, how each impact the achievement of the community's strategic goals, and the value proposition of the option over its life cycle.

Of course, each option needs to deliver the functional requirements of the infrastructure required as a basis for being assessed. Still, a basic premise should be that all other things being equal, a solution that incorporates green and blue features is preferable.

The three general principles for GBI are necessary checks during this business case development, namely responsive and integrated design, increased multifunctionality and the application of holistic systems thinking across the whole asset life cycle. For a business case, the costs and benefits of the options should be estimated and assessed, including non-financial benefits such as those mentioned in this guide.

### *Checklist*

- ☐ What is the value proposition of a GBI approach?
- ☐ How does it align with the Council's vision and goals?
- ☐ What does the GBI option involve?
- ☐ What were other options (including conventional) considered?
- ☐ What are all the quantifiable costs and benefits (e.g. shading, water quality, irrigation, wider project benefits)
- ☐ What are the non-quantifiable costs and benefits (e.g. amenity, reputation, kerbside appeal)?
- ☐ What are the risks of a GBI approach (compared to other options)?
- ☐ How results will be monitored
- ☐ Who might be a co-investment partner?

# Case study 1 - Haddon Community Learning Centre

## The problem

Haddon is a small town of approximately 1000 people in the Golden Plains Shire. The Haddon Community Learning Centre offers a range of education and training programs to the local community. After several years of neglect, the outdoor areas of the Community Centre were in need of some TLC - obscured by overgrown vegetation, weeds and rubbish and with a decrepit, unused outdoor table and chairs.

## The Opportunity

Via a direct approach, Council environment staff saw an opportunity to work with the Community Centre Manager about the problem and discuss options to improve the amenity of the space.

## GBI Principles

The GBI principles that were considered relevant to the opportunity included:

- Increase multifunctionality
- Protect, enhance and restore natural green features
- Increase stormwater detention, retention and reuse

## Options

| GBI principle | Option A | Option B | Option C |
|---|---|---|---|
| **Increase multi-functionality** | No change, retain existing table and chairs | Replace table and chairs | • Replace table and chairs<br>• Develop Landscape Plan for entire site<br>• Add raised beds for a community garden |
| **Protect, enhance and restore natural green features** | No change, leave vegetation as is | • Removal of some older vegetation and weeds<br>• Replant with local indigenous species | • Removal of some older vegetation and weeds<br>• Replant with local indigenous species |
| **Increase stormwater detention, retention and reuse** | No change; rely on potable water for outdoor use | • Increase water retention through onsite mulching | • Onsite mulching<br>• Install water tanks to reduce reliance on potable water use |

Case Study Haddon_Before

Case Study Haddon_After

## GBI Solution

Option B was selected as the preferred GBI option, based on various factors, including:

- It represented a significant improvement on what was there
- It could be easily maintained by Council
- It could be afforded at the time
- It provided a basis for improvements over time

## Lessons

- The lessons from this case study for implementing GBI projects include:
- It started with a conversation, so take the first step and talk to your colleagues
- Put all the options on the table, there will always be more options than you think, giving more room for negotiation
- GBI works – it helps improve the attractiveness and patronage of community facilities
- Get some runs on the board – start small and stimulate interest to become catalysts for other opportunities

# Case study 2 - Beaufort Linear Green Link

## The problem

Beaufort is a small town of approximately 13,000 people in Pyrenees Shire. Garibaldi Creek is a key waterway corridor within the township that is currently undervalued and provides limited amenity value for the local community and visitors.

The existing waterway corridor is a critical link for a number of key destination nodes including Beaufort Lake, the school precinct, sports precinct, RV park, public pools, skate park and the future town entry.

Council has invested in some key community assets within the corridor, however the it lacks an overall strategic masterplan that recognises a vision for the space, priority projects and a long-term implementation plan.

## The Opportunity

Through the Green Blue Infrastructure Guide development phase, the Beaufort Linear project was developed through a workshop design approach involving key internal stakeholders within Pyrenees Shire.

The project was presented at a Council meeting late in 2021 at which point Councillors endorsed an initial investment into the masterplanning phase of the project.

## GBI Principles

The GBI principles that were considered relevant to the opportunity included:

- Responsive & integrated design
- Increase multi-functionality
- Apply holistic, systems thinking
- Protect, enhance & restore natural green features
- Increase green-blue connectivity
- Increase stormwater detention, retention and reuse

# Options

| GBI principle | Option A | Option B | Option C |
|---|---|---|---|
| **Responsive & integrated design** | No change to existing corridor, implement projects adhoc without consideration of a broader vision for the space | Only invest in priority projects within the corridor focussed on waterway rehabilitation and pedestrian connectivity | Develop a staged approach to the corridor redevelopment that include design skills from Planners, Urban Designers, Landscape Architects and Civil Engineers with a view to include key assets to improve social and environmental values |
| **Increase multi-functionality** | Include no additional community assets within the waterway corridor | Locate community assets at key locations within the waterway corridor | Consider a holistic approach to pedestrian connectivity within the waterway that is linked with the strategic placement of community assets |
| **Apply holistic, systems thinking** | No long-term planning for the corridor | Focussing purely on the environmental improvements within the waterway | Create a masterplan that plans future works in the corridor to maximise community and environmental values as well as how the corridor adds to the attraction proposition of the town |
| **Protect, enhance and restore natural green features** | No additional vegetation planted in the waterway and broader corridor | Focussed revegetation of the waterway, to limit the progressive degradation of the waterway | A revegetation program for the entire waterway corridor that improves the long-term environmental value of the waterway and surrounding green space |
| **Increase green-blue connectivity** | No consideration for pedestrian connectivity of increased vegetation within the waterway corridor | Limited connectivity considered between key destination nodes and increased vegetation density in limited locations within the corridor | Creation of pedestrian walkways along the waterway corridor using paths, waterway crossings and boardwalks. Works will also include densification of planting within the waterway and broader corridor |
| **Increase stormwater detention, retention and reuse** | Stormwater management not considered in the long-term improvements of the waterway | The inclusion of strategically located wetlands within the corridor to improve stormwater quality within the waterway | Multiple wetlands located within the corridor to improve stormwater quality within the waterway. The wetlands are also used as a source of alternative water to maximise urban greening |

**Beaufort Green Links Concept_Before**

**Beaufort Green Links Concept_After**

## GBI Solution

Option B was selected as the preferred GBI option, based on various factors, including:

- It represented a significant improvement on what was there
- It could be easily maintained by Council
- It could be afforded at the time
- It provided a basis for improvements over time

## Lessons

- The lessons from this case study for implementing GBI projects include:
- It started with a conversation, so take the first step and talk to your colleagues
- Put all the options on the table, there will always be more options than you think, giving more room for negotiation
- GBI works – it helps improve the attractiveness and patronage of community facilities
- Get some runs on the board – start small and stimulate interest to become catalysts for other opportunities

# Resources

## Green-Blue Infrastructure

Infrastructure Design Manual.
https://www.designmanual.com.au/

Planning a Green-Blue City.
https://www.water.vic.gov.au/__data/assets/pdf_file/0029/89606/Green-blue-Infrastructure-Guidelines-Feb17.pdf

## Green Infrastructure

Building with Nature.
https://gbca-web.s3.amazonaws.com/media/documents/gs-future-focus-building-with-nature-fa-web_emZlpIB.pdf

Healthy Active by Design Public Open Space Checklists.
https://www.healthyactivebydesign.com.au/resources/healthy-active-by-design-master-checklists

How to grow an urban forest.
https://www.greenerspacesbetterplaces.com.au/guides/

Urban Design Guidelines for Victoria.
https://www.planning.vic.gov.au/policy-and-strategy/urban-design/urban-design-guidelines

## Blue Infrastructure

Central Highlands IWM Forum Strategic Direction Statement.
https://www.water.vic.gov.au/liveable/integrated-water-management-program/forums

Frankston WSUD guidelines.
https://www.frankston.vic.gov.au/files/assets/public/environment-and-waste/environment/water/pdfs/frankston_wsud_guidelines.pdf

Integrated Water Management (IWM) framework for Victoria.
https://www.water.vic.gov.au/liveable/integrated-water-management-program/integrated-water-management-framework-for-victoria

Optimising Open Space Management Best Practice Guidelines.
https://waterportal.com.au/swf/projects/item/178-optimising-open-space-management-best-practice-guidelines



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