

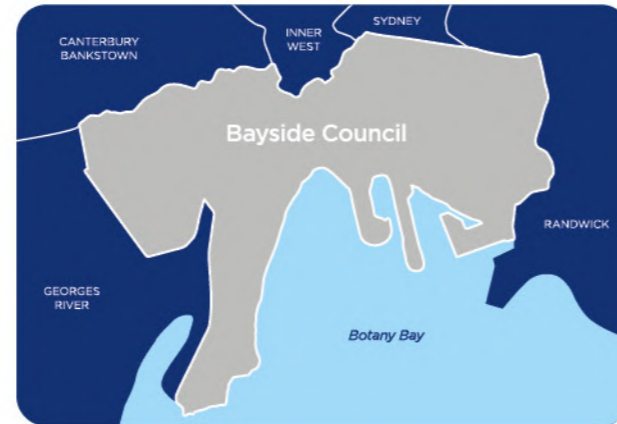


RIVERINE PARK MASTERPLAN

Adopted 24 July 2024

Acknowledgement of Country

Bayside Council acknowledges the traditional custodians: the Gadigal and Bidjigal people of the Eora Nation, and pays respect to Elders past, present and emerging. The people of the Eora nation, their spirits and ancestors will always remain with our waterways and the land, our Mother Earth.”



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Τηλεφωνικές Υπηρεσίες Διερμηνέων بخدمة الترجمة الهاتفية 電話傳譯服務處 Служба за преведување по телефон

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Arnccliffe

Cahill Park

Marsh Street

M6 Compound

Wickham Street

Kogarah

Eve Street
Wetland
SWSOOS

M5 Motorway

SWSOOS

West Botany Street



Spring Creek
Wetland

Riverine Park



Spring Creek

Landing Lights
Wetland

(Source: Google Map 26 November 2020)



1. Introduction

Riverine Park is situated 400 metres from Sydney International Airport and adjacent to the Arncliffe and Banksia urban growth areas.

Positioned adjacent to key city infrastructure including the M5 and M8 motorways, Sydney Water desalination pipe, Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS), the park has been heavily impacted by its infrastructure history and surroundings.

The park's landscape bears the imprint of its history, having been heavily modified by past land use including Sewage farms, sand mining and land-filling.

The Riverine Park Masterplan acknowledges the layers of history that have shaped this precinct and moreover, it identifies the opportunity for the precinct to improve and become an inviting public space with a prime foreshore presence. This masterplan builds upon the analysis, consultation, objectives and actions outlined in the *Arncliffe and Banksia Green Plan*, Central Sydney Green Grid and the Bayside Priority Green Grid Corridors and Spatial Framework.

The masterplan envisions a future where Riverine Park and its periphery open space thrives as a symbol of progress and adaptability, transforming formerly neglected spaces into thriving, vibrant, beloved, activated environments.

Key design considerations informing the plan include:

- Legibility of access and circulation including universal access.
- Addressing conflicts that will arise as use increases between vehicles, pedestrians and cycle movements.
- Connectivity with its urban context and broader public realm.
- Recognition of site heritage and local values.
- Enhanced tree canopy and strategies to mitigate the urban heat island and climate change.
- Increase planting selection from the existing planting palette to improve biodiversity and botanical diversity.
- Enhancement of outdoor spaces and its programming.
- Provision of an all inclusive play space and amenities.
- Opportunity to create event spaces for a range of activities and programs.
- Upgraded park furniture, pavements, structures and park amenity.
- Improved signage and use necessary way-finding recognise First Nations language and culture..
- Consider opportunities for public art and potential for trails within and beyond the park.
- Improve views to better connect the open space to the Cooks River foreshore.
- Increase usage and flexibility of existing underutilised amenities, facilities and civil assets.
- Increase usage and upgrade sporting and recreation, facilities to meet the needs of the growing community.

1.1 Design Principles & Strategy

Our vision is to craft a dynamic and welcoming landscape project that seamlessly integrates nature with recreational activities. Emphasising water-sensitive urban design and native vegetation, our initiative celebrates the unique setting at the Cooks River mouth and aligns with the significant Green-Blue grid in the Bayside LGA. The park is designed to offer diverse recreational opportunities, catering to a wide array of community members, enhancing river connectivity, championing environmental sustainability, and encouraging active lifestyles for everyone.

The Riverine Park Masterplan is guided by the following design principles:

- Respect Site Context
- Coastal and Environmental Protection
- Connectivity within and beyond
- Promote active lifestyles and recreation
- Safety for all
- Sustainable infrastructure

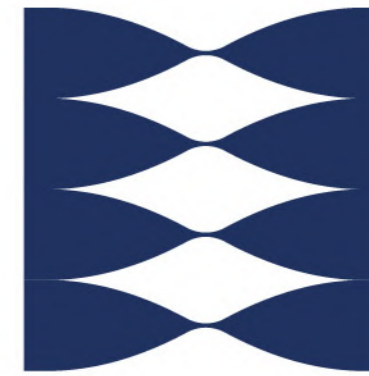
These principles are elaborated in Chapter 5, supported by evidence-based Design Strategies that inform the comprehensive Riverine Park Masterplan and its implementation phases.

This report references numerous guidelines and studies that underpin the development of the Riverine Park Masterplan, ensuring a robust and well-informed approach.



INTEGRATING RECREATION AND WATER-SENSITIVE DESIGN

Develop a vibrant, inclusive riverside space that merges water-sensitive design with varied recreational offerings.



GREEN BLUE GRID UNIFICATION

Enhance the park with native flora, sustainable water practices, and spaces for community and sports activities, aligning with the green-blue grid concept.



CONNECTING COMMUNITY, SUSTAINABILITY, AND ACTIVITY

Foster a nature-integrated park that strengthens community-river ties, supports environmental sustainability, and promotes active living.

2. Background

2.1 Current Site Context

Riverine Park is located at 210 & 210B West Botany St, Arncliffe to the west of Sydney International (Kingsford Smith) Airport and 10km south of the Sydney CBD. It is bounded by Cooks River, Firmstone Gardens, West Botany Street, Barton Park and Muddy Creek.

The overall site is approximately 39 ha in size (Figure 1 - Location Plan). The site is covered by State Environmental Planning Policy (Precincts—Eastern Harbour City) 2021. The majority of the site is zoned for open space with a road reserve corridor through the centre of the site.

The Riverine Park site is entirely within the suburb of Arncliffe which is a residential area comprised of mostly low density dwellings and some unit development and is adjacent to the Bayside West Urban Growth precinct. The park is approximately 1km from Arncliffe Train Station and town centre, 1 km to the Botany Bay foreshore, is within the Rockdale Wetlands Corridor identified as part of Sydney Green Grid recreational open space and wetlands. The Rockdale Town Centre and Brighton-Le Sands Town Centre are both approximately 1.5km away. The end of the east-west airport runway is only 400 metres away from the study area and part of this site is impacted by the airport public safety area (PSA).

The main access to Riverine Park is via West Botany Street which is a regional road. Secondary access for pedestrian and cyclist is via Eve Street, Firmstone Gardens and a active transport link from the adjacent Barton Park connecting to the M6 Stage 1 Active Transport Corridor that terminates at Scarborough Park. Future stages of this active transport corridor are anticipated to continue along with the implementation of the M6 motorway.

In the past decades, the park has been underused. Mostly because the quality of the park infrastructure and amenity have declined and the uncertainty associated with the future road corridor limited the appetite for investment.

Consequently, the site has been temporarily used as a compound to support infrastructure such as construction of the M5, M6, M8, as well as desalination works and telstra cable installation. It has relatively limited recreational facilities that do not match its potential to serve the growing community of Bayside in a prime position along the foreshore of The Cooks River. The site history has left it vulnerable to misuse by opportunists such as vandals who frequent the site and inflict damage and further alienate the general public resulting in the perception that this park is unsafe. The nature of the site is also increasingly witnessing homelessness as well as parking for adjacent construction including heavy vehicles occupied by nearby businesses.

The completion of infrastructure work, such as the M5, M6 and M8 now allows this open space to return to an entirely public use. The Riverine Park Masterplan seeks to guide the reactivation of the park to create a vibrant and exciting place that caters for the Bayside Community.



Figure 1 - Location Plan

2.2 Historical Context

The traditional owners of the area are the Aboriginal Peoples of the Eora Nation including the Gamaygal, Gwegal, Bidjigal and Gadigal Clans and collectively they are known as the “water people”.

Prior to European settlement, the Bayside Local Government area was comprised of coastal, wetland, waterway and bushland environments that sustained the Eora Nation with plentiful resources to support a rich culture.

Arncliffe’s name comes from a small village called Arncliffe in North Yorkshire, England. The name appears in the Domesday Book of 1086, as ‘Arneclif’, meaning Eagle Cliff.

Between 1895 and 1899, The Southern and Western Suburbs

Ocean Outfall Sewer (SWSOOS) was constructed for the disposal of sewage from much of Southern Sydney. It stretched from Marrickville to Rockdale. The sewage from this system flowed to a sewage farm located at present-day Riverine Park and Barton Park. The extensive tract of open space including Barton Park, Firmstone Gardens, Riverine Park and Landing Lights Wetland is a significantly disturbed landscape with areas of it used for a Sewage Farm servicing Sydney for 30 years until 1916.

The sewage farm which was 200 acres in size was Sydney’s earliest attempt at purifying sewage in the hope of beating the major sanitary problems of the era. The system is of considerable historical and scientific significance as one of the early sewers to service the southern, western and Illawarra suburbs of Sydney. In the late 1890s, the Sewage Farm was extended to allow for the disposal of the sewage from the Western Suburbs.

The northern side of the river was mainly occupied by small market gardens. The secondary function of the Sewage Farm was to utilise the manure value of the sewage to produce much-needed vegetables for household.

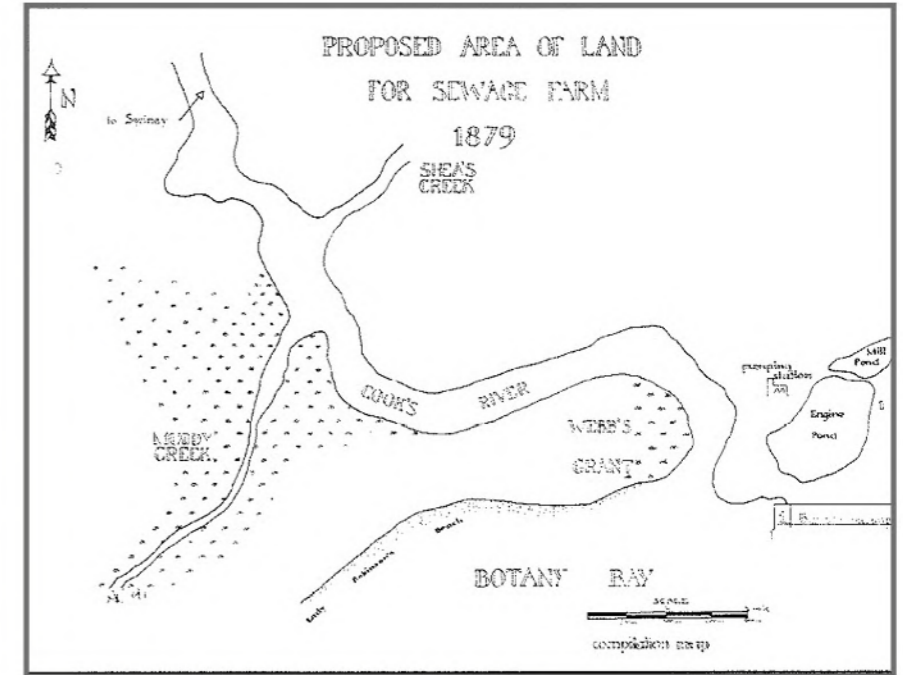


Figure 3 - The plan dated 1879 shows the Sewage Farm was proposed at the land on the southern side the mouth of Cook’s River (Source: Australasian historical archaeology, 8, 1990)



Figure 2 - Aboriginal uses of the Cooks River catchment before the arrival of Europeans. (Source: aboriginal history along the cooks river)



Figure 4 - The photo of the Sewage Farm (Source: Bayside Library)

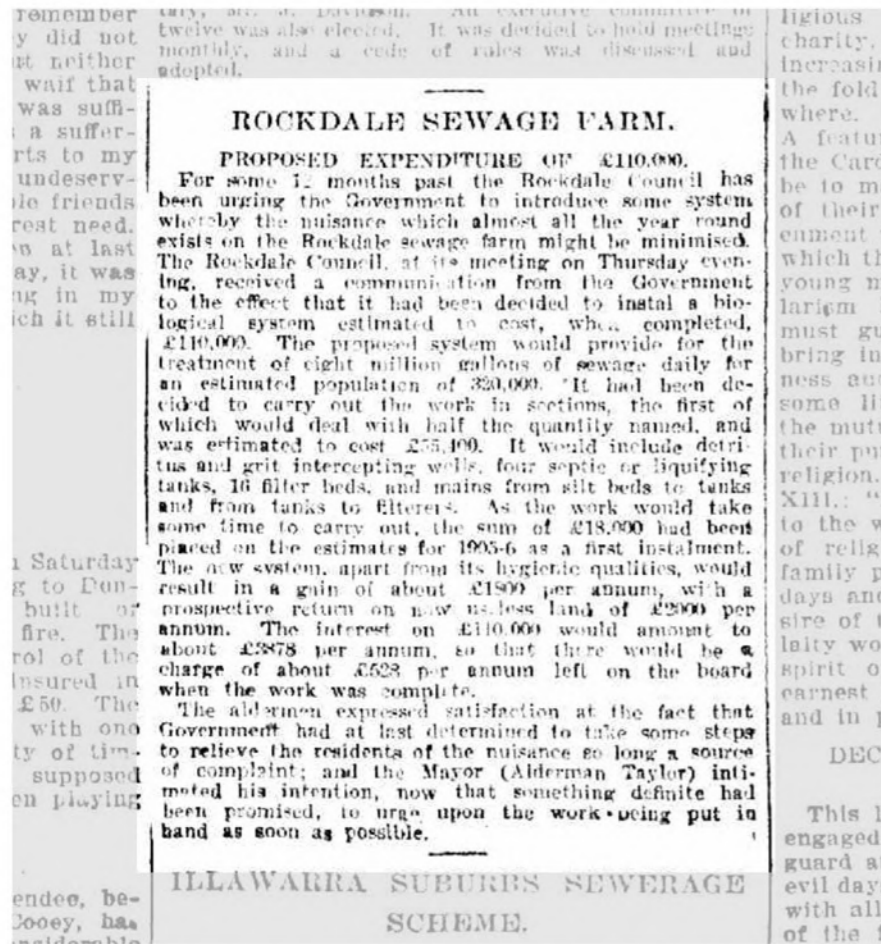


Figure 5 - News article about the Sewage Farm on The Daily Telegraph on Mon 11 Sep 1905



Figure 6 - Aerial view of the site and Muddy Creek before the diversion of the Cooks River, circa 1945 (Source: Bayside Library)

By the turn of the century, the Sewage Farm was in crisis. There was too much sewage on too little land, and the establishment was unanimously disliked by Councils and residents. By then, government priorities were changing, and following parliamentary investigations between 1906 and 1908, the decision was made to transfer the sewage to a new ocean outfall at Long Bay.

In 1916 the SWSOOS was extended to Long Bay ocean outfall. The whole of the sewage of Cooks River and Wolli Creek valleys now drains to this outfall. The three brick barrels, which are encased in concrete, are an excellent example of the oviform brick construction method of the time, which have provided continuous service for over 100 years. The Sewage Farm ceased operating in September 1916. Until 1939, almost all of the site of the Sewage Farm was alienated for sport or recreational facilities, once the Sewage Farm became historically expendable. Later, the SWSOOS No.2 was constructed in 1941 with both systems traversing the former Sewage Farm.

After the closure of the sewage farms, former Rockdale City Council created a large park at the site, by raising the level of the land and the swamp lands in the south-west corner no longer exists.

Between 1947-1956, Cook's River was diverted south of its original mouth to a new outlet into Botany Bay, to allow for extensions to Kingsford Smith Airport. The former sewage farm land was resumed and was extensively sand mined for civil projects and later, as recently as the late 1970s, it was used as a council landfill site.

The history of the site is evident in its altered landform, disturbed and degraded vegetation and poorly developed infrastructure. There is little remaining of former vegetation and no evidence of past use by traditional owners. Yet nature has opportunistically developed alternative habitats that thrive and are now highly valued in the Landing Lights Wetland and the enriched soils continue to support the adjoining heritage listed market gardens.

This area was know as Barton Park North until Riverine Park was gazetted on 25 January 1996 as a reserve and formerly named. The name evolved from the waterways bordering the area. The name describes the planned theme of the park.

2.3 Historical Park Development

The aerial maps in this section demonstrate the history of park development.



Figure 7 - The map shows the original Cooks River alignment and the realigned Cooks River. (Source: New South Wales. Department of Lands, cartographer & Central Mapping Authority of New South Wales. (1950). City of Sydney & environs.)



Figure 8 - Work underway on the building of the triple sewer at Kyeemagh after the reclamation and diversion of the Cooks River, late 1940s (Source: Bayside Library)

YEAR 1943

The aerial photo taken in 1943 shows the landform before expansion of the airport and changes to the Cooks River and Muddy Creek.

The aerial map shows that the central area of the site was used as cricket fields after closure of sewer farm, while the west side facing West Botany Street and north-west corner are used as a Market Garden.

Evidence of the former sewage farm can be sighted at the adjacent Kogarah Golf Course site.



YEAR 1955

The aerial photo in the 1950s shows that the landform is already significantly disturbed. Muddy Creek and the mouth of the Cooks River have been substantially changed due to the expansion of the airport.

The northern corner of the site and adjacent areas north were excavated for sand mining. There is evidence of a golf course north of that area.



YEAR 1965

This site and the adjacent future parklands north and south were continually use for sand mining and land fill during this period.

The expansion of Sydney Airport continues on the reclaimed land.

More residential developments appears in the area, replacing some of the market garden and paddock areas.





Figure 9 - Aerial view of Cooks River Entrance and the Airport in 1973, Riverine Park is visible in the background (Source: National Archives of Australia)



Figure 10 - Photo taken during development of park, after completion of garbage filling, levelling of land near the sewer carrier. September 1959 (Source: Bayside Library)

Year 1975

By this time, the site was operated as a landfill for council operations. Ponds were extended in the lower areas of the site to become the Eve Street Wetland, Spring Creek Wetland and Landing Light Wetland later.

The adjacent land north is expanded as a golf course in areas formerly mined for sand.

More land was reclaimed by the airport.



YEAR 1977

The precinct was filled and levelled and started to be used for sports and recreation again.

Some bike tracks can be seen at the eastern side of the site. Meanwhile, a stadium was built at Barton Park (south) and opened to public in 1978.

More market gardens in the West Botany Road precinct are disappearing.



YEAR 1982

The aerial photo shows that the market garden within the site was completely removed by 1982. The site remains grass land with few canopy trees.

An asphalt vehicle road was built off West Botany Street to provide formal access to the site.

A small building is evident in the middle of the site.



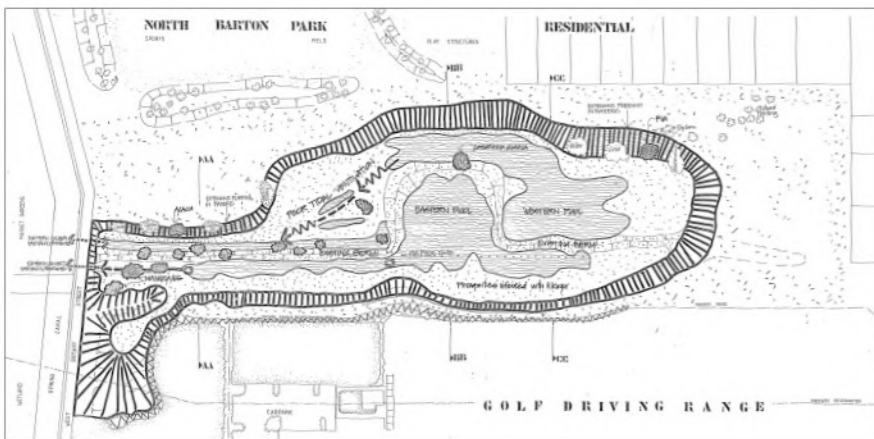


Figure 11 - The 1992 design of Spring Creek Wetland



Figure 12 - A photo of Spring Creek Wetland, 1993 (Source: Bayside Library)

YEAR 1994

The aerial shows the extensive grass cover across the site which is used for sport. Carparks, buildings and paths were created to serve the golf driving range and fields.

In 1988, bicentennial funding was made available for various council projects including a large salt marsh project near the Spring Creek Canal. During 1992-1993, work was undertaken at the Spring Creek Wetland, and officially opened to public in February 1994.



YEAR 2004

This site was known as Barton Park North until the name Riverine Park was first gazetted on 25 January 1996 as a reserve.

Between 1998 and 2001, the M5 Motorway East was constructed. In the aerial map dated 2004, it emerges from the tunnel at Marsh Street, running parallel with the SWSOOS, along the northern boundary of Riverine Park crossing the Cooks River via an underground tunnel. A playground is evident at Firmstone Gardens.



Year 2022

The park is used for sports activities and the playground has received a shade structure.

Around 2010, a desalination pipe was installed by Sydney Water to connect Kurnell desalination plant to Erskineville. The installation of the pipe removed existing vegetation near the eastern boundary of Riverine Park which can be seen in the aerial map. The pipe is not always underground and can be seen emerging or impacting landform along its route.

Recently, Council upgraded the pedestrian bridge at the mouth of the Spring Creek significantly improving user safety.





2.4 Existing Facilities and Character

NOTE: site condition photos are on the following pages.

KEY

1. Main park entry from West Botany Street
2. Firmstone Garden Playground
3. Spring Creek Wetland
4. Golf Driving Range
5. Eve Street shared path and Moreton Bay Fig
6. Sport fields
7. Dilapidated amenity building
8. Spring Creek
9. Car park
10. Active Transport Link and Barton Park Bridge
11. Eve Street Wetland
12. Landing Lights Wetland
13. Arncliffe Market Garden
14. Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS)
15. WestConnex Electrical Substation and associated compound
16. Eve St Reserve
17. Sydney water desalination pipe
18. Ausgrid temporary work compound
19. Temporary compound

Figure 13 - Existing Site (Source from: 2024 Near Map)

1. Main park entry from West Botany Street

The main vehicle entrance to Riverine Park is accessed from West Botany Street. It's a vehicle and pedestrian mixed environment.

This small car park near the entry was used for a drive-through collection centre during the Covid pandemic.



2. Firmstone Garden Playground

The playground equipment within mulch softfall was installed in 2006. This playground caters for a range of ages and is highly utilised. The condition of the equipment is nearing the end of its expected asset life of 20 years consisting of mostly timber and rope components. The playground is not supported with pathway connections or park facilities to support carer comfort or longer visitation. Renewal of this playground is planned as part of implementation of the Riverine Park Masterplan. The playground has an expansive shade canopy which provides a safe and comfortable play area for children in all seasons.



3. Spring Creek Wetland

This rehabilitated wetland was constructed in 1994 but continues to suffer problems arising from poor design and construction. Its small catchment area leads to insufficient water levels, and the lack of maintenance has further degraded its condition.

Originally, mangroves were planted at the mouth of the creek, but now dominate and overshadow the waterbody. The wetland suffers from insufficient water source, and stagnates resulting in poor water quality, mosquitoes and odours resulting in complaints from nearby residents.



4. Golf Driving Range

The central area of Riverine Park is occupied by a Golf Driving Range. There is an existing unmarked parking area containing approximately 60 parking spaces, which appears adequate for the usage generated. However, the driveway access and car park associated with the golf driving range are in poor condition.



5. Eve Street shared path and Moreton Bay Fig

Situated at the end of Eve Street, the notable Fig tree acts as a distinctive landmark and elegantly frames the entrance to Riverine Park. Aerial imagery from as early as 1943 confirms the tree's long-standing presence. The tree provides substantial shade, supports local biodiversity and enhances the area's comfort and aesthetic appeal.



6. Sports Fields

Several large sporting fields exist and were refurbished in 2022. The perimeter includes lighting, shelters and spectator seating.



7. Dilapidated Amenity Building

The amenity building, constructed in the late 1990s, has unfortunately been subject to vandalism and lack of use in recent years. Despite these challenges, the building's structure remains sound and intact. Its central location, strategically positioned between the sports fields, provides significant advantages to spectators, and sporting groups.

The amenity building is directly accessible by vehicles via a sealed road, allowing for servicing, maintenance and deliveries. While the perimeter is paved, there is currently no formal pedestrian network, and pedestrians are required to use the service road.



8. Spring Creek

The brick and concrete lined open stormwater channel was constructed in the 1930's as part of a Public Works initiative to provide employment during the Depression. It conveys stormwater flows from a catchment approximately 2.7km² from Forest Road and Wollie Creek Road to Muddy Creek, Cooks River and Botany Bay. The existing channel is in very poor condition due to concrete cancer, subsidence of the sub-base and cracking by plants and root invasion.

At its downstream end in Muddy Creek a silt basin has been designed to collect sediment that flows along this channel to prevent silting of Muddy Creek. In 1994, Council completed a project in Muddy Creek to dredge the creek (50,000m³) creates 2 attempts for later dredging. One of these sumps is approx 300m³ & is located at the mouth of the Spring Creek.

This channel is suitable for naturalisation potentially retaining the concrete channel floors and reconstructing the revetment walls with sandstone battered walls and environmentally friendly design suitable for increasing marine biodiversity.

Due to the complexity of the channel naturalisation, Alluvium Consulting have been engaged to undertake a study on environmental, ecology and hydrology for Spring Creek and the adjacent wetlands. The future rehabilitation of this waterway forms an important part of the Riverine Park Masterplan, and will be detailed further in a separate report.



9. Car Park

Riverine Park features a sizable sealed car park, designed to cater to the substantial influx of sports attendees. This car park is divided into two distinct sections. While the perimeter boasts adequate vegetation, there is a noticeable lack of tree canopy along the northern boundary and within the parking bays.

In recent years, the underutilised parking areas have been fenced off to prevent anti-social behaviour however the reduced activation encourages other unwanted behaviours as the carpark has poor visibility from other areas.



10. Active Transport Link and Barton Park Bridge

A north-south shared path connects from Bestic Street in the south, through Barton Park and Riverine Park. This connection provides key active transport links to Wollie Creek, Sydney Airport and further to Sydney CBD.

This shared path also branches off to form an east-west link along the Spring Creek through to Banksia train station and towards Arncliffe. This shared path relies on the existing vehicle access, and places users in conflict with vehicles.

These active transport links are subject to regular inundation due to the proximity to Muddy Creek and its tidal influence and flood prone location. The asphalt surface is uneven and is reaching the end of its serviceable life, but otherwise serves as an excellent link through open space in a prime location along the foreshore.



11. Eve Street Wetland

The Eve Street Wetland was naturalised in the late 1990s, at the cumulation of three creeks prior to entering Muddy Creek. While predominantly a natural environment, offering habitat to a variety of wildlife, the M5 bounds the northern edge.



12. Landing Lights Wetland

Landing Lights Wetlands is 4.9ha (approx.) and incorporates a low lying area of heavily disturbed bushland with overgrown weed. Access to the area is available via a footpath bridge over Spring Creek and timber boardwalk, both of which are in a state of disrepair.

The reserve occurs within soil landscapes mapped as 'Warriewood' as well as 'Disturbed' (Chapman and Murphy 1989). It is bounded to the north by a channelised tributary of Muddy Creek, just prior to Muddy Creek entering the Cooks River, known as the Spring Creek Drainage Channel. There is a swale running approximately north near the western boundary leading towards a standing body of saline water. Weeds occurring in the wetter lower lying areas are dominated by *Juncus acutus*. Weeds dominating higher areas are more varied and include *Kikuyu*, *Green Cestrum*, *Lantana*, *Hydrocotyle bonariensis* and *Acacia saligna*. Core bushland within the reserve is in poor to good condition.

Native species diversity is generally low. However the local communities associated with estuarine environments typically show a low species diversity compared to other local non-estuarine communities. Estuarine areas in the locality are also potentially dynamic, sometimes making identification of depauperate estuarine vegetation difficult. Bushland condition declines around the edges of the reserve and downstream from the exotic species infestations adjacent to the stormwater outlets.



13. Arncliffe Market Garden

The Arncliffe Market Gardens, established in 1892 and located at 212 West Botany Street, Banksia, New South Wales, is a heritage-listed site notable for its continuous use as a market garden since the late 19th century. It holds significant historical, social, and aesthetic value, especially for its association with early Chinese immigration and the vital role it played in local and regional food production, particularly during the Inter-War and Depression periods. Listed on the New South Wales State Heritage Register in 1999, the gardens are one of the few surviving examples of such market gardens in the Sydney region, showcasing early market gardening practices and providing rare insight into the cultural history of the area.



14. Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS)

The SWSOOS, aligned to the M5, and the ancillary sewer connection near Eve Street is a heritage-listed infrastructure built between 1895-98. Historically significant as one of Sydney's oldest main sewers, it was designed to end sewage discharge into Sydney Harbour and originally served the Botany Sewage Farm. Listed on the New South Wales State Heritage Register on 15 November 2002, this section of the sewer is notable for its technical significance, featuring three brick barrels encased in concrete, exemplifying late 19th-century sewer construction methods and in continuous operation for over 100 years.



15. WestConnex Electrical Substation

Used by the relevant roads authority, the small depot and electrical substation is generally accessed via the nearby M5 slip lane. Whilst this substation has direct access from the M5, TfNSW rely on access through Riverine Park for heavy vehicles when required. This compound prevents through access to the open space north of Riverine Park and foreshore access is desirable and a point of negotiation with TfNSW.



16. Eve Street Reserve

Eve Street Reserve is a small corner parcel of open space that could better serve the local community. It is bound by residential properties to the west and south, which offer minimal passive surveillance. It serves predominantly as a passive recreation lawn area, with utility and maintenance services occurring in the south eastern corner.



17. Sydney Water Desalination Pipe

While typically underground, the desalination pipe is exposed where it crosses the M5 and SWSOOS. This large scale infrastructure is a unique civil asset which dominates the landscape.



18. Ausgrid temporary work compounds

In the vicinity of the desalination pipe, there remains evidence of a former compound utilised by Sydney Water during its construction and later it was used by as a temporary compound by Ausgrid for nearby infrastructure works.

This former compound space has been cleared of vegetation and is fenced.



19. Temporary Compound

This temporary compound were used by Ausgrid for nearby infrastructure works. And is fenced with sealed car park.



The Cooks River Paddle Trail

The Cooks River Paddle Trail connects 25km network of waterways along the Cooks River, Wollie Creek and Botany Bay for leisurely water pursuits. This trail offers popular routes that people of all ages, skills and interests can participate in. Each route has an average time and length that can vary with tidal and weather influences. The website for this Trail offers safety information

and route planning suggestions and is supported with interactive maps. The website recommends starting the route at the River Canoe Club at Tempe which is in close proximity to public transport and car parking facilities. There are limited launching locations within the Bayside Local Government Area.



Figure 14 - Map of the Cooks River Paddle Trail (Source: <https://cooksriverpaddletrail.au>)

2.5 Land Ownership

The majority of the site is owned by Bayside Council. There are some linear parcels along the northern boundary, adjacent to M5 Highway which are owned by TfNSW and the park comprises Eve St Wetland is owned by Sydney Water.

The map (Figure 14 - Acquisition and Land Ownership Plan illustrates land ownership across the site.

2.6 Stakeholders

A number of government and community groups serve as integral stakeholders, with investment in the use and future development of the Riverine Park area.

The M5 motorway borders the park's northern edge, making TfNSW a significant stakeholder. They require access through Riverine Park for maintaining state infrastructure.

The map identifies land for future road acquisition which may no longer be required but is to be confirmed by TfNSW.

The hatched parcels (shown in the Figure 14) along the foreshore are noted in the titles as being leased until 2062 to the Sydney Desalination Plant (SDP). This may impact Council's ability to implement the north south connection, and is subject to negotiation.

The park's proximity to the Airport brings specific land use restrictions. This includes compliance with the Obstacle Limitation Surface (OLS), Australian Noise Exposure Forecast (ANEF), and the Public Safety Area (PSA), all influencing the development opportunities within Riverine Park.

Sydney Water holds assets in the area, including the Southern and Western Sydney Ocean Outfall Sewer System (SWSOOS), Eve Street Wetland, Muddy Creek, and the Spring Creek, all form part of the Cooks River Catchment. Additionally, the Cooks River Alliance, a coalition of multiple councils and Sydney Water, collaborates to tackle the environmental challenges of the waterway.

Riverine Park hosts various tenancies, including the Barton Park Golf Range. Recently the Arncliffe Aurora Football Club were successful in being selected as sporting partners for two soccer fields and amenities building. Another Expression of Interest will be exhibited in concurrence with this masterplan to seek additional partners to utilise the remaining sports fields in the centre of the park. These relationships will share the maintenance and stewardship of the park in a manner that supports increased utilisation by the Bayside community.

Local residents are important stakeholders as are the growing communities in Banksia and Arncliffe who will provide the necessary activation and passive surveillance for this park to flourish and succeed as a important recreational hub for local people and beyond.



Figure 15 - Acquisition and Land Ownership Plan

2.7 Adjacent Land Use

Adjacent public open space

Barton Park is located on the southern banks of the Spring Creek and connects to Riverine park via a pedestrian and cyclist bridge near the mouth of the creek adjoining Muddy Creek. The access off Bestic Street allows vehicle access to the southern parking lot. Barton Park is complementary open space to Riverine Park and shares a similar history in terms of its development. The Barton Park Recreational Precinct is currently undergoing redevelopment, and is scheduled for completion in April 2024.

There will be substantial improvements to its sport facilities, active transport path network and improved accessibility.

Arncliffe Market Gardens (also known as West Botany Street Market Gardens, Rockdale Market Gardens, Banksia Market Gardens and Chinese Market Gardens) – 212 West Botany Road, Banksia. The market gardens are located on Crown Land that is on the State Heritage Register.

The Statement of Significance states that the Arncliffe Chinese Market Gardens are of high significance for their association with the Chinese community and their demonstration of a continuous pattern of land usage since the late nineteenth century. They are one of only three such surviving market gardens in the Inner

Sydney region and one of few similar surviving examples in the Sydney Metropolitan Region.

The site demonstrates prolonged and continuous use as a market garden. The site was first occupied as market gardens in 1892 by Sung Kuong War, Lee How and Sin Hop Sing. A 1930 aerial photograph shows the site still occupied as a market garden. Market gardens such as this played an important role in food production for the local and regional community, particularly during the Great Depression and Post and Inter-War periods.

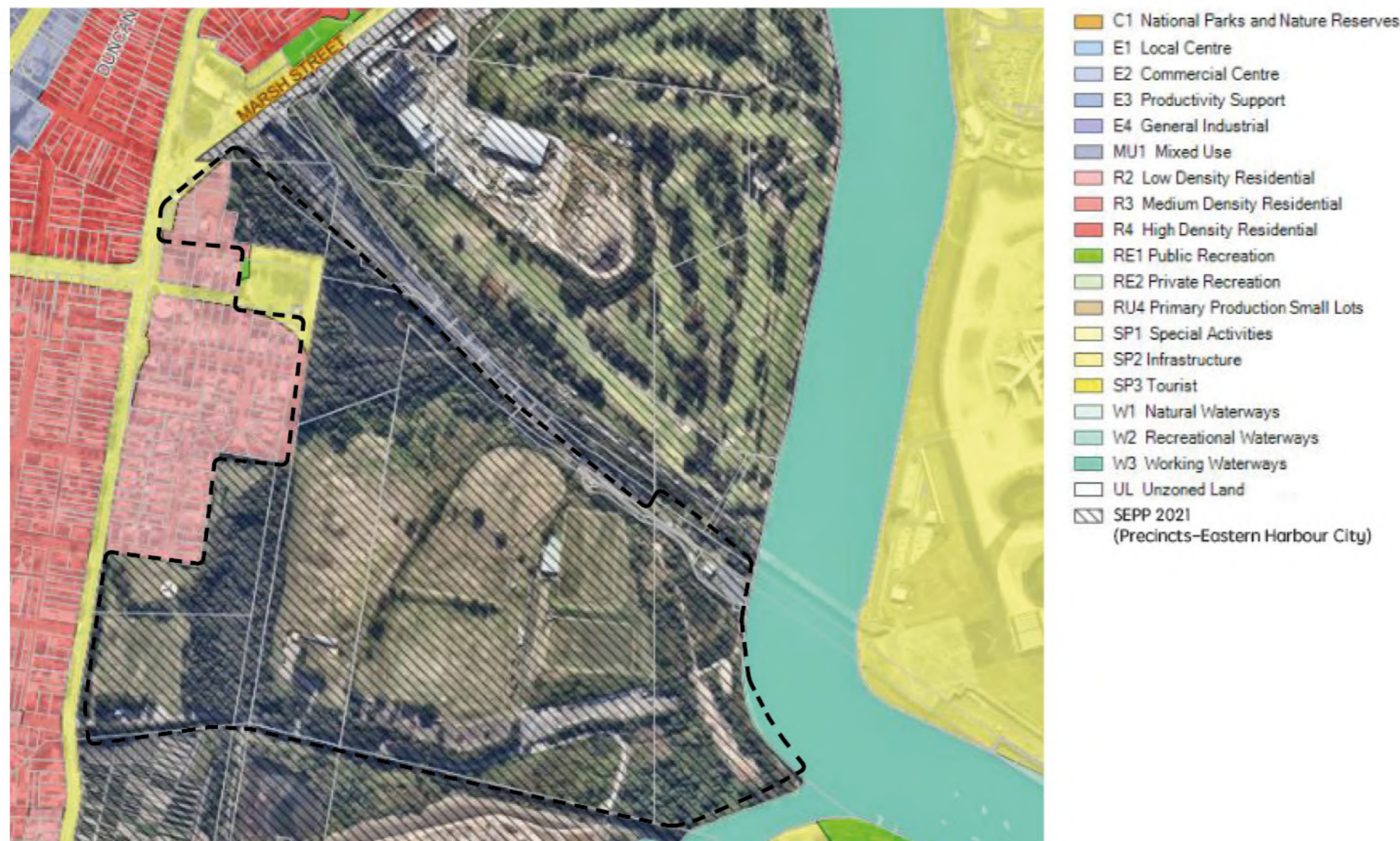


Figure 16 - Bayside LEP 2021

Roads

Riverine Park is accessed from West Botany Street. Smaller local roads bound the park, such as Eve Street and Firmstone Gardens. While they do not allow access into the park, they do provide on-street parking opportunities.

Residential Land

Land zoned as residential (R2) adjoins Riverine Park on the western side. This small pocket of residential land is bound by West Botany Street, and the market gardens to the south. Unfortunately, while some of the residences face towards Riverine Park, their views are typically restricted by wetlands and overgrown vegetation.

Opposite West Botany Street, land zoned as residential (R3) indicates a higher population density. Direct access is limited due to the busy nature of West Botany Street.

2.8 Biodiversity, Ecology

The sites contains some of the last remaining saline wetlands on the Cooks River and includes significant flora and Endangered Ecological Communities, such as:

- Bangalay sand forest
- Coastal saltmarsh
- Estuarine saltmarsh
- Swamp oak floodplain forest
- Mangrove forest

The wetlands provide habitat to a number of threatened Australian coastal bird species and migratory birds from as far away as Siberia, who visit during the warmer months to feed and fatten up before returning to the Northern Hemisphere to breed. With the significant urban development that has occurred along the Australian coast, Riverine Park serves as one of the few suitable sites in Botany Bay that can provide this important habitat. Critical species are:

- Migratory birds (threatened species: the Terek Sandpiper, Broad-billed Sandpiper, Great Knot, Sanderling, Black-tailed Godwit and the Lesser Sand Plover)
- The Green and Gold Bell frog (GGBF, listed as Endangered under the Threatened Species Conservation Act 1995).

Riverine Park is also potentially habitat for threatened fauna species, such as the Grey-Headed Flying Fox, Select Microbats and Powerful Owl.

Spring Creek and Muddy Creek serve as important tributaries of the Cooks River with remnants of significant Mangrove (*Avicennia marina*) forest and riparian vegetation along the banks.

Any proposed works must be sensitive to the requirements of fauna, habitat and bird migrations in their design and location.



Figure 17 - Threatened Fauna and Flora Records



Figure 18 - Endangered Ecological Communities Map



Figure 19 - Shorebird Habitat Map

Green and Golden Bell Frog (GGBF)

The GGBF is an endangered species which needs careful management to ensure its survival. Riverine Park is a critical habitat for this species, providing a unique opportunity for conservation efforts through habitat enhancement and careful ecological planning, ensuring the park not only serves the community but also plays a vital role in the survival and thriving of this iconic amphibian.

Any proposed activation adjacent to GGBF habitat should allow for passive recreation only to avoid excessive impacts to this species, including light spill.



Green and golden bell frogs in NSW



Figure 22 - Former and current distribution of green and golden bell frogs

Council has previously engaged a specialist consultancy to undertake studies and provide advice on the ecologies in this area. Distribution can be separated into four typologies:

- Breeding Habitat - Includes a wide variety of freshwater and estuarine water bodies, ranging from ponds through to large lakes. Constructed naturalised stormwater basins are known to have been used for successful breeding.
- Foraging Habitat - Preferred foraging areas include flowering plants, grasses and foliage. Foraging often occurs in tussock vegetation where it can provide shelter and is close by to breeding habitat



Figure 20 - Green and Golden Bell Frog records from surveys (AMBS Ecology & Heritage) 2021

- Refuge Habitat - Refers to spaces allowing GGBF to avoid danger and climatic extremes, such as hiding during inactive winter months. Stacked stones, rubble and felled logs are common examples.
- Connectivity Habitat - Connectivity habitat enables frogs to move between different areas of habitat at different times of the year. Drainage lines, swales, wetland banks and open lawn areas free of excessive human use are common examples.



Figure 21 - BioNet records for Green and Golden Bell Frog (DPIE 2021)

Remnant Vegetation

Pre-european patterns of vegetation along the Cooks River include Mangroves and Saltmarsh, Mudflats and Freshwater & Brackish Swamp. Changes to the landscape and vegetation brought about by European settlement began in the 1790's with the development of farmland.

Areas of mangroves and saltmarsh were likely reduced severely in the early 19th century, as mangrove wood was burnt in the manufacturing process of soap at a series of manufactories. The construction of dams to meet increasing development and water demand likely further impacted natural ecosystems. Freshwater and brackish swamps were typically deemed as useless land due to their limited agricultural potential. A number of wetlands, mudflats, mangroves and saltmarsh were filled, allowing for the development of market gardens along Muddy Creek.

While it is impossible to re-establish all of the natural vegetation which once framed the Cooks River, we can ensure that the pieces that still exist are looked after, maintained and protected. Additionally, the redevelopment of Riverine Park serves as a momentous opportunity to enhance remnants - through buffer

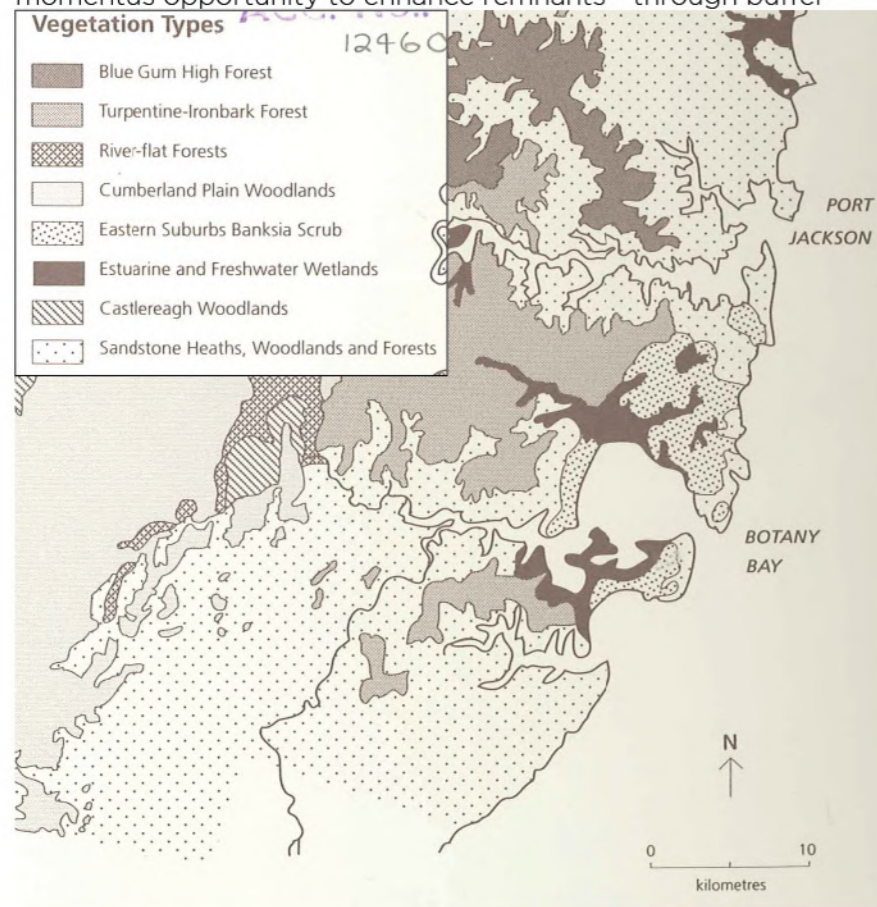


Figure 23 - Natural vegetation Sydney 1788 (Source from: Taken for Granted)

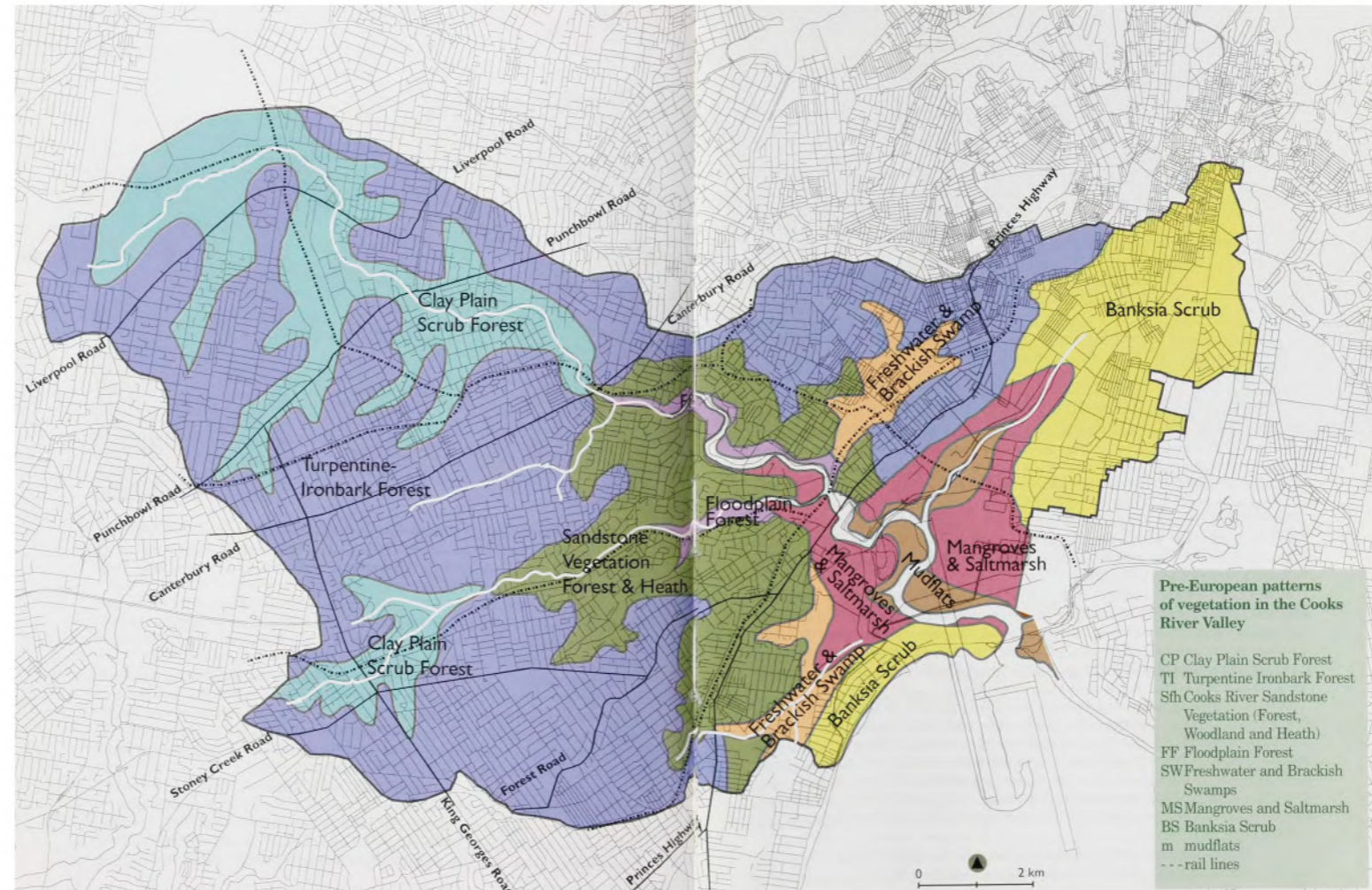


Figure 24 - Pre-European vegetation (Source from: Missing Jigsaw Pieces - Bushplants of the Cooks River Valley)

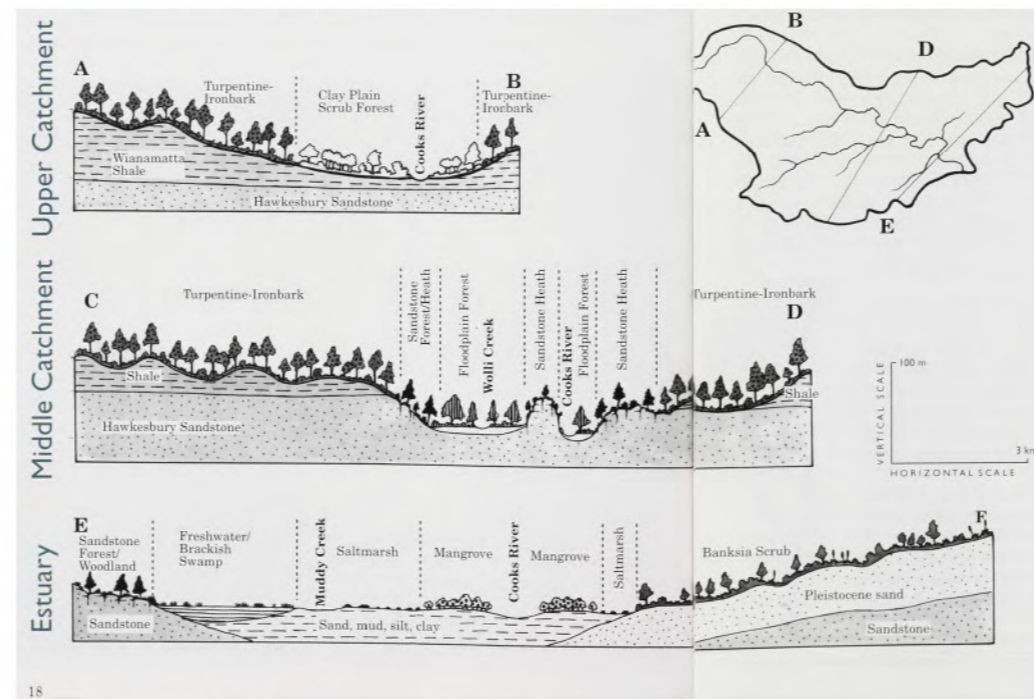


Figure 25 - Vegetation cross sections (Source from: Missing Jigsaw Pieces - Bushplants of the Cooks River Valley)

2.9 Heritage and Conservation Assets

While there is no current evidence of remnants of Aboriginal sites in Riverine Park and its adjacent wetlands, the area's location at the confluence of waterways suggests it may have held significant cultural importance for Aboriginal communities.

There are no heritage listed items within Riverine Park. Two adjacent sites are listed in Schedule 5 Environmental Heritage of the Bayside Local Environmental Plan 2021 (Bayside LEP 2021).

- The Arncliffe Market Gardens. This item is also listed in the Heritage Schedule of the Bayside LEP 2021.
- The Southern & Western Suburbs Ocean Outfall Sewer (SWSOOS). This item is also on the State Heritage Register as having significance as one of Sydney's earliest infrastructure NSW under the Heritage Act 1977 (NSW).

Riverine Park, along with its neighbouring park were originally utilised as a Sewage Farm in the late nineteenth century, later being mined for sands used in Council construction of roads and other civil assets before being operated as a land fill site for Council operations. In 1988 bicentennial funding was made available for various council projects including a large salt marsh project near Spring Creek.

While it is not in itself listed as a heritage item, it has a legacy of continued use as a public reserve since 1930 when according to Ron Rathbone Rockdale Council purchased 89 acres from the Water Board for 5 pounds per acre for the purpose of recreational purposes. This was in conjunction with other acquisitions from adjacent land owners and set about reclamation works in 1932 "to convert a low lying mosquito infested wasteland into the St George Sporting Complex". Philip Geeves also describes the acquisition of 120 acres of the then disused North Brighton Sewage Farm.

2.10 Historical landfill Site

The use of the site as a sewage farm, sand mine and as an uncontrolled landfill site (including putrescible waste) means that the legacy of contamination must now be carefully monitored and managed.

A Long Term Site Environmental Management Plan (LTSMP) has been prepared for the site. This Plan provides guidance on:

- Contaminants at the site
- Measures to reduce landfill leachate generation rates by improving site drainage
- Measures to ensure appropriate soil cover is maintained
- Measures to monitor and manage landfill gas
- Responsibilities and obligations of relevant parties to administer the Long Term Site Management Plan
- Robust processes for the management, maintenance and upgrade works at the site.
- Environmental monitoring requirements

The NSW Environment Protection Authority (EPA) reviewed the LTSMP and concluded that the site does not require regulation, provided the LTSMP is implemented.

Any changes/works proposed, if not minor works as defined in the LTSMP, must be accompanied by a Remediation Action Plan (RAP). Depending on the scale of the works proposed, a Site Audit Statement (SAS) and revision of the LTMSMP may also be required.

Due to the complexities and ongoing monitoring and management requirements of contaminated land, Council requires continued unrestricted access to the site, including all leased property, to undertake required monitoring and works.

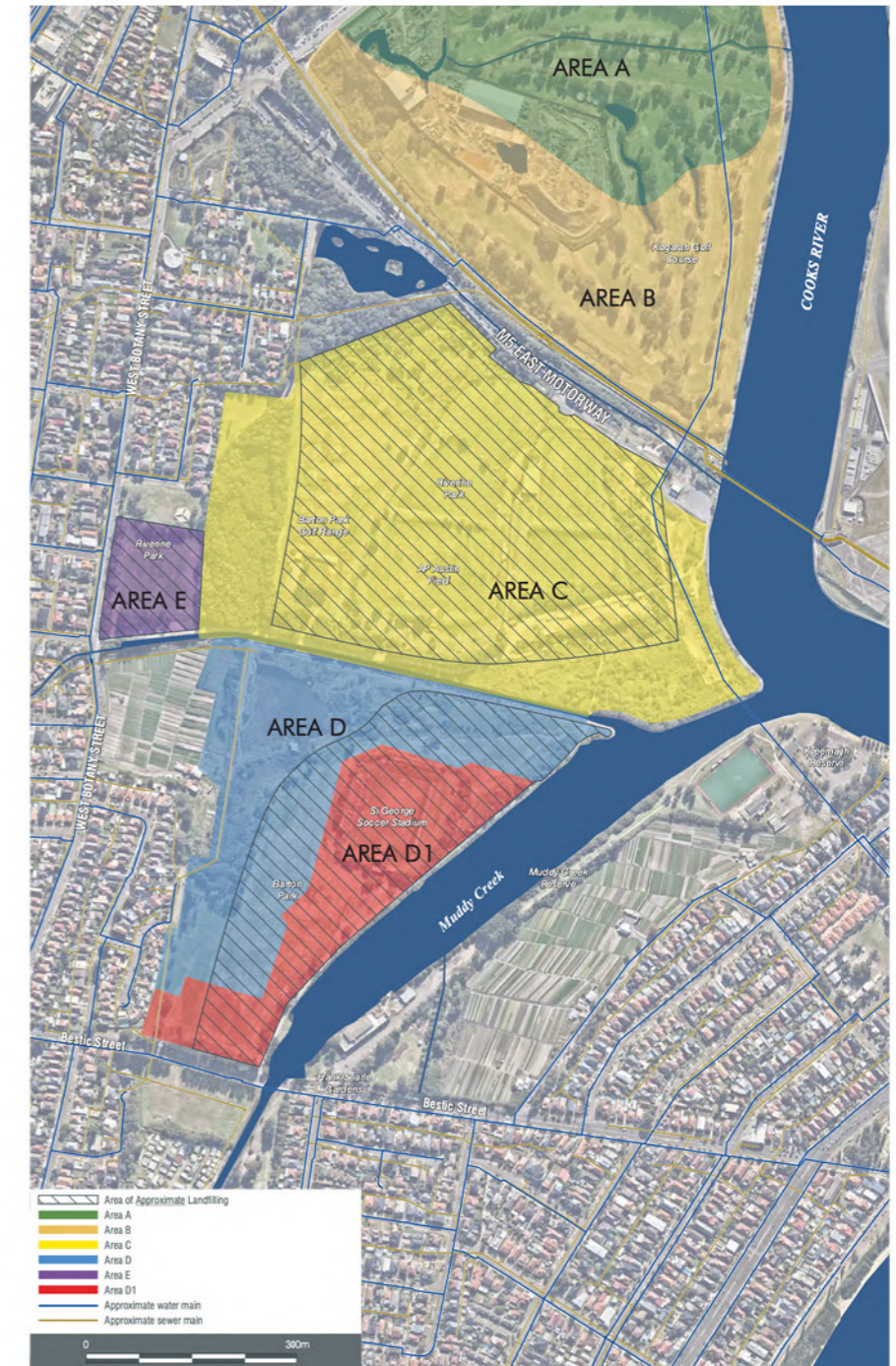


Figure 26 - Historical landfill area

Suburb	Item Name	Address	Property description	Significance	SHR
Arncliffe	Southern and Western Suburbs Ocean Outfall Sewer (SWSOOS) Western Main Carrier	11 & 13a Marsh St	Lot 17, DP 1069479; Part Lot 5, Lot 9 & Lot 10 DP1050923	State	01647
Banksia	Arncliffe Market Gardens	212 West Botany Street	Lot 1, DP 514811	State	01395
Kyeemagh	Kyeemagh Market Gardens	2A, 2B, 2D and 2E Occupation Road	Lots 2, 3 & Part Lot 4 DP 171133; Lot 4, DP 529923	State	01393

2.11 Climate Change

The Report by BMT WBM “Botany Bay Western Foreshore Coastal Hazard Risk Assessment and Management Options Study” completed in 2013 provides a discussion of the geomorphology and coastal processes of Botany Bay and the surrounding study area followed by a risk based assessment of coastal hazard and their consequence. The study considered coastal inundation due to high water levels during storms resulting in inundation into rivers, creeks, drains connecting with the ocean and permanent inundation due to sea level rise. Sea level rise was calculated to increase 0.4m by 2050, and 0.9m by 2100 above 1900 mean sea level. That was widely accepted as competent scientific opinion based on reports by IPCC (2007) and CSIRO (2007) for NSW in the absence of other suitable recommendations although these figures are no longer prescribed by the NSW State Government.

The low lying areas within Riverine Park are subject to inundation as a consequence of sea level rise.

The importance of protecting and regenerating coastal ecosystems

Blue carbon refers to the carbon captured by the world’s coastal ecosystems, which are predominantly made up of seagrasses, mangroves and salt marshes. Blue carbon ecosystems play an important role in climate change mitigation as they store carbon dioxide up to 40 times faster than inland forests due to an ability to store large amounts of carbon in their soils and for far longer than terrestrial systems. It is estimated four times more carbon is sequestered in Australian soil beneath marine ecosystems over a given area than in other environments.

Other than storing large amounts of carbon, mangroves, tidal marshes and seagrasses are critical ecosystems, supporting coastal water quality, healthy fisheries, and coastal protection against floods and storms.

However, large areas of blue carbon ecosystems have been lost due to land reclamation, clearing, pollution and severe weather events. Tidal salt marshes cover roughly 140 million hectares of Earth’s surface, this is roughly half of their historical area and this area is continuing to decrease at a rate of 1-2% per year.

Coastal ecosystems are big carbon sinks so when they are degraded or destroyed. They emit large amounts of carbon. Experts estimate that as much as 1.02 billion tons of carbon dioxide is being released annually from degraded coastal ecosystems.



Figure 27 - Cooks River Catchment



Figure 28 - Flood function mapping within Lower Muddy Creek



Figure 29 - 1% AEP Flood extent

2.12 Hydrology and Flooding

Riverine Park is located in the Spring Creek and Muddy Creek sub-catchment.

The topography of the catchment is relatively flat with the upper reaches of the Muddy Creek catchment generally sloping in a south-easterly direction with the lower reaches draining north east towards the Cooks River. Muddy Creek is a small tributary of Cooks River.

The Spring Creek has a peak elevation of 55.5m AHD with the catchment draining eastwards. The catchment is a highly modified landscape, comprising medium to high-density residential and commercial developments. It also includes major infrastructure assets which are raised above the natural ground level, restricting surface flows from west to east. In its current state, the creek overflows during 20% AEP events, resulting in ponding of up to 0.5m depth within Riverine Park and flooding of the access road.

The topography of the former land fill site impedes natural drainage which acts as a barrier for natural water flows from the west and exacerbates the impact of tides and flood waters along the banks of Muddy Creek along the east.

In addition to the Muddy Creek and Spring Creek catchments, a small urbanised catchment feeds into the Eve Street Wetland.

There are two relevant flood studies for this area including:

1. Cooks River Flood Study, MWH and PB, 2009 Sydney Water commissioned this report to determine baseline conditions of the Cooks River Catchment to enable the design of naturalisation options to be considered as part of their ongoing asset renewal program.
2. Bayside West Floodplain Risk Management Study and Plan, May 2023, was commissioned to understand the existing flood behavior and to establish the basis for floodplain management activities.

2.13 Aviation Safety

Close proximity to Sydney Airport impacts the height of structures, as well as the style and intensity of lighting that can be provided within the park, along with land-use constraints.

The National Airport Safeguarding Framework (NASF) comprises of 9 guidelines that apply to all airports in Australia and affects planning and development around airports including development activity that might impact operational airspace and/or affect navigation of aircraft.

The 9 guidelines are:

A: Managing Aircraft Noise

B: Managing Building Generated Windshear and Turbulence

C: Managing Wildlife Strike Risk

D: Managing Wind Turbine Risk to Aircraft

E: Managing Pilot Lighting Distraction

F: Managing Protected Airspace Intrusion

G: Communications, Navigation and Surveillance

H: Protecting Strategically Important Helicopter Landing Sites

I: Managing the Risk in Public Safety Areas at the Ends of Runways

Obstacle Limitation Surface (OLS)

The OLS is defined by international specifications, as adopted by CASA. It defines the airspace surrounding an airport that must be protected from obstacles to ensure aircraft flying in good weather during the initial and final stages of flight, or in the vicinity of the airport, can do so safely. Figure 2.19 Mapping of OLS (Gap analysis between OLS and AHD contours) identifies the constraints of the OLS as it impacts the heights of structures to under 20m in some sections of the park.

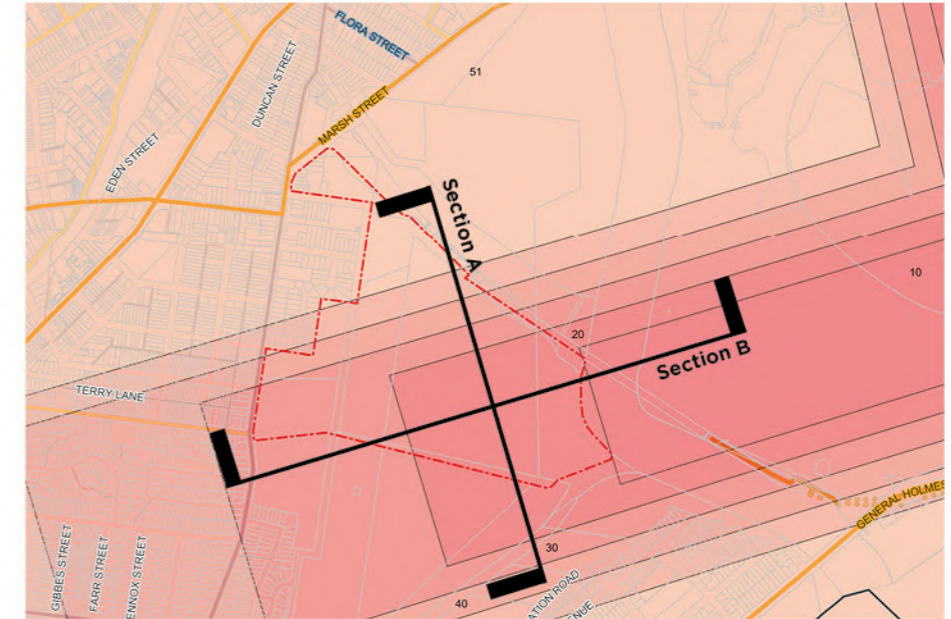


Figure 30 - Airport Obstacle Limitation Surface OLS Map

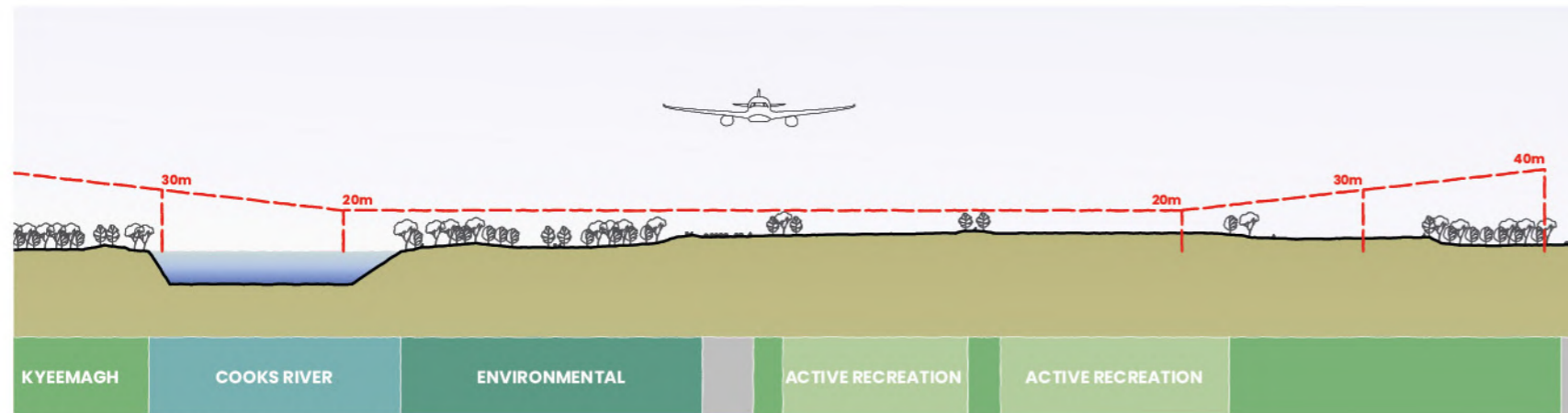


Figure 31 - Section A aviation impact

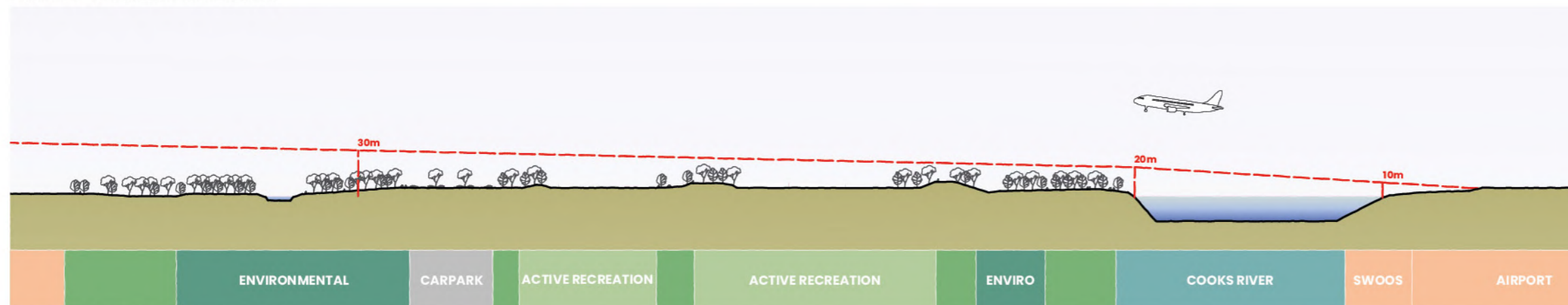


Figure 32 - Section B aviation impact

Public Safety Areas (PSA)

Public Safety Areas are implemented at airports to protect the safety of the public from aviation activities and accidents. Riverine Park is within the affected zones of 1,000 metres before the runway on approach or within 500 metres beyond the runway on departure. These zones are generally accepted standards set by the International Civil Aviation Organisation (ICAO). Figures below shows the extent of the PSA which limits the level of activity and permissible uses.



Figure 33 - Sydney Airport Public Safety Area (source: Intramap)

PSA	COMPATIBLE USES	INCOMPATIBLE USES/ACTIVITIES
<p>OUTER AREA - 1 IN 100,000</p>	<ul style="list-style-type: none"> • Long stay and employee car parking (where the minimum stay is expected to be in excess of six hours) • Shorter stay car parking (with a safety case - depends on intensity of use) • Built development for the purpose of housing plant or machinery and would require no people on site on a regular basis, such as electricity switching stations or installations associated with the supply or treatment of water • Golf courses, but not club houses (provided appropriate mitigation measures are in place to reduce wildlife attraction risk - see NASF Guideline C) • Open storage and types of warehouses with a very small number of people on site. The planning authority could consider imposing conditions to prevent future intensification of the use of the site and limit the number of people to be present on the site • Developments which require few or no people on site on a regular basis such as buildings housing plant or machinery • Low intensity public open space 	<ul style="list-style-type: none"> • Accommodation activities: This includes dwelling houses, multiple dwellings, resort complexes, tourist park, hostels, retirement villages or other residential care buildings • Community activities: educational establishment, community centres, hospitals, theatres, child-care and playgrounds, detention facilities, place of worship • Recreation activities: This includes parks, outdoor recreation and sport, major sport and entertainment facilities • Entertainment and centre activities: Shopping centres, service stations, showrooms, markets, hotels, theatres, tourist attraction, garden centres • Industrial and commercial uses involving large numbers of workers or customers: Intensive uses such as high impact, medium and low impact industry, warehousing, services industry • Manufacture or bulk storage of flammable, explosive or noxious materials • Public passenger transport infrastructure: This includes bus, train and light rail stations
<p>INNER AREA - 1 IN 10,000</p>	<ul style="list-style-type: none"> • Long stay and employee car parking (where the minimum stay is expected to be in excess of six hours) • Built development for the purpose of housing plant or machinery and would require no people on site on a regular basis, such as electricity switching stations or installations associated with the supply or treatment of water • Golf courses, but not club houses (provided appropriate mitigation measures are in 	<ul style="list-style-type: none"> • Accommodation activities: This includes dwelling houses, multiple dwellings, resort complexes, tourist park, hostels, retirement villages or other residential care buildings • Community activities: educational establishment, community centres, hospitals, theatres, child-care and playgrounds, detention facilities, place of worship • Recreation activities: This includes parks, outdoor recreation and sport, major sport and entertainment facilities • Entertainment and centre activities: Shopping centres, service stations, showrooms, markets, hotels, theatres, tourist attraction, garden centres • Industrial and commercial uses involving large numbers of workers or customers: Intensive uses such as high impact, medium and low impact industry, warehousing, services industry • Manufacture or bulk storage of flammable, explosive or noxious materials • Public passenger transport infrastructure: This includes bus, train and light rail stations

Figure 34 - General guidance for new/proposed developments on compatible and incompatible activities within PSA risk contours (source: NATIONAL AIRPORTS SAFEGUARDING FRAMEWORK)

Sydney Airport - Utilities reservation

The Sydney Airport Masterplan 2039 (Figure 25) identifies a very small parcel of land as an “AD4 - Utilities Reservation Zone” within Barton Park south west of the M5 East Motorway. This is within the Landing Lights Wetland. This parcel accommodates special uses of the airport.

Lighting near the airport

CASA has the authority under the Civil Aviation Regulations 1988 to control ground lights where they have the potential to cause confusion or distraction from glare to pilots in the air. Design Guidelines have been prepared to assist lighting designers and installation contractors to determine the location and permitted intensities of ground lights within a six kilometre radius of an airport. Sports field lighting and street lighting require careful consideration.

The intensity of reflected sunlight may also be considered under the regulatory regime.

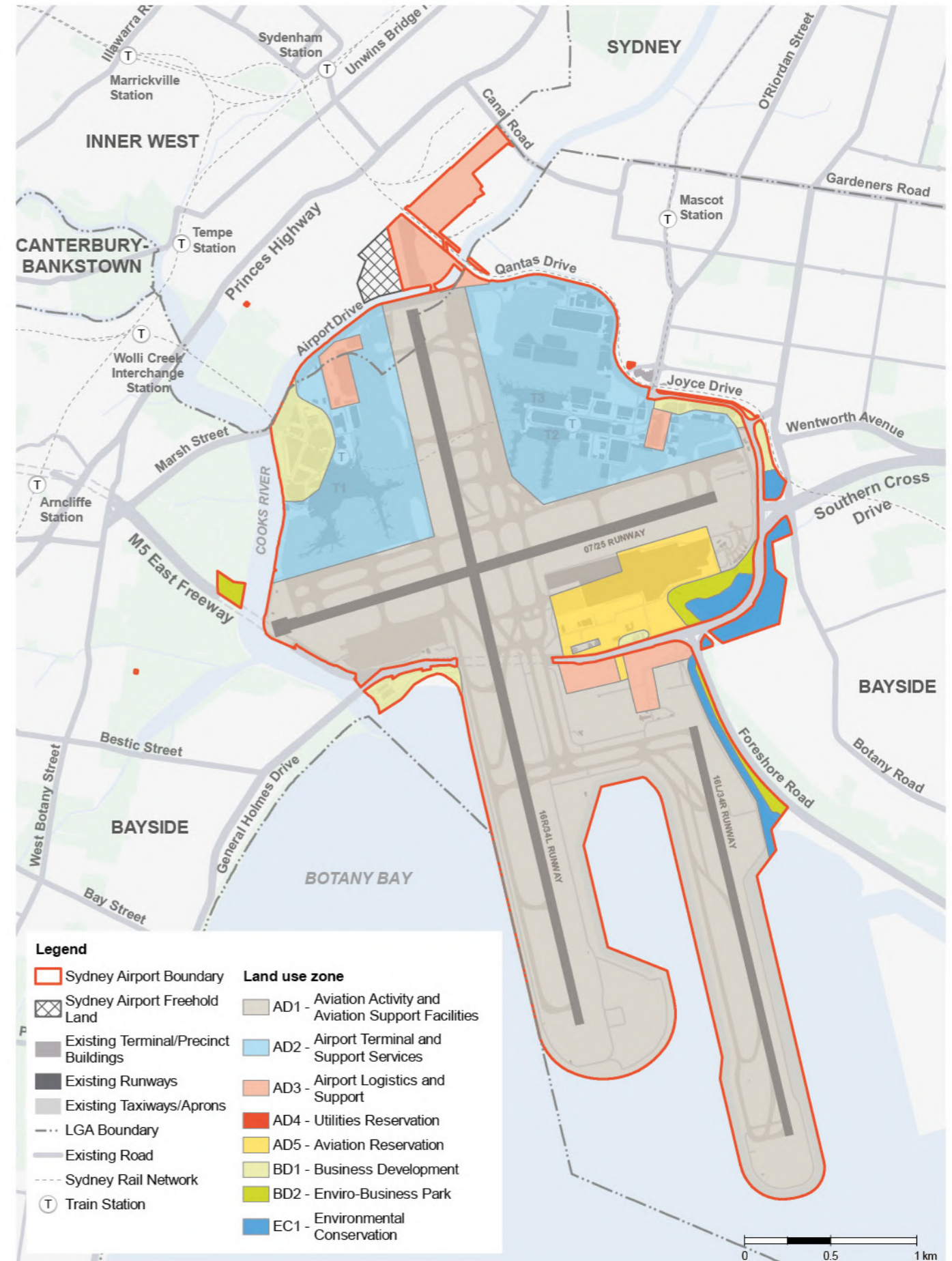


Figure 35 - Sydney Airport - Utilities reservation (Note AD4 in Landing Lights Wetland) (source: Sydney Airport Master Plan 2039)

2.14 Visual and Spatial Impact

Once considered a wasteland, the landscape of the area has undergone significant transformation since the mid-19th century. It served as a Sewage Farm for Sydney for 30 years until 1916, followed by sand mining for council civil projects and later as a council landfill site. These activities have dramatically altered the topography, making the site's history and its resultant landscape challenging to comprehend for those unaware of its industrial past. The now highly valued wetlands are a direct consequence of previous sand mining activities. Interestingly, the heritage-listed Market Gardens have thrived, benefiting from the enriched soil due to deposits from the Sewage Farm.

However, this history of industrial use has not been without its drawbacks. The tree canopy and vegetation quality have suffered, dominated by weeds - a result of prolonged poor land management practices. Similarly, the Mangrove Forest, a product of these neglected practices, now obstructs sightlines to the water, with only two openings along the adjacent cycleway. The landscape shows little remaining evidence of former dune and woodland vegetation, and it's unlikely that any traces of traditional owners' past use remain.

Today, the site is characterised by vast grassland monocultures, necessary to contain the disturbed soils, with limited interruptions to the long views. These views are dominated by a three-tiered benched landscape with the highest point closest to the Cooks River and stepping downward towards West Botany Street. From this altered elevation, there are sweeping views towards the airport and across the Landing Lights Wetlands, Market Gardens, Spring Creek, Muddy Creek, Cooks River, and the residential areas of Arncliffe and Banksia, providing a unique perspective on the area's complex history and current form.



Figure 36 - Visual and Spatial Impact diagram

2.15 Management and Maintenance

Maintenance of Riverine Park is primarily undertaken by Bayside Council.

Routine Park Maintenance

The parks staff undertake a range of routine park maintenance activities including mowing, litter collection, broad acre mowing of the outer fields and herbicide spraying.

Seasonal improvements are undertaken of the sports fields including

- Aerating
- Fertilising
- Top-dressing
- Turf repairs
- Filling uneven surfaces
- Turf weed control
- Line marking fields

Council is seeking sporting partners who as part their tenure will be required to undertake maintenance of their lease areas. These arrangements are mutually beneficial as this gives autonomy to sporting partners to manage the spaces of interest to them as well as reducing maintenance burden for council. These groups function under a form of user pay. The expectation is that sporting partners keep open spaces available to the general public and work collaboratively with council on this ongoing arrangement for the benefit of the broader community and the sporting groups involved.



Figure 37 - Routine maintenance work

Bush Regeneration

To protect the Landing Lights Wetland site Council undertakes significant weed control and vegetation removal which has continued since 2016. These works have included the removal of Grey Mangroves (*Avicennia marina*), Casuarinas species and Acacia species within and adjacent to the main wetland. Removal has occurred to protect the existing salt-marsh from being invaded by trees and shrubs that should not exist in this area and to open up the site to ensure it continues to provide important habitat for threatened and migratory coastal birds.

Works that have been completed include:

- Treatment of the weed species *Juncus acutus* along the boardwalk and within the saltmarsh area
- Removal of mangroves within the wetland and Spring Creek
- Removal of Casuarinas growing adjacent to Spring Creek
- Treatment of woody weeds such as Mickey mouse plant (*Ochna serrulata*), Green Cestrum (*Cestrum parquii*) and Golden wattle (*Acacia saligna*)
- Treatment of the fast-growing vines, Coastal Morning Glory/ Mile-a-minute (*Ipomoea cairica*), Turkey
- Rhubarb (*Acetosa sagittata*) and highly invasive groundcover *Hydrocotyle bonariensis*
- Replanting with native species using community volunteers along the boardwalk
- Removal of rubbish that was blocking the pipe outlet of the



Figure 38 - Local community caring for shared public land

wetland

- Some parts of Riverine Park can continue to be conservatively managed with bush regeneration whilst in some heavily degraded areas a more target intervention effort will be required to restore suitable ecologies.



Figure 39 - Bayside teams undertaking bushcare at Hawthorne