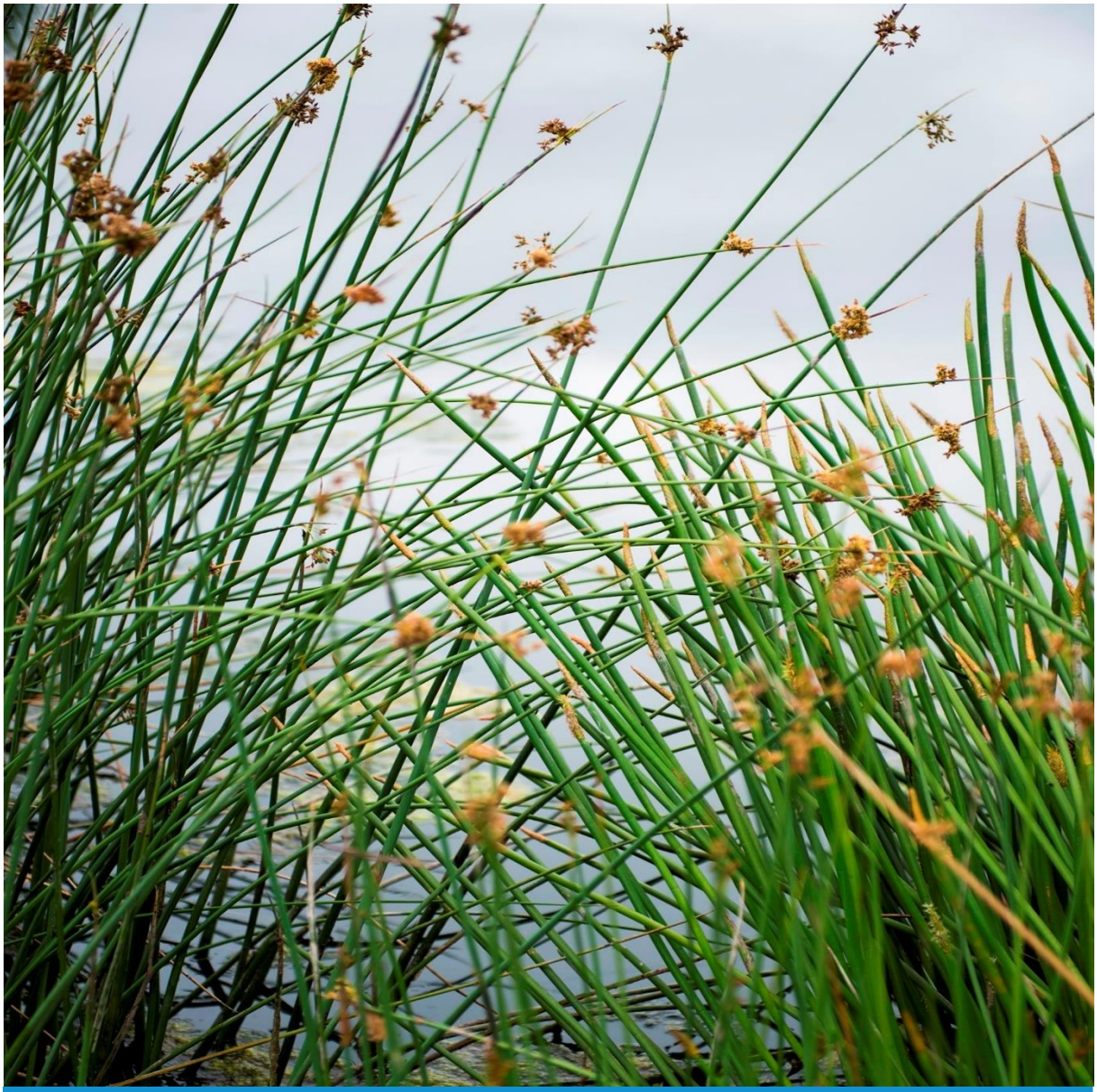

PART A:
VISION, OUTCOMES AND CRITERIA

A1. DESIGN CONTEXT

Constructed waterways should be designed to respond to the opportunities, and constraints at a particular site, which are influenced by the site characteristics (e.g. its topography, existing vegetation, geomorphic character and soils) and the requirements of the urban development. The final form of a waterway will be strongly influenced by the vision and desired outcomes for the waterway.

To assist the designer, a glossary of relevant best practice constructed waterway design terms used in this manual are clearly defined in Table 1.

TERM	DEFINITION	WHO SPECIFIES	EXAMPLE
Desired outcome	The end result that is achieved by preparing a design that meets all design criteria and objectives. Meets Deemed to Comply.	MWC	Neighbouring development and associated built assets are protected from flooding and erosion.
Design objective	A clear requirement of the design that needs to be achieved in order to deliver on the desired outcome that it influences. • Design objectives are descriptive and provide qualitative information regarding the requirement.	MWC	Constructed waterways must contain and safely convey the design flood event.
Design criteria	An explicit technical standard or collection of standards that must be achieved by the design in order to demonstrate that the corresponding design objective can be met. • Design criteria are quantifiable and measurable and provide specific information regarding the requirement.	MWC	The constructed waterway must be designed to: • have a capacity that conveys the 1% AEP flood event. • meet MWC Floodway Safety Criteria in the 1% AEP flood event; and • not cause erosion that threatens built assets adjacent to the waterway in a 1% AEP flood event or otherwise erode the batters or bed of channel in either minor or major events.

Table 1 – Terminology used in the manual and their definition and application.

A2. Vision

A2.1 Healthy Waterway Strategy Vision

The Healthy Waterways Strategy (Melbourne Water 2018) is the guiding resource for waterways, estuaries, and wetlands across the Port Phillip and Westernport region. The Healthy Waterways Strategy is driven by a single regional 50-year vision:

> "Healthy and valued waterways are integrated with the broader landscape, and enhance life and liveability. Waterways connect diverse and thriving communities of plants and animals; provide amenity to urban and rural areas, and engage communities with their environment; and are managed sustainably to enhance environmental, economic, social and cultural values."

Constructed waterways in greenfield urban developments are, by definition, artificial. However, if well designed, constructed, and maintained they will ultimately provide many of the functions set out in the Healthy Waterways Strategy vision. Ensuring that waterways provide for these functions at the level expected by Melbourne Water is a principal driver for applying the *Constructed Waterway Design Manual* to all future constructed waterway designs.

A2.2 Project (Site or Place) Vision

To assist with the design process landscape architects will prepare a Vision that responds to the unique characteristics of a site, the local community who will be living there, and the aspirations held by Melbourne Water and other Agencies for the waterway. Constructed waterways must be integrated into the broader urban landscape and not treated as stand-alone assets.

The vision will demonstrate what the future waterway will look like and the types of experiences visitors could expect to have while visiting it. The design objectives for constructed waterways (Section A3) will accompany the vision. They will articulate the features of the Project Vision that will be delivered as a part of the new waterway. Table 2 outlines the 5 themes that must be explored through the design objectives to accompany the Project Vision.

A3. DESIGN OUTCOMES AND OBJECTIVES

The vision set out in the Healthy Waterways Strategy applies to all waterways in the Port Phillip and Westernport region. To guide the design of constructed waterways in particular, the characteristics of a best practice constructed waterway have been defined as:

Safe and Enjoyable Places

- Provide a safe environment for the community to enjoy the amenity and recreational opportunities provided by the waterway and its corridor
- Provide an appropriate level of flood and erosion protection to public and private assets in the vicinity of the waterway corridor, as well as erosion protection of the waterway itself
- Safely convey stormwater and floodwaters from and through urban developments
- Provide a safe environment for the cost effective, long-term operation and maintenance of the waterway.

Well-designed waterways are attractive places for the community to spend time, connect with nature and interact with other people. They also provide important active transport links between different places in urban areas. It is important that aquatic safety risks are managed appropriately, and that the safety of people around waterways, especially when in flood, is a central focus of any design.

Healthy, resilient and connected waterway environments

- Provide resilient habitat for native flora and fauna within the waterway and its corridor to encourage the presence of native flora and fauna.
- Utilise linear linkages to connect communities and ecosystems through urban areas and, lateral linkages between the waterway channel and the surrounding riparian zones and floodplains.

Places for communities to connect

- Provide opportunities for social gatherings and connections along waterways where suitable
- Provide for a range of experiences along waterways including contemplation, engagement with others and more active uses.
- Design for multiple users who can passively recreate along the waterway or utilise active transport links simultaneously and safely
- Provide connections to nature to deepen user awareness and appreciation of nature without compromising flora and fauna health.

Design objectives for constructed waterways articulate how the desired outcomes should be achieved. These design objectives are summarized in Table 2 according to the outcomes they address and the drivers behind them.

Table 2 – Design objectives for constructed waterways

DESIRED OUTCOMES (WHAT)	DESIGN OBJECTIVES (HOW)	PRINCIPAL DRIVERS (WHY)
Asset protection	• Flood capacity and conveyance • Drainage outfall • Channel stability	• Community health and safety • Risk mitigation • Financial sustainability
Amenity	• Aesthetics • Accessibility	• Community wellbeing • Community safety
Flora and fauna	• Habitat • Connectivity • Diverse vegetation	• Community expectation • Ecosystem function • Biodiversity
Asset Management	• Maintenance • Renewal • Efficient investment	• Legislative requirements • Risk mitigation • Financial sustainability
Community connection	• Sociable settings • Equitable Access	• Mental health and wellbeing • Increase Social Capital

A3.1 Asset protection

Asset protection reduces the risks posed by flooding and erosion in a waterway. This includes risks to the health and safety of the community, the costs imposed on communities, and the risk of damage to public and private assets.

Waterways must meet the following objectives to achieve the asset protection outcome:

Flood conveyance and capacity

- Safely convey large flood events within the waterway corridor. Flood events up to the 1% AEP flow (plus 300mm freeboard) must be accommodated in the waterway corridor in a way that protects public safety.
- Provide an appropriate level of flood protection to existing public and private assets in the waterway corridor. A variety of public and private assets are often present in waterway corridors in new urban developments. The constructed waterway design must ensure these assets are not adversely affected by flooding. Future assets must be designed such that they do not compromise the flood conveyance and capacity of the waterway.

Drainage Outfall

- Provide for free draining outfall of stormwater drainage from the surrounding development. Stormwater drainage systems from adjacent urban development require an outfall to allow stormwater to drain effectively to the waterway and protect the development from minor flooding.
- Integrate drainage outfalls/stormwater connections into the waterway corridor. Stormwater connection points should visually blend into the waterway and avoid negatively affecting the stability, ecology or amenity value of the waterway.

Channel Stability

- Provide an appropriate level of erosion protection to public and private assets in the vicinity of the waterway corridor. Although erosion is a natural process, constructed waterways must be designed with a more limited amount of channel adjustment to provide a high level of protection to public and private assets.
- Use native vegetation as the primary channel boundary material, in preference over rock or other hard engineered materials where modelling shows it will work. Native vegetation supports multiple social and ecological values in waterways and should be used throughout the waterway unless rock armouring is required to meet the design criteria.

A3.2 Amenity

Waterways provide significant amenity value to the community and contribute to the liveability of new urban developments. The amenity value of a waterway to a community largely depends on its aesthetic appeal and accessibility to the community. Research shows that a waterway with a naturalistic, variable form (e.g. varying channel bank slopes, bends, pools and benches) and abundant, healthy and diverse vegetation is valued more by the community than one with an engineered appearance (e.g. a straight channel, or a rock lined or concrete channel). Water quality (including litter) is also an important factor in the amenity value of waterways. Waterways must meet the following objectives to achieve the amenity outcome:

Aesthetics

- Have a naturalistic and variable form. Mimic natural waterway form and provide a range of physical features, which may include a meandering low flow channel, varying bank slopes, pools, riffles and benches. These features are also important habitats for native animals.
- Have abundant and diverse native vegetation. Native vegetation is a key element in achieving both the aesthetics and habitat design objectives. Tree canopy cover can also contribute to a greener, cooler environment.

Accessibility

- Provide a safe and accessible environment for the community to interact with. Safety is a key aspect of waterway design, particularly with respect to landscape features and recreational infrastructure.
- Provide an appropriate level of direct and indirect access to and along the waterway. Many people wish to 'get close' to waterways. They seek out a direct physical and/or indirect visual (line of sight) connection with water. Melbourne Water's shared pathway guidelines provide direction for formal routes along waterways, but the design should consider managing informal access points where people can get close to the waterway.

Pedestrian Connectivity

- Provide an appropriate level of connectivity within and beyond the waterway to the adjoining urban fabric. Pedestrian connectivity relates to the ability of community members being able to move between the waterway to adjoining pedestrian networks, landmarks, activity nodes etc. Barriers to connectivity or poorly designed connections that do integrate with the urban fabric will detract from the amenity of the waterway and possibly its use. Connections between the waterway and adjoining urban landscape must be legible and work to accentuate the values of the waterway.

A3.3 Community Connection

Waterways must meet the following objectives to achieve a community connection outcome:

Sociable Settings

- Provide places that attract a variety of users and support community connection. Safe and attractive places are often highly visible and activated by different user groups engaged in a range of passive and active uses. Flexible spaces can be used in a variety of ways by different users i.e. local community groups, families, individuals etc.
- Provide a variety of well-designed spaces for different user groups to experience the waterway.
- Provide seating that is visible and provides different views and experiences of the waterway

Equitable Access

- Provide public space to local communities who have radically different and changing mobility needs. Waterway corridors provide for those who may have difficulty with mobility such as the elderly and people with disabilities. Waterway corridors provides equitable access for all users.

A3.4 Native flora and fauna

Research shows that the community values the presence of native fauna including: birds, fish, and frogs and other species along urban waterways. The provision and connection of diverse and thriving communities of plants and animals is a central element of the overarching Healthy Waterways Strategy vision. Waterways therefore need to provide appropriate habitat for urban tolerant fauna. In terms of physical form, habitat type diversity is critical to ecosystem health. There are some specific features that may be required in some locations to support threatened species such as ponds for Growling Grass Frogs (DELWP,2017).

Vegetation is also important from a biodiversity and amenity perspective. The diversity of instream and riparian vegetation depends on the shape of the waterway and the wetting and drying regime at different locations in the waterway. Provision of pools, riffles, runs, benches, and other physical features will provide the physical 'template' for a healthy and diverse native vegetation community, that in turn will support a diverse native fauna. The connectivity between habitat features is critical to ensuring native animals can move around the waterway and access different habitats at different times. Waterways must meet the following objectives to achieve a flora and fauna outcome:

Habitat

- Provide for the establishment of abundant and diverse native vegetation species within the waterway. The successful establishment of native vegetation communities in waterways depends on a variety of factors, including the physical form of the constructed channel, the preparation of topsoil, and selection and location of the right species for different locations in the channel.

- Provide suitable physical habitat. An appropriate range of physical habitats for native fauna should be provided, which may include pools, riffles, benches or large wood. Where possible, the amount and diversity of habitat should be maximised.

Habitat and vegetation connectivity

- Provide an appropriate level of connectivity within and beyond the waterway being designed. Connectivity relates to the ability of animals to move from the waterway to the riparian zone, and longitudinally along the waterway. Barriers to connectivity include poorly designed culverts and overly steep rock chutes that fish cannot traverse and breaks in riparian vegetation. Barriers to habitat connectivity should be excluded from the waterway design.
- Constructed waterways should provide passage for transient species to move into and through the constructed waterway where species are known to be present upstream and/or downstream. Waterways are often located upstream, downstream or between reaches of an existing waterway. These waterways may be used as habitat corridors to support populations of native animals. In these instances, the waterway design should ensure the constructed waterway functions as a corridor to facilitate the passage of native animals.
- Provide vegetation connectivity for vegetation. Vegetation connectivity relates to continuous patches of vegetation, which can enhance resilience to weed invasion and other disturbances and enhances the ability to manage the vegetation.

A3.5 Asset Management

Asset management refers to the operation and maintenance of natural and built assets, including waterways. The elements of efficient and effective asset management include:

- Adopting a "whole-of-life" system approach to the planning, design, construction, operation and maintenance of our assets
- Embracing opportunities for innovation in optimising the levels of service provided by our assets to meet Melbourne Water's needs
- Undertaking performance and condition monitoring, and data capture and reporting via knowledge management systems, to continuously improve our asset management approach

To achieve efficient and effective asset management, waterways must meet the following design objectives:

Operation and maintenance

- Ensure sufficient access and space for all required maintenance activities. Appropriate forms of access to the waterway must be provided, as well as room for maintenance vehicles and machinery to maneuver along the waterway outside of the core riparian zone.
- Provide safe environments for Melbourne Water officers and contractors to access and maintain. Maintenance requirements must be incorporated at the design stage to ensure Melbourne Water staff can maintain waterways in a safe and efficient manner.

Renewal

- Meet the expected asset life of 100 years. Constructed waterways have an expected design life of 100 years and should be designed to ensure that they can function without intensive maintenance during this time. Components of the waterway will have shorter design lives.

Efficient investment

- Constructed waterways must be cost effective to design and construct and be cost-effective to operate and maintain

A3.6 Design criteria

Table 3 presents an overview of the design criteria that need to be met in order to achieve the design objectives. Clear links between the design criteria and objectives are illustrated, assisting the designer to check that their design is meeting Melbourne Water's Deemed to Comply requirements. These design criteria are detailed in the relevant sections of **Part D** as part of the technical design elements.

Table 3 – Relationship between the design criteria and design objectives

DESIRED OUTCOMES	DESIGN OBJECTIVES	DESIGN CRITERIA CATEGORIES
Asset protection	Flood capacity and conveyance	• High flow and low flow channel capacity • Freeboard to lots and other infrastructure • Floodway Safety
	Drainage outfall	• Outfall capacity, depth, velocity and angle • Outfall physical interface with waterway
	Channel stability	• Shear stress on/resistance of channel boundary • Hydraulic roughness along and across waterway • Waterway geometry • Engineered stabilisation structures
Amenity	Aesthetics	• Physical form of the waterway and its features • Vegetation in the core riparian zone and buffer • Water quality in the waterway
	Accessibility	• Direct (physical) access to and along the waterway corridor • Indirect (visual) access to and along the waterway corridor
Flora and fauna	Habitat	• Physical form of the waterway and its features • Vegetation in the core riparian zone and buffer
	Connectivity	• Laterally through the core riparian zone • Longitudinally up and down the waterway
Asset Management	Maintenance	• Features supporting efficient maintenance • Safe maintenance access to all functioning features • Safe assets & safe people
	Renewal	• Design life of the waterway (25 years)
	Efficient investment	• Cost-effectiveness of maintenance
Community connection	Sociable settings Equitable Access	• Integration and connections to surrounding area/urban fabric • Safe passage of all user groups, their mobility and speed they travel. • Pedestrian infrastructure to support active and passive uses of the waterway • Encourage people to congregate and / or linger along the waterway • Provide clear view lines to and from areas where people congregate or recreate