

Living.

Beside the ridge,
before the sea.



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Introduction

Context

Globally, urban landscapes are taking strain as environmental pressures coincide with the need to accommodate more than half the world’s population (United Nations 2014). The common response for low-density cities is to aim for increasing residential density to constrain the spatial footprint of the urban area. In Perth, the need to enact this response is particularly acute – the city has sprawled beyond what seems justifiable within a global biodiversity hotspot (Weller 2007, 2009, Seddon 1972). Perth’s “ubiquitous suburban fabric” (Bolleter 2015) is seen as a “generally unhealthy, costly, unsustainable and unproductive form” (Bolleter 2016b). Densification targets are a key mechanism by which urban change is planned to occur. However, action to this effect is not progressing as fast as environmental concerns and governmental mandates require (Grose 2010, Bolleter 2016b).

Amongst the reasons for this inertia are NIMBY (not in my backyard) responses from suburb residents who oppose change (Bolleter 2016b). Negative responses to urban infill plans are often based on experiences of developments that don’t “leverage greater liveability outcomes” for residents (Bolleter 2016a). Surveys in Australia indicate that only 11% of communities support densification in their area (Bolleter 2016b). Equally, on occasions when residents claim satisfaction with higher density living it is often clarified with the caveat that they would move to a lower density area if they could afford to (Haarhoff, Beattie, and Dupuis 2016). Is a single expression of satisfaction then sufficient to call success? Certainly the parallel rise of density and liveability as urban planning goals should not imply a correlation between the two – a hopeful notion that is firmly dismissed by many (Sendra and Sennett 2020, Hes et al. 2020, Gehl 2011).

Consideration of ‘place’ is not new to urban designers, however there is potential for better use of nuanced examinations of the “multifaceted relationships of people and places in transformation” (Palazzo 2020). There is great complexity in people-place interactions that exist within urban landscapes and, in the context of enacting rapid urban change, these should be explicitly designed for and then examined in evaluation (Marcus, Giusti, and Barthel 2016, Palazzo 2020, Manzo and Perkins 2006, Hester 2014, Hes et al. 2020).

Place attachment and values

The first part of this study provided a discussion on why and how urban designers should consider the processes of place attachment and theories of affordance when designing residential neighbourhoods. The study found that if designers work with knowledge of these cognitive value-forming processes, they can best support a society’s ability to cope with the rapid urban changes required to meet global socio-environmental challenges. Changes in urban design form and modes of living – such as to higher density – are embraced or rejected by residents based on experiences, learnt norms and ascriptions of value to elements and configurations of urban landscapes. Designers can influence the development of these norms and values via careful affective design.

When people experience place attachment via physical or social mechanisms they align their values and landscape preferences according to these positive experiences. Equally, if landscapes provide people with rich opportunities for learning, feeling and interacting, then they have many sources with which to develop broad and diverse perceptions of ‘normal’. Together these factors influence what people value and therefore what is deemed desirable and economically attractive. If designers work with the goal of broadening the spectrum of residents’ values, they curate a diversity in future viable design options. This is an important design intent if humanity wishes to maintain any quality in life in coming decades.

The design presented in this study offers many place attachment potentials and opportunities for recognising landscape value. The design is intended to be evaluated using a suite of people-place relationship measures as proposed by Hes et al. 2020.

Design aim

The aim is to design a neighbourhood that encourages experiences of place attachment and offers residents a landscape to learn from. The intention is to invite residents to engage with the landscape (and people in it) beyond their front gate and to find value beyond an ocean view. The design proposes higher density living (than projected for the site) and offers reasons to remain beyond financially-driven compromise.

From theory to design decisions

The aims of this study encompass high level ideas underpinned by theoretical models of human cognition and behaviour. Translation of these ideas into practical design decisions has been done using a series of steps. In the first part of this study a number of urban design practitioners and projects were examined for their methods of encouraging place attachment and affecting value formation processes. The designers and theorists were Richard Sennett, Pablo Sendra, Jan Gehl, Walter Hood and Julian Bolleter, and an additional multi-party project – the WGV development – was also examined. The major, and often common, design drivers used by these people and projects were summarised. These points have become the set of governing guidelines for the design phase of this project (see page 7).

The guidelines are used to assess the site analysis findings and establish site-specific design responses. The specific combinations of guidelines acting upon site observations leads to key design responses that are presented on page 23. Each key design move contains a set of proposals for the site. This study provides broad conceptual design only. A detailed design phase would need to revisit the examined practitioners to extract the smaller-scale specificities of their design approaches.

Scope

A number of assumptions define the design scope. They are as follows:

- the proposed design is a complete replacement of existing local structure plans for the site – the design caters for the same projected resident numbers (as the structure plans) and will respond to the site as it was in 2006 (prior to redevelopment commencing),
- the nearby Woodman Point Wastewater Treatment Plant can supply recycled water (a purple pipe) to the site,
- that funds are available for major transport infrastructure work and cultural centre construction, and
- the site is one suburb, not parts of three suburbs.

The site



The site chosen for this design study is an area of 239 ha in the City of Cockburn – partially within Coogee, North Coogee and Spearwood suburbs. It is on Beeliar Boodjar. The site is bounded by the ocean, Mell Road in the east, Spearwood Avenue in the north, and Yakas Chase and the southern boundary of the Coogee Regional Open Space. The site is currently undergoing redevelopment to a suburban residential area (with marina) following settler use for market gardening and animal processing industries – abattoirs, meat works, tanneries and wool scouring.

The site was chosen for its culturally rich landscape (Indigenous and settler), variable geomorphology, abundance of undeveloped spaces and recent land use transition.

The recent residential developments in the area are Port Coogee (west) and Eliza Ponds (east).



Methodology

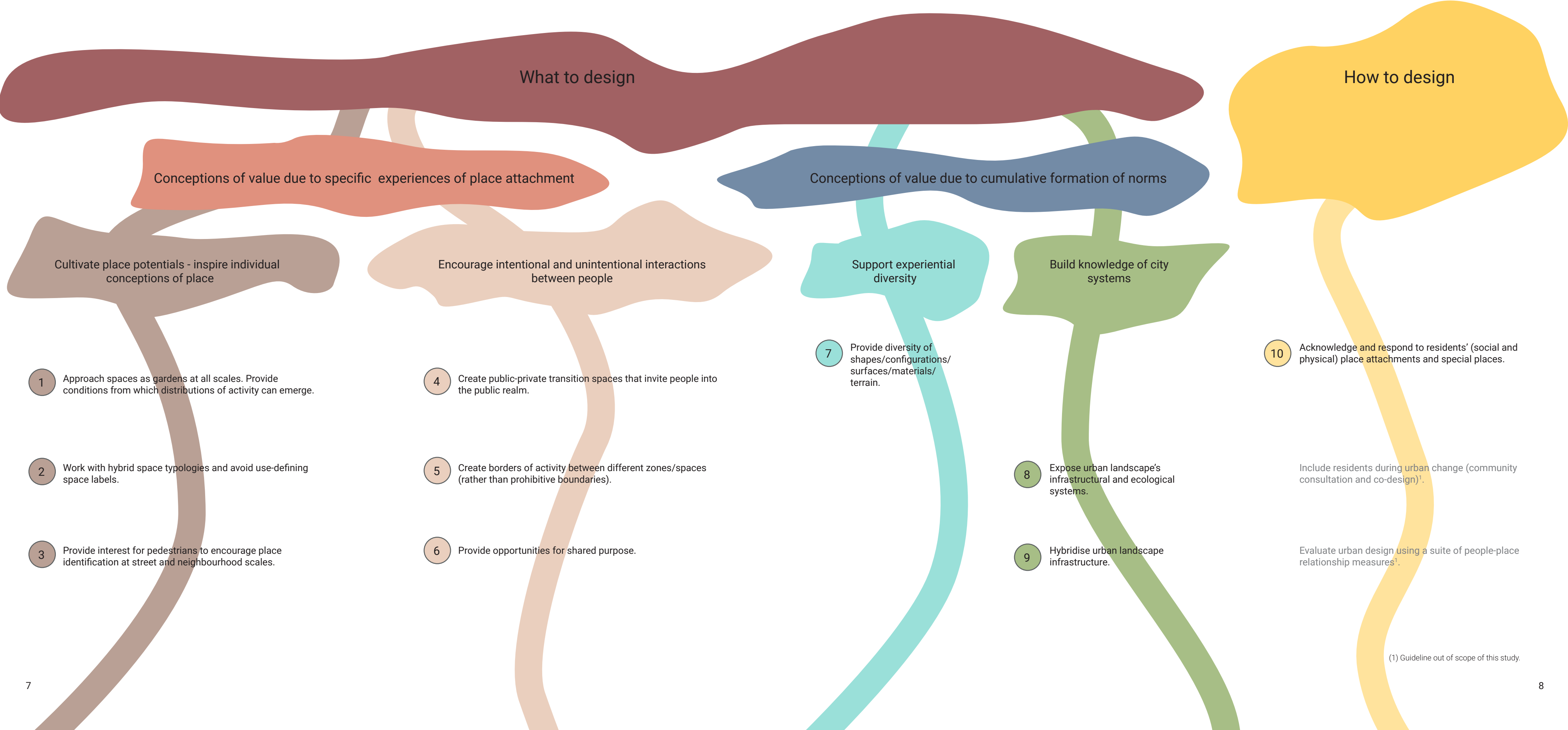


First impressions

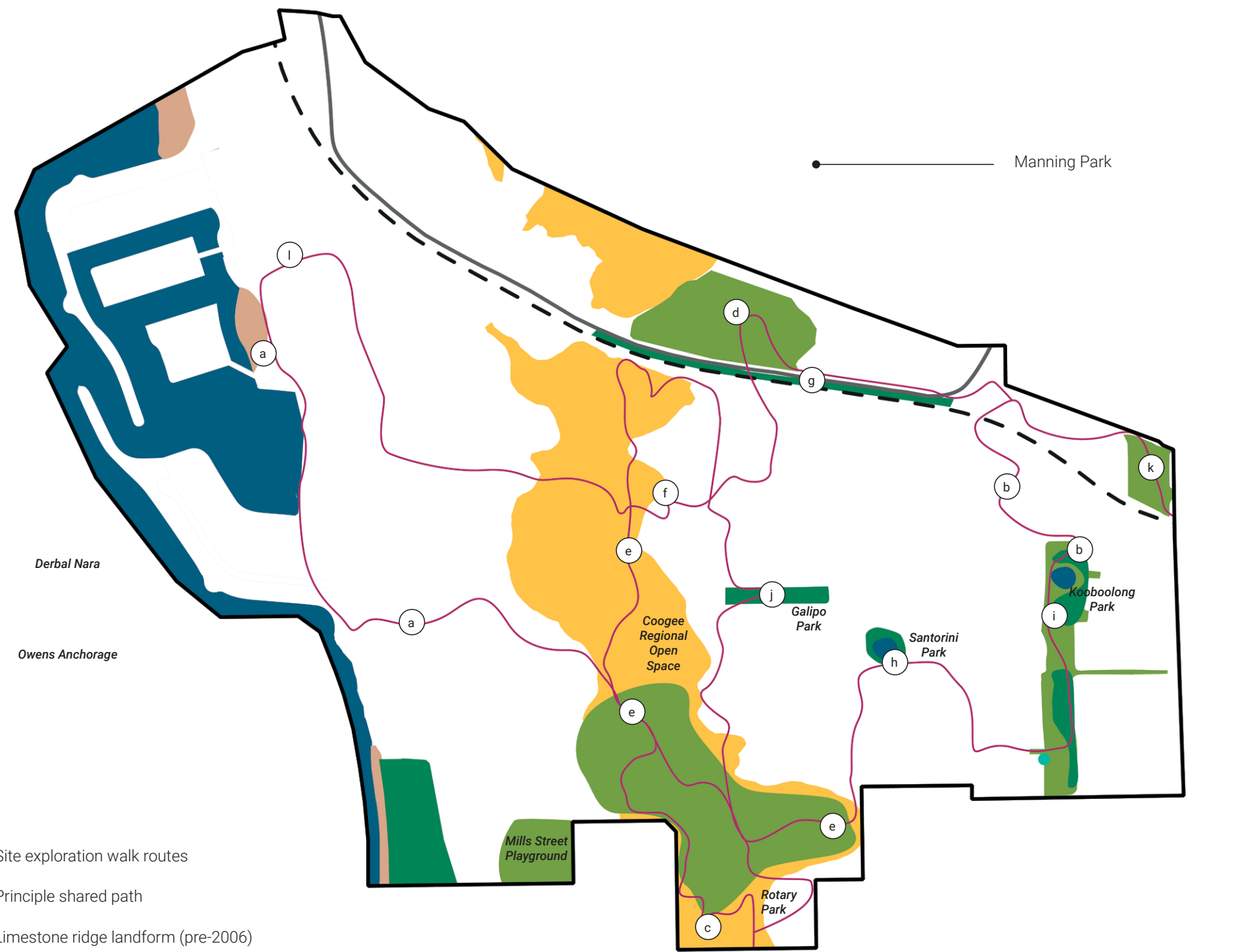


All photos by the author.

Design guidelines



Places and people



(City of Cockburn 2020b, Landgate 2020)



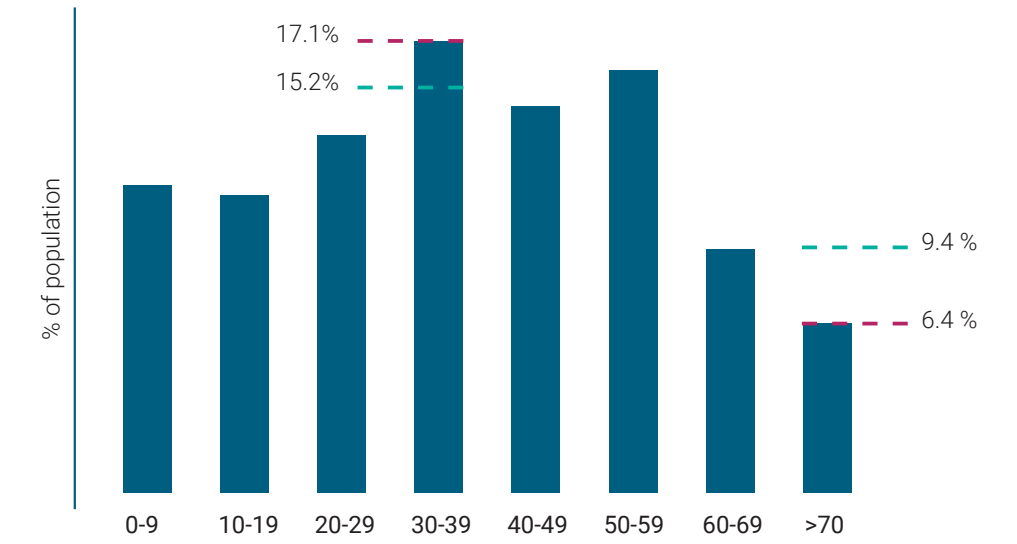
The site holds many important and captivating places. The ocean and the limestone ridge are the two most important places – involved, respectively, in the creation mythology of Derbal Nara (Cockburn Sound) and the inland wetlands (particularly Lake Coogee) as told by Nyungar Wardan Katitjin Bidi - Derbal Nara (2020) contributors and Indigenous consultants to the Port Coogee development (McDonald Hales and Associates 1997). The ridge runs ~400 m inland from the coast and forms part of Manning Park, the Coogee Regional Open Space (within the study site) and south towards Coogee Lighthouse and the Woodman Point Wastewater Treatment Plant. Consultants called for funding of local mythology research as a part of the Port Coogee development although it is not clear that this recommendation was taken on (McDonald Hales and Associates 1997).

There are plaques and signage at three locations through the site. In the Port Coogee there is information about Nyungar words at the local parks (a). Around Eliza Ponds there is information about the Woodlands house and the Watsonia factory (b). There is a rotary memorial celebrating the market gardening history of the area at the highest point in the site (c). There are good views of the South Fremantle Power Station from Port Coogee (l).

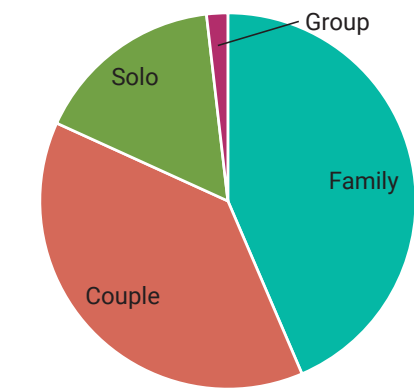
The most experientially interesting parts of the site are the uncared – Sennett’s ‘under-determined’ – spaces. There is a regrowth grove of *Eucalyptus gomphocephala* where kids have made a network of bike paths and ramps (d). It feels like a special place. There is the high plateau-like area on top of the ridge at the southern end of the site with small informal paths, and wider sandy tracks that people use for bike riding and dog walking (e). Despite the abundance of invasive species the variation between rocky ridge and sandy landforms is interesting. The Mills Street Playground seems well used, while the Rotary Park one is not (it is an exposed and uninspiring space).

There is the ruin of a lime kiln on the eastern slope of the ridge – not heritage listed and not sign-posted (f). This same slope is grassy and well-used by the local finch breeder for nest material collecting. There are impressive remnant balga along the northern side of the train line beside the principle shared path (g) and equally old *Melaleuca* in the Santorini Park wetland (albeit choked with weeds) (h). The Kooboolong Park wetland (i) revegetation is nice although the piping of stormwater beneath turf brings the wetland to an abruptly enforced end. Galipo Park is nice (j).

The stand of *Pinus radiata* in Peace Park are incongruent but loved by the cockatoos (k). The two Water Corporation storm water sumps (at Peace Park and Santorini Park) are weedy, under maintained and uninspiring.



Age distribution of residents in 2016 (ABS 2016).



Household types in 2016 (ABS 2016).

In 2016 the site was partially redeveloped (as it remains in 2020) and it is interesting to observe the demographics of people attracted to the area. The age distribution shows that it is a young population compared to Perth metropolitan averages – in particular, there are more people in their 30s and fewer people over 70. It is interesting to note that there are far fewer family households with kids (44%) than at the Perth-scale (73%) (ABS 2016). It is unlikely that this household type distribution will stay static as the area is populated but it does indicate that the area has offered attractive living for young people. A more in-depth analysis of the dwelling types (page 37) shows that households currently have many spare rooms. In combination (and statistically speaking) these figures suggest that many recently arrived couples will have kids and there will be more family households in the future. This study is being conducted with the assumption of that demographic change (towards more households with children).

Early settler history



The area was first used by European settlers for market gardening –beginning at Market Garden Swamp then moving north. Robb Jetty was built to receive livestock from ships and many abattoirs, meatworks and tanneries were established along the coast. The Watsonia factory (inland) and Anchorage Butcher (on the coast) were long-lasting businesses, running until 2009 and 1990, respectively (City of Cockburn 2020a).

Robb Jetty Camp became a place where Aboriginal people (and settlers) camped after being excluded from Fremantle or released from prison. Casual work was sought at the abattoirs and shepherd work was available further south in the Cockburn area (McDonald 2003). Local people still talk of the long-running significance of Robb Jetty camp as a gathering place (City of Cockburn 2020a, Nyungar Wardan Katitjin Bidi - Derbal Nara 2020).

The long-standing industries have left a legacy of contaminated soil and groundwater sites throughout the area. Each of these sites required excavation and removal of topsoil and have groundwater abstraction restrictions (DWER 2020).

In the early 1900s there were two train lines operating through the site. The Jandakot line was originally open to passengers although this service ceased in 1950s. Freight continues on the Jandakot line, but the Woodman point line has been removed altogether (City of Cockburn 2020a).

The Coogee Regional Open Space (along the ridge) was set aside as an odour buffer between the coastal industry and residential areas to the south and east (Bowman, Bishaw and Gorham 2001).

There is a shipwreck off the Port Coogee beach – the Omeo – that has, at times, been further up the beach but is currently submerged. It was used as a wastewater pipe support by Anchorage Butchers for some time (Bowman, Bishaw and Gorham 2001).



Grain train on the Fremantle - Jandakot train line, looking south-west to the Coogee ridge, 1967 (Langford).



Anchorage Butchers, 1965 (City of Cockburn 2020a).

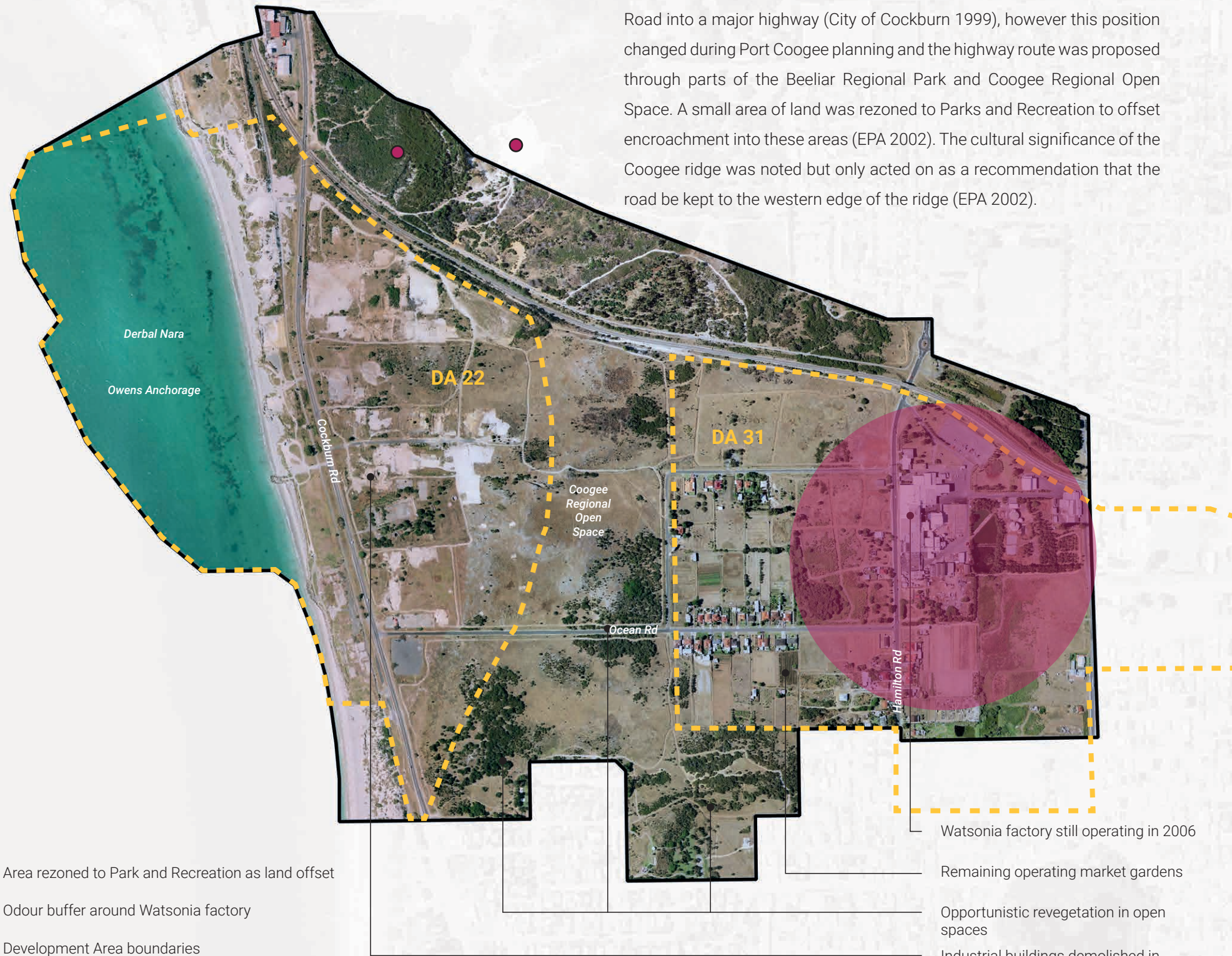


Robb Jetty, 1920 (Wikipedia 2020).

2006

Between 2004 and 2011 redevelopment of the site was planned. The Port Catherine (DA 22) (later Port Coogee) local structure plan was adopted in 2005 and construction began in 2007. The Watsonia factory closed in 2009, the restricting odour buffer was removed and the Packham North (DA31) plan was adopted in 2011 (City of Cockburn 2011, Taylor Burrell Barnett 2010). The majority of that area is being developed as 'Eliza Ponds'.

Initially the City of Cockburn was against the development of Cockburn Road into a major highway (City of Cockburn 1999), however this position changed during Port Coogee planning and the highway route was proposed through parts of the Beelliar Regional Park and Coogee Regional Open Space. A small area of land was rezoned to Parks and Recreation to offset encroachment into these areas (EPA 2002). The cultural significance of the Coogee ridge was noted but only acted on as a recommendation that the road be kept to the western edge of the ridge (EPA 2002).



- Area rezoned to Park and Recreation as land offset
- Odour buffer around Watsonia factory
- Development Area boundaries
(City of Cockburn 2020b, Landgate 2020, Bowman, Bishaw and Gorham 2001)

- Watsonia factory still operating in 2006
- Remaining operating market gardens
- Opportunistic revegetation in open spaces
- Industrial buildings demolished in preparation for redevelopment

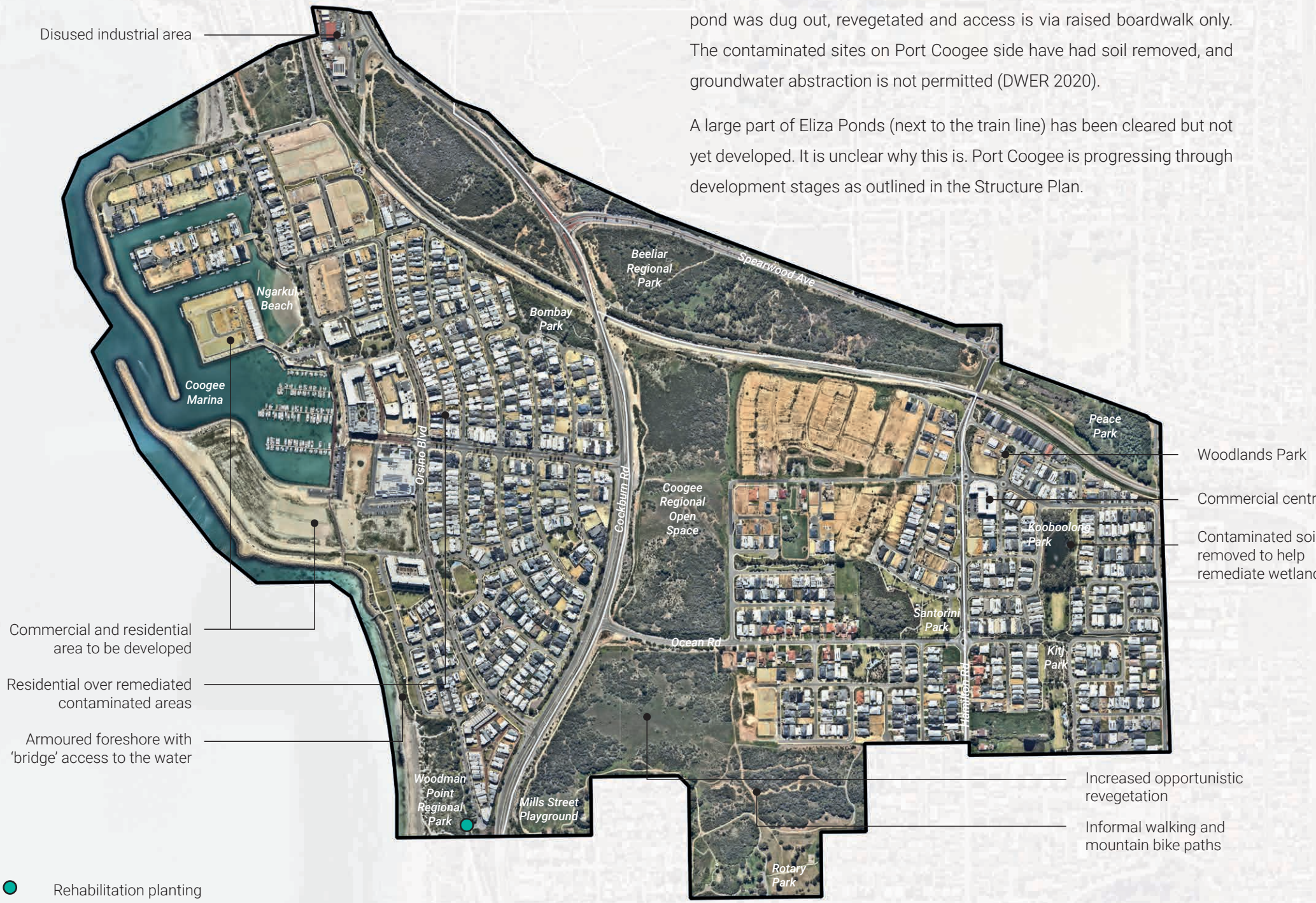


2020

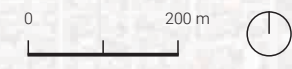
In 2020 developments east and west of the ridge are partially complete. The Port Coogee area offers (generally) higher density living than the eastern side (see Page 38 for more details). There have been major road infrastructure works to re-route Cockburn Road, extend Spearwood Avenue and widen Ocean Road. The Coogee Regional Open Space and Regional Park areas have more opportunistic vegetation cover but only one area has received rehabilitation planting (Cockburn 2020b).

Contaminated areas have had top soil removed. The Watsonia factory pond was dug out, revegetated and access is via raised boardwalk only. The contaminated sites on Port Coogee side have had soil removed, and groundwater abstraction is not permitted (DWER 2020).

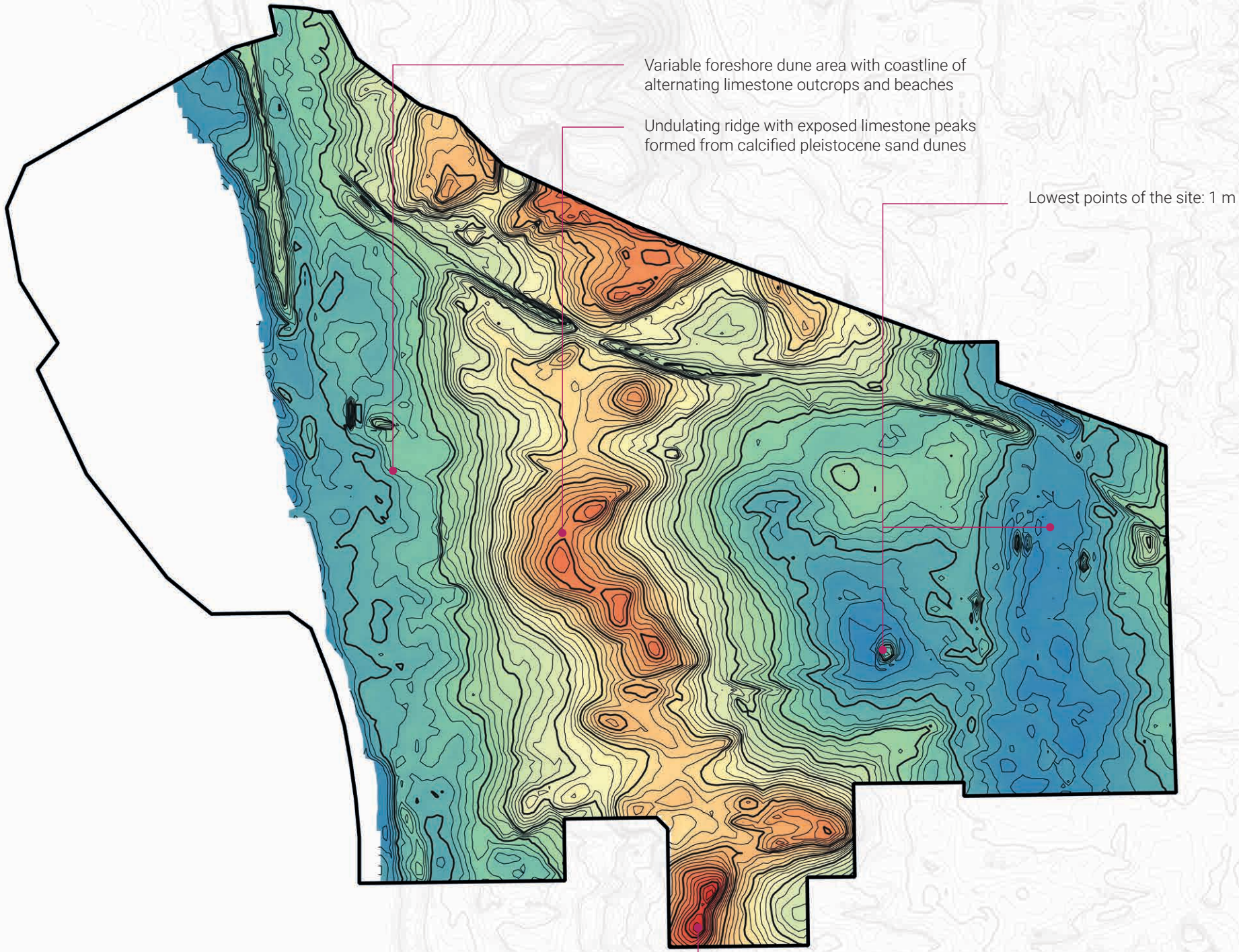
A large part of Eliza Ponds (next to the train line) has been cleared but not yet developed. It is unclear why this is. Port Coogee is progressing through development stages as outlined in the Structure Plan.



- Rehabilitation planting
(City of Cockburn 2020b, Nearmap 2020)



Topography



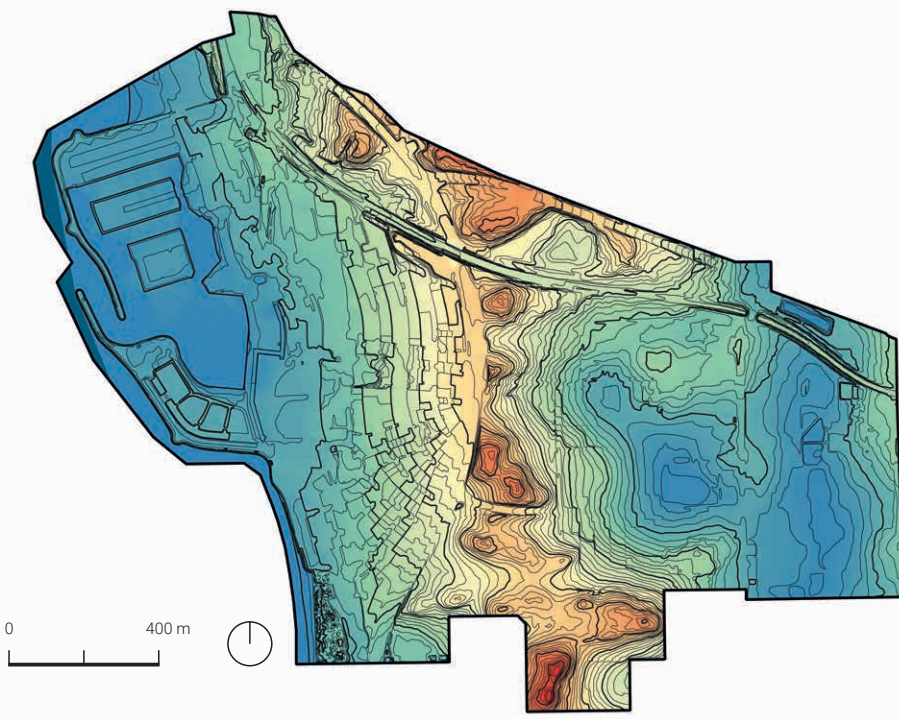
2006 elevation contours (m AHD) (Landgate 2020)



The western part of the site has been significantly re-graded since 2006. Up to 8m was removed from the ridge to create the Cockburn Road corridor. The change to the ridge profile is shown in the diagram below. The 35 m high point (second highest in the site) has been removed.

The western side of Cockburn Road has been 'benched' to maximise the number of consistently sized level blocks with ocean views. This is a typical example of coastal residential development in Perth that is ecologically questionable (for complete disruption to soil biota and hydrology) yet difficult to modify given buyer values (of ocean views above all else) and density targets (Kullman 2017). Some parts of this area required removal of ~2 m of top soil as part of contaminated site remediation, although these were only three discrete areas (DWER 2020).

The topography of the eastern part of the site is less variable and fewer modifications have been necessary to accommodate higher density housing. The trend (cost benefit) of flat sites has resulted in the introduction of some large retaining walls.



2020 elevation contours (m AHD) (Landgate 2020).

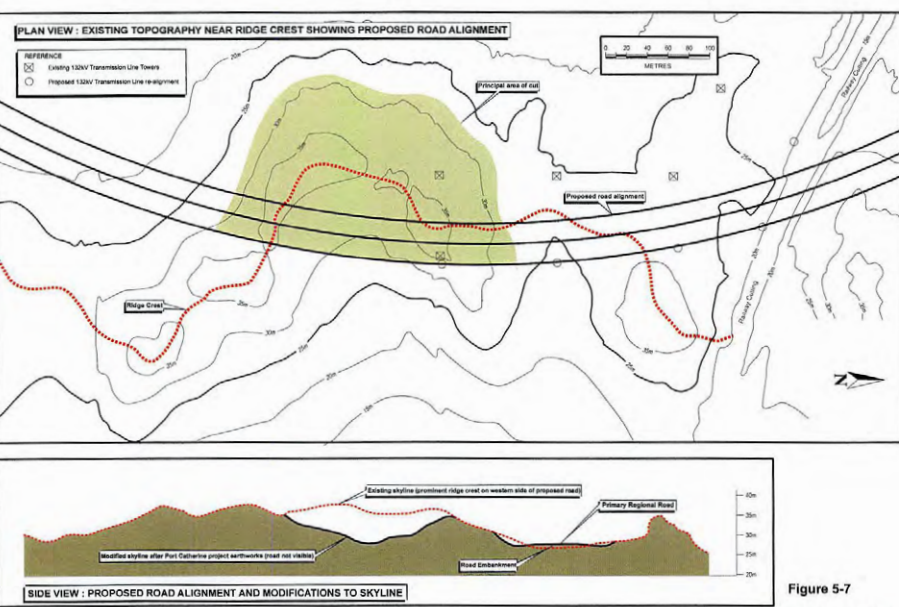


Diagram of Port Coogee impact on the ridge line (Bowman, Bishaw and Gorham 2001).

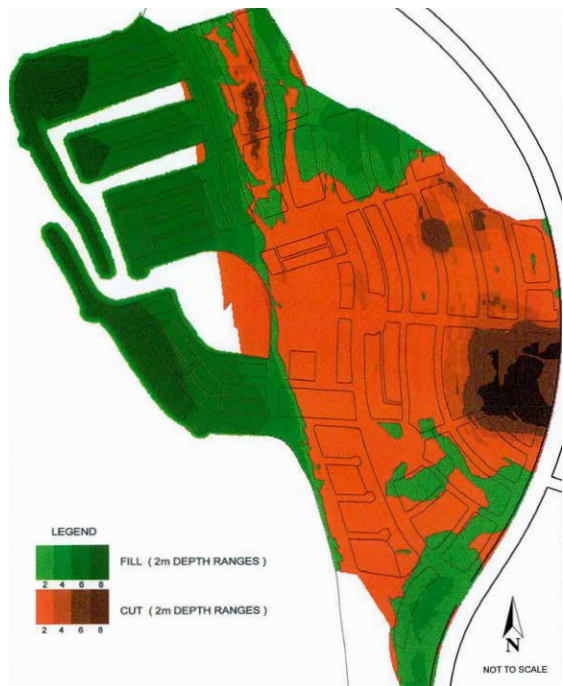
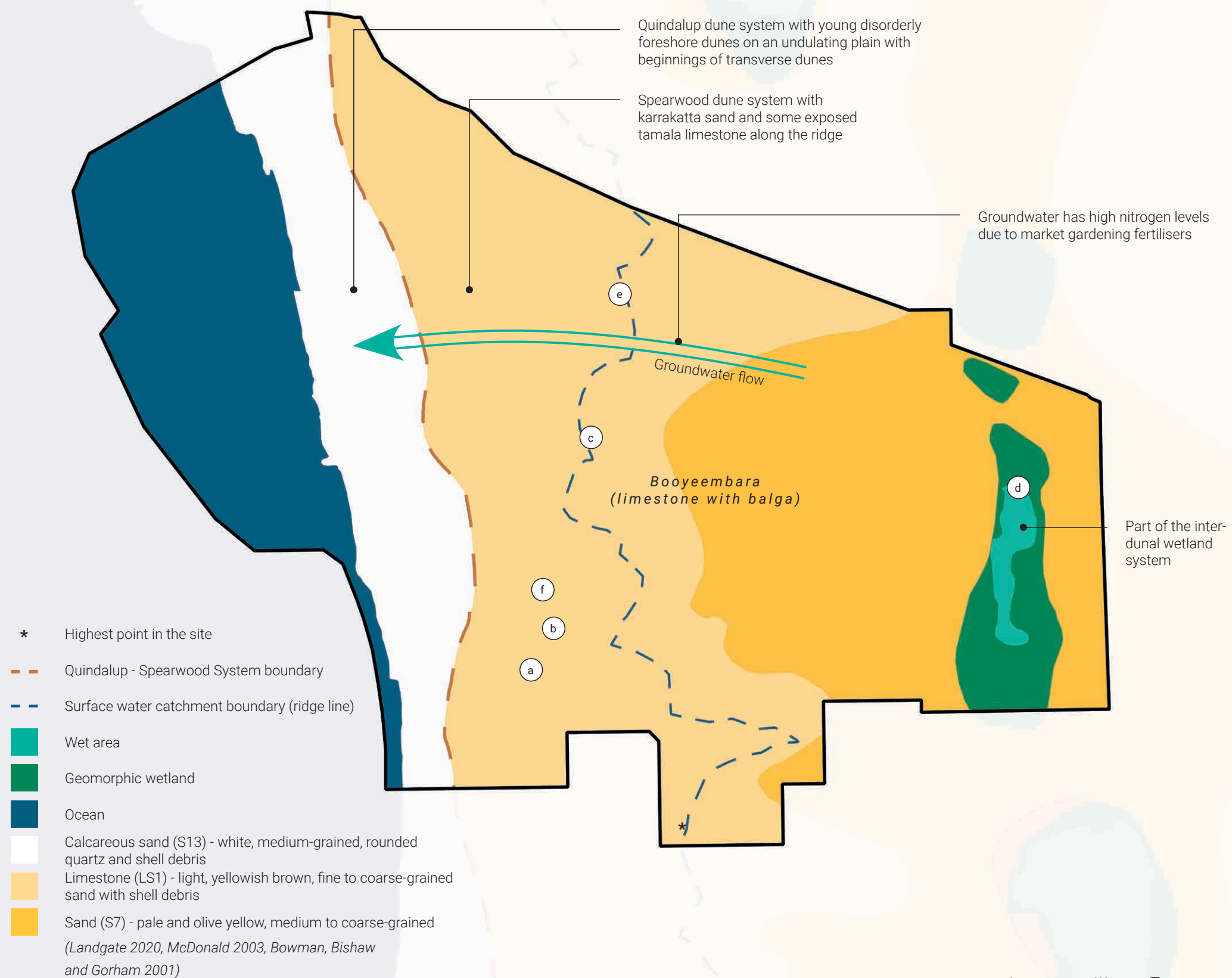


Diagram of Port Coogee cut and fill (Bowman, Bishaw and Gorham 2001).

Landscape systems



The site covers a range of geomorphological and soil systems, offering a rich snapshot of Swan Coastal Plain coastline. The first ~200 m in from the coastline is part of the Quindalup Dune system which is a young and varied system. This area is flat and prior to development would have exhibited Semeniuk's foredune and undulating plain dune types moving towards the older shore transverse ridges (Semeniuk et al. 1988). The mobile and stable dunes are made up of white rounded quartz sand and support open heathland and open scrub in the lee of the dunes. *Melaleuca lanceolata*, *Callitris preissii* and *Acacia rostellifera* are key stabilising species (DPAW 2015, Bowman, Bishaw and Gorham 2001).

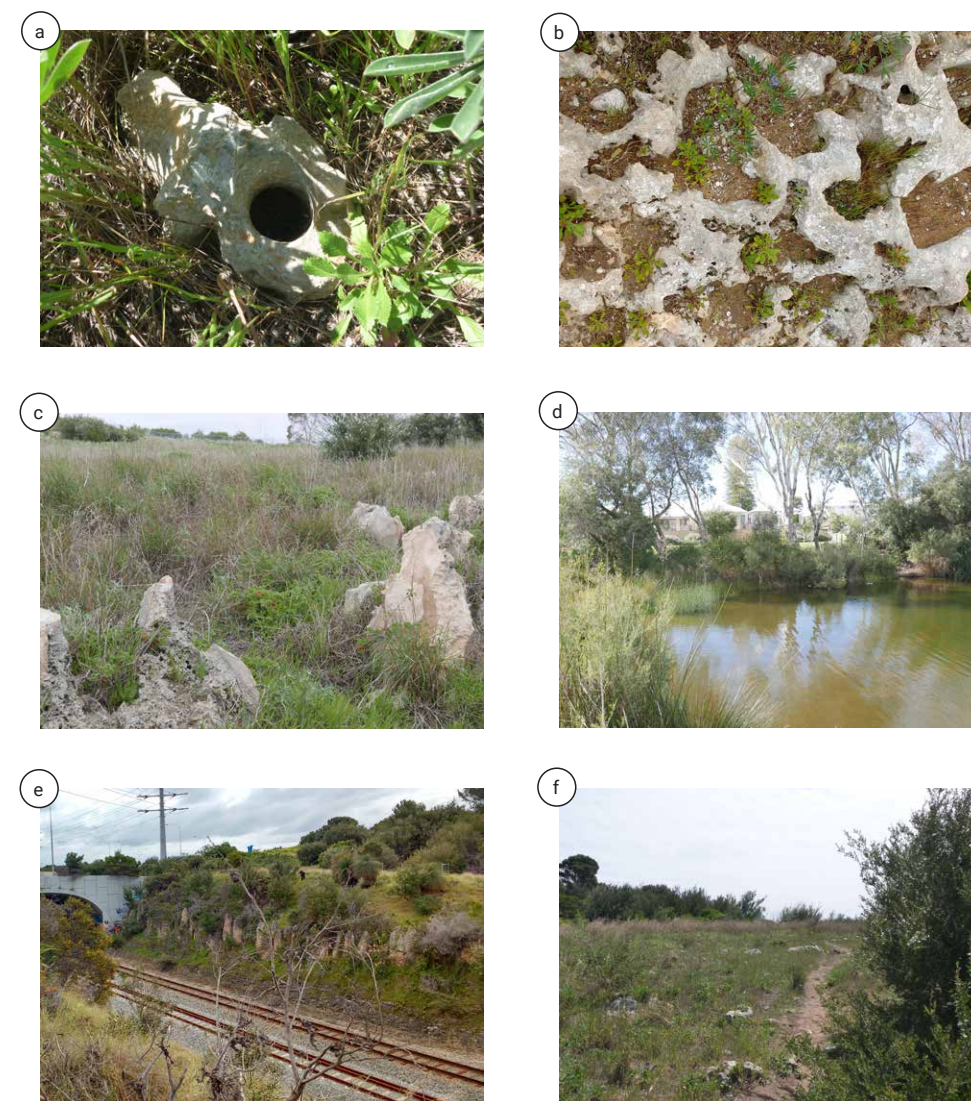
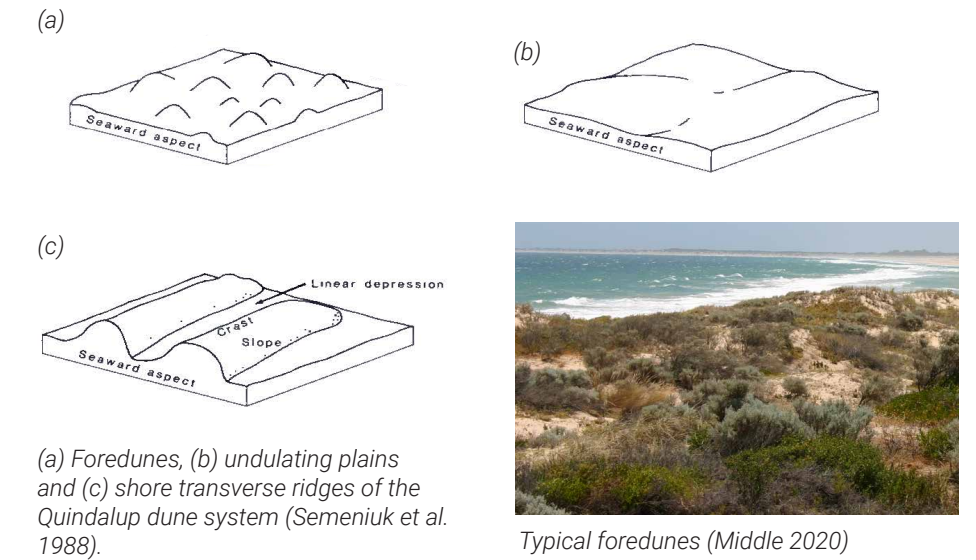


Diagram of (a) limestone formation around plant roots and (b) old calcified dune overlaid with more recent sands which can be blow away by wind (Semeniuk and Glassford 1987).



(a) Foreduces, (b) undulating plains and (c) shore transverse ridges of the Quindalup dune system (Semeniuk et al. 1988).

Typical foredunes (Middle 2020)

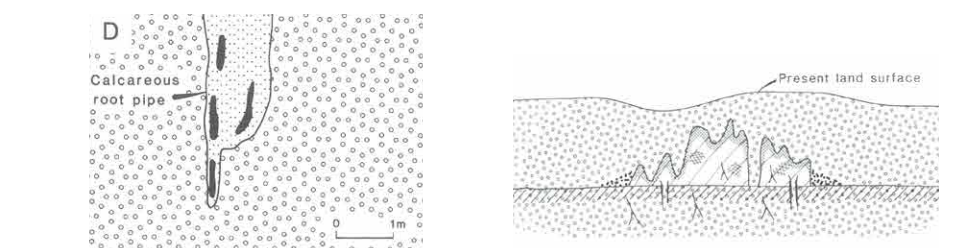


Diagram of (a) limestone formation around plant roots and (b) old calcified dune overlaid with more recent sands which can be blow away by wind (Semeniuk and Glassford 1987).

At the base of the ridge the site transitions to the Spearwood Dune system which consists of older pleistocene-era sand dunes that have calcified to form tamala limestone ridges. These ridges are covered with karrakatta sands and are occasionally exposed by the wind (Semeniuk and Glassford 1987). The eastern base of the ridge transitions from fine limestone sands to courser yellow-olive sands. This area is characterised by *Eucalyptus gomphocephala* woodlands with closed heath and *Callitris preissii*, *Xanthorrhoea preissii* and *Acacia rostellifera* on the ridge (DPAW 2015, Apace 2019). At the lowest part of the site is an inter-dunal wetland area of brownish-grey silt with fine sand (City of Cockburn 2011). These wetland areas have *Melaleuca raphiophylla*, *Melaleuca preissiana* and various sedge species.

The whole site is within the Cottesloe Vegetation Complex. The species listed above are specific to the site's geomorphic and soil conditions overlapping with the broader Cottesloe complex area.

High nitrogen levels in the groundwater are reducing over time and are not considered to impact water quality in the Coogee marina (Taylor Burrell Barnett 2010).

Public green spaces and services

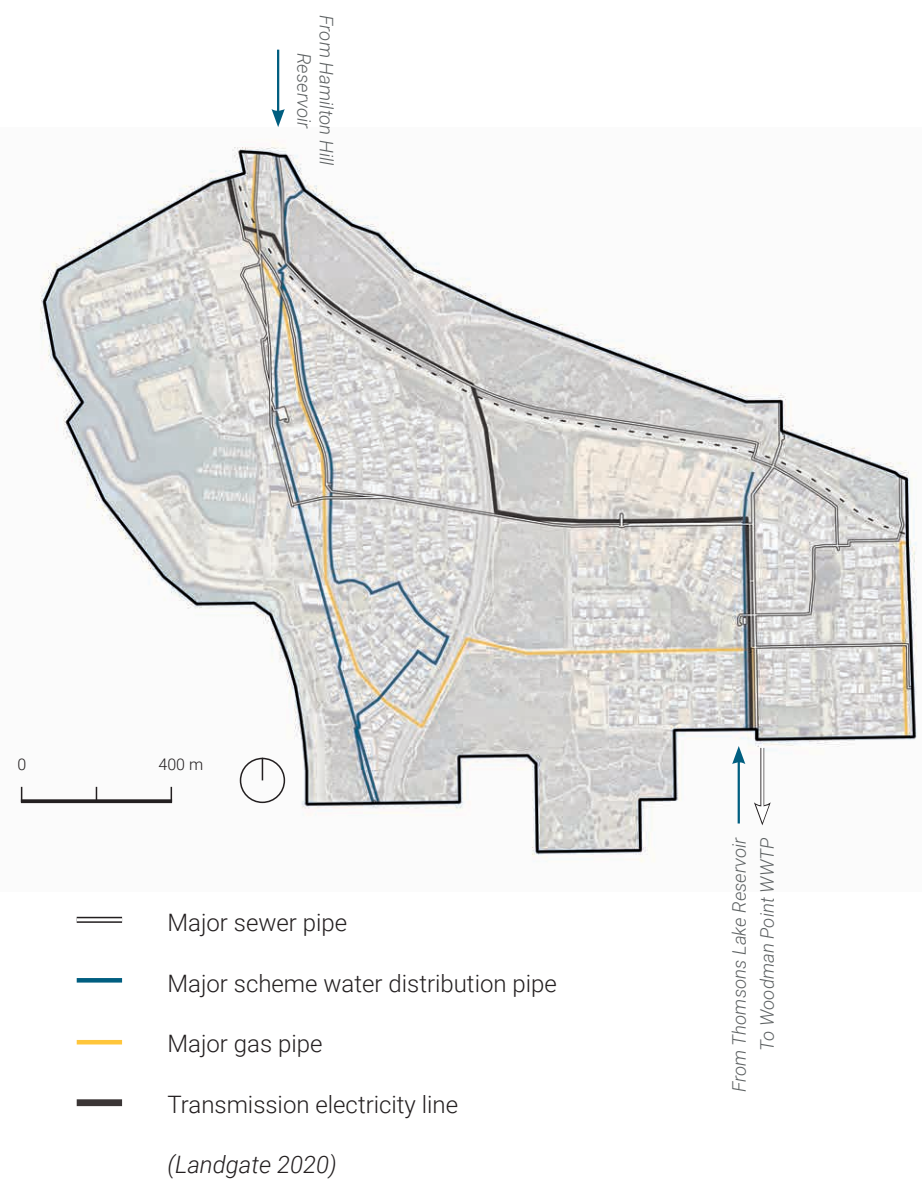


Currently the site does not have many areas of remnant (or high quality regrowth) vegetation. The section of Beelias Regional Park has some regrowth of value – particularly a stand of *Eucalyptus gomphocephala* and the strip of *Xanthorrhoea preissii* along the train line. Small local park areas – such as Koooolong Park – have been planted with appropriate species alongside turf and the only targeted dune rehabilitation planting is within the Woodman Point Regional Park. The largest green space – Coogee Regional Open Space – along the ridge is predominantly vegetated with invasive and opportunistic species offering little biodiversity value.

The poor habitat value of the Coogee Regional Open Space means it has not been included in the Beelias Regional Park network and only half the area is included within the planned regional ecological linkage corridor. There is no documentation of plans to rehabilitate the ridge and it is likely that the shallower slopes will be developed for residential purposes in the future.



Photos of (a) the *Eucalyptus gomphocephala* grove with bike tracks within Beelias Regional Park, (b) mature *Xanthorrhoea preissii* in Beelias Regional Park, (c) the ridge looking north along Coogee Regional Open Space and (d) part of Koooolong Park.



Many major service routes pass through the site. This is largely due to the historical industrial uses and only recent redevelopment to a residential area. The major gas line likely passed through the site to supply coastal industry. The electricity transmission line route was altered during the Port Coogee development to follow the new Cockburn Road corridor, but still runs along the (minor) Entrance Road in the midst of the new Eliza Ponds residential area.

Current situation summary



Opportunities

1. Opportunity to build on informal use of open spaces (bike riding and walking).
2. Interesting varied topography with opportunity for diverse built form responses.
3. Wetland system with water treatment potential.
4. Existing train line and historic precedent of another north-south train line.
5. Proximity to the Woodman Point Wastewater Treatment Plant for recycled water provision.
6. Proximity to Fremantle and Kwinana (for work opportunities).



Strengths

13. Currently large areas of public open space throughout the site.
14. Variation in soil and landscape systems – coastal, limestone ridge and low-lying wetlands.
15. Rich cultural history and landscape significance – Aboriginal and settler.
16. Range of residential densities (R20 to R80).
17. Area attracting both families and single/couple/group households (although geographically divided).
18. Proximity to the Bush Forever Beelir Regional Park area (Manning Park to the north).



Challenges

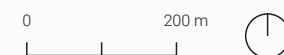
7. Distances – it's a large area over which to form a cohesive suburb.
8. Large elevation variation across the site.
9. Major rail and road infrastructure corridors through the site.
10. Major service infrastructure through the site.
11. Land contamination from historic industries.
12. Area surrounded by traditional low density suburbs and post-industrial land.



Weaknesses

19. Limited accessibility to significant views and ecologically important places (due to residential/road layout).
20. Cockburn Road dividing the east and west parts of the site and cutting through significant ridge.
21. Limited access to non built edge coastline within the site.
22. Lack of fast frequent public transport connections.
23. Limited pedestrian infrastructure.
24. Homogeneous residential form.
25. Limited habitat rehabilitation/conservation priority areas despite large vegetated areas.
26. Few markers of landscape value/significance other than maximising ocean views and marking Watsonia factory land use.
27. Few (and far apart) community service and social/commercial destinations

(Landgate 2020, Nearthmap 2020)



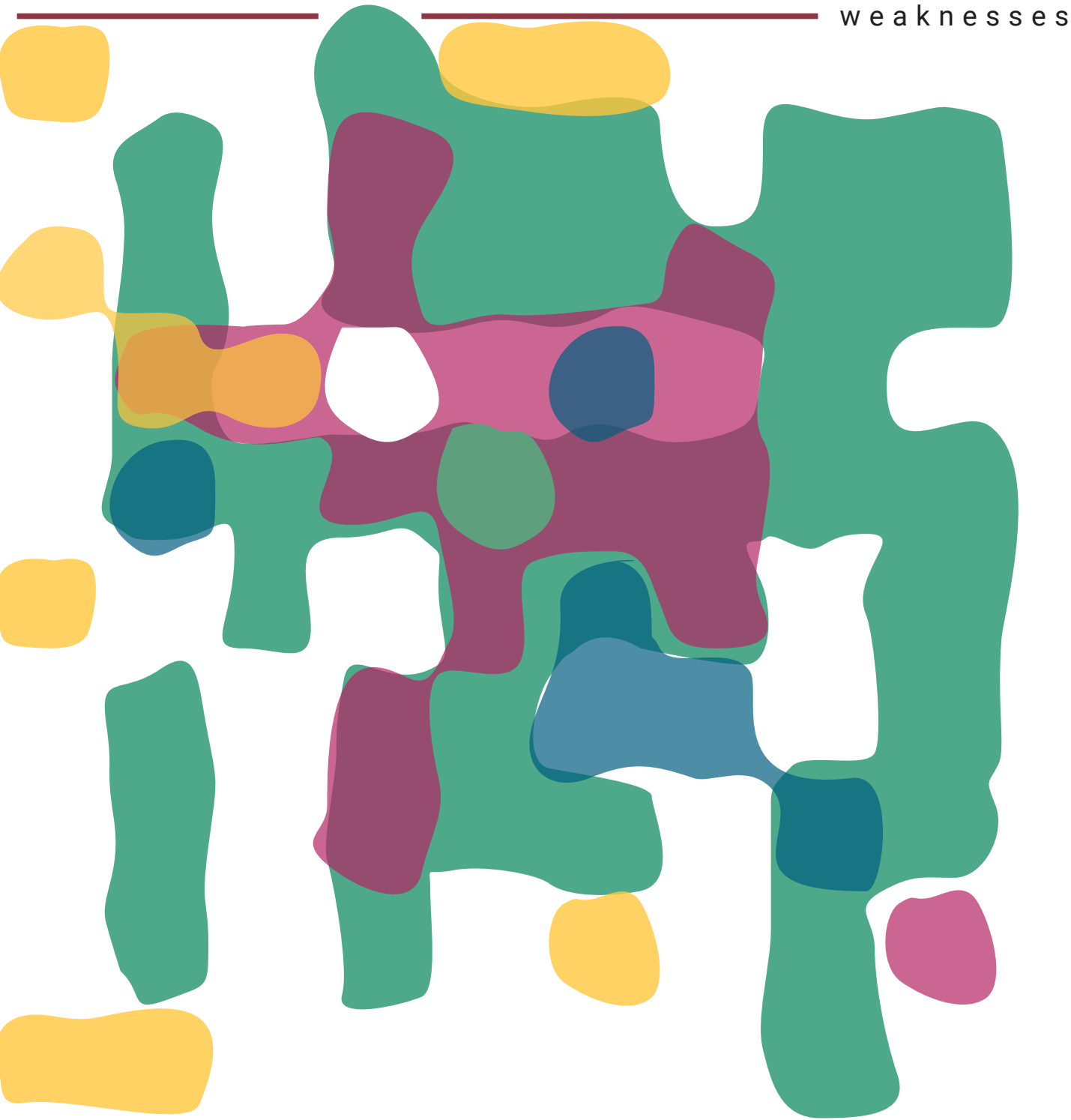
Response to the site

Guidelines

- 9 Hybridise urban landscape infrastructure.
- 1 Approach spaces as gardens at all scales. Provide conditions from which distributions of activity can emerge.
- 2 Work with hybrid space typologies and avoid use-defining space labels.
- 7 Provide diversity of shapes/configurations/surfaces/materials/terrain.
- 3 Provide interest for pedestrians to encourage place identification at street and neighbourhood scales.
- 5 Create borders of activity between different zones/spaces (rather than prohibitive boundaries).
- 8 Expose urban landscape's infrastructural and ecological systems.
- 10 Acknowledge and respond to residents' (social and physical) place attachments and special places.
- 4 Create public-private transition spaces that invite people into the public realm.
- 6 Provide opportunities for shared purpose.

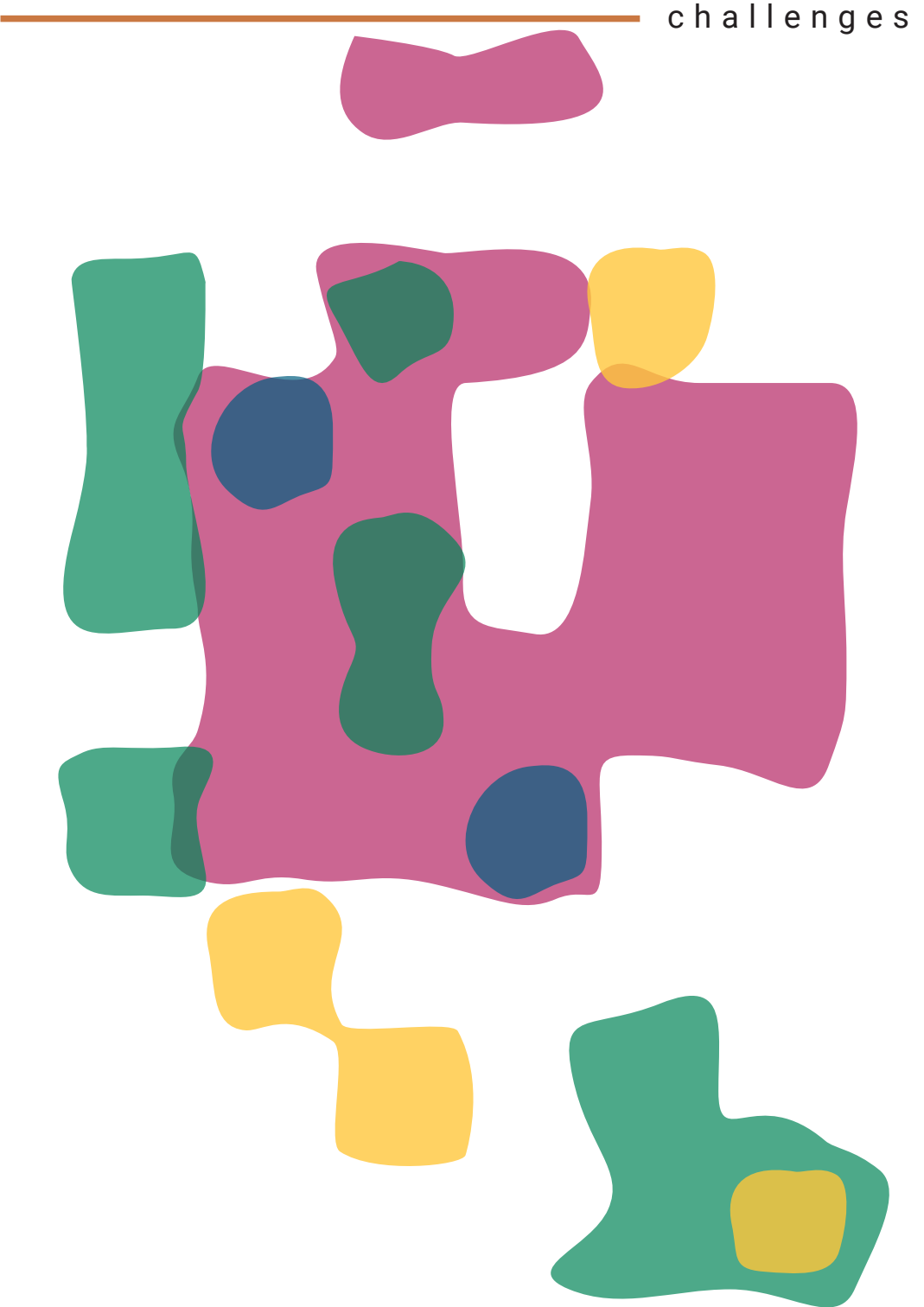
Few community services/facilities *Homogeneous residential form* *Limited access to non built edge coastline* *Limited habitat priority areas* *Limited accessibility to views and ecologically important places* *Limited pedestrian infrastructure* *Lack of frequent public transport options* *Few markers of landscape value* *Major dividing road*

weaknesses



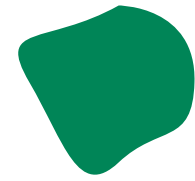
Industrial land contamination *Long distances* *Major road and rail infrastructure* *Major service infrastructure through site* *Surrounded by traditional low density suburbs and post-industrial land* *Large elevation variation across the site*

challenges



- Key Move 1: Public (*) spaces
- Key Move 2: Modes of movement
- Key Move 3: Living beside, beyond inside
- Key Move 4: Systems to the surface

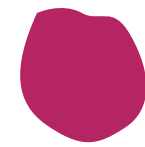
Key design moves



Key Move 1: Public (*) spaces

(*) = action/education/conservation/service/under-determined/accessible/modifiable/habitat/transport

- Indigenous-led landscape mythology and ecosystem research and cultural centre near ridge top.
- Road and rail into a tunnel to allow for continuous ridgetop public (*) space and inviting public-private transitions.
- Wetlands for stormwater treatment, habitat and social destination.
- School and community-managed conservation area.
- Council-maintained coastal ecosystem habitat preservation and contamination remediation areas.
- Informal community and school-use areas for bikes/walking/playing.
- Residential-adjacent wetland, coastal and ridge recreation and habitat areas.
- Streets as public space (with verge gardens, playgrounds, storm water management).
- Reroute Spearwood Avenue to form larger continuous habitat restoration space.



Key Move 2: Modes of movement

- Reintroduce the southern train route (as Fremantle to Rockingham).
- Reintroduce the eastern train route for passengers (as Fremantle to Forrestfield).
- Two new passenger train stations - Coogee Ridge Station and Spearwood Sands Station.
- Formal (sealed, shared, accessible) and informal (unsealed) paths throughout.
- Shaded walking routes along all travel P(*)S corridors.
- Uninterrupted coastal walking/riding path.
- Sign-posted walking trail between train stations and on to marina.



Key Move 3: Living beside, beyond inside

- Higher density (than R20) residential areas with varied configurations and abundant access to various P(*)S.
- Shared residential energy (solar and batteries), water (storage tanks) and transport (share cars) systems.
- Shared community and school buildings (halls, sports centre), services (library, cafe) and spaces (streets, oval).
- Smaller boat pen/ramp area to minimise ocean floor disturbance and maximise access to variable undisturbed coastline.



Key Move 4: Systems to the surface

- Major water flow routes painted on pavements.
- Introduction of a recycled (purple) water supply from the Woodman Point Wastewater Treatment Plant.
- Hydrology and geomorphology information along station to station walk trail.
- Tunnel to the cultural centre with windows to expose geological/biological processes and urban services.
- Road routes following green corridors and optimised for exposed storm water management.
- Material changes and urban configuration changes in response to landscape position.

Design



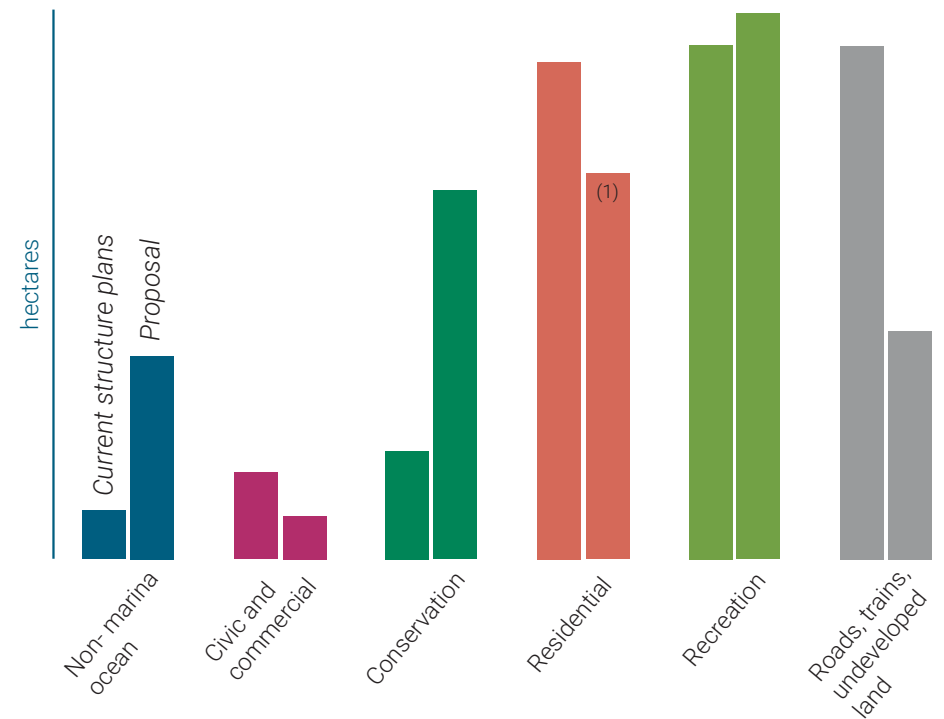
The proposed design offers

- diverse forms of medium density living,
- opportunities to connect with ecologically and culturally significant landscapes,
- community learning through shared school facilities, community-managed spaces and exposed city systems.

The area is intended to be visited on foot – with attractions and shaded routes throughout. There are formal (accessible) and informal (unsealed) paths, and all but the major roads are set in shared corridors that prioritise pedestrians. There are two passenger train lines and two stations within the site, providing easy public transport options.

By comparison with the current structure plans for the area (shown on the right), this proposal places greater emphasis on the reintroduction and conservation of local dunal, limestone ridge and wetland ecosystems. Routing Cockburn Road and the north-south train line through tunnels enables this intention. The decrease in land surface area required for transport is shown in the figure, below. Consequently the ridge can remain intact and connected to adjacent residential areas, while residents have multiple efficient transport options.

There is slightly less area given to commercial uses, although their distribution through the site means more options and greater accessibility for residents.



Current structure plan zoning (City of Cockburn 2020b).

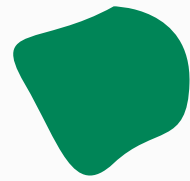
The ridge and the ocean are the major topographical and culturally significant features of this site. The design is intended to conserve and celebrate these areas without compromising on facilities and ease of movement. Indigenous responses to Port Coogee development plans included a call for funding research on the mythology of the area, and this design aims to cater for that request.

The intention is to provide diverse opportunities for residents and visitors to informally experience this landscape. More formally, people can learn about the area at the Ridge Cultural Centre where research on the mythology and ecology of the Cockburn coastal environments is conducted. Visitors can attend performances and exhibitions, visit the cafe and use the space for events.

Placing the road in a tunnel provides the space for increased ridge habitat conservation while maintaining higher intensity recreational areas – such as ovals, turf play areas, mountain biking and dog walking areas.

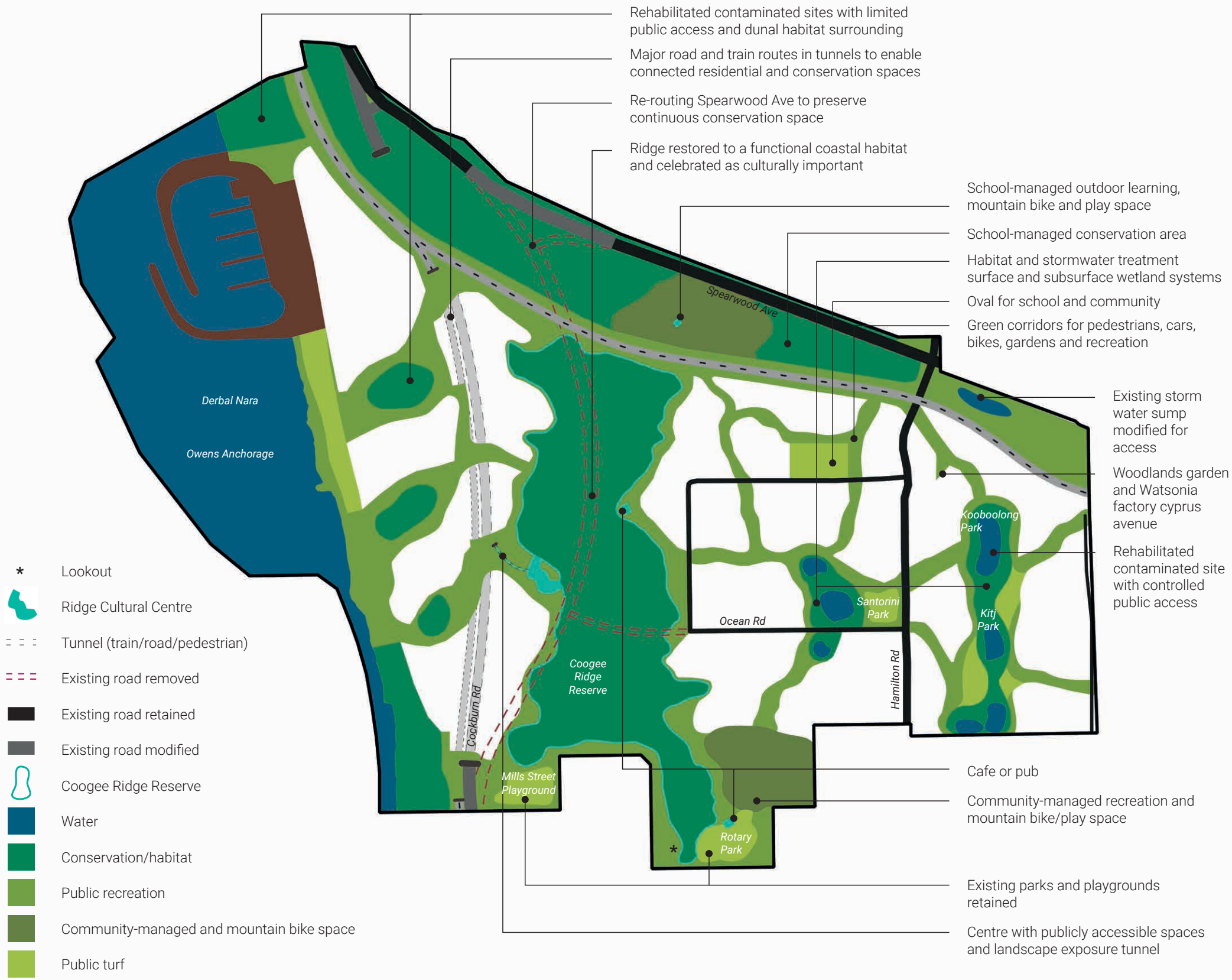
All the conservation and recreation areas are multipurpose – affording water and soil treatment, fire break, aesthetic, human health and habitat functions. No areas are completely blocked to people although the modes of access are curated to best balance the complementary purposes.

(1) 20% has been removed from the mapped areas to cater for local roads.



Key Move 1: Public (*) spaces

(*) = action/education/conservation/service/under-determined/accessible/modifiable/habitat/transport



Place potentials and interaction

This design, and particularly the P(*)S component of it, intends to provide many place potentials for many people. This means that people are encouraged to inhabit the public space in a way that suits them, allowing personal (and possibly shared) recognition of place to emerge. There is a purposeful emphasis on providing a lot of public space – and particularly green space – throughout the site, with minimal restrictions on modes of public use. The largest public space is the Coogee Ridge Reserve which is to be rehabilitated and conserved as functioning coastal limestone ridge habitat. It is intended to support flora and fauna biodiversity, ecosystem and cultural research, and pedestrian visitor access.

The site is big and there is potential for the Coogee Ridge Reserve to become a boundary between the east and west residential areas, rather than a border of activity. To mitigate this possibility, attractors of activity are proposed alongside the ridge to initiate a density of people and facilitate place-based interactions.

- The Ridge Cultural Centre is the primary ridge-side attraction – supporting researchers, artists, the local community and visitors (more details on page 45).
- An informal cafe gathering space on the eastern side of the ridge will support day-to-day interactions for residents in that area.
- Two community-managed areas of land are allocated to continue support of the informal uses that currently occur at those locations. The northern school-managed area is currently a grove of *Eucalyptus gomphocephala* trees with a network of kids' bike tracks and jumps. This space can remain as an outdoor education and play space for the extended school community. An equivalent area at the south of the site is intended to be used and modified by the whole community – for making mountain bike tracks and dog walking. It is purposefully located beside the children's playground and new cafe/pub attraction.

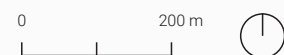
It is assumed that higher intensity peopled recreation will occur at the edges of the larger open spaces and throughout the residential areas. The design is intended to provide contiguous open spaces that support a multitude of uses in close proximity to private houses. It is not clear, for example, where the street ends and the local park starts because the streets are all shared-use greened corridors. Some spaces have larger trafficable surfaces for cars but pedestrian access, opportunity for gardens, playgrounds, gathering and recreation are consistent throughout all the public recreation land. These are hybrid spaces and residents are invited to form their own conceptions of what a space offers them, as proposed by Hood (2004) and Bolleter (2016b).

Landscape value and learning

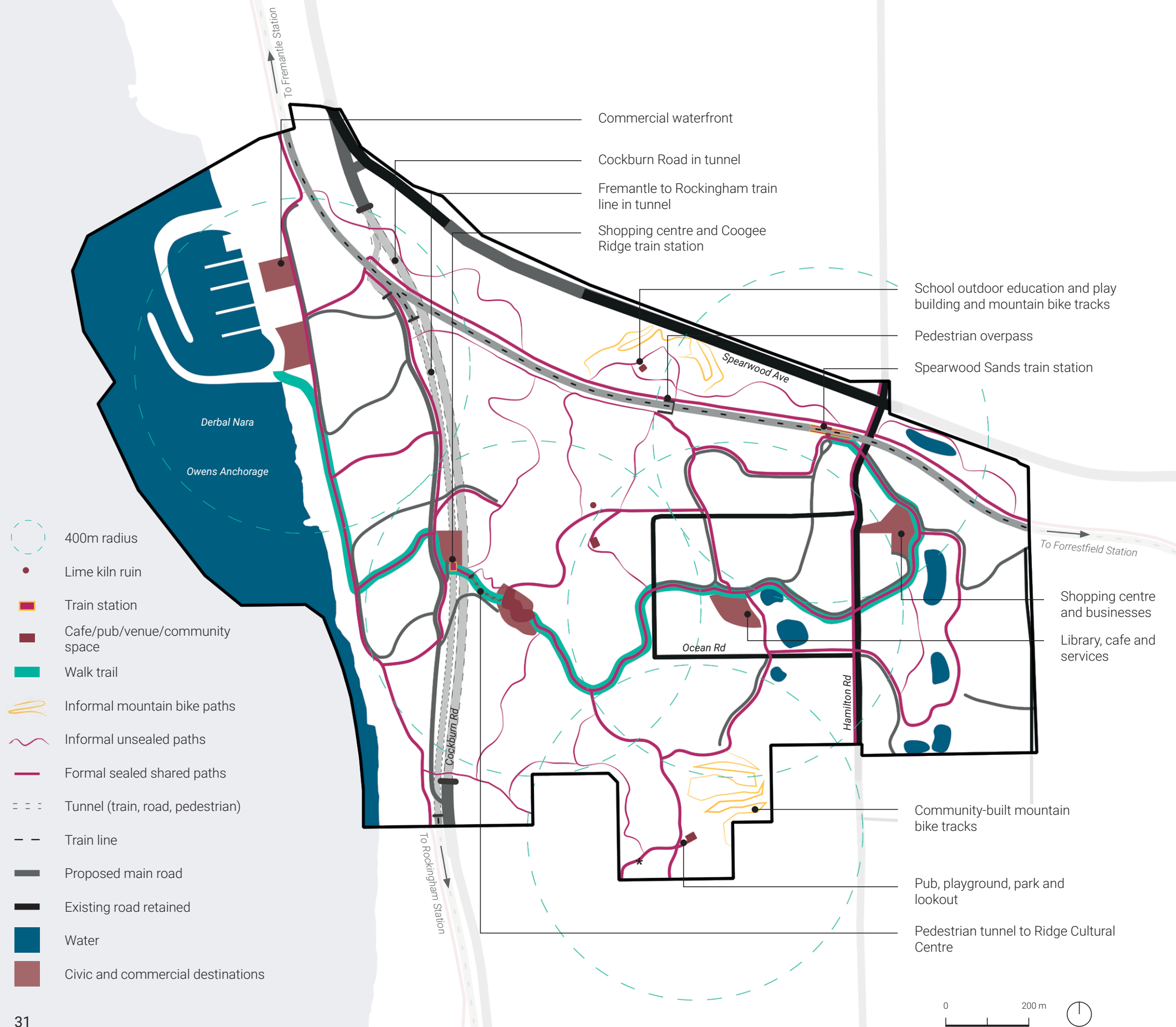
The design of the green networks within the residential areas reflects the geomorphology of the site. The spaces on the western side take the form of shore transverse Quindalup dunes – alternating between more and less stable 'dune' ridges. The vegetated areas coincide with the post-industrial contaminated sites, where appropriate dense vegetation will be used to aid soil remediation and prevent people from coming into contact with the contamination. Contaminated topsoil will still need to be removed and replaced at these sites (DWER 2020). The corridor network on the eastern side of the ridge reflects the way water follows the topography to the wetlands. It is intended that storm water does flow, exposed, along these routes, and that people are equivalently encouraged to move towards the larger lower wetland spaces.

Currently the Coogee Regional Open Space does not have much biodiversity-supporting habitat and is dominated by weedy regrowth. The cultural significance of the ridge is not celebrated. It is, however, used by residents for dog walking, bike riding, and finch nest-material gathering. These activities are encouraged to continue in the proposed design and the Coogee Ridge Reserve will still allow people access via a path network. Knowledge of this ecosystem and landscape mythology can be researched, shared and celebrated via activities and interactions within the Reserve and the Ridge Cultural Centre.

The current large marina (being built) requires the majority of the site coastline be reinforced with rock armory and there is little access to natural beaches and headlands near residential areas. This serves to disconnect people from the ocean and limits foreshore activities – reducing the ocean to a view. The proposed smaller boat pen and launching area reduces these impacts while maintaining the attractive boating and commercial foreshore facilities.



Key Move 2: Modes of movement



The available modes of movement are important because they influence how people interact with spaces and each other. The primary intention with this design is to cater for, and encourage, walking and cycling throughout the site. People are able to observe and enjoy more detail and complexity in the landscape when they walk (compared to driving). Observing the details brings many more possibilities of place recognition over different scales, and opportunities to learn from, and become connected to, the urban landscape.

The reintroduction of a Fremantle to Forresterfield passenger train will connect the site to inland southern suburbs via the Spearwood Sands train station. The reintroduction of a Fremantle to Rockingham coastal passenger train, and the Coogee Ridge station, will connect the site to southern coastal destinations. Together these two stations provide easy work commute options for residents and offer visitors options for car-free round-trip visits through the area. The Coogee Ridge station is located in a shopping precinct and near the Ridge Cultural Centre. The Spearwood Sands station is within the school zone, with the intention that kids from surrounding areas can attend that school.

The Rockingham train line and existing Cockburn Road have been pushed down into tunnels beneath the western residential area. This offers many benefits to the site. Most importantly the tunnels prevent major infrastructural works cutting through the ridge (as the current alignment of Cockburn Road does), helping to facilitate east-west movement through the site and allowing the ridge-top to act as a central border of activity, not a great divide.

The formal path network is sealed, accessible to all and connects train stations, major destinations and ecological zones – wetlands, ridge and coast. These routes sometimes follow train corridors and major roads, but in other locations are within shared street or pedestrian-only areas. There is one main sign-posted trail that guides visitors through the area from the Spearwood Sands train station to the Coogee Ridge train station, and on to the waterfront. This trail is 1.9 km from station to station and 2.8 km in total. It offers visitors and residents a spacious, treed walk with many options to deviate to other destinations and loop past attractions. The walk serves to connect the community over the ridge-top and encourages visitors to explore the whole area. The introduction of formal walk routes will cater for the majority of users – preventing major habitat disturbance in sensitive areas as the local resident population increases.

The extensive informal path network preserves the existing modes of movement through the ridge reserve area, allowing local residents to continue using the spaces for dog walking, bike riding and exploring. Fewer people will want to use the informal paths (than the sealed ones), but they are important for supporting the connections people already have with the areas adjacent to their houses. The areas that are currently used for mountain-bike riding will be retained for that use, and residents are encouraged to modify and inhabit these spaces freely.



Van Gogh Walk, London. A pedestrian priority shared street (Van Gogh Walk 2020, Project for Public Spaces 2020).



Examples of pedestrian and shared path types.

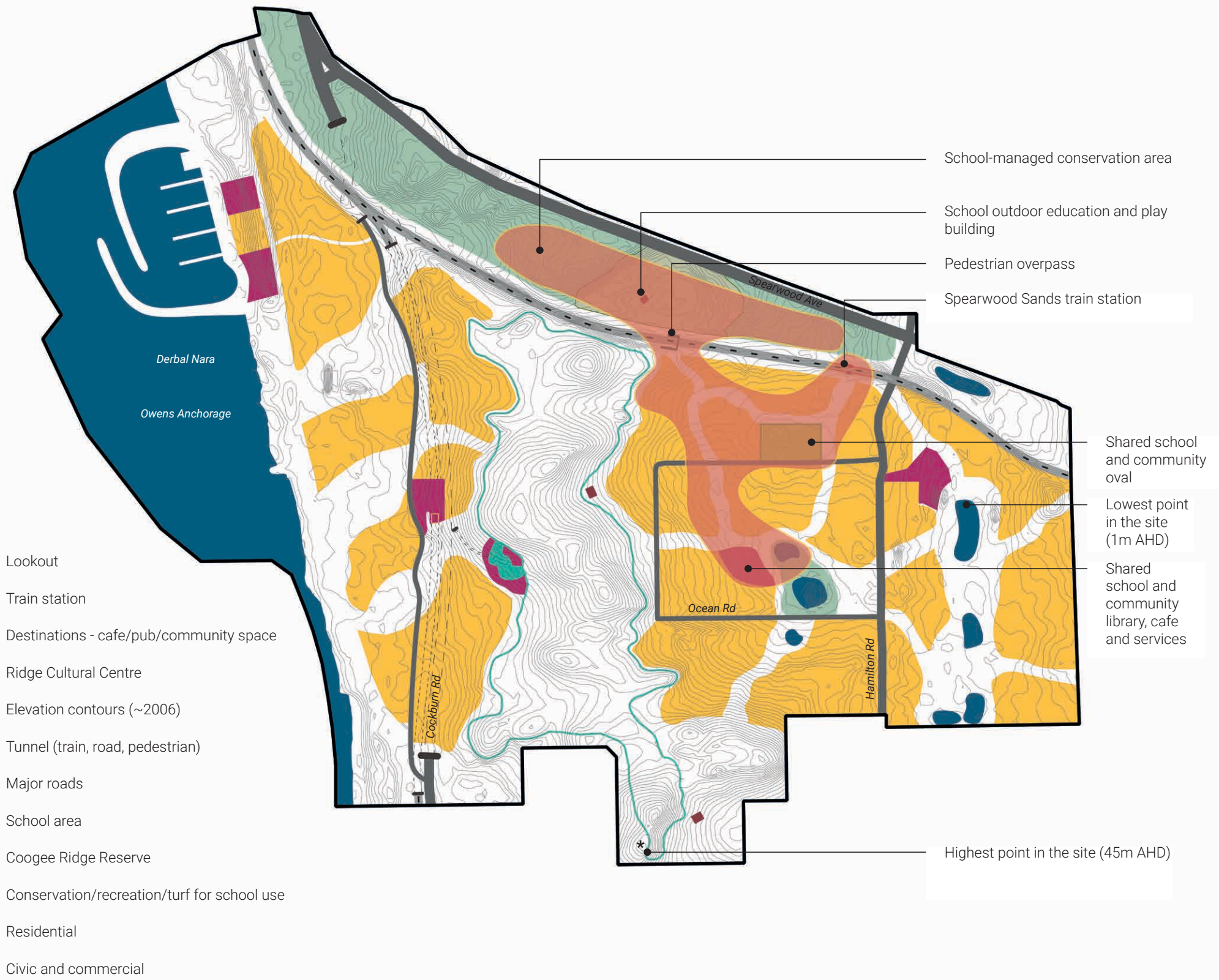


St Helena tunnel, NSW. Example of the intended road tunnel entrance (Skyscraper City 2015).





Key Move 3: Living beside, beyond inside



- * Lookout
- Train station
- Destinations - cafe/pub/community space
- Ridge Cultural Centre
- Elevation contours (~2006)
- - - Tunnel (train, road, pedestrian)
- Major roads
- School area
- Coogee Ridge Reserve
- Conservation/recreation/turf for school use
- Residential
- Civic and commercial



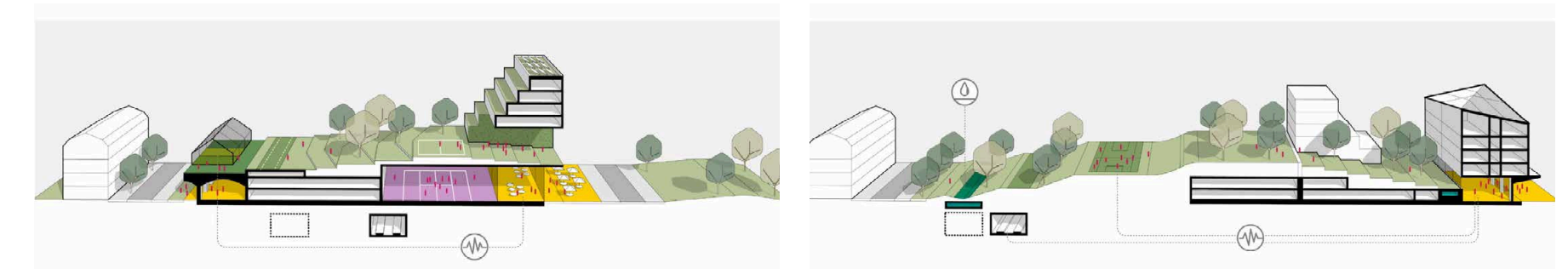
The residential areas across the site are intended to be diverse, and responsive to their position within the landscape and proximity to civic, commercial and ecologically significant spaces. The transitions between private and public areas are open and will invite residents to connect with and inhabit the surrounding public (*) spaces. In this way many people coincide in spaces; towards Gehl and Sennett's propositions that urban design should be about maximising opportunities for people to interact (Gehl 2011, Sennett and Sendra 2020).

Medium density living is intended for the whole site, with some variability in density and much variation in dwelling types and configurations. It is intended that there is little benching done to prepare dwelling sites, and rather the topography remains recognisable and the built form adjusts to best use the space. In this way variety in form becomes normal and people are encouraged to value living configurations beyond ocean-facing smoothed slopes.

It is intended that people are encouraged to form place attachments at the street and residential precinct scale, rather than limiting their spatial connections to their private dwelling only. Harnessing the social mechanisms of place attachment is important at this scale and Sennett and Sendra (2020) suggest that shared infrastructure systems are one way to instigate social place attachments. For example, shared energy (solar and batteries), water (harvesting and use) and transport (share cars) form avenues for shared identity in place.

Spaces with civic facilities (library, shopping centres, businesses and community venues/performance spaces) and attractions (cafes, restaurants and bars) are placed throughout the site, with the intention of maximising accessibility and, therefore, opportunities for people to coincide. Residents live within walking distance of multiple destinations, and are offered varied pedestrian experiences as they move between spaces. The commercial space in the east has shops, businesses and venues overlooking the wetland. The central civic space has a library and cafe/cafeteria. There is a food shopping centre near the Coogee Ridge train station, and waterfront cafes/bars and restaurants near the boat marina.

There is a school to cater for the growing population and projected increase in proportions of families (compare to 2016). The school area is not a separate zone within the site. Instead the school facilities are set amongst residential, civic and conservation/recreation areas. This means that school buildings are located on residential streets, that small shared streets are the corridors by which students move, that the local cafe and community library is shared with the school, and that the student 'grounds' extend into the school-managed conservation and play area to the north of the train line. The students are not separated from the rest of the neighbourhood and are offered a range of spaces and experiences throughout their day. Many options to form connections to places and people within them.



International Competition Rosenstein, Germany, entry by DUTCH urban solutions, demonstrating high density residential design with variable topography (DUTCH urban solutions 2018).

Residential design

The design proposal presented here offers an alternate residential density distribution to that outlined in the current structure plans for Port Coogee and Packham North. The structure plans contain 67 ha of residential area (within this study site) and the distribution of density (represented using R-code values) is shown in dark blue in the figure opposite. The distribution indicates higher proportions of land allocated to the very low (R20/25) and very high (R80) densities, but less in the medium density range (City of Cockburn 2020b). This distribution prioritises two main types of residential form – stand alone houses and multi-dwelling complexes of five to eight storeys (Taylor, Burrell, Barnett 2010). There is little opportunity or intention for development of dwelling form variability. By contrast the proposed design suggests an inverted density distribution that gives a greater proportion of residential land to R30 and R40, in particular. There is greater opportunity for dwelling form diversity in this range (standalone/multi-dwelling/multi-storey) and the number of very high multi-storey blocks is reduced.

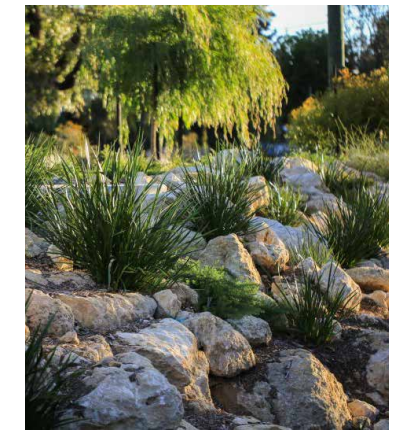
This approach responds to projected household types and corresponding dwelling requirements for the area. Census data for the site has been compared to North Coogee and Coogee suburbs, below. Coogee is an old low-density suburb and North Coogee offers recently re-developed higher density coastal living. The existing structure plans for the site reinforce this dichotomy with higher R-codes proposed for Port Coogee than North Packham (City of Cockburn 2020b). By comparison this study proposes that the whole site can support attractive medium density living for families, couples, group and solo households. The table below shows the projected make-up of dwelling and family types that this proposal caters for (using the same population and dwelling projections as the structure plans). In comparison with the (partially re-developed) site in 2016 there will be proportionally:

- more households with children (to 50%),
- more 1 and 2 bedroom dwellings (but more 3 bedroom houses (65%) than family households (50%) to cater for those who need more space),
- less houses with spare rooms, and
- the intention to design for more partially shared living (5% group households).

	2016 site ¹	2016 North Coogee ¹	2016 Coogee ¹	Site structure plans ²	Site proposal
Dwellings	831	1 154	1 913	3 600	3 600
People	1 950	2 388	4 597	6 700	6 700
Children (%)	23	19	26		26
Adults (%)	77	81	74		74
Dwellings with spare rooms (%)	70	-	-		↓
0/1/2 bedroom dwellings (%)	16	33	8		35
3 or more bedrooms (%)	71	65	90		65
Unknown no. bedrooms (%)	13	2	2		-
Family households (with kids) (%)	44	37	50		50
Single households (%)	16	20	18		17
Couple households (%)	38	40	30		28
Group household (%)	2	3	2		5

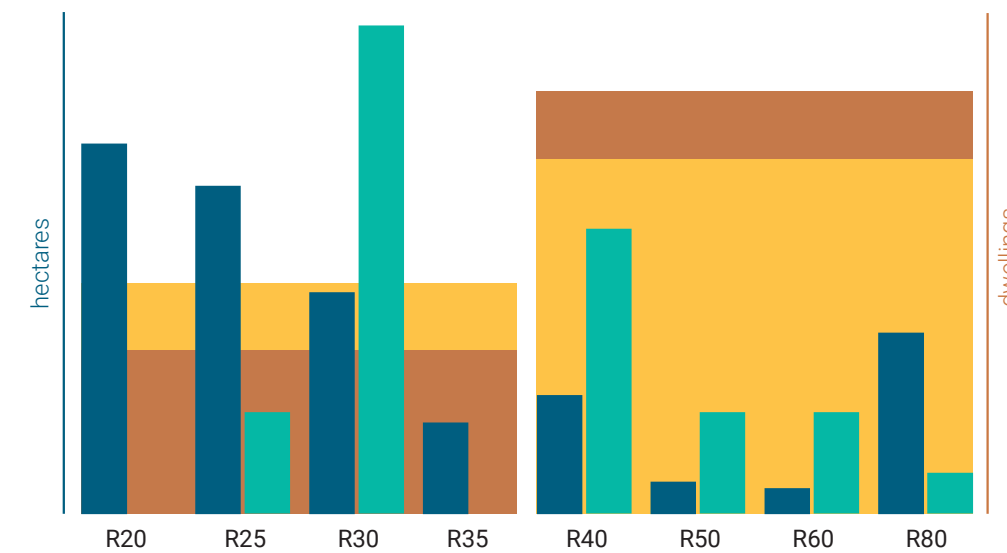


Living Village by Jasmax & Viva! Project, Christchurch (The Viva! Project 2014).



WGV at White Gum Valley by CODA Studio, Urbis, Landcorp and Josh Byrne and Associates, Perth (ArchitectureAU 2016, Bioregional Australia 2019).

The following graph shows the current and proposed R-code distributions for the site and the proportions of dwellings in the low density areas (R20 - R35) compared to high density (R40 - R80). The proposal places more dwellings in the high density range, but with fewer in the very high R80 (5-8 storey block) density.



Current structure plans within the site^{2,3}

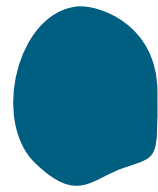
- Hectares of land (total 67 ha)
- Dwelling count (total 3600)

Proposed design

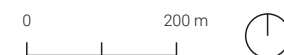
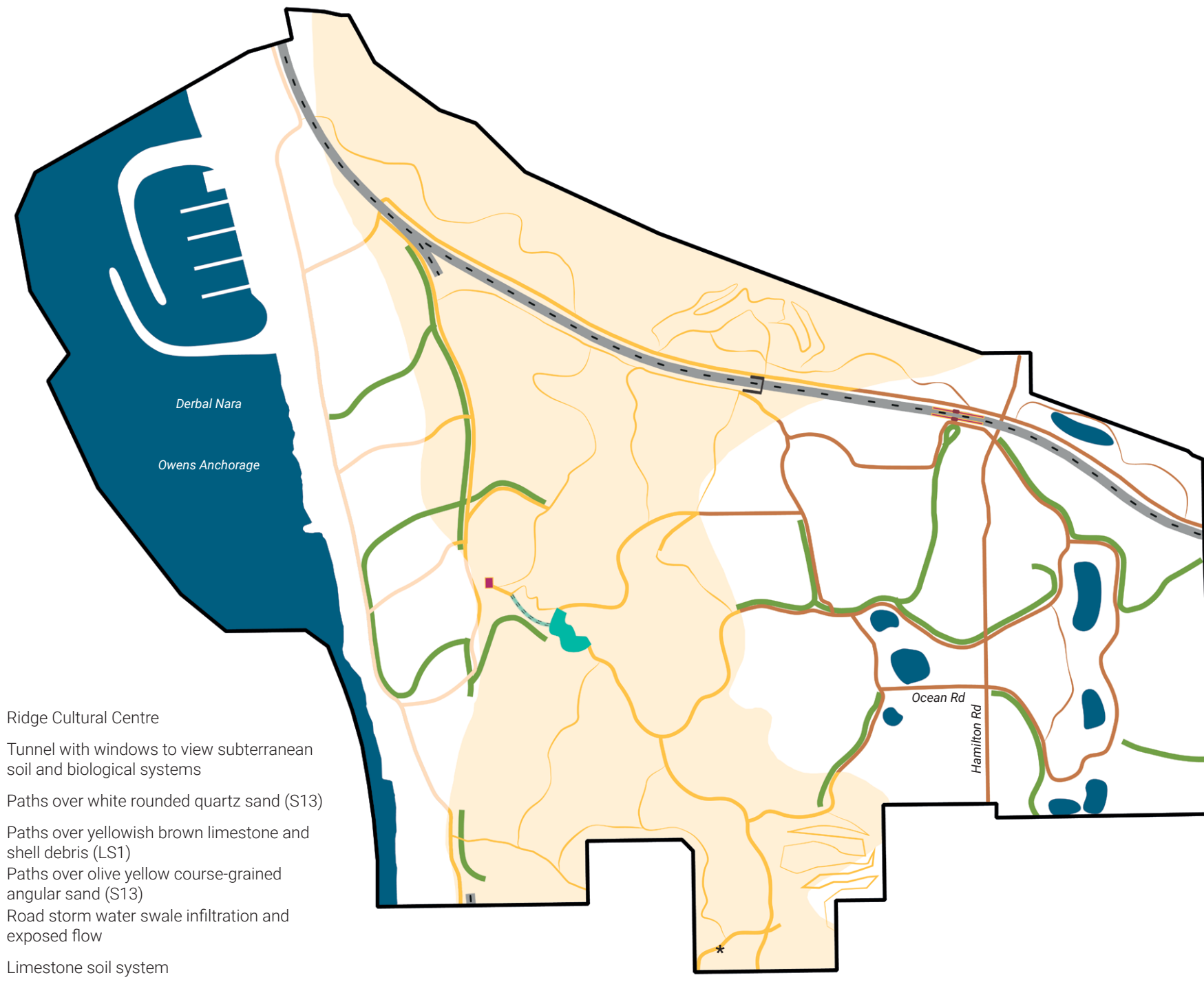
- Hectares of land (total 55 ha)
- Dwelling count (total 3600)



Nightingale Village by Wowowa and Breathe Architecture, Melbourne (The Fifth Estate 2019).



Key Move 4: Systems to the surface (soil and water)



The day-by-day movement through one's local landscape is where our conceptions of 'normal' arise and where we learn what to value. The design presented here aims to offer the passer-by a rich landscape experience and opportunities to learn about urban and ecological systems. Designers can place markers of value in landscapes and offer people something to learn, something to feel, to understand. A trend of homogeneity for the purpose of clarity does not give a resident many possibilities to form their own personal conceptions of value. People are able to make sense of complexity and are able to determine their own, diverse, urban landscape readings and preferences.

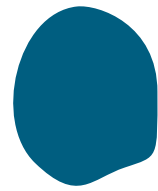
This design offers a richness of urban landscape experience via markers of value placed on urban service systems and ecosystem features.

- The network of formal (sealed) paths are coloured to reflect the three major soil types through the site. This encourages residents to form an awareness of where they are in the landscape and encourages them to value this variation. The western coastal areas have very light paths to represent the coastal quartz sands, the central area has a limestone-yellow colour, and the eastern part of the site has darker yellow-orange paths.
- Storm water flow is explicitly revealed throughout the site. Roads are purposefully set within green corridors with visible storm water infiltration and flow infrastructure alongside. In the eastern part of the site the configuration of the storm water flow towards treatment wetlands governs the road (and residential) layout.
- There is a pedestrian tunnel from the Coogee Ridge train station to the Ridge Cultural Centre. This provides a sheltered accessible entrance to the venue, but also acts as a canvas on which to expose and ascribe value to the subterranean landscape. Observation panels will allow people to view the soil structure, and the limestone root pipe formations. It will also let them see the buried service pipes bringing power and water to the venue. Skylights let light into the tunnel and plants can be grown beneath them. This serves to exhibit the complexity and intricacy of life systems by presenting them out of the usual context.
- The low lying areas in the eastern part of the site form a series of water treatment surface and subsurface wetlands. Water treating sedges and rushes are planted and able to cope with seasonal changes in water levels.



Examples of coloured bitumen paths as will be used in the three different soil zones across the site.

Examples of storm water swale planting to be used in street corridors.



Key Move 4: Systems to the surface (services)

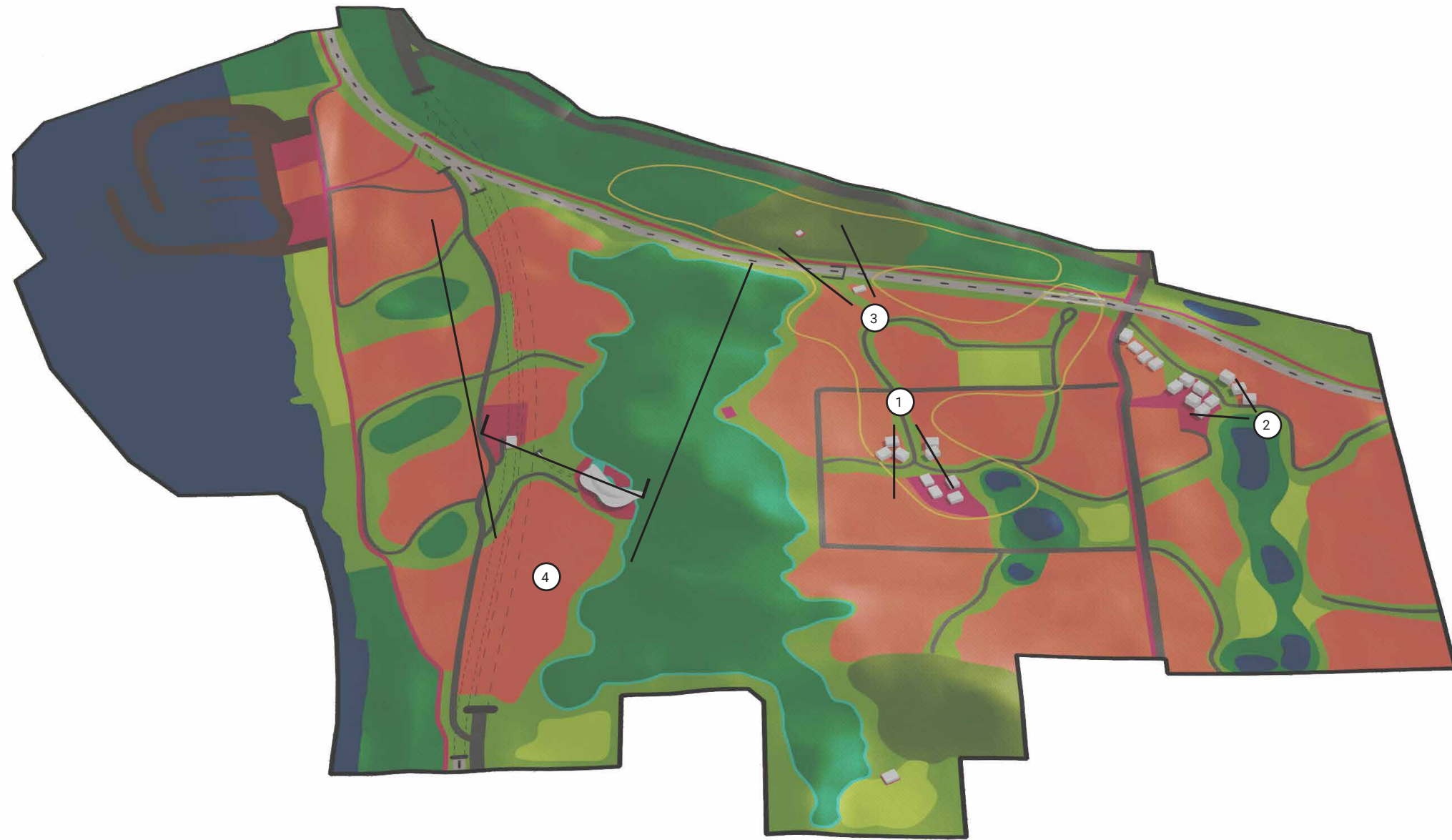


The movement of water through the urban landscape is highlighted and infrastructure routes are aligned with transport corridors.

- The paths along major water service routes are marked with colours and arrows to indicate the directions and types of water passing along that route – scheme water, recycled water and black water flows. The markings are not large or intrusive, but they are intended to inspire curiosity, learning and a perception that it is normal to understand how water comes and goes through urban landscapes.
- The purple recycled water pipe is intended to be supplied from the nearby Woodman Point Wastewater Treatment Plant for use in irrigating recreation areas throughout the site. Local decentralised water recycling systems will be implemented within dwellings, but this large-scale water supply can help support the maintenance of public (*) spaces.
- The major gas pipeline that currently runs through the ridge has been re-routed to follow the train line (as it does at the western and eastern borders of the site). The residential areas do not require the type of gas supply that industrial areas required.
- The major sewer pipe that runs across the ridge is not retained, and rather the lower grade routes along the train line, Hamilton Road and Cockburn Road are favoured. Similarly for the recycled water distribution route. This prevents further disturbance to the ridge-top, reduces the number of access tracks to maintain and prevents the need to pump water over the high elevation area.



Detail locations

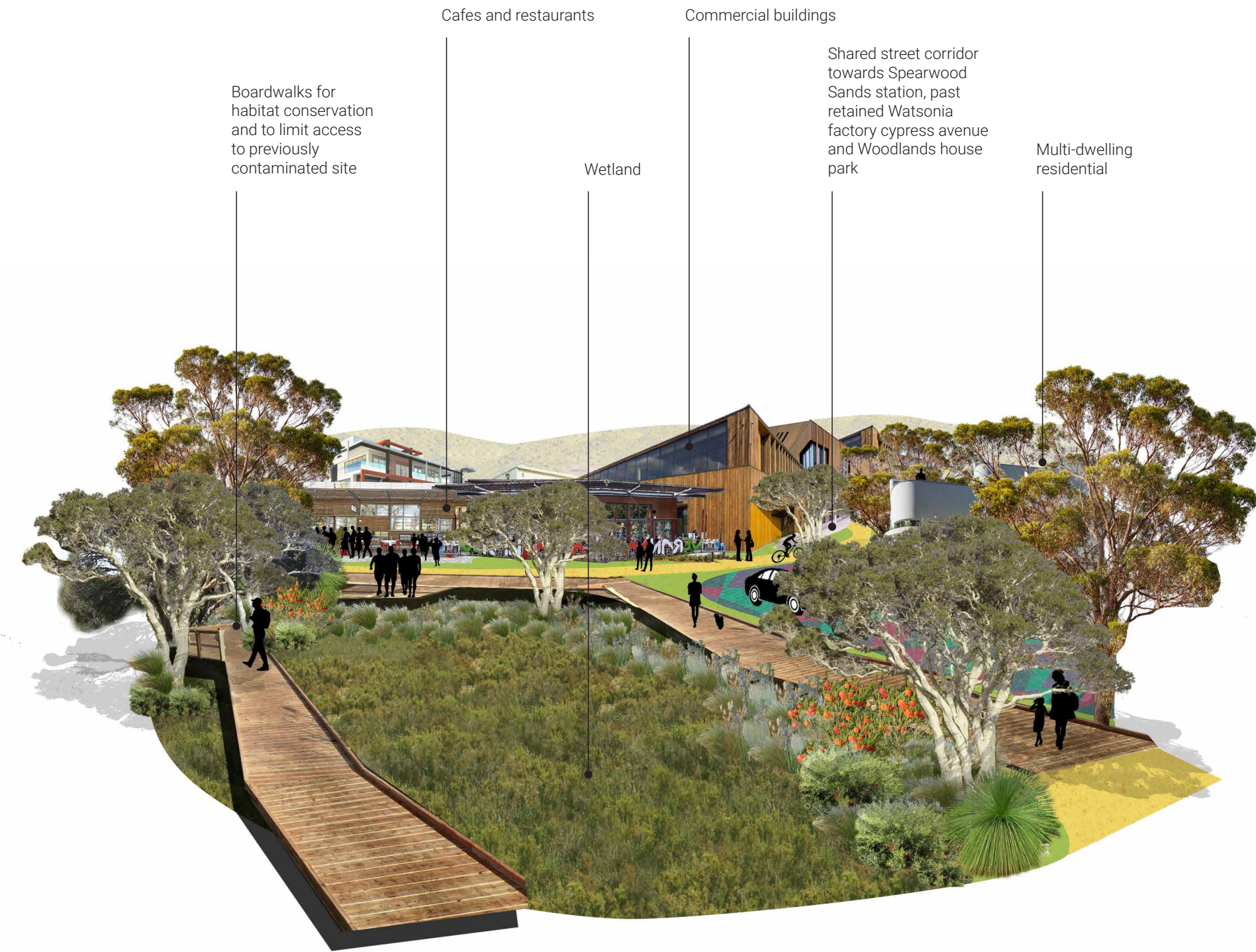


① View
┌───┐ Section

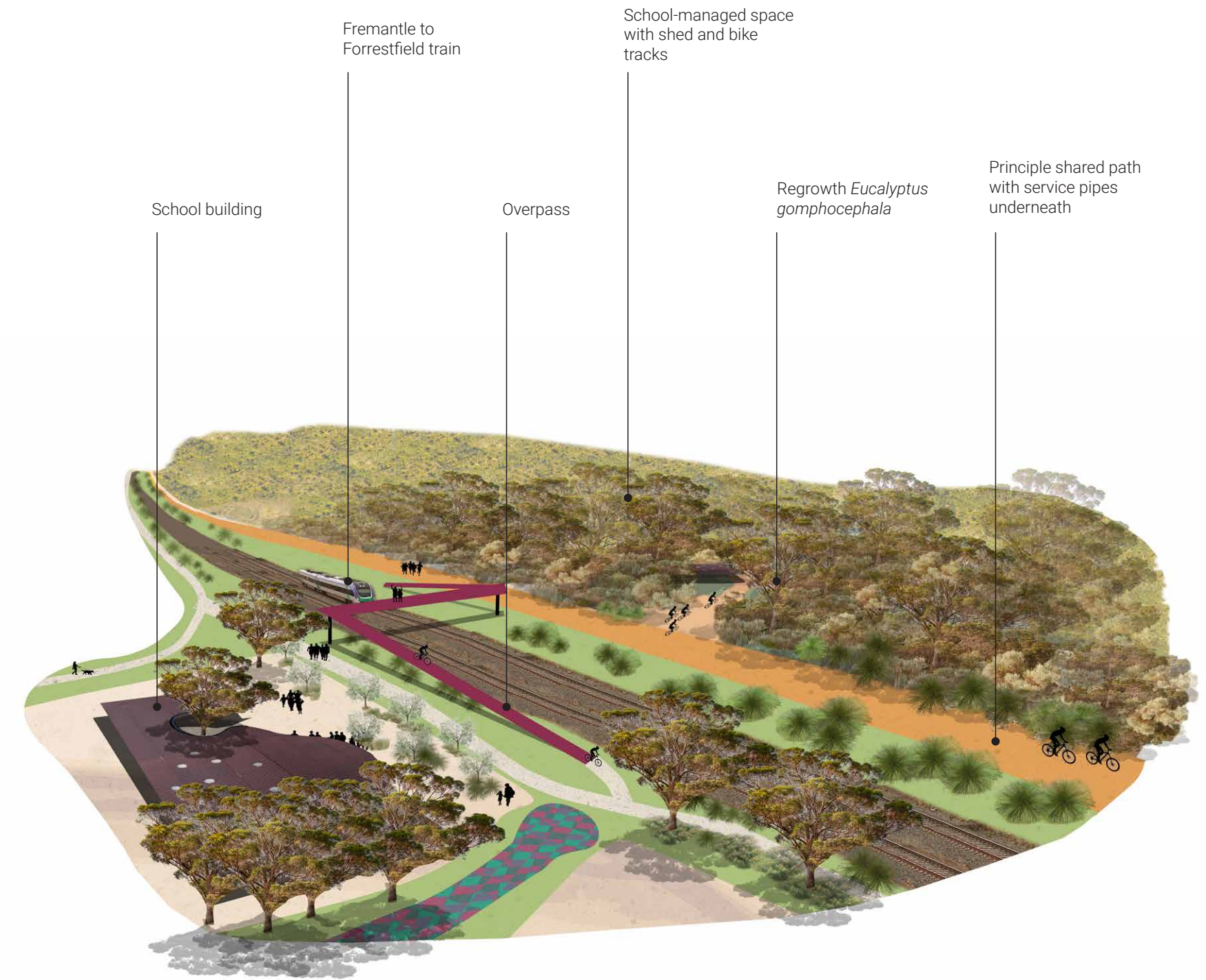
View 1: School area



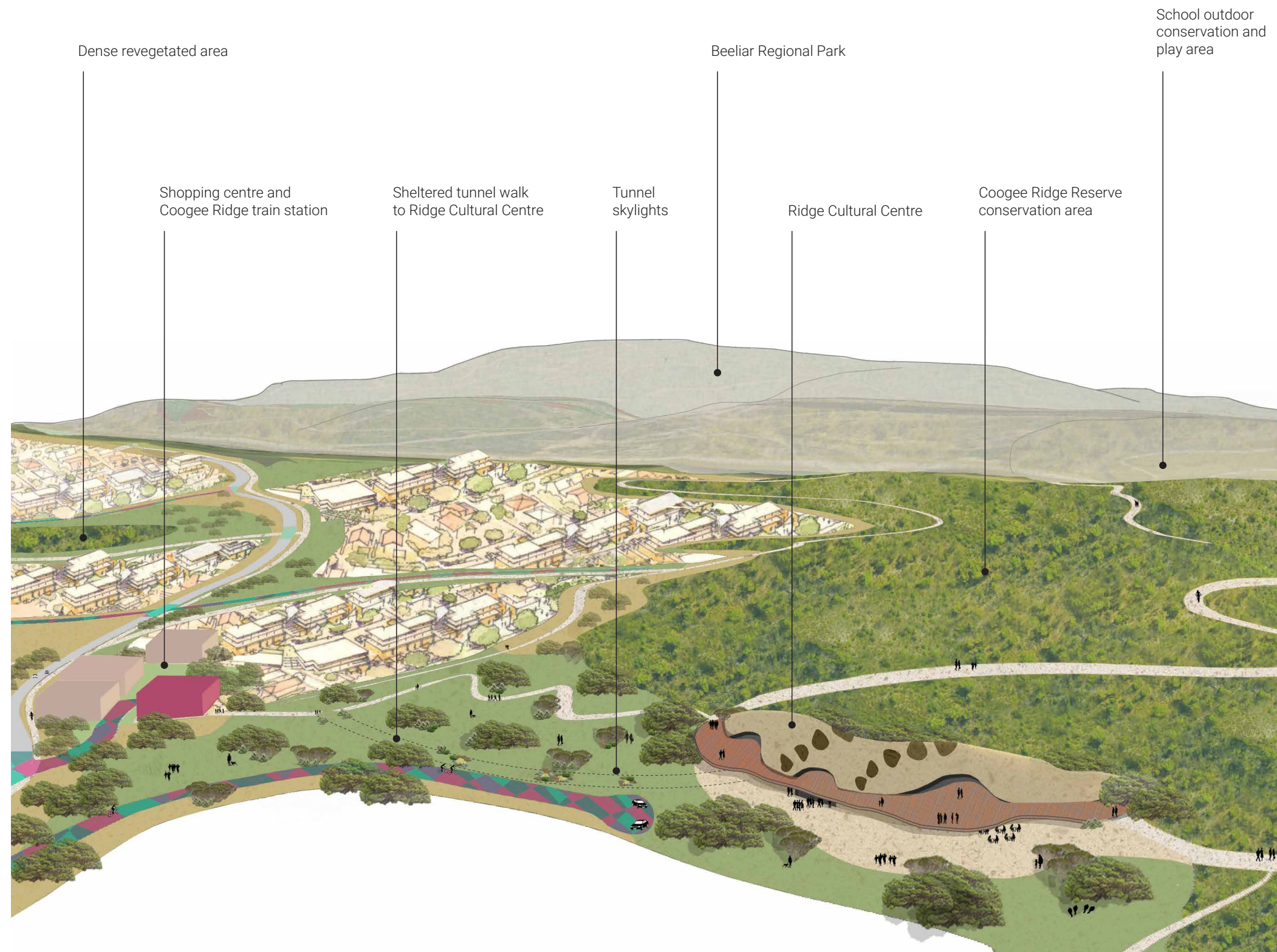
View 2: Commercial area near Kooboolong Park



View 3: School outdoor play and conservation space

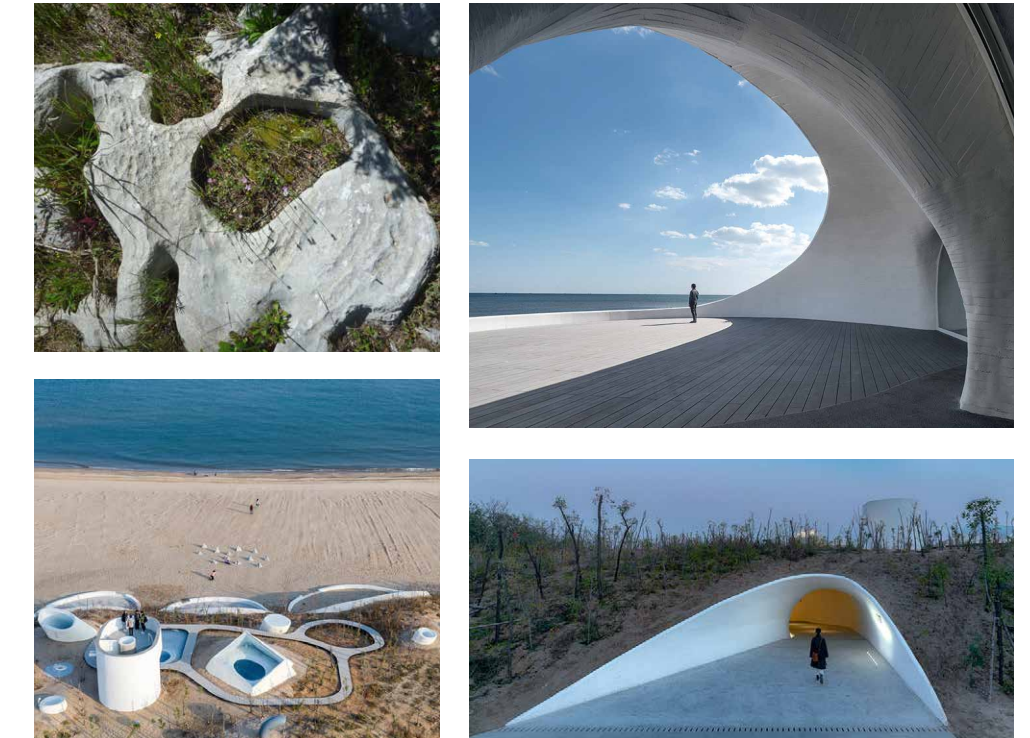


View 4: Ridge Cultural Centre



The Ridge Cultural Centre is a large building that is divided into different spaces catering for ethno-ecological researchers, Indigenous community groups visitors and local residents with galleries and performance spaces, a cafe and information centre, and event facilities. It is intended that some areas are open to the general public. The building is set into the hillside and inspired by the cap limestone forms found on the adjacent ridge.

There is a pedestrian tunnel providing a sheltered accessible route from the train station. This tunnel mimics the root cavities that form in limestone. The space can be used to observe subterranean landscape systems and as an exhibition space. There are a number of skylights along the route that are connected to fibre optic technology – transmitting sufficient light to grow plants in the tunnel. It is interesting to observe the level of technology and effort required to replicate this everyday process in an alternate context.



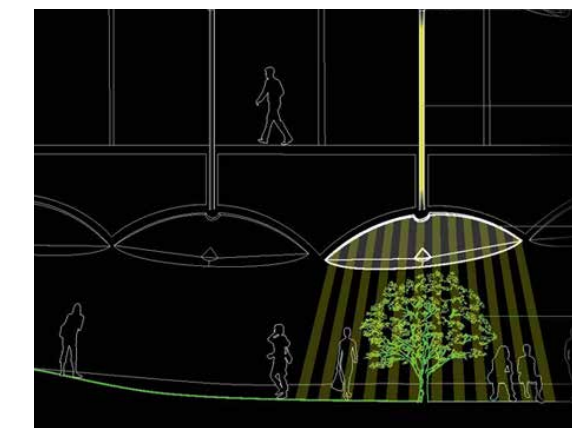
UCCA Dune Museum by OPEN Architecture, China (Arch Daily 2019).



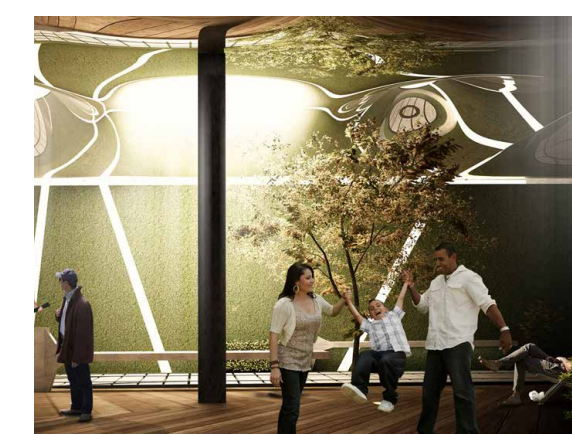
ON-A proposal for Camp Sou Stadium. (Design Boom 2020).



Katwijk Coastal Defence by OKRA, the Netherlands. (Landezine 2015).

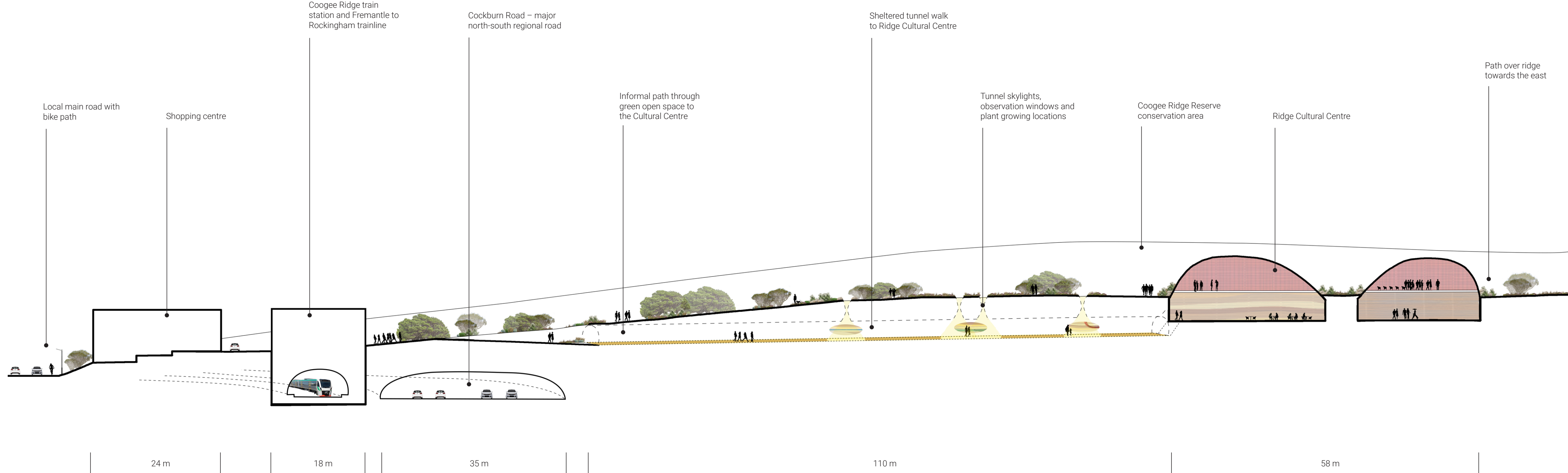


The Lowline Lab by the Lowline organisation (Lowline 2020).



Coogee Ridge train station to the Ridge Cultural Centre

1:500



Reflections

Design outcomes

The design proposal presented here demonstrates how landscape response and recognition can be used to support the potential for place attachment and development of diverse urban form values. Careful response to the nuances of landscape systems – ecological and infrastructural – offers a bounty of scale-traversing opportunities to bring variability, richness and multitudes of possibilities to the urban dwelling experience. Homogeneity, over-determination, and an over-emphasis on ease and the ocean view do not encourage creative responses to the spaces we inhabit and do not inspire individually conceived place-based connections. This design explores some details that can be offered to urban residents, some ideas by which we might encourage an appreciation of urban form diversity, an understanding of how urban landscapes work and an expectation for them to facilitate much more than satisfaction behind the gate.

A hypothetical evaluation of this design would be done using a suite of measures assessing the multiple relationships between individuals, communities, 'natural' spaces and human-made spaces (as proposed by Hes et al. 2020) to capture the complexity that underpins substantive quality living.

Future work

The next phase of this project would include consulting with and listening to current and prospective residents of the area, traditional owners of the land, City of Cockburn planners and the Department of Parks and Wildlife. It is intended that these parties would be the major co-collaborators in researching if and how any of the suggestions from this proposal might be introduced to the area alongside ongoing residential redevelopment.

Although parts of this design proposal are clearly not feasible to implement (sinking Cockburn Road into a tunnel), there is value in exploring ways to introduce the other interventions (or scaled-down versions). Particularly considering the substantial areas of land that are yet to be built on and could, therefore, become test sites for new ideas.

Future work would also encompass details of housing development characteristics including: specification of affordable housing targets, sustainable building/living goals and consideration of decentralised development-scale water and energy systems.

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