JOSH BYRNE & ASSOCIATES

LIVING STREAMS CONCEPT DRAWINGS FOR THE LOWER VASSE RIVER

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Document Status

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12 November 2020	-	Review	JLS	PV	PV
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20 June 2021	C	Information	JLS	PV	PV

STAGING

STAGE 1 SEDIMENT REMOVAL

Options that comprise dredging within the Lower Vasse River. Stage 1 options include:

- Dredge lower reach
- Dredge whole study reach

STAGE 2 CONSTRUCTED WETLAND

Stage 2A - Light Industrial Area (LIA) bushland site (treats lower reach)

Stage 2B - Molloy Street site (treats upper reach).

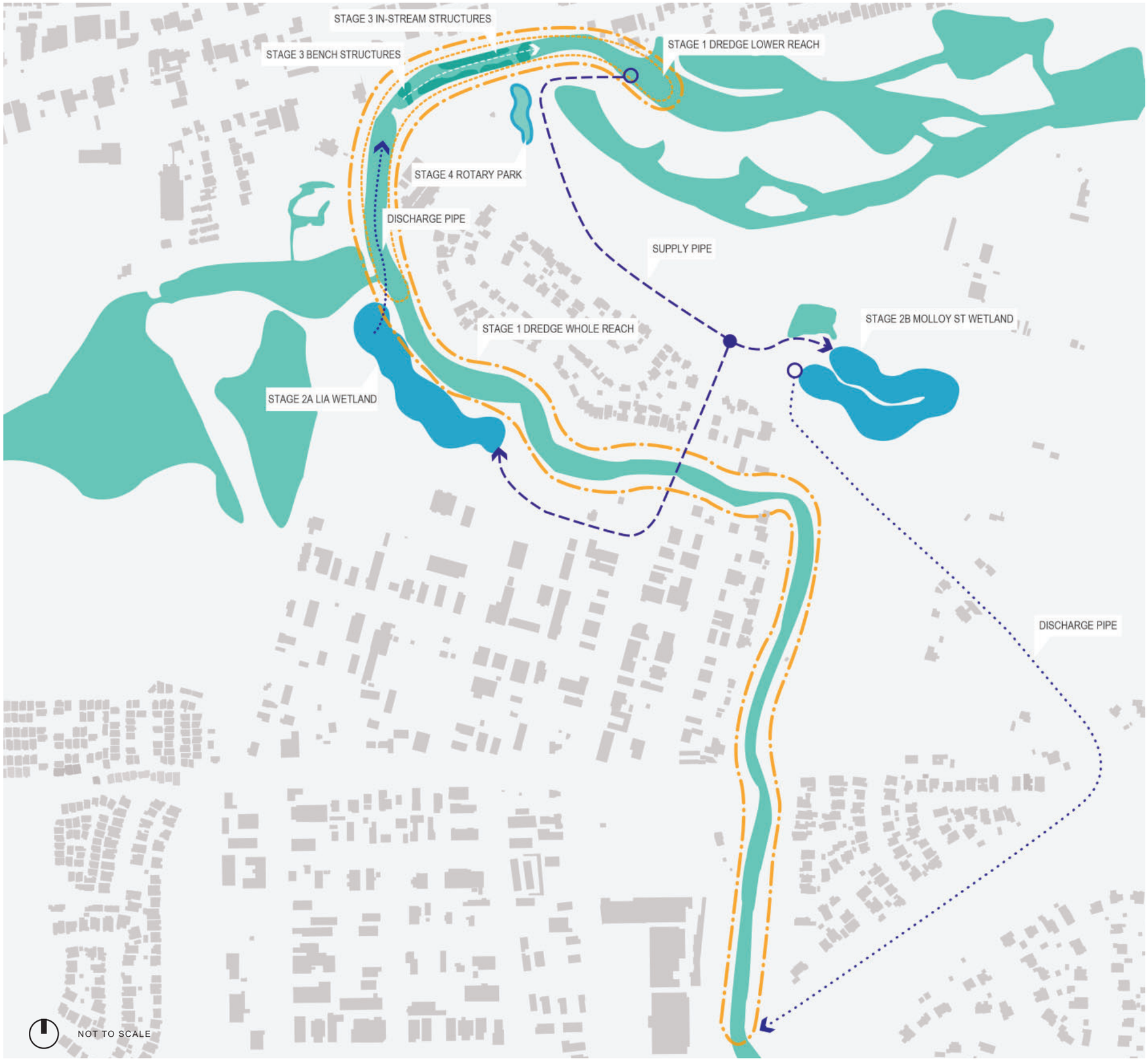
STAGE 3 IN-STREAM STRUCTURES

Options that comprise in-stream structures within Lower Vasse River. Stage 3 options assessed include:

- Bench Structures
- Cross-stream structure

STAGE 4 WETLAND ENHANCMENT

Comprises the enhancement of the existing Rotary Park stormwater basin.



STAGE 1 SEDIMENT REMOVAL

Nutrient-rich sediments have built up on the bed of the Lower Vasse River due to low flow and deposition of cyanobacterial blooms. The sediments smother aquatic vegetation and release nutrients under anoxic conditions in summer, fueling the cycle of continued cyanobacterial growth.

Removing these sediments controls a key source of nutrients from the river and helps to prevent cyanobacterial blooms into the future. The build up of nutrients appears to be greatest between the Causeway and Eastlink bridges, so this area is a priority for sediment removal. Removing sediments throughout the reach will have even greater benefits.

Sediment removal techniques such as dredging can have a negative impact on freshwater mussels. Mussels should be removed and relocated to a suitable aquatic environment for the duration of any dredging operations.

DREDGE LOWER REACH

DREDGE WHOLE REACH

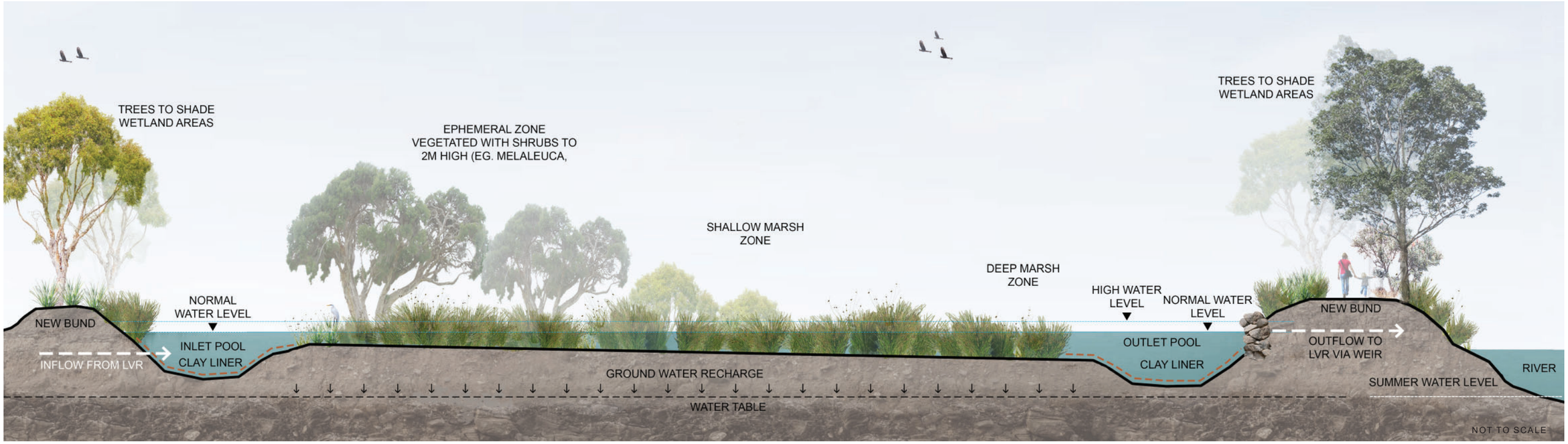
STAGE 2A CONSTRUCTED WETLAND LIA

The wetland is created by excavating the deep pools and using the sediment to bund the perimeter to create a shallow basin. It is planted with a dense coverage of native sedges and shrubs that are adapted to periodic inundation. The existing vegetation are typically species suited to periodic inundation (i.e *Melaleuca viminea, Juncus palladus*). In spring and summer, water is pumped from the river at the Butter Factory weir into the wetland. It flows back into the river via gravity. Water spends 5 days in the wetland, allowing enough time for the shade from dense vegetation to kill cyanobacterial cells. Water spends 20 days in the river before it is pumped back out again, preventing cells from accumulating to bloom concentrations. In autumn, the wetland is partially drained, allowing plant species that require seasonal drying to thrive.

Additional benefits of the wetland are the removal of nutrients by vegetation and soil microorganisms and provision of habitat for birds, frogs, and other wetland species. A footpath on the raised bund is proposed to the river side. The location of the wetland is indicative only (final layout to protect cultural heritage and conform to land tenure boundaries).

STAGE 2A LIA BUSHLAND PIPE NETWORK

STAGE 2A LIA BUSHLAND CONEPT PLAN



LIA BUSHLAND INDICATIVE LONG SECTION

INDICATIVE CROSS SECTION THROUGH POOL

INDICATIVE CROSS SECTION THROUGH SEDGE ZONE

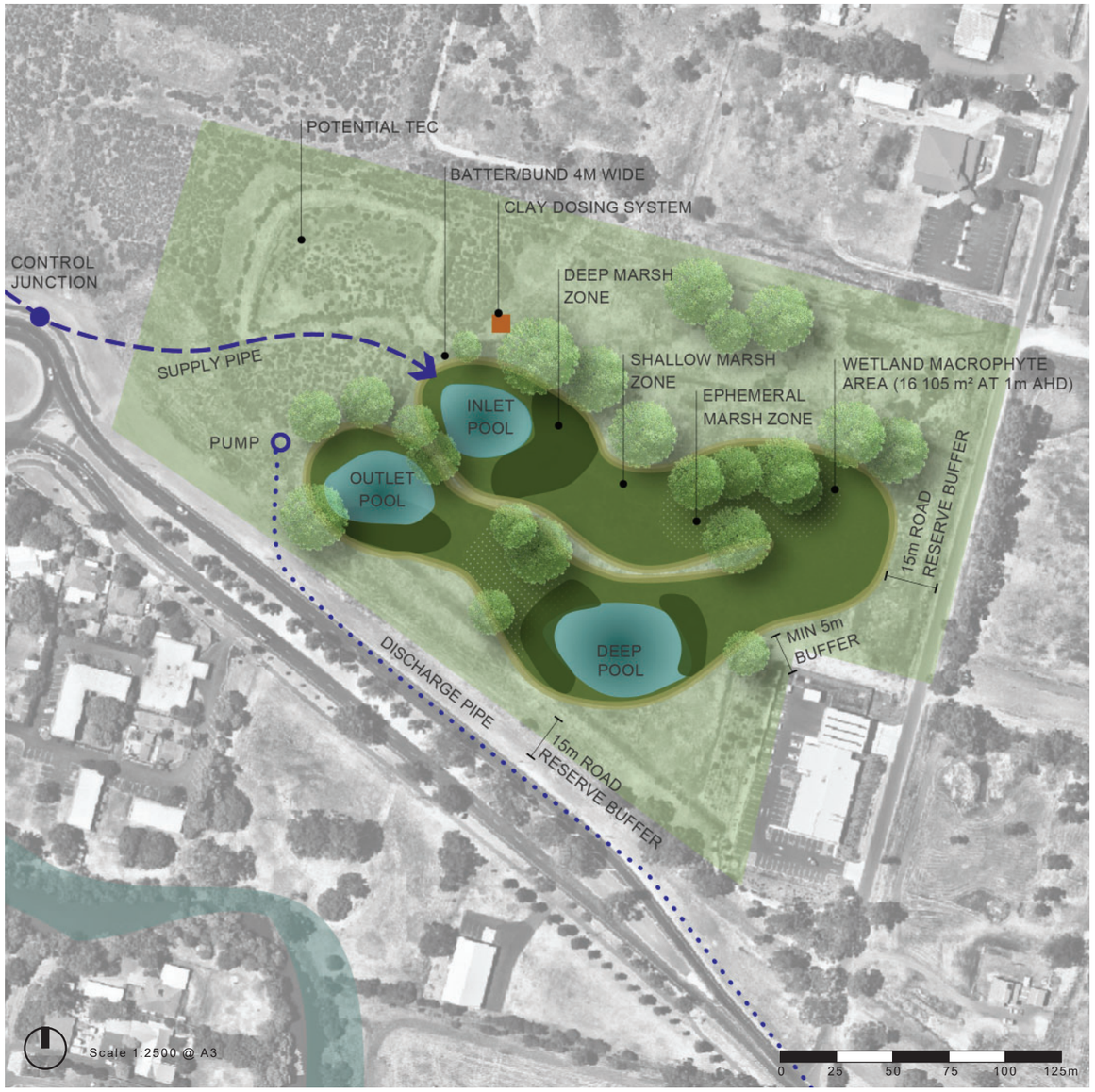
STAGE 2B CONSTRUCTED WETLAND MOLLOY ST

The wetland is created by using the sediment to bund part of the perimeter (where existing ground level is lower) to create a shallow basin. It is planted with a dense coverage of native sedges and shrubs that are adapted to periodic inundation. The wetland at Molloy St is designed to provide treated water to the upper reach and functions in the same way as the LIA wetland that treats the lower reach. However, it requires an additional outlet pump to drain the wetland and transport water to the upstream end of the reach at the Busselton bypass. A subsurface clay liner is installed below the root zone of vegetation to prevent water loss in summer via seepage to groundwater.

A valve where the supply pipes separate enables flow rates to be adjusted to each of the wetlands, allowing greater flexibility and control of cyanobacteria in upstream or downstream reaches as needed.

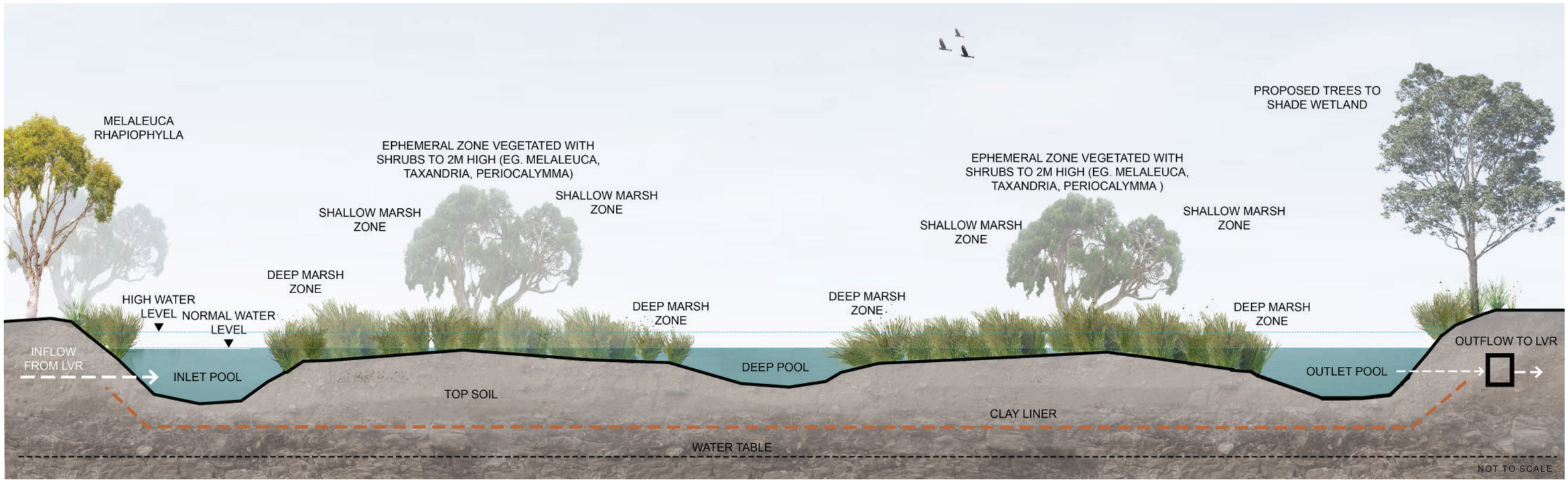
Additional benefits of the wetland are the removal of nutrients by vegetation and soil microorganisms and provision of habitat for birds, frogs, and other wetland species. The wetland location is indicative only and will be adjusted to accommodate potential community uses of the site. The layout accounts for 15m buffer required for road corridor, and the protection of the samphire area.

Together the wetlands would provide 33055m^2 of macrophyte area. The control junction builds flexibility into the design. Flow rates to each wetland can be adjusted based on system response.



STAGE 2B MOLLOY STREET WETLAND CONCEPT PLAN

COMBINED PIPE NETWORK



MOLLOY ST INDICATIVE LONG SECTION

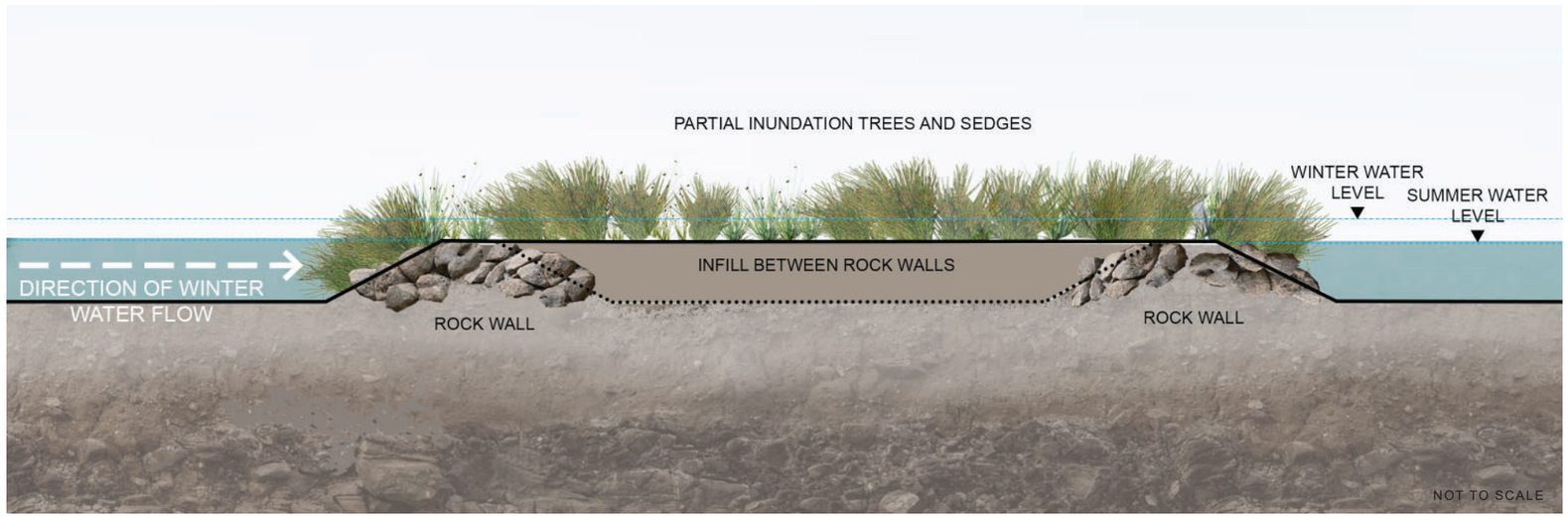
STAGE 3 INSTREAM STRUCTURES - CROSS STREAM

Cross stream structures are installed at two locations near the Causeway and Eastern Link bridges. The crest of the cross-stream structures are lower than the winter water level, allowing flow and migrating fish to pass through. In summer when the water level drops, the structures are exposed and the river between the two structures is isolated from the rest of the river. Water in the isolated section can be recirculated or treated with products such as nutrient binding clays to prevent algal blooms. Isolating this section of the river prevents the blooms that form there from spreading to the rest of the river.

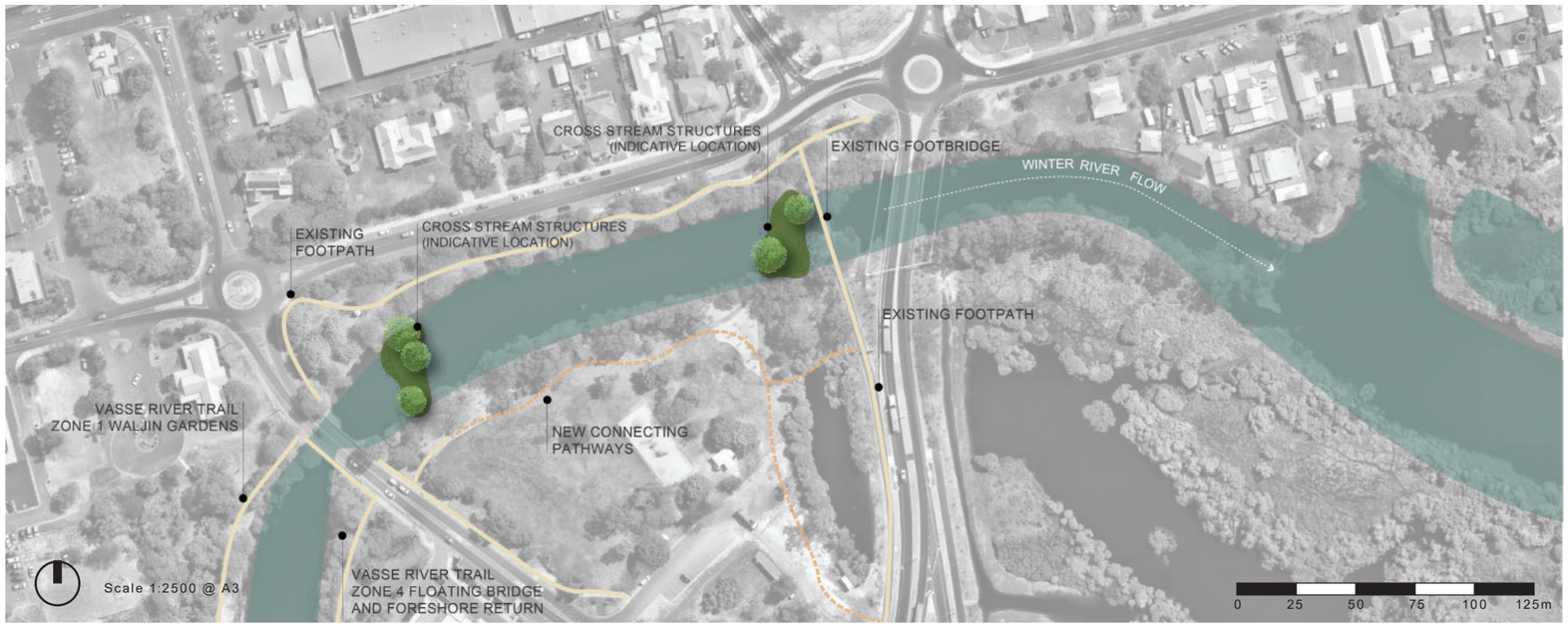
Mussels are removed and relocated to a suitable aquatic environment for the duration of construction.

Sedges planted on the raised bed help to control algal blooms by removing nutrients and allowing water to flow through during winter. Shallower sections or raised islands can be incorporated to support wetland trees that further control algal blooms by shading the water column. In the longer term, enough canopy coverage can be achieved to allow possums to safely cross the river in summer and autumn, connecting habitat on both sides of the river.

The location of structures is indicative and may be constructed upstream or downstream of the locations indicated.

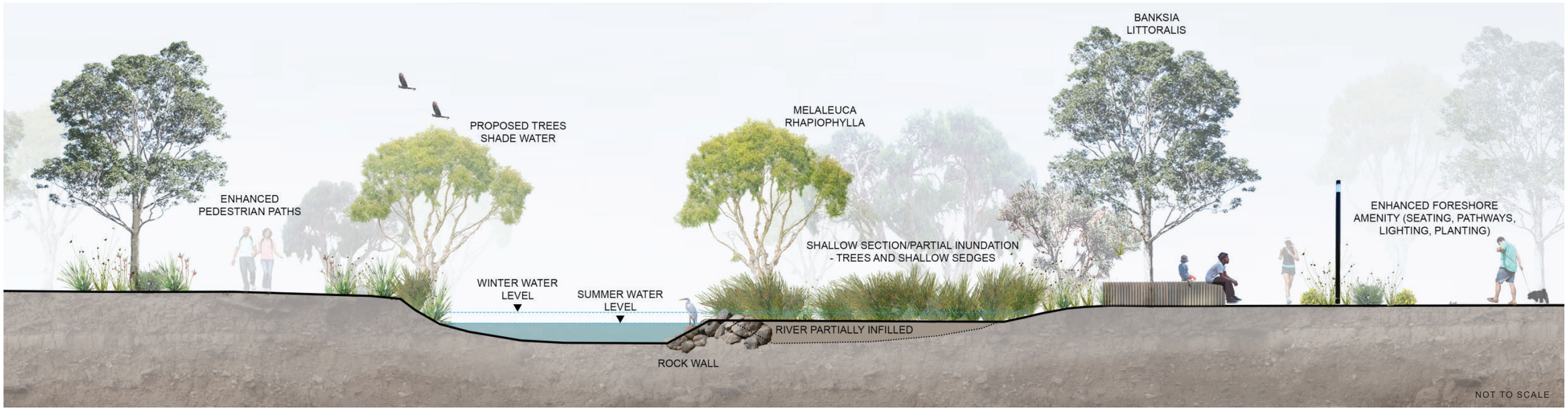


CROSS-STREAM STRUCTURE INDICATIVE LONGITUDINAL SECTION



CROSS STREAM STRUCTURES CONCEPT PLAN

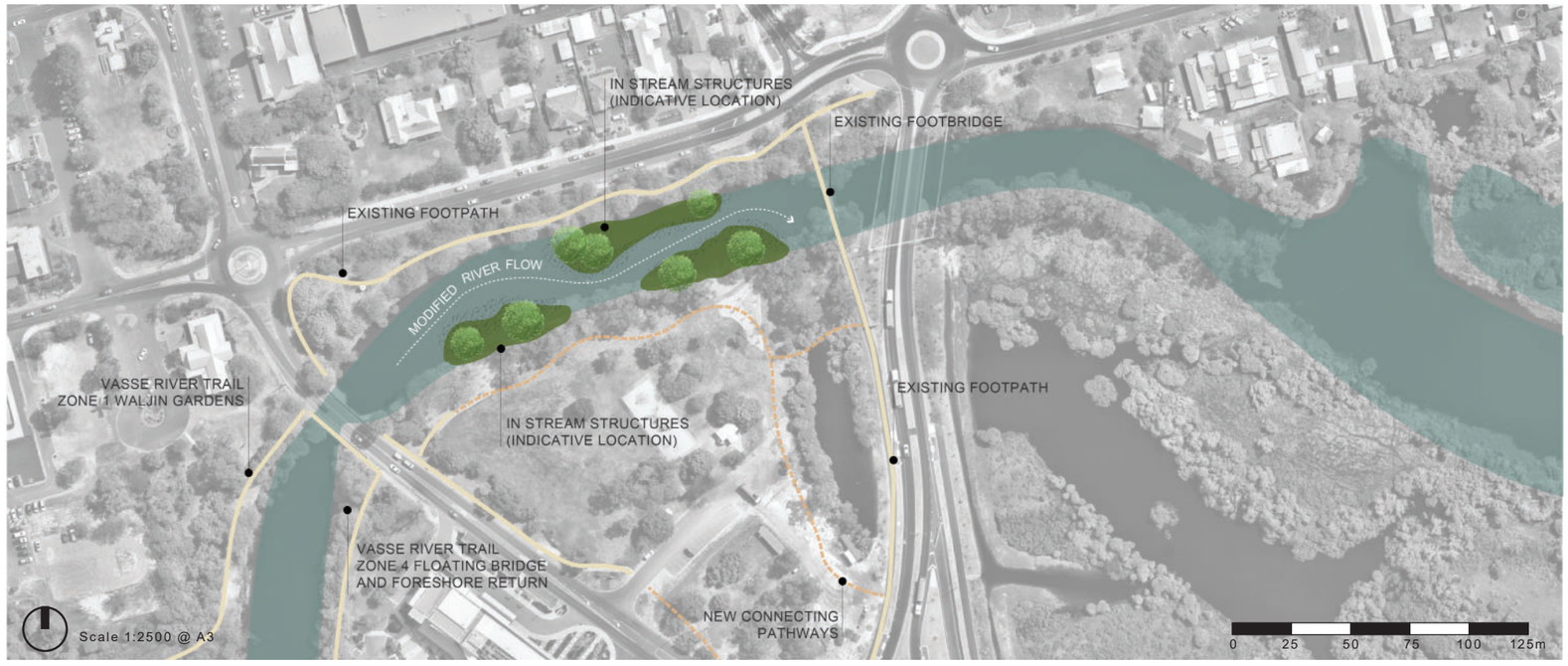
STAGE 3 INSTREAM STRUCTURES - BENCH



BENCH STRUCTURE INDICATIVE CROSS SECTION

The riverbanks are extended into the channel on one or both sides and planted with a dense coverage of sedges and scattered wetland trees. The new bank is lower than the winter water level, allowing water to flow through and inundate vegetation. When the water level drops in summer, the vegetation is exposed and allowed to partially dry. Mussels are removed and relocated to a suitable aquatic environment for the duration of construction. Sedges and trees prevent cyanobacterial blooms by shading the water and removing nutrients.

The constructed banks reduce the amount of time water spends in the river before being recirculated through constructed wetlands. Native Riparian re-vegetation creates spawning habitat for frogs and fish, nesting habitat for water birds and provides a more nature-based experience for the community. The location of structures is indicative, structures would be beneficial throughout the study reach and may be constructed upstream or downstream of the locations indicated.



BENCH STRUCTURES CONCEPT PLAN

STAGE 4 ENHANCEMENT OF EXISTING ROTARY PARK BASIN

The existing basin in Rotary Park is enhanced to create denser wetland vegetation without the need for excavation. Water is pumped from the river near the Butter Factory weir and allowed to drain back via gravity through a vegetated swale. Dense vegetation kills cyanobacterial cells and absorbs nutrients.

This option creates a smaller amount of wetland habitat than the constructed wetlands and should be considered as an “optional add-on” that would be implemented after the construction of the LIA or Molloy St wetland to improve water quality even further and enhance the environmental values of Rotary Park.

ROTARY PARK CONCEPT PLAN

JOSH BYRNE & ASSOCIATES

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T 08 9433 3721 **E** jba@joshbyrne.com.au **W** joshbyrne.com.au

A Suite 109 Atwell Buildings 3 Cantonment Street Fremantle WA 6160