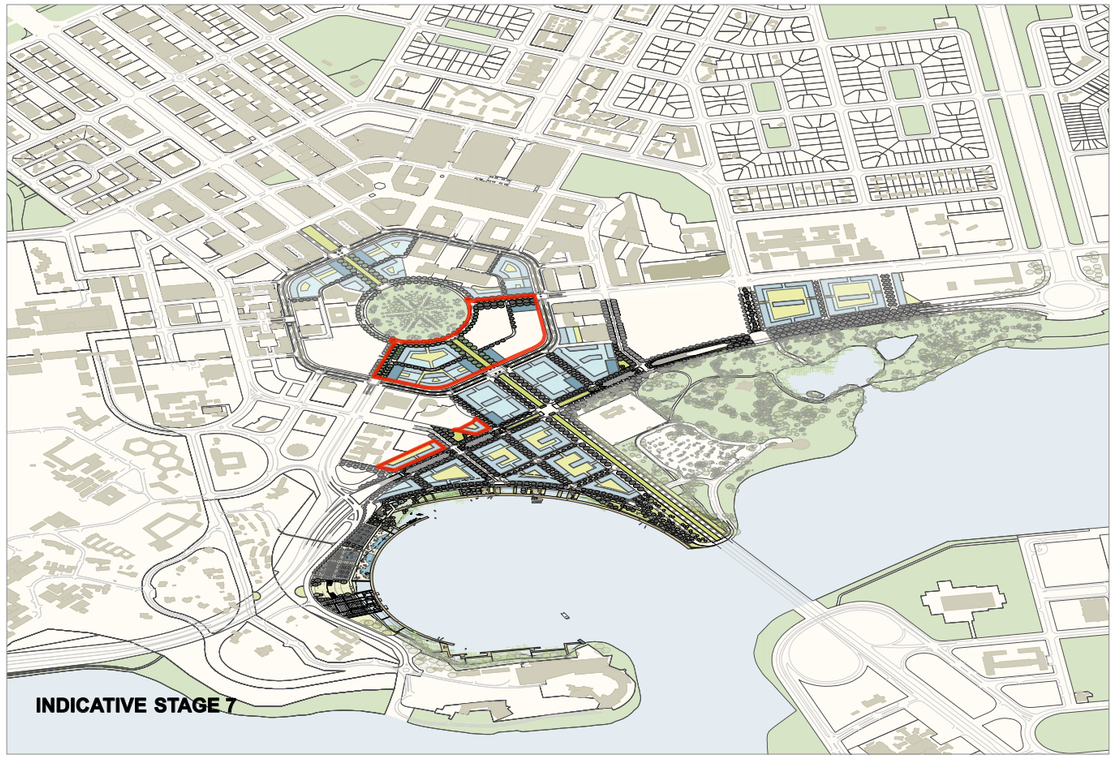
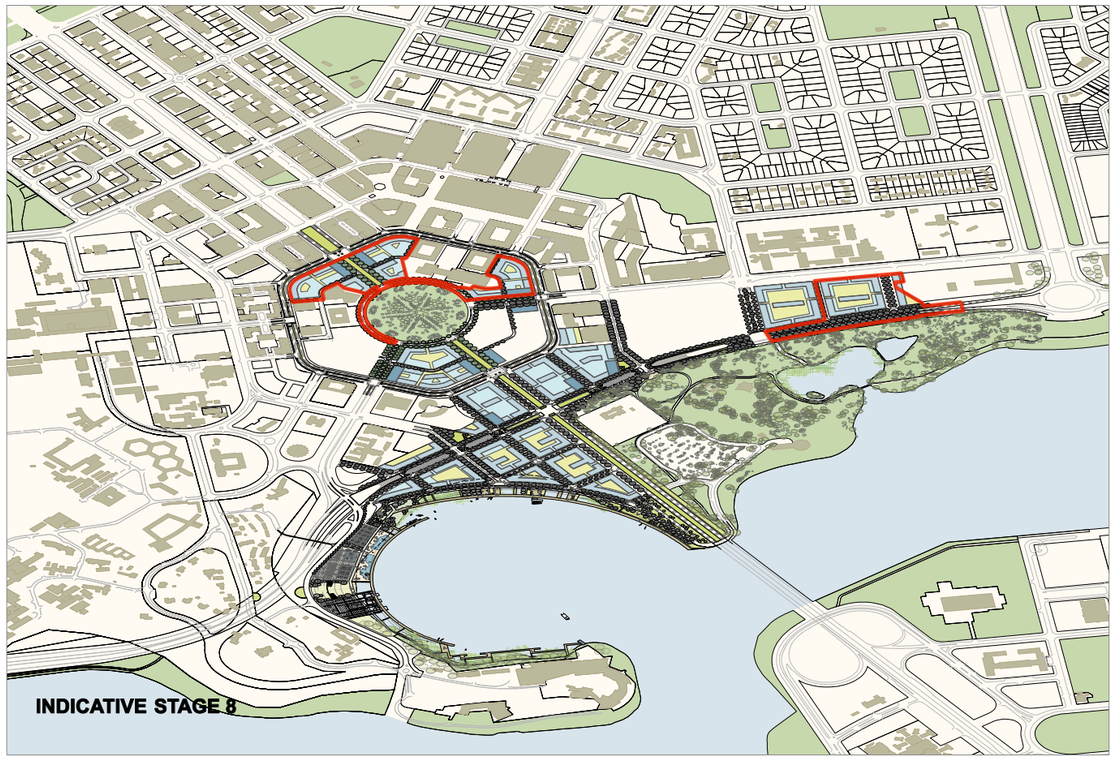
8.1 Staging





APPENDIX

URBAN ANALYSIS

LINKING CANBERRA CITY TO THE LAKE

October 2013

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A1

SITE EVOLUTION

1.1 SITE EVOLUTION

Natural and Cultural Elements

The leading French landscape architect and professor Alexandre Chemetoff observed that, “For me, landscape is a culture, a necessity and a discipline of the project – the project being a way of developing and building”…, it lays claim to a dynamism that is continually transforming territory, which is seen as heritage in perpetual transformation. This amounts to saying that there is no invention without foundation, and it reminds us that every project is attached to a site, indeed, the site transmits the laws of its own transformation.

Civic’s hexagonal plan, Northbourne Avenue’s emphatic axis towards the Parliament, Lake Burley Griffin’s sinuous profile, the parkland’s environmental and recreation resource, Parkes Way’s scenic qualities; all these are aspects to consider as part of Canberra’s rich cultural landscape.

Planning Controls

The Griffin Legacy offers a far-sighted blueprint for re-imagining centre of Canberra. A blueprint that intelligently considers ways of resolving the Griffins’ wondrous plan with Canberra’s present realities and future possibilities.

On a pragmatic level, the project will present many planning, functional and implementation challenges.

Current Situation

In Non-Places; Introduction to an Anthropology of Supermodernity, Marc Auge argues that;
“Motorway travel is thus doubly remarkable: it avoids, for functional reasons, all the principal places to which it takes us: and it makes comments on them (through signs).” This summarises the problems of the current arrangements; both the lakefront and Civic suffer by the presence of Parkes Way, while the motorway itself is indifferent to their proximity.

Therefore the proposed solution in Linking Canberra City to the Lake preserves the functional attributes of the motorway, while making all the desirable connections possible over time.

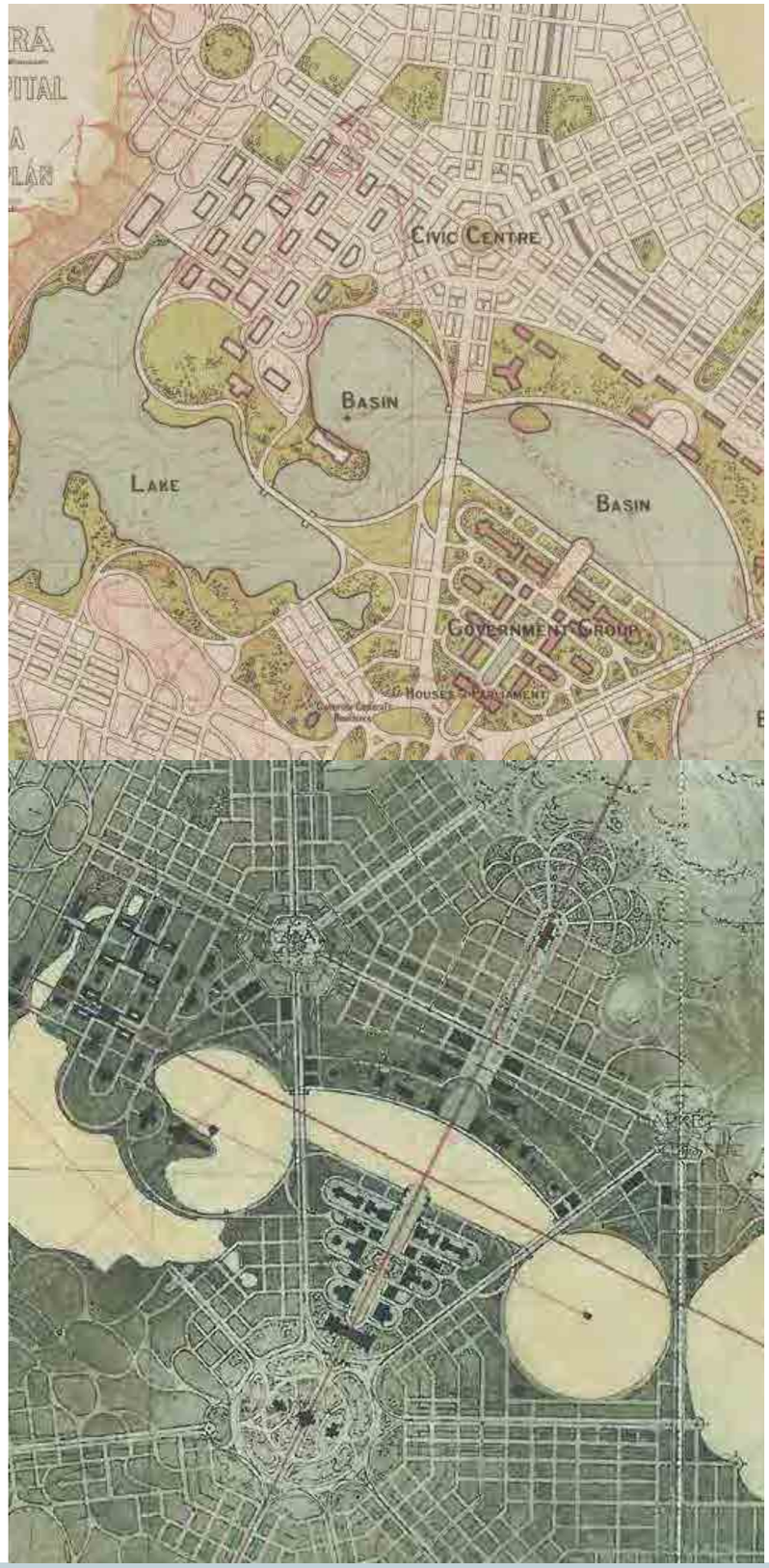
Future

In 1911 the Griffins’ conceived of one of the most far-sighted and resolved urban plans in the history of city making, opening Canberra to unimagined future benefits. Linking Canberra City to the Lake is a project of enablement, which will create a process of connection.

History

Parkes Way was a key element of Canberra’s extensive motorway network, which was implemented before other Australian cities had even considered such options. Initiated in the 1950’s by Professor Sir William Holford and implemented by John Overall and the newly enacted NCDC, the motorway followed North American models, at that time seen as essential to the future of the city.

In contrast, the Griffins had seen the lakefront as an extensive parkland, anchored and accessed from the major civic spine of Constitution Avenue. Speeding motor vehicles replaced the landscape idyll.



1.2 GREATER CANBERRA

Canberra's Urban Footprint

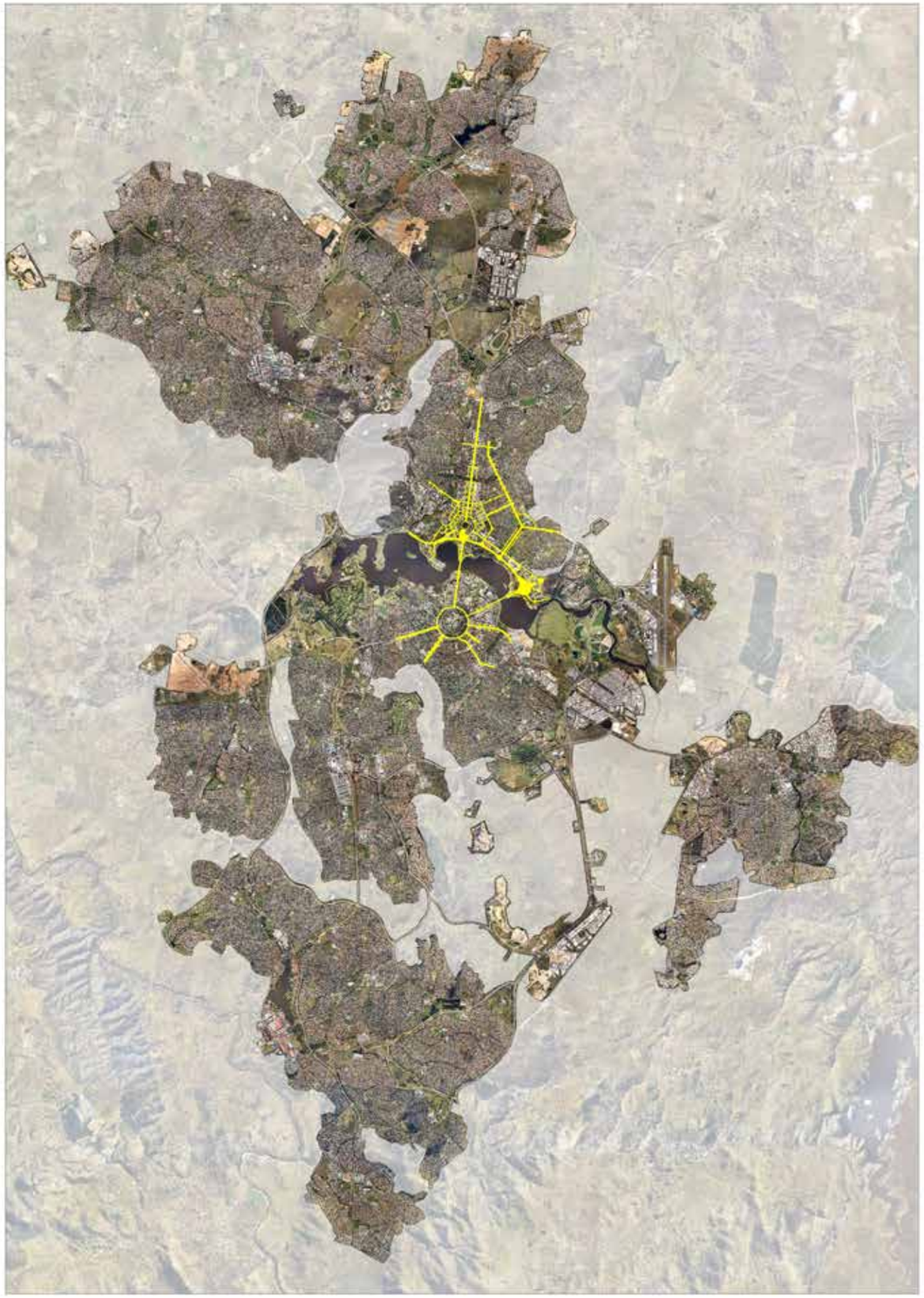
From the original concept of compact planning around Lake Burley Griffin, hugged by forested hills, Canberra's urban footprint has expanded since WWII ever closer to the boundaries of the Australian Capital Territory (ACT). Strategic infill will need to be a key strategy for sustainable population growth in our nation's Capital.

The ACT government undertakes most of Canberra's planning and land management; however, the Federal Government administers key sites of national significance, under the NCA. This area is collectively known as the Central National Area and is bound loosely by the Inner Hills; Capital Hill and the Parliamentary Triangle, Government House, Lake Burley Griffin and the foreshore, and the Canberra Airport. This area is slated to be reduced by more than 70% following recent review, returning the planning of nationally significant land to the Territory.

Almost 50% more people are expected to live in Canberra by 2050 - housing them in a sustainable manner, close to high amenity environments is a challenge.

Residential development in Canberra is currently characterised by the following conditions:

- It is the most car-dependent capital city in Australia;
- The average population densities per square kilometre are only half the density of Melbourne, and a third of the density of Sydney;
- Urban sprawl reduces the efficiency of public transport and has proliferated a continued priority in infrastructure spending on roads; and
- Failed containment of the city within the Inner Hills means a large number of residents are geographically dislocated from Canberra's centre of employment and services.



1.3 URBAN CANBERRA

Canberra’s Contemporary Plan

Canberra’s centre is comparable with a number of contemporary cities when overlaid in plan. Several points are of note:

- Canberra’s centre is almost equal in size to that of Adelaide. Each operate as a super-grid - where Adelaide demonstrates a completeness in connectivity and legibility;
- Canberra has equally as much public domain as any of the comparison cities, but is realised in many wide and generous reserves with variation between 20m and 60m+;
- The lack of lanes and small streets throughout the urban grid denies moments of fine grain and secondary uses for activities such as creative start-ups and businesses seeking reduced rent without main-street presence;
- Canberra is situated on a water body much the same size as Zurich’s lake or Wellington’s coastal harbour. Each of the underlaid cities demonstrate a consistent address of built form and active water uses along the water’s edge; and
- Canberra’s current form allows little interaction with the lakefront other than passive recreation within parklands. A great potential exists for moments of urban interaction and built address to the foreshore of Lake Burley Griffin.

Canberra’s street network above Adelaide

Canberra’s street network above Melbourne

Canberra’s street network above Wellington

Canberra’s street network above Zurich

1.3 URBAN CANBERRA

Canberra's Street Tradition

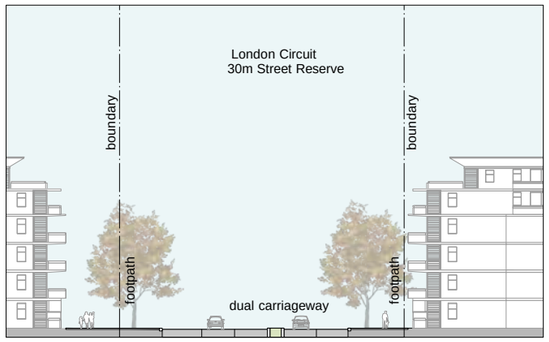
In the Griffin's 1912 plan, streets are designed as more than just corridors for car traffic. They were designed to enable traffic to flow while also allowing for great increases in traffic capacity. At the same time they were to reinforce the existing aesthetic and landscape character, focusing on views and vistas to surrounding landscape features, as well as considering business, residential and pedestrian amenity.

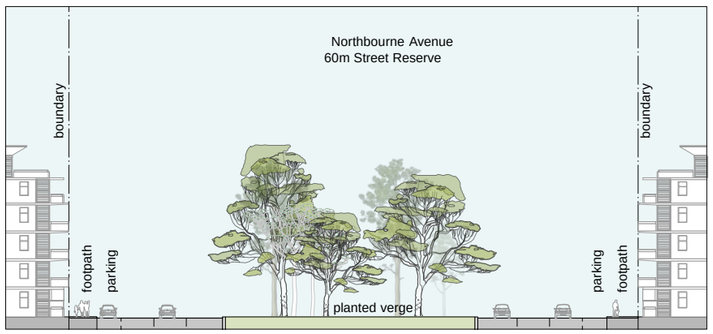
The embodiment of the potential power of streets to organize ideas and function, reinforce an ideal as well as to inspire is clearly evident in the 1912 competition winning scheme by Walter Burley Griffin and Marion Mahony Griffin for Canberra. The griffins proposed a city of avenues that demonstrated a deep resonance with the site, sensitivity to nature and a clear and precise understanding of and vision for Australian democratic society.

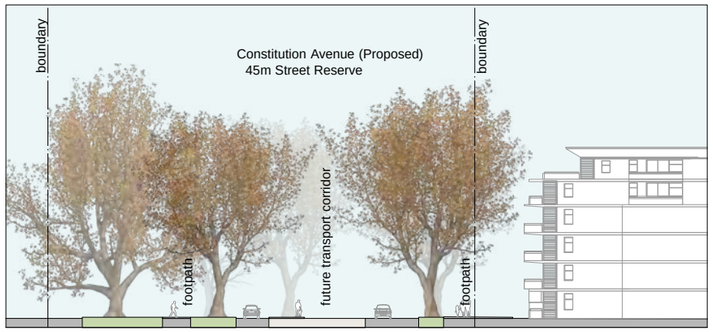
Griffin designed a full hierarchy of the city's street system ranging from grand boulevards, to avenues, residential streets and recreational drives. Griffin's hierarchy consisted of two types of main avenues, Business streets, and two types of residential streets. These were broadly applied across Canberra and became the prime means of organising suburbs.

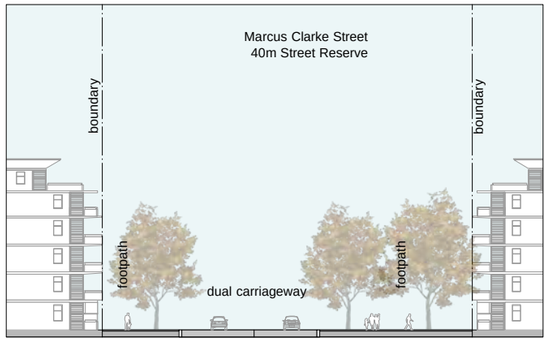
The main elements connecting and reinforcing the symbolic building arrangement in Canberra were a broad network of avenues. It was intended that they would be elegant tree lined thoroughfares lined with significant buildings providing direct access between the principal destinations of the city and civic life. It was intended that the pattern of main avenues would set the framework for the plan, containing major traffic movement, while allowing growth and expression without compromising the unity envisaged for the city as a whole. The framework of main avenues reinforced the formality of the plan, with radial a pattern of vistas cutting across urban areas and visually terminating in landscape features and public buildings. It was Griffins intention that the Main Avenues would be straight and direct between destinations to allow a maximum capacity for rapid transport, including public transport, and be lined by buildings that would allow for the greatest intensity and mix of land uses.

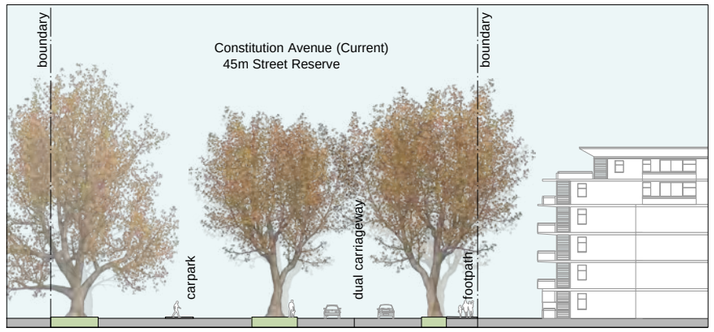
However the Avenues would, just as significantly as civic and transportation function, form parkways of greenery through the city and create formal vistas to the central area. Although not realised in their entirety they remain one of the most memorable parts of central Canberra because of the highly formal design that visually connects the city to its natural setting and to its nationally significant buildings and monuments.

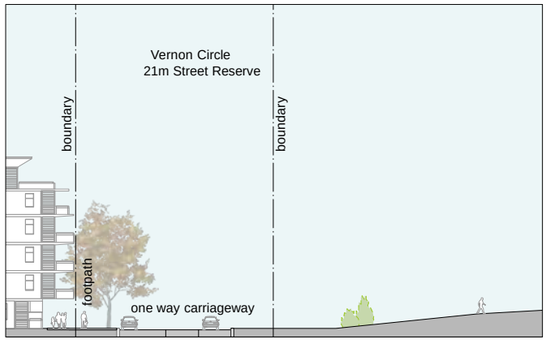










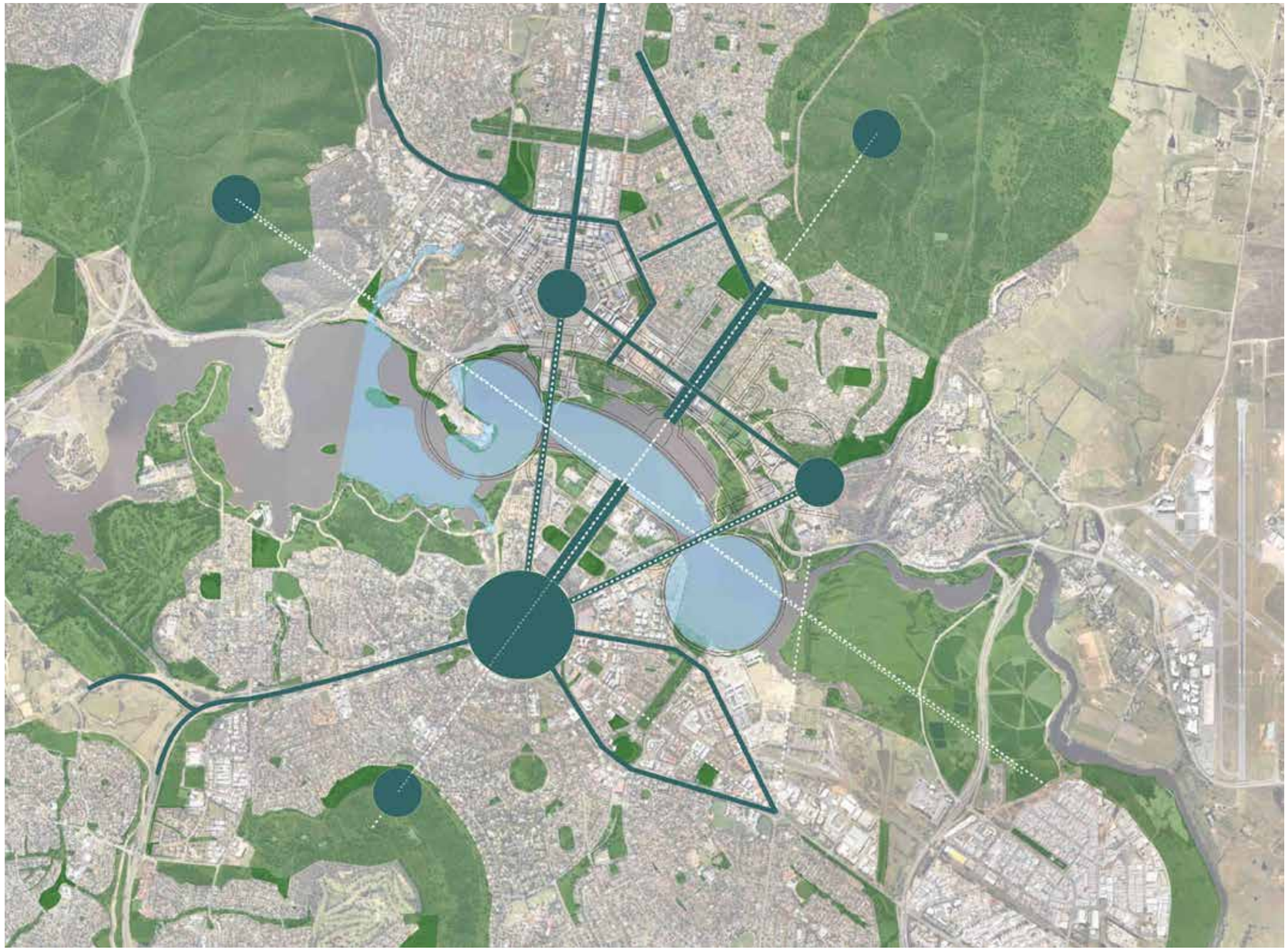


1.4 LAYOUT AND LANDSCAPE

Canberra's Landscape Character

Canberras geometric layout and the form of the immediate and distant surrounding landscape have from the first been inseparable. By linking the geometry of the city with the prominent landscape features both the topography and the plan have been given heightened significance.

- The connection to the surrounding landscape is most clearly expressed through the broad axial layout that connects points in the city to points in the landscape. It is truly a city in the landscape;
- Streets are green landscape corridors that connect major points in the city and reinforce the connection beyond. Griffin always saw the streets as more than simple thoroughfares, rather he saw them as connecting all the important structures a green and connected frontage;
- Strong street network with landscape character that is typified by broad verges, tall trees that set up a unique landscape scale;
- Through various iterations beginning in 1913, there has been a reinterpretation and redesign of street network and building locations which has changed the smaller scale physical structure, as well as the philosophical underpinning;
- Largely based on the city beautiful movement with the aim of producing beauty and grandeur in cities – beautification could promote harmonious social order that would increase quality of life;
- Although not strictly based on a garden city ideal, the garden city principles of interlacing the built areas with the countryside are evident however the connection of city centre to landscape edge has not been entirely realized; and
- Vernon circle - originally intended to house City Hall, the 1913 plan set the scene for the creation of London Circuit and changed Vernon circle to a roundabout with a park in the middle, that had no relation to the rest of the city.



1.4 LAYOUT AND LANDSCAPE

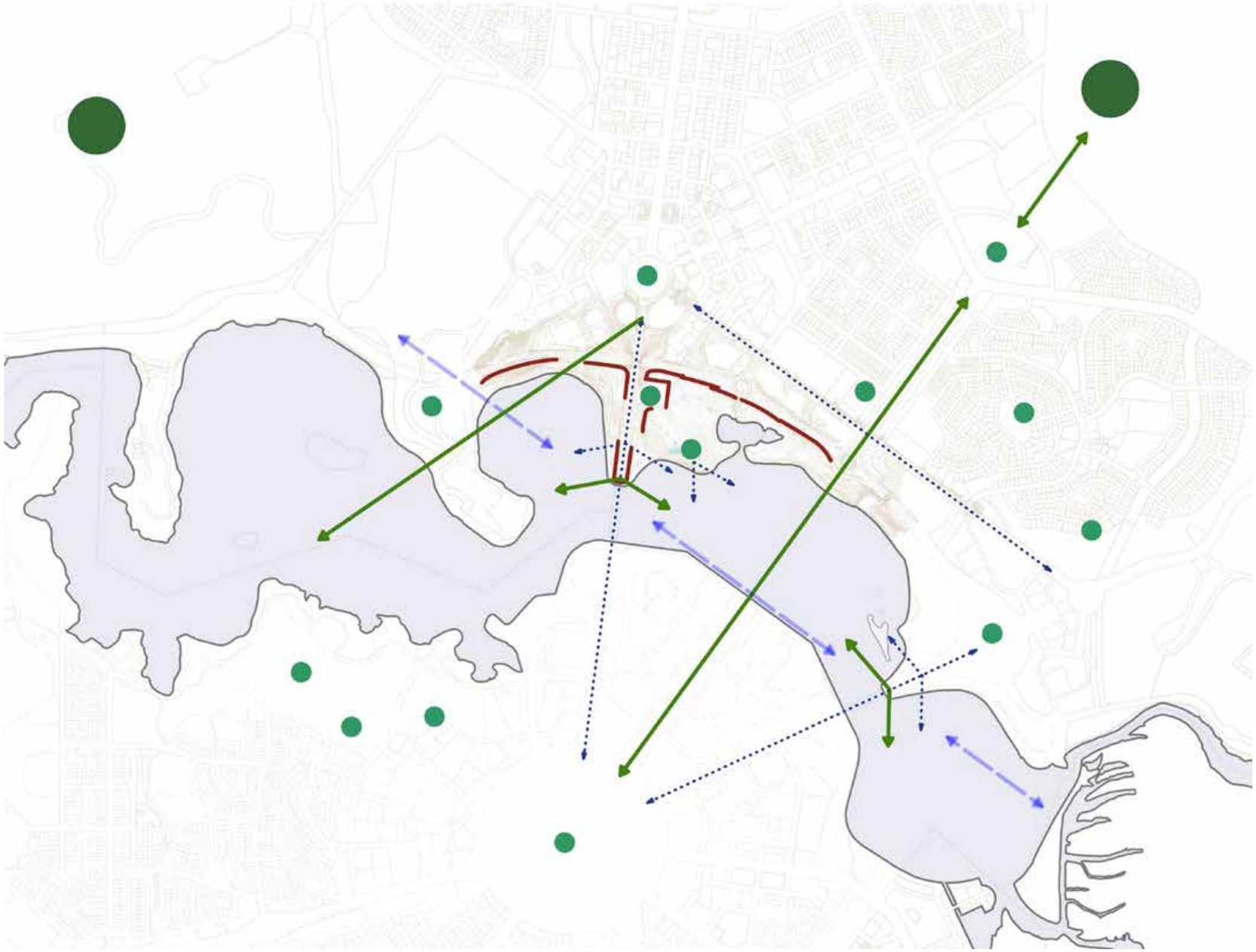
Topography

None of the other competition entrants of the 1911 competition for designing Australia's new capital responded to the topography of the site with the same intimate site understanding and dextrous hand as that of the Griffins. By intimately linking the structure of the city with both a deep theoretical understanding of democratic life, as well as to the form of the surrounding landscape has given Canberra a deep resonance with place.

The site and its context was the basis of griffins design and the major natural features were immediately recognised and drawn upon to formulate the hierarchy and structure of the city.

Griffins five major landscape categories were.

- **The distant mountains** - Brindabella mountains - one of the most important moments in moving through Canberra is the expansive views toward the Brindabella mountains that open up as you travel south alone Commonwealth avenue;
- **Local mountains** - Black mountain, Mount Ainslie, Mount Mugga Mugga were conceived as the major features in determining the axial layout of the streets, Avenues, and consequently the rest of the City. They were always intended to be retained in as natural state as possible and become bush reserve;
- **Small Hills** - The Hills in the landscape when compared to the surrounding landscape were not major landscape features. However through the introduction of significant buildings these sites took on a greatly increased importance. Although not fully realised, one can still appreciate the power of this gesture through the resonance that Vernon circle has today, simply as a result of the street geometry. It is a landmark visible from many points throughout the city. These sites most succinctly describe the combination of landscape and architecture that distinguishes Griffins vision for Canberra;
- **Waterways** - Lake Burley Griffin was a very deliberate attempt by the Griffins to respond in an urban way to the character of their City. It was a very focused on the control of water as a monumental addition to the City. This intent was later changed to fulfil recreational needs as well as to represent philosophical shifts toward a more naturalistic lake edge, as is seen today; and
- **Valleys** - Flat areas between the hills and the waterways running north and south east from the central triangle were to form the basis of everyday life, and be the areas that contained Canberra City



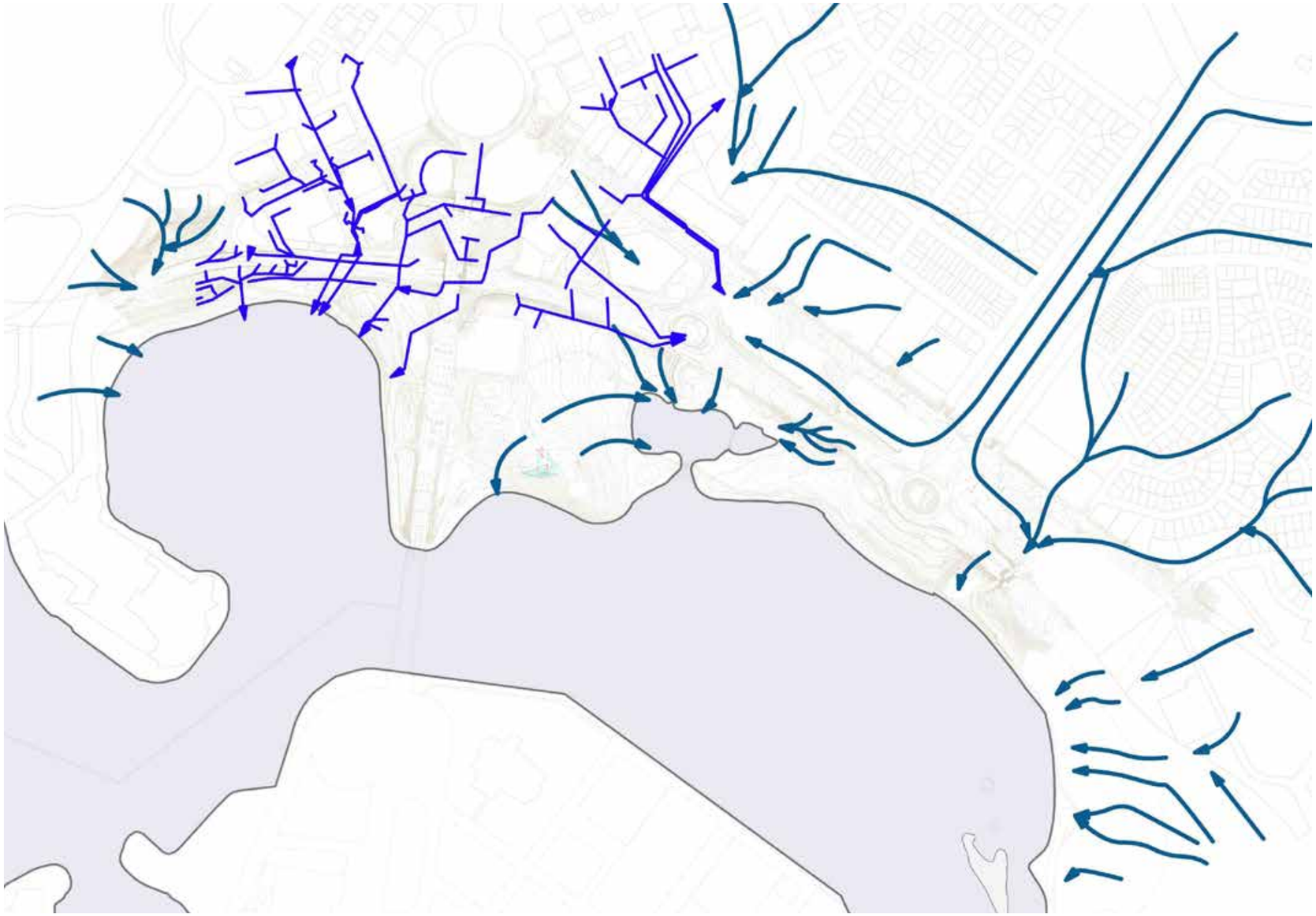
1.4 LAYOUT AND LANDSCAPE

Hydrology

Lake burley griffin flooded much of what was originally the surrounding floodplain of the Molonglo River. As such there are many localized tributaries that now flow directly into the lake. The majority of this water is redirected through the network of street drains to the larger stormwater grid and eventually into the lake. This is evident through the exposed stormwater pipes on the foreshore of West Basin.

Major stormwater pipes currently cross Parkes way would need to be upgraded as part of the works. In addition the existing stormwater trap at Coranderrk Street would need to be removed with a concurrent upgrade of the entire stormwater system. It is anticipated that the overland flow will continue across Parkes way through the proposed streets and discharge into the lake.

Currently the streets, areas of hardscape, as well as the parklands surrounding the lake contribute little to the treatment of stormwater. There are, however, key open space locations within the site in which water sensitive urban design (WSUD) projects may be initiated in order to filter and treat the runoff before it reaches the lake. These locations also have the potential to use the micro catchment of streets to direct water to treatment sites.



Structured piped stormwater system

Natural drainage lines

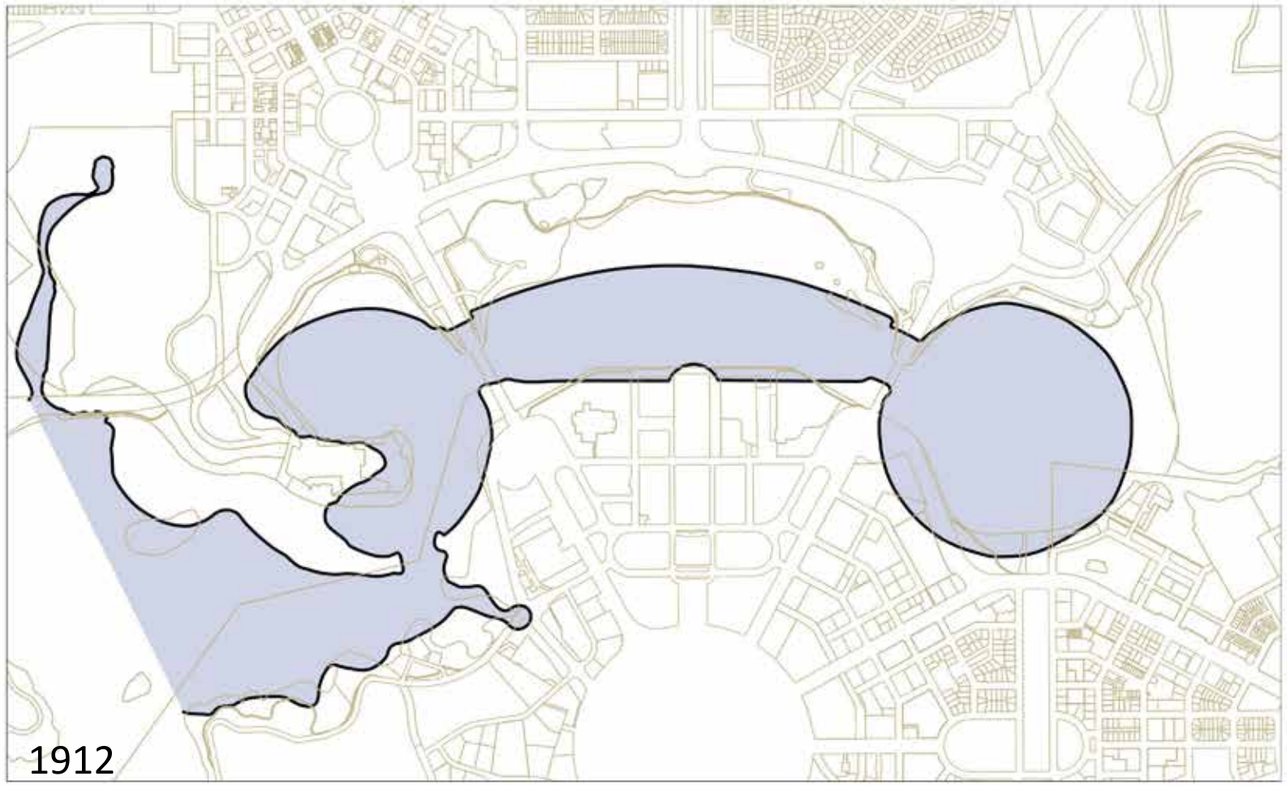
1.5 LAKE DEVELOPMENT

Lake Burley Griffin Edge

Griffin was very deliberate in his attempt to predetermine the fore shore of Lake Burley Griffin. It was very important that the lake water not be left to determine the foreshore based on the topography. The water was to be a sculptural feature for the reflection of buildings.

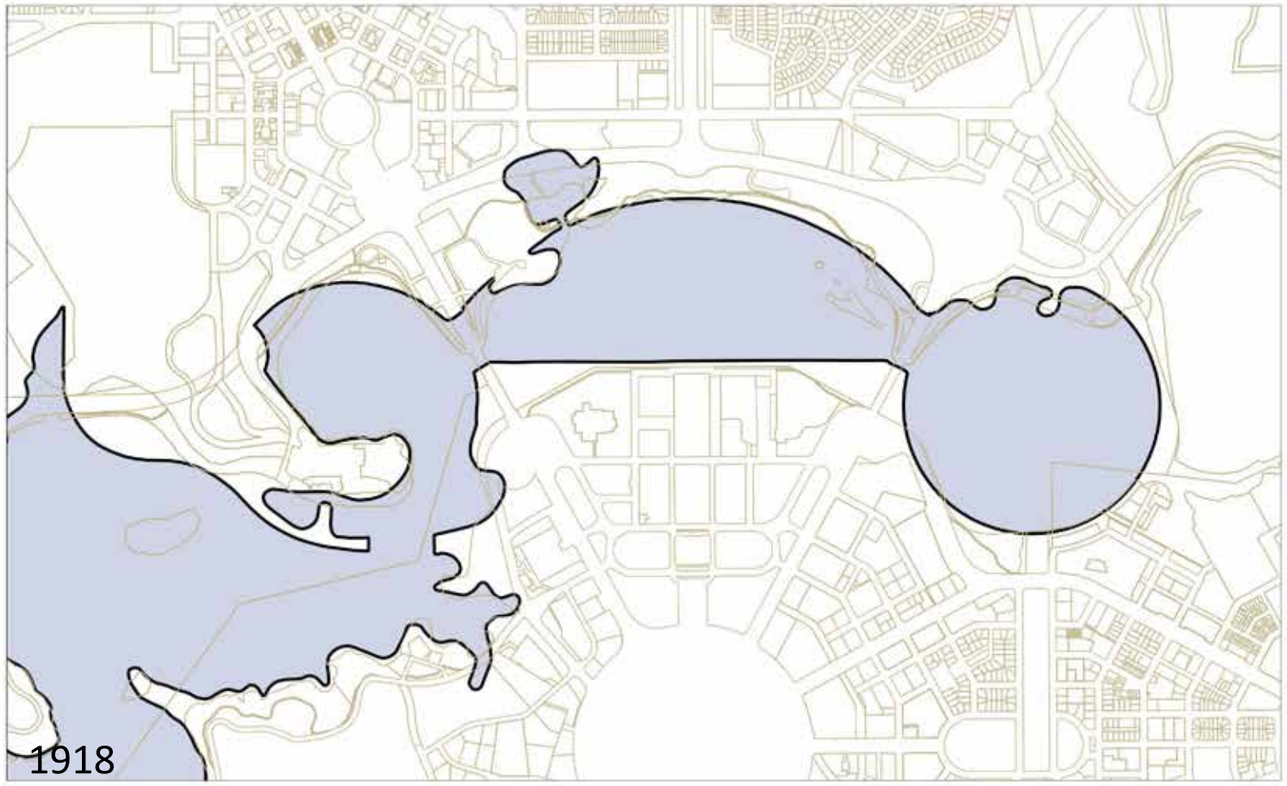
1912

- The lake and the overall geometry are inseparable due to the precise nature and alignment of the roads, and thus the bridges. To this end the shape and location of the lake edge at the bridge crossing points was to be a short as possible. This is in part the reason for the use of strict geometry to determine the lake edge;
- Lake originally conceived as having a role to plan in manipulating the microclimate of the city; and
- Original arc of central basin was generated from Capital Hill.



1918

- Conception behind Lake Burley Griffin changed from a symbolic function to a recreational one - for the enjoyment of citizens;
- Enlarged to allow as much recreation as possible;
- The arc of the central basin is no longer generated from Capital Hill, it is enlarged which changes the structure of roads and buildings on the northern banks of the lake;
- Both arcs which organised the northern shore have either been removed or significantly disrupted;
- The greatly enlarged central basin completely changes the make up of the buildings, as many of the public institutions that were conceived to be located in the public gardens needed to be relocated;
- Result of a number of iterative developments including 1913 and 1916;
- Introduction of Aquarium pond and peninsular on northern bank of lake; and
- Despite inclusion of regular geometries on plan the department had already decided hat the lake edges would be formed with the object of following the natural contours.



1.5 LAKE DEVELOPMENT

1957 (Holford Plan)

One of the major defining elements for Canberra as a whole, the influence of Holford's diagram is immense. It entrenched the idea of the naturalistic lake shore, as well as greatly decreasing the overall size of the lake.

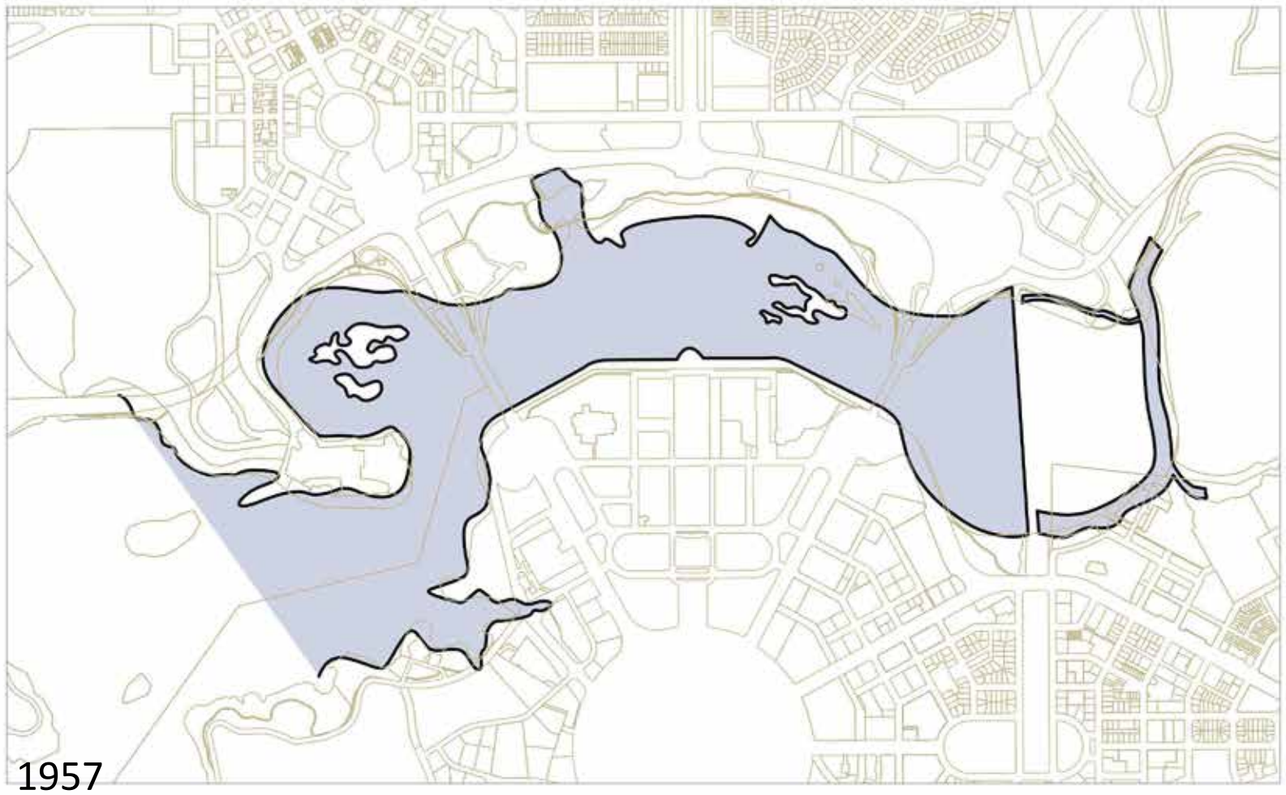
Holford identified major features of griffins plan that needed amendment:

- Street Pattern and the land axis;
- Program of the building and engineering works; and
- Absolute symmetry of Griffins Parliamentary Triangle was ridiculed and ignored.

One of the most important philosophical shifts was the change from viewing the lake, parklands and city intimately linked. Holford entrenched the idea that the park, and thus the Lake shore was treated not as part of the city, but as a contrast to it.

Thus, separating the lake from the city, a legacy that remains today is seen in:

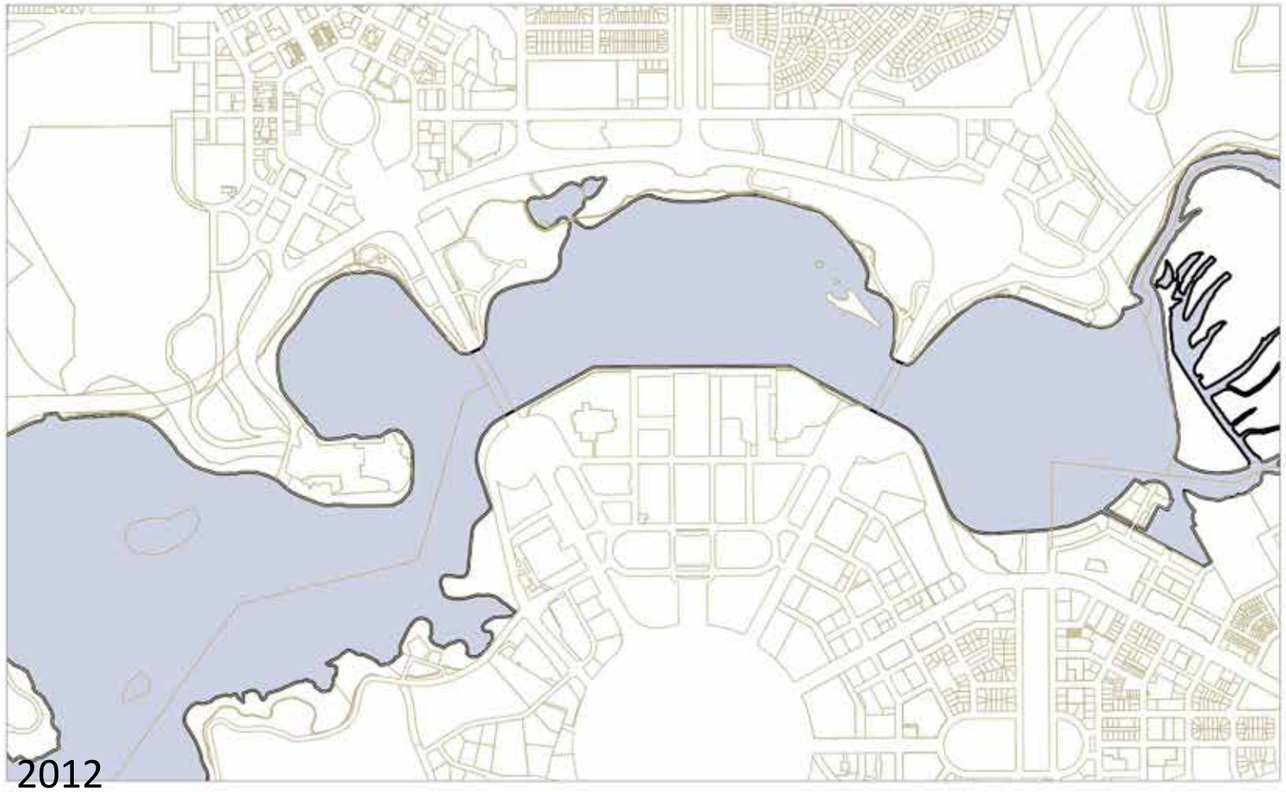
- The east and west edges of the southern shore being chamfered as a result of flood studies; and
- The 1959 (current) bridge abutments are located to the south - and this disrupts and greatly narrows the water axis.



2012 (Present form)

Between 1957 and 2012 there have been a series of small iterative changes that have contributed to the park and lake edge in its current form.

- 1963 – Lake built
- 1964 – Lake full on the 29th of April
- 1965 – Dame Sylvia Crow's Master plan programmed Commonwealth Park and solidified the lake shape
- 1968 – The NCDC modified Crow's plan and began construction
- 2007 – Canberra central parklands competition won by Oxigen
- 2009 – Completion of Menzies walk (Direct result of master plan prepared by Oxigen)



1.6 LANDSCAPE DEVELOPMENT

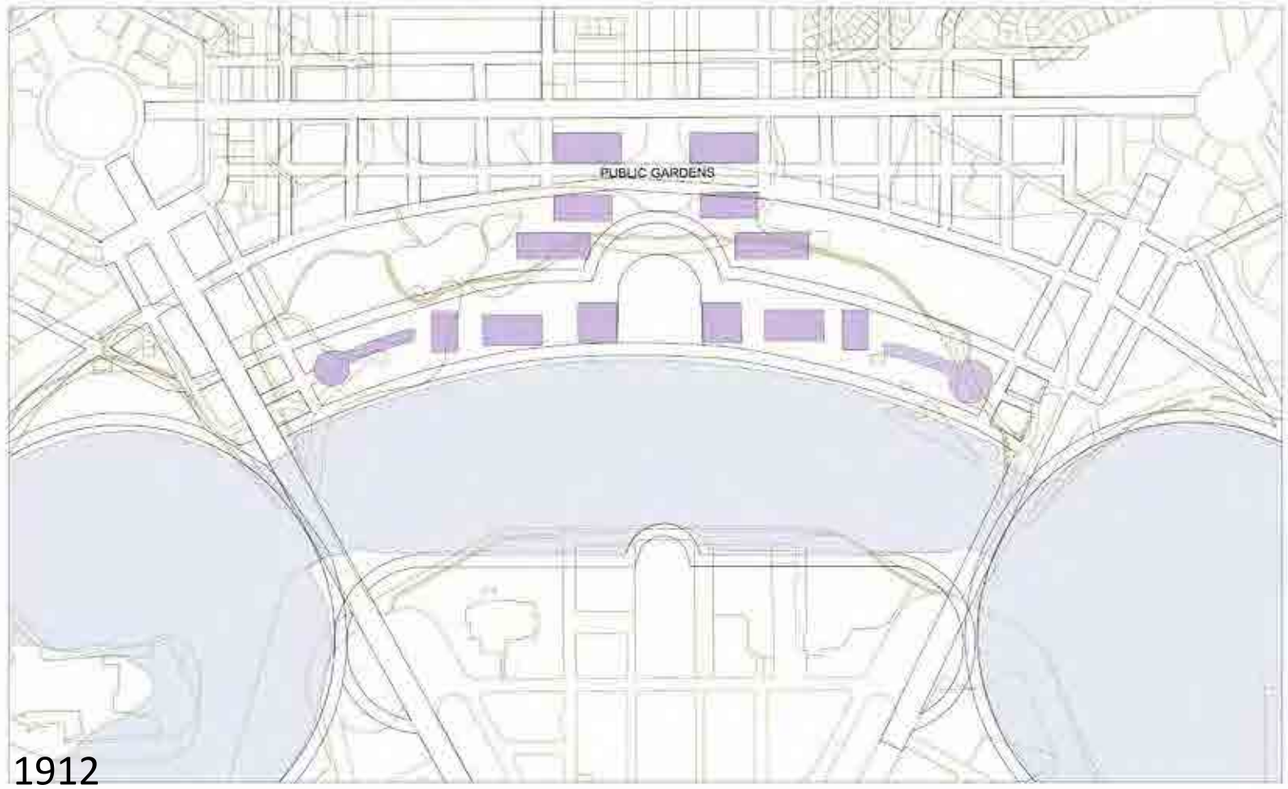
1912 - The Griffin's Winning Scheme

Born from the ideals of the City Beautiful movement with undertones of the Garden City, The Griffins competition award winning scheme was ultimately an eloquent, detailed and inspired response to site, and function.

The area now known as Commonwealth Park was originally conceived as a large public gardens which would house all the public institutions in a grand parkland setting. It was to be Canberra's Central Park, In addition it was the base of the triangle in Griffins democratic diagram, an area that embodied and represented the will of 'The People'.

Buildings included:

- Zoological Gardens
- Museum of Natural History
- Museum of Archaeology
- Aquatic Gardens
- Plant conservatory
- Gymnasium
- Baths
- Galleries of the Graphic Arts
- Galleries of the Plastic Arts
- Theatre
- Opera House
- Stadium

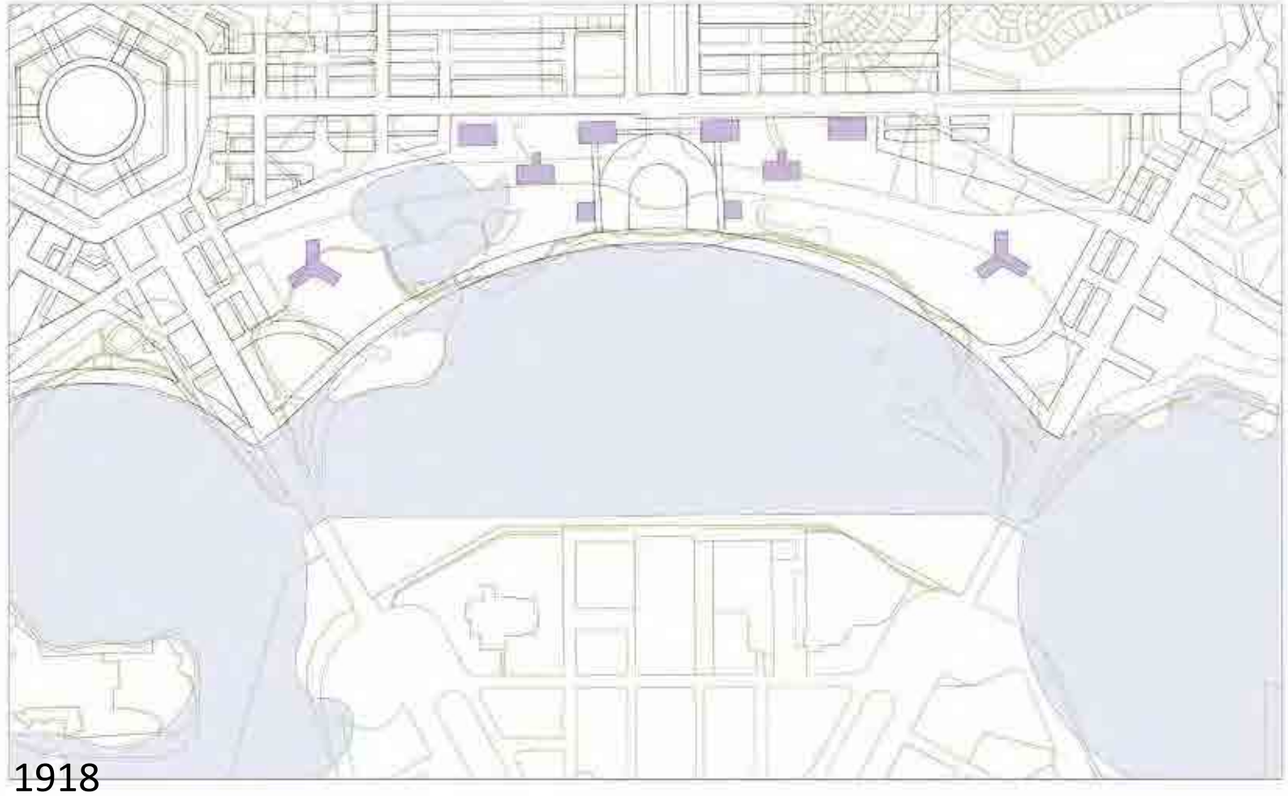


1912

1918 - The Griffin's Modified Scheme

A series of iterative changes from both bureaucratic and ministerial influence as well as from Griffins response to site.

- Public buildings on the northern side of the lake are no longer specified and there is an overall reduction in number;
- Area of lake has been dramatically increased and thus the park decreased as a result of adjustments to more closely align with existing topography and to allow greater recreational opportunities. The result of this is that the arc of the central basin moves north and interrupts the make up of roads and buildings in the city centre. The middle arc has gone and the remaining northern arc is not complete;
- Introduction of Aquarium Pond to more closely align with existing topography and drainage courses; and
- Introduction of peninsular, modified from an Island in the 1913 plan, to account for existing topography and reduce expense.



1918

1.6 LANDSCAPE DEVELOPMENT

1949 - Lindsay Pryor's Landscape Establishment

For the first half of the 20th century Canberra development as vary slow. It occurred in stops and starts as the world wars and various points of contention hampered consistent decision making and a will to realise Griffins plan. In 1949 Lindsay Pryor secured land for Canberra's Central Parklands as well as oversaw the development of a master plan. It was never intended to be a holistic master plan, but rather a means to achieve official recognition of the need for a central park in Canberra.

Important Developments:

- Introduction of Catholic land allotment, granted in perpetuity by the federal capital commission in 1927; and
- Mulwala House hostel opened in 1947 to house an influx of single people in the post war years.

Pryor's' intention:
The general idea of the plan was to encourage the use of the park by many people of varying interests. This is suggested in the design in the following ways:

- A paddling pool surrounded by a walk on a low wall, and fed by clean water;
- The day use of the area by picnic groups of varied composition and size which would be more or less separated from one another;
- Dancing, restaurant and swimming facilities are in one section, easily accessible by road and foot; and
- The band shell, conservatory and boating facilities would provide a natural separation and spread the use of the area by people, and also encourage circulation through the park.

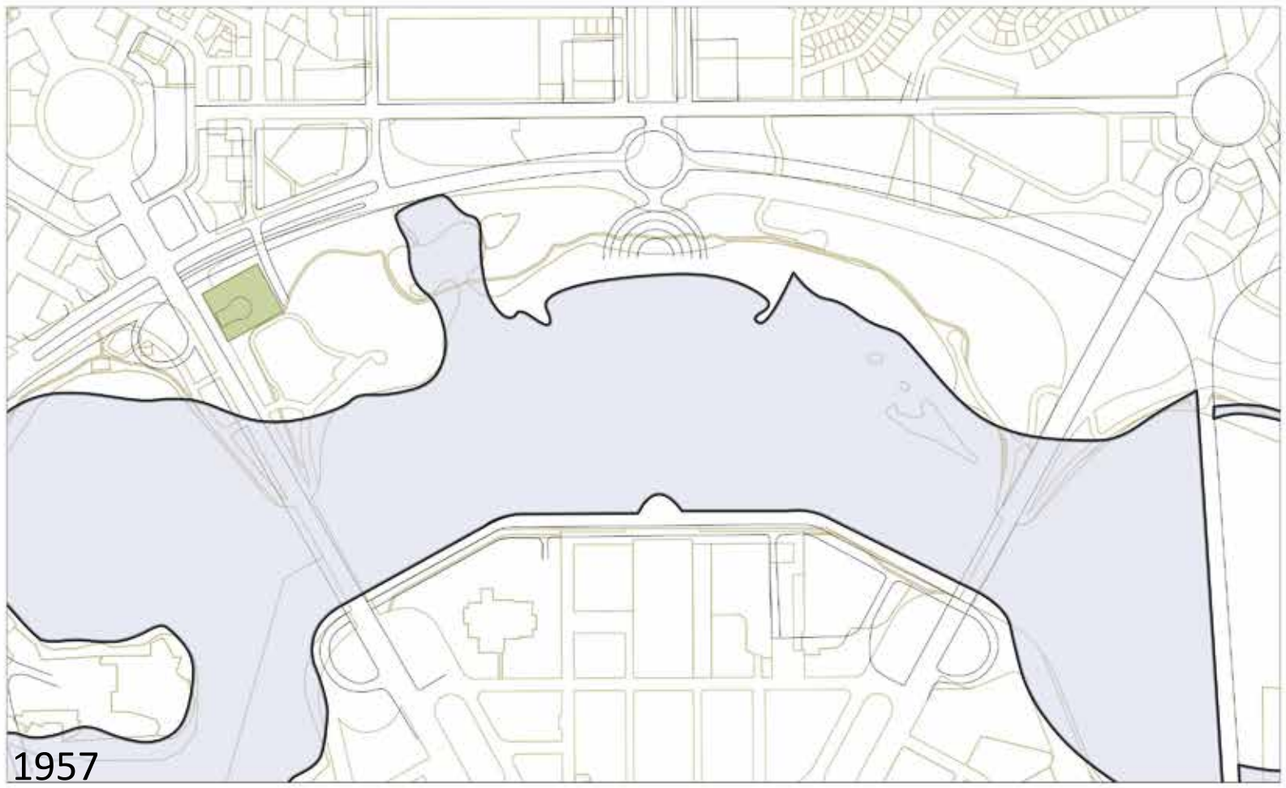
Pryor aimed to provide a space for the people of Canberra to relax and play in a landscape setting with some horticultural interest. In essence, what was proposed was a domestication and functionalisation of what was originally conceived as a powerful ceremonial landscape. However, without this drive, a park may not have been present at all.

1957 (Holford Plan)

Motivated by the lagging development Prime minister Menzies authorized, in response to a senate committee report, invited William Holford to advise the Government on the ongoing development and transformation of Canberra.

The key elements of Holford's influence include the following:

- Influence of the Motor Car;
- Influence of the garden city and picturesque movements;
- No public buildings in the landscape;
- All meaning lost from the landscape;
- All of Griffins geometries lost;
- Chamfer of the southern bank of the lake to appease engineers concerned about flooding;
- Street network connection into park lost and therefore this could be seen as the beginning of the disconnection of Commonwealth Park from the city;
- Park divided in two by pool;
- No peninsular along Commonwealth Avenue and Kings Avenue.



1.6 LANDSCAPE DEVELOPMENT

1961 - NCDC Landscape Master Plan

Advisory Report on the landscape of Canberra's lake scheme prepared by Holford and the NCDC made some major recommendations:

- The area was to be considered a park. It was to be an open space that exists to give pleasure;
- Examples of possible uses include a children's play field and pool and a music bowl;
- The Rond Point terraces on the land axis would provide a grandstand for boat races or ceremonies at Parliament house (which at that time was planned to be on the opposite lake shore);
- The area was considered to be primarily for recreation and walking with car parks at the perimeter;
- The Aquarium pond, now Nerang Pool, would provide a safe pool with a protected edge with the water at a constant level where children could play and aquatic plants were to be grown
- The landscape was to be dominated by the grass and trees of the landscape surrounding Canberra. The green of watered grass and deciduous trees were to be used only for contrast or emphasis;
- Regatta Point was to be kept bare, to contrast the wooded areas on either side of it;
- First drawing showing Parks Way scale and character - enhances disconnection from city, but includes some underpasses and a street through the park; and
- Shape of aquarium pond modified so as not to divide park.

1968 - NCDC Landscape Master Plan

In 1964, in response to policy changes the need for a master plan was recognized to appropriately plan and Program what would become known as commonwealth Park. This commission was given to William Holford and Partners and Sylvia Crowe. This was to be Sylvia Crow's only built landscape in Australia. The master plan was prepared and submitted in 1965.

Key requirements of brief were that Mulwala house was to be removed, there to be some on site parking and three types of buildings with catering facilities in addition to the regatta point restaurant and conservatory. The consultants disagreed with the NCDC's proposal for vehicular access from Allara Street in Civic Centre to the park, and recommended that traffic within the Park be more limited than was suggested in their Brief - They wanted the main entrance to the park to be a foot bridge from Allara Street

Key elements:

- Series of different landscapes including a hill top garden, water avenue, colour gardens, shrub glades, bog gardens, children's shore, lily pond and spectators shore;
- Two large contained lawn areas created by Pryor's Planting in 1949 and the views out from them retained;
- Key structures - Regatta point restaurant, floating light refreshment structure in the north west corner of Nerang pool, a conservatory placed on the edge of the central lawn and a kiosk at the underpass entry to the east;
- Framework of large tree plantings to give scale to the gardens and there would be thick planting along Parkes way to eliminate the sight and sound of traffic;
- Lighting was to be incorporated into various features; and
- The NCDC approved the plan with minor amendments, including the provision for increased car access and parking.

1.7 SIGNIFICANT PARKLAND ELEMENTS

Key milestones in the development of the parklands since 1968 include:

1969 - Introduction of the Captain Cook Jet

1970 - David Tolley's play sculpture

1970 - Introduction of a carpark between the cathedral and Regatta Point

1974 - Richard Clough (NCDC Director of Landscape Architecture) Proposed changes to master plan - moving the conservatory, removal of "Avenue of fountains" and combination of flower garden and marsh garden

1975 - Australia '75 arts festival (catalyst for increased use)

1976 - Barbara Hepworth's "Two Figures"

1977 - Sue Birch-Marston's underpass mural and Ann Morris' amphitheatre mural

1979 - Construction of the Parkes Way pedestrian bridge

1979 - Construction of the children's play sculpture

1980 - 200 Japanese Cherry trees donated by the Japanese Government

1981 - Jan Brown's Kangaroos

1987 - Expansion of carparking within the park

1988 - Floriade (later became an annual event)

1988 - Music Bowl opened (Phillip Cox, Richardson Taylor and Partners)

1. Waterloo Bridge Stone and Plaque
2. National Capital Exhibition
3. Archbishop's Residence
4. Captain Cook Memorial Globe and Water Jet
5. Lake Burley Griffin Scheme - Institution of Engineers Plaque
6. Walter Burley Griffin Terrazzo
7. Canadian Flagpole
8. Stage 88
9. Commonwealth Avenue Geological site
10. Citizenship Place Memorial
11. 'Two Figures'
12. Bicentennial Time Capsule
13. Mulwala Hostel site Bicentennial Time Capsule
14. Kangaroos
15. 'Earthwork'
16. 'Seated Lady'
17. 'Dance of the secateurs'
18. 'Untitled'
19. Stone Fort
20. Nerang Pool
21. Amphitheatre
22. Children's Play Sculpture
23. Murray's Bakery site
24. Stanley Melbourne Bruce Memorial
25. Commemorative Oak
26. Pioneer Women's Memorial
27. Sybil Howy Irving Memorial
28. Battle of Trafalgar Memorial
29. Murray's Bakery Site
30. Gallipoli Reach
31. Blundells Cottage
32. National Emergency Services Memorial
33. Merchant Navy Memorial
34. H.M.A.S. Canberra Memorial
35. National Carillon
36. National Bonsai and Penjing Collection of Australia
37. National Police Memorial

1.9 SIGNIFICANT VEGETATION

The vegetation in Commonwealth park is a rich amalgamation of various influences since 1913. Various people have contributed to its development and there are remnants of each of those throughout various areas of the park.

The first concerted effort to plant the area was undertaken by Thomas Weston in 1922. Some of these plantings are still seen today on the western edge of the park.

The next major influence was the years between 1950 and 1970 which say Lindsay Pryor and Dame Sylvia Crowe's influence.

In the ensuing years various bureaucracies have taken control and what exists today is a rich layering of vegetation that is a living testament to the many hands that have contributed to the development of Canberra.

1922 - Thomas Weston's Planting

1968 - Planting based on Sylvia Crow's Masterplan

1980 - Japanese Government donated Cherry Trees

2013 - Existing vegetation

APPENDIX

URBAN PRECEDENTS

LINKING CANBERRA CITY TO THE LAKE

October 2013

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B1

URBAN MORPHOLOGIES

1.1 URBAN FORM

Adelaide

Adelaide was founded on a sweeping coastal plain in 1836 as a free settlement. An extensive grid plan of generous streets was designed by Colonel William Light and is more than 1 square-mile in area.

Streets and Parklands

Adelaide's super-grid is mediated by 5 green squares and a range of small streets and lanes which provide walkable block depths and fine subdivision. The centre of Adelaide is ringed in public parklands which house garden, sporting and social facilities.

Disconnective Elements and Under-utilised Urban Land

Adelaide's centre has small pockets of remaining surface car park which are yet unrealised as contributory built form. A small amount of land adjacent to the river in the north-west is under-developed or awaiting construction, but for the most part Adelaide's centre is developed in various densities.

Railway corridors to the west stretch along the parkland edge. These disconnective elements are broken by generous trees at intervals of 400-600m which is considered unwalkable for the mainly residential interface in this location beyond Adelaide's park-ring.

There are no large alienating motorway or other infrastructure elements which disconnect Adelaide's centre from it's extensive parklands and riverfront.

Public Buildings

Adelaide's North Terrace is the setting for a suite of civic, cultural and institutional uses. The universities of Adelaide and South Australia have interface to this grand street and the River Torrens to their north.

Adelaide's Central Station, Entertainment and Conference Centre and State Library all grace North Terrace.

Adelaide Oval is located in parkland between Adelaide and it's smaller urban partner, North Adelaide. It is within walking distance to public transport and facilities of central Adelaide. The Town Hall and Supreme Court of South Australia are found on King William Street within the body of Adelaide's central Grid.

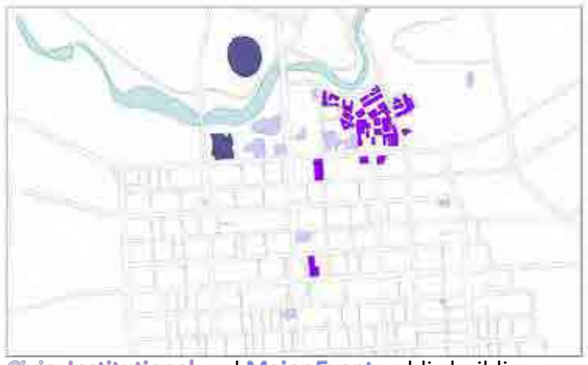
Structural Public Transport

Adelaide has a train network comprised of 5 lines and 81 stations developed in the mid to late 19th century. These lines converge and terminate at Adelaide's Central Station in the north west of the city centre. The network is partially electrified and undergoing renewal and extension.

A single tramway remains between Adelaide and suburban beach side Glenelg. Recent extensions along Adelaide's main north south street to North Terrace and the inner suburb of Hindmarsh have been realised. Plans exist to extend this system to the northern suburbs.

Street Reservations and Parklands

Man-made / Natural disconnective elements and Alienated or Under-utilised urban lands



Civic, Institutional and Major Event public buildings

Structural Public Transport

1.1 URBAN FORM

Hobart

Hobart was founded in 1804 as a penal colony. It occupies a series of foothills below Mount Wellington and stretches north to south along the River Derwent as it empties into the South Tasman Sea.

Streets and Parklands

Hobart's centre is dominated by an somewhat informal grid of similarly proportioned blocks. Significant urban parks are seen at the edges of the centre - The Domain Parklands and Cenotaph to the north, and the St David's Park to Princes Park open space network to the south in Salamanca, above the Castray Esplanade.

Davey Street is key in linking each of these extensive park networks through the city centre along the waterfront.

In the City Centre Franklin Square can be seen fronted on all sides by some of Hobart's busiest city streets.

Disconnective Elements and Under-utilised Urban Land

The north-east edge of Hobart's centre has working port facilities and railways that prevent this area of the city from engaging with its waterfront.

Over recent decades Hobart has had a successful policy of opening up its waterfront for public use, and a number of uses from Franklin Wharf around to Salamanca Place along a majority of the water's edge occur with public access maintained.

Public Buildings

Hobart has a small number of public buildings located adjacent to the waterfront and distributed throughout the Domain Parklands (Cenotaph, Aquatic Centre and in the City's north. Several significant public buildings, including MONA, are located outside of the city centre.

Structural Public Transport

Hobart has no structural public transport.

Street Reservations and Parklands

Man-made / Natural disconnective elements and Alienated or Under-utilised urban lands

Civic, Institutional and Major Event public buildings

Structural Public Transport

1.1 URBAN FORM

Perth

Perth is one of the most isolated capitals in the world - located on the lower-reaches of the Swan River in south-western Western Australia. Over the last decade Perth has received a high level of investment which has encouraged a high level of growth and change in the city centre.

Streets and Parklands

Two long east-west grids of streets can be seen running almost paralell to the waterfront, separated by Perth's main train lines. The City Centre grid retreats from the water's edge where park and public buildings occupy prominent locations.

An almost unbroken network of parks are seen linking King's Park in the west to the WACA in the east and beyond along the river.

Perth has several notable squares and parks in the ciy grid including Victoria Square, Wellington Square and the Queens Gardens which are all well fronted.

A significant reworking of the foreshore and streets fronting the water is occurring as part of the "Elizabeth Quay" renewal.

Disconnective Elements and Under-utilised Urban Land

Perth's centre is divided from its hinterland by the rail and motorway corridor linking greater eastern and greatern western Perth. Recent projects have begun to address this divide and attempt to provide greater connectivity across this busy corridor.

At the waterfront, significant motorway infrastructure has disconnected the ability for areas of the city centre to engage with the water. These high speed roadways also sever the open space network along the river's edge.

Public Buildings

Several clusters of public buildings occur in Perth's centre. A number of administrative and historic buildings are grouped along St Geroge's Terrace and in Stirling Park - Including teh City of Perth, the WA Surpeme court and Government House.

North of the Railway station lie the State Library and Museaum of Western Australia, colocated with a number of related institutions.

The famous WACA ground and related facilities can be seen at the end of the City Grid in East Perth.

Structural Public Transport

Perth has a modest metropolitan rail system which converges on the city centre and runs parallel to the city's street grid east-west before fanning into singular suburban lines.

A more recent addition to the network from Mandura in the south arrives at the city along the Kwinana bridge and undergrounds at the Convention Centre, connecting the Perth's Central Station.

Street Reservations and Parklands

Man-made / Natural disconnective elements and Alienated or Underutilised urban lands

Civic, Institutional and Major Event public buildings

Structural Public Transport

1.1 URBAN FORM

Wellington

New Zealand's capital is located on a picturesque harbour by the same name. Wellington's central area occupies a limited expanse of flat land along Lambton Bay before rising steeply around all sides. This dominating landscape constrains central Wellington's expansion potential and connectivity.

Streets and Parklands

Wellington's centre is comprised of a number of small warped street grids with a relationship to the curved water-front. This more connective system gives way to limited connections over undulating topography within a very short distance from the centre.

Disconnective Elements and Under-utilised Urban Land

Wellington's dramatic topography constrains the more densely developed city greatly to the immediate area surrounding Lambton Harbour.

A motorway from the north further exascibates this by disconnecting the inner western hills from the City Centre and major waterfront facilities.

Public Buildings

A grouping of administrative buildings including the New Zealand parliament are seen at the northern end of central Wellington, with proximity to the city's harbour docks.

In the South lies a series of cultural facilities scattered along the water's edge including a number of theatres and galleries, most notably Te Papa Tongarewa - New Zealand's National Museum and Art Gallery.

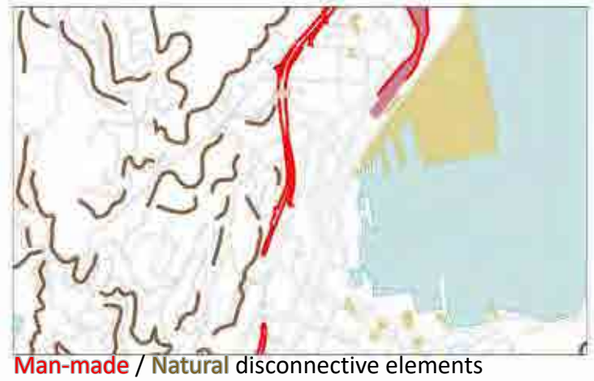
Structural Public Transport

Wellington has a limited outer metropolitan/regional rail netowork which converges into central Wellington and terminates at its northern extents.

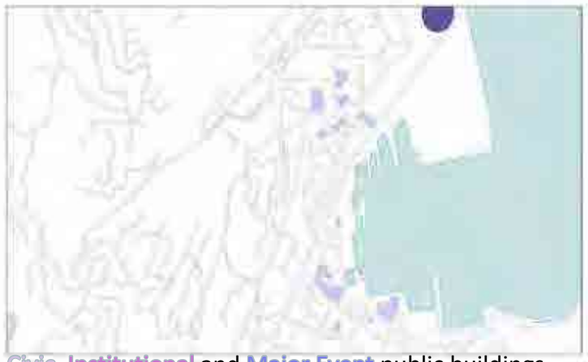
Within the city centre itself, a cable car connects to the immediate inner western suburbs, and provides a proximate connection to the Victoria University of Wellington campus.

There is no structural transport connecting Wellington's centre to the southern suburbs or surrounding coast.

Street Reservations and Parklands



Man-made / Natural disconnective elements and Alienated or Under-utilised urban lands



Civic, Institutional and Major Event public buildings

Structural Public Transport

1.1 URBAN FORM

Zurich

Zurich is the largest city and former capital of Switzerland with human settlement dating back to Neolithic times. It sits at the base of Lake Zurich where the Limmat River begins. The historic centre of Lindenhof is situated approximately 700m along the Limmat away from the Lake's edge.

Streets and Parklands

Zurich's original streets can be seen eliminating from the Lindenhof - a small hill on the western edge of the Lammat. The extent of the Roman town (called Turicum) is seen on both shores of the river. For a period the town functioned as a tax collection point on the border between Gaul and Italy.

Small Pocket parks and squares exist in the old centre, with the Lindenhof hill offering views across the old town.

Successive growth occurred with the introduction of the railways in the C19 visible as perimeter block development in varying irregular street grids.

More extensive public open space and parklands exist around the centre particularly south of the centre along the lake edge comprised of a number of foreshore treatments and promenades, arboretum and exhibition park.

Disconnective Elements and Under-utilised Urban Land

Lots of undeveloped urban land are rare in central Zurich and surface carparks almost non existent. A consistent 4-6 storey built form is predominant across the focus area.

Zurich is fortunate to have motorway development of the 1950's and 60's terminate beyond the centre so a fine network of public streets persist.

Rail lines which previously cut across the south centre of Zurich have been partially under grounded and their corridors efficiently utilised.

Public Buildings

Zurich's town hall and civic buildings are found throughout the old centre with many adjacent to the river or at prominent locations in the grid.

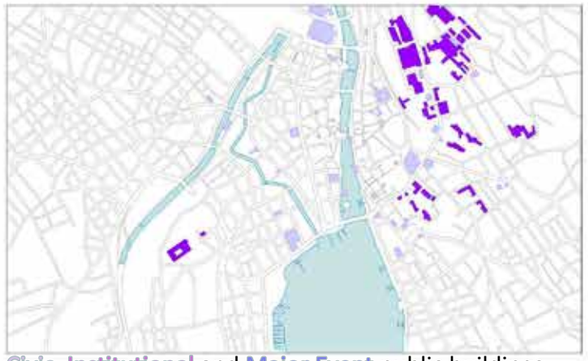
Structural Public Transport

Zurich has a long established rail system which has been incrementally upgraded and extended and caters for international and regional services as well as outer metropolitan commuting.

Inner city Zurich is served by a high quality and high frequency network of light rail with interchanges at the Hauptbahnhof (Station) and Lakefront, and priority movement along the main street, Bahnhof Strasse.

Street Reservations and Parklands

Man-made / Natural disconnective elements and Alienated or Under-utilised urban lands



Civic, Institutional and Major Event public buildings

Structural Public Transport

1.2 URBAN INTERFACE

Sydney's Domain

Macquarie Street runs from Hyde Park in the South and terminates at the forecourt to the Sydney Opera House and harbour edge in the north. The street forms the eastern edge of Sydney's Central grid and is the address to the Governor's Domain - "The Domain".

Macquarie Street is home to the largest concentration of public and civic institutions in Sydney including (north to south):

- Sydney Opera House
- Government House (and botanic gardens)
- Sydney Conservatorium of Music
- Chief Secretary's Building
- State library of NSW
- Parliament of NSW
- Sydney Hospital
- Reserve Bank of Australia
- The Mint
- Supreme Court of NSW
- Hyde Park barracks
- St James' Church

The street is also the address of prestigious hotels, office buildings and apartments.

The entire length of Macquarie Street is within walking catchment to multiple bus routes as well as Circular Quay, Martin Place and St James stations.

Source: Google Earth/ Hill Thalis

1.2 URBAN INTERFACE

Brisbane's Southbank

The southern shore of the Brisbane River in Southbank is an almost 2km stretch of north-east facing parkland dominated with public buildings and programme. It has become one of the Australia's most popular cultural destinations.

Southbank is supported by Grey Street and the convergence of Brisbane's southern railway lines, both parallel to the river. There are 2 well located railway stations at each end of the precinct.

A number of major public and cultural institutions are found here, including:

- Gallery of Modern Art (GOMA)
- Queensland Museum
- State Library of Queensland
- Queensland Performing Arts Centre
- Queensland Conservatorium
- Griffith Universtiy
- Queensland Maritime Museum

The precinct offers wide prospect back to Brisbane's centre across the Brisbane River with park edges and boardwalks, and is connected at regular intervals by 6 bridges - one rail, 2 trafficable and 5 accessible by pedestrians.

Southbank offers access to the waterfront not possible in Brisbane's centre - prevented by extensive motorway infrastructure.

Source: Google Earth/ Hill Thalis

1.2 URBAN INTERFACE

Paris' Bercy

Some of the first recorded human settlements in Paris are claimed to be in the vicinity of modern Bercy. This once industrial outskirt of Paris has seen a revival and reinterpretation as a new home for public programme on the Seine.

Extensive public programme and parklands exist on both edges of the river. Significant items on the left-bank include:

- Le Jardin des Plantes (Botanic Gardens)
- Universite Jussieu (University)
- Gare d'Austerlitz (major rail station)
- Piscine Josephine Baker (public swimming pool)
- Bibloteque Nationale (French National Library)
- Universite Paris Diderot (University)

Significant items on the right-bank include:

- Gare de Lyon (major rail station)
- Ministere des Finances (Ministry of Finance)
- Palais Omnisports de Paris Bercy (major multi-use entertainment)
- Parc Bercy (major urban park and housing)

The precinct is also the address of prestigious hotels, office buildings and apartments.

A number of bridges at regular intervals allow for ease of crossing between the left and right bank.

The river is also traversed by private vehicles and the Metro.

Source: Google Earth / commons.wikimedia.org/ Hill Thalis

1.3 URBAN BOULEVARD

Avenue des Champs Elysees, Paris

- Length: 1910m
- Reservation: 70m
- 4 rows of shade trees
- Paris Metroline 1 runs under Champs Elysees

Source: JILA/Hill Thalis

St Kilda Road, Melbourne

- Length: 6km
- Reservation: 60m
- Each Footpath: 10m
- Side (local) streets: 10m
- 4 rows of shade trees
- Bicycle lane
- Tram lines on either side

Source: Hill Thalis/Google Street View

1.3 URBAN BOULEVARD

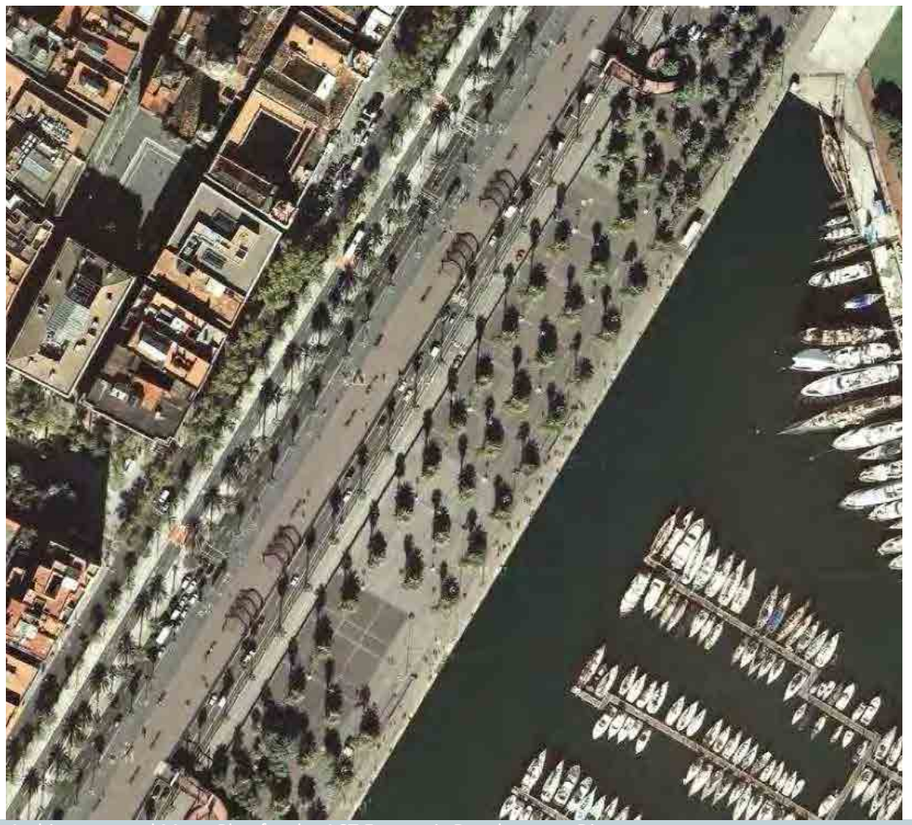
Passeig de Gracia, Barcelona

- Reservation: 60m
- Each Footpath: 11m
- Fast Central Traffic: 18m
- 2000 to 3000 cars per hour
- 4 rows of shade trees
- One of the major avenues in Barcelona

Source: JILA/Hill Thalis/Google Earth

La Ronda Litoral, Barcelona

- multiple reservation widths greater than 50m
- Creation of new public waterfront spaces by covering parts of the bypass
- multiple planting and hardscape arrangements



Source: JILA/Hill Thalis/Google Earth

1.4 TRANSPORT INTERCHANGE

Transport Interchange - Adelaide

Adelaide has recently extended it's City-Glenelg light rail route to the inner northern suburb of Hindmarsh via North Terrace. Plans exist to extend this line further which has the potential to include the branching of new lines.

Victoria Square + King William Street

Formerly the terminating point of Adelaide's light rail, Victoria Square's western edge now forms the central interchange in Adelaide's grid. Public open space, dedicated cycleways and buses all converge within the square.

To the north and south of Victoria Square King William Street forms a light rail and bus spine that bisects the entire Adelaide City Grid and crosses important destinations such as Rundle Mall.

North Terrace

The extension of light rail along North Terrace has enabled the interchanging of light rail and heavy rail to occur for the first time. Bus interchange is also possible in this location.

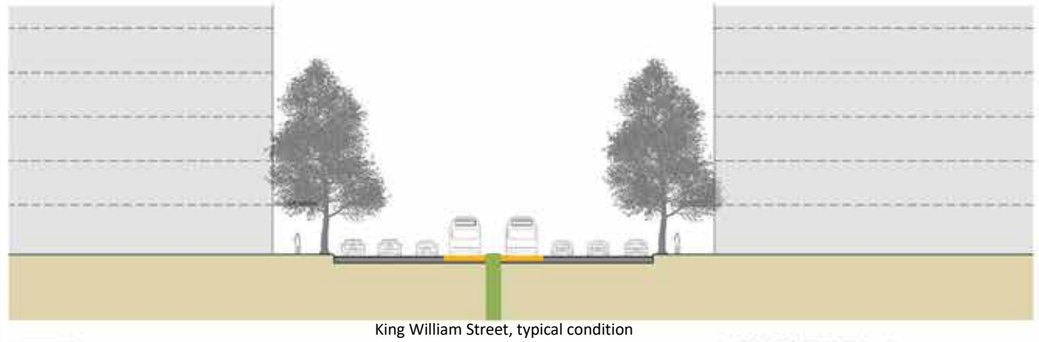
Public Institutions such as Parliament, the Universities of South Australia and Adelaide, State Library and Museum are all within walking catchment to the light rail.

Source: Hill Thalis/Google Earth

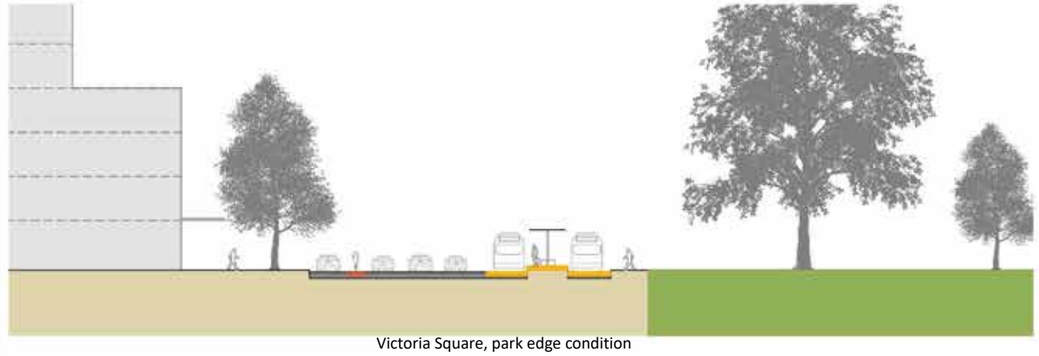
Bicycle Lanes

Structural Transport (Trams and Trains)

Tram and Train Stations



King William Street, typical condition



Victoria Square, park edge condition

1.4 TRANSPORT INTERCHANGE

Transport Interchange - Melbourne

Melbourne's extensive tram network intersections with its suburban rail network at several points around the City's grid. Both Flinder's Street and Southern Cross stations offer street based interchange to the tram system on adjoining streets.

Flinders Street Station

Flinders Street Station is situated on the corner of Flinders and Swanston Street, and each contain significant tram movements. These streets facilitate East-West lines and North South lines respectively - allowing interchange between the entire Metropolitan rail and tram networks.

Rail lines sit one level below and pass under Swanston Street. Australia Square is located in the airspace above the railway corridor and is a pair to Flinders Street Station.

Light rail in Flinders Street is services by a central median platform, whilst Swanston Street is more recently upgraded with 2 median platforms. On Street cycleways are located on Swanston Street only.

Southern Cross (Spencer Street) Station

The upgrade of Southern Cross Station has afforded a generous and permeable response to Spencer Street. Particular attention is given to Bourke Street which terminates at the station. 3 Tram stops covering all movements allow a full interchange of all tram lines with metropolitan and country V-line services.

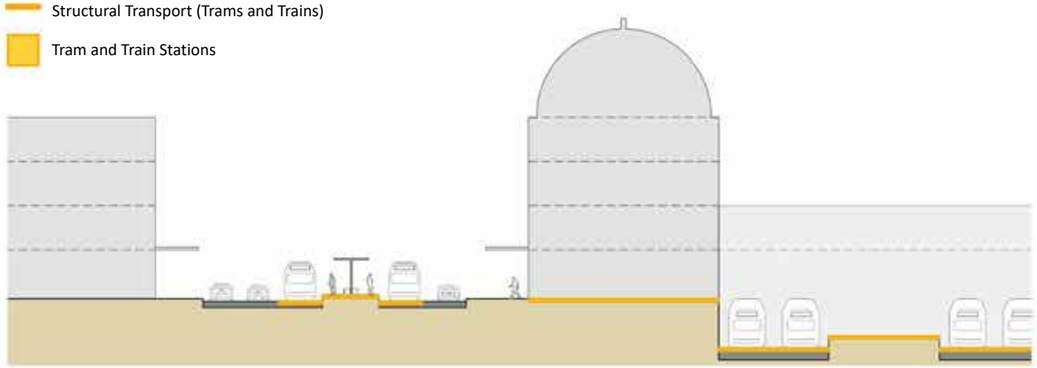
All Tram stops adjoining Spencer Street are a central median platforms.

Source: Google Earth/ Hill Thalis

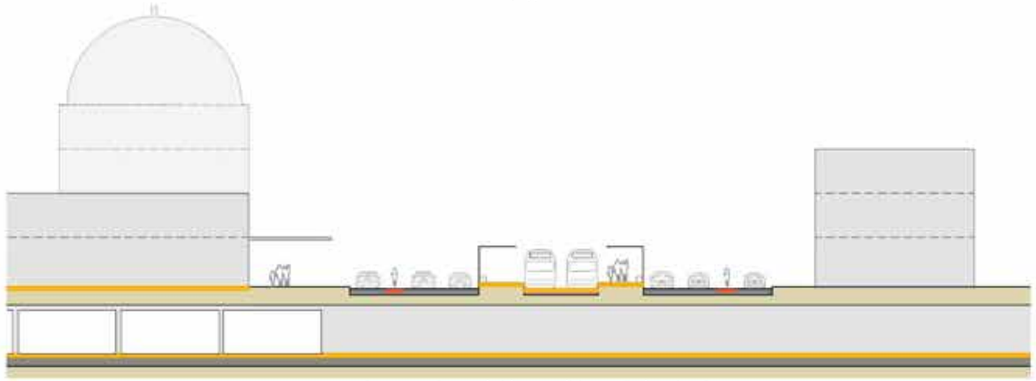
Bicycle Lanes

Structural Transport (Trams and Trains)

Tram and Train Stations



Flinders Street, typical condition



Swanston Street, bridge condition at Federation Square

1.4 TRANSPORT INTERCHANGE

Transport Interchange - Paris T3

Paris once boasted an extensive tram network of which the last line closed in 1957. Like many modern cities Paris has realised 4 far reaching tram lines over the last 20 years. Another 4 are planned.

Line T3, Pont du Garigliano RER to Porte d'Ivry metro station

In the west the T3 terminates at street level and interchanges with the Pont du Garigliano RER station below running alongside the Seine.

The route follows the historic Napoleonic wall of Paris (Boulevards des Marechaux) and services several significant destinations including

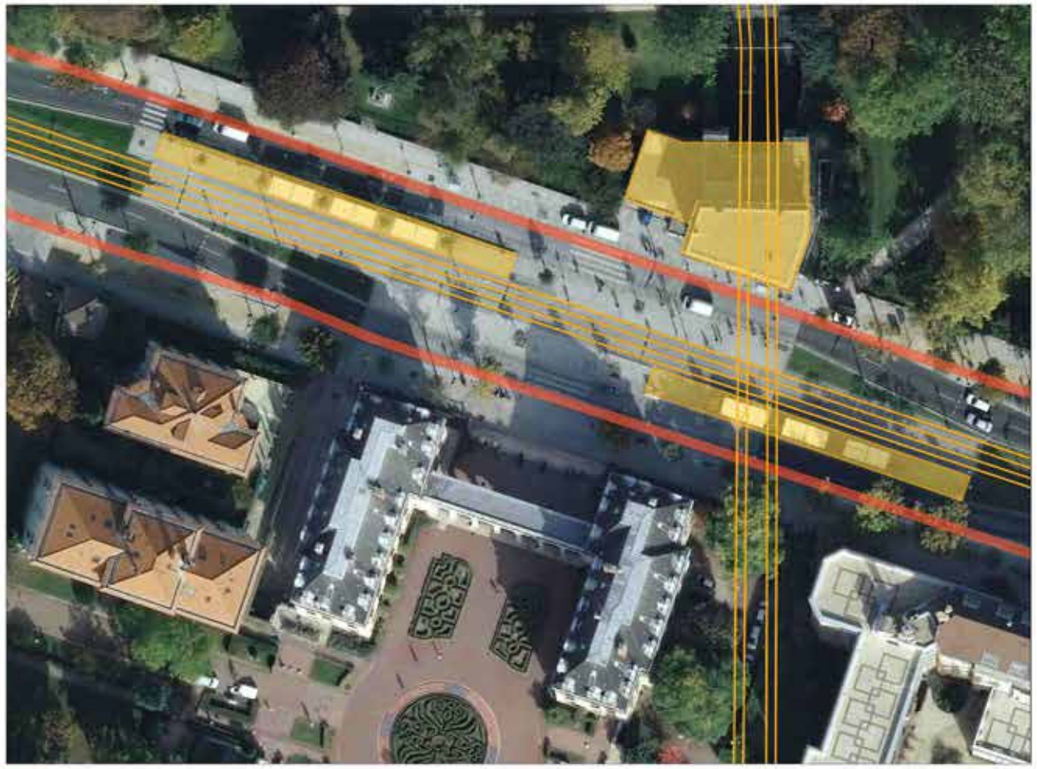
- Paris Exposition Porte de Versailles;
- Cimetiere de Montrouge;
- Cite Internationale Universitaire;
- Parc Montsouris; and
- Stadium Sebastien Charlety

The tramway terminates on street above the Porte d'Ivry Metro which links it to the entire metro network.

The T3 tramway integrates in the centre of the boulevard with single and split median stations, separated and shared cycles ways vary along the length of the corridor.

This tramway currently carries 100,000 passengers a day along its 8km length.

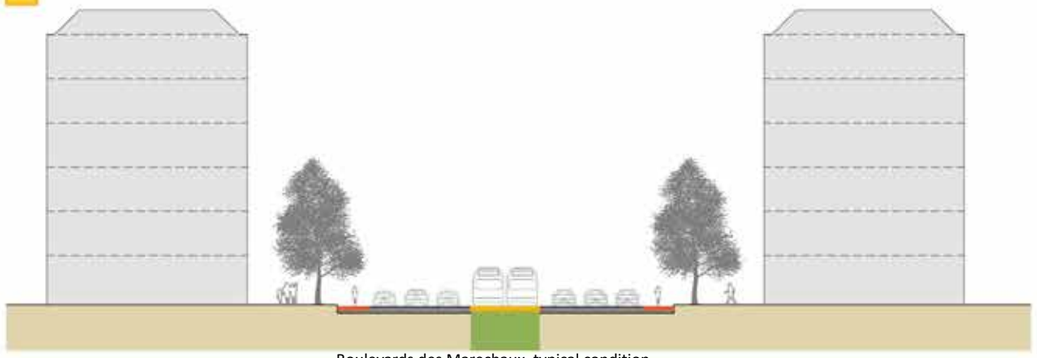
Source: Google Earth/ Hill Thalis



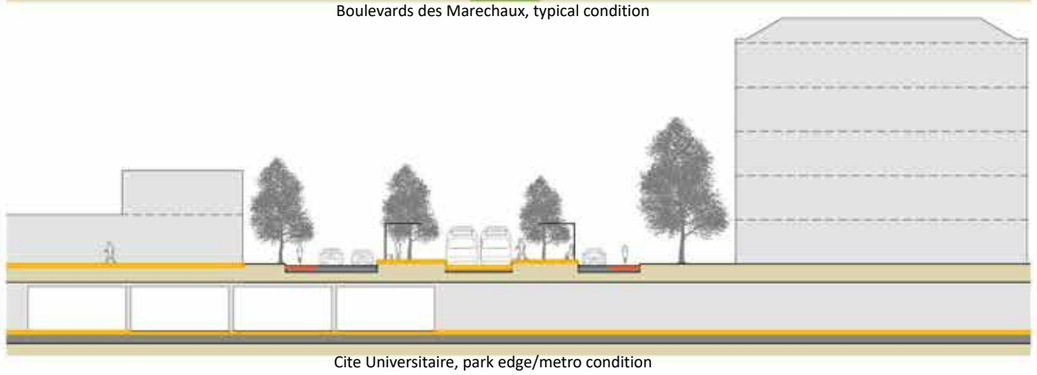
Bicycle Lanes

Structural Transport (Trams and Trains)

Tram and Train Stations



Boulevards des Marechaux, typical condition



Cite Universitaire, park edge/metro condition

1.4 TRANSPORT INTERCHANGE

Transport Interchange - Zurich

Zurich has an extensive metropolitan transportation system of trams, metropolitan and international rail. Each system interacts and interchanges at multiple points through a webbed-system at grade and below ground.

Zurich Hauptbahnhof

Zurich's central station (bahnhof) is the focus and primary interchange for all public transport modes. It is located at the north of the historic centre and is the terminal for interstate and international services.

Bahnhofstrasse

Bahnhofstrasse is Zurich's main street and functions as a pedestrian and transport spine running from the Bahnhof's grand entry south to the Lake's edge. The relationship of trams to the ground plane is consistent and passengers alight and exit trams at street level.

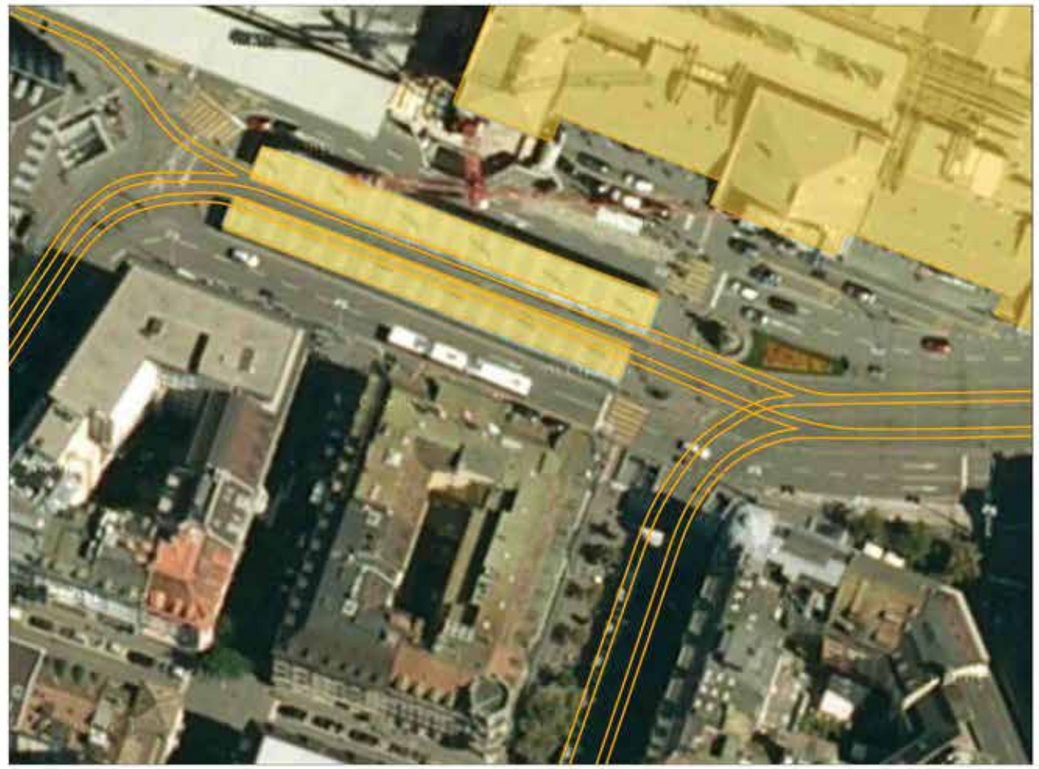
A number of lines converge on this route serving the north-east and south/ south west of Zurich's suburban core.

Bahnhofplatz

The wide street immediately to the south of the hauptbahnhof's grand entry serves as a multi-modal plaza for pedestrians, buses, trams and private vehicles, allowing each of these modes to interchange seamlessly with interstate and international rail services.

The Bahnhofplatz tram interchange is less than 30m from the station entry and connects directly to the Bahnhofstrasse spine to Lake Zurich.

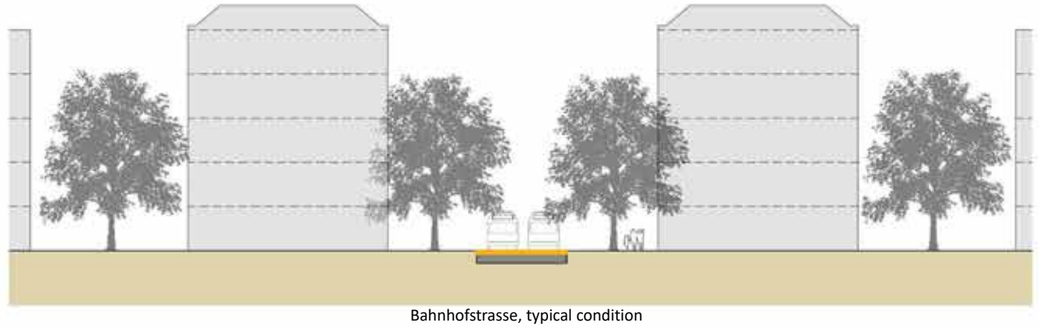
Source: Google Earth/ Hill Thalis



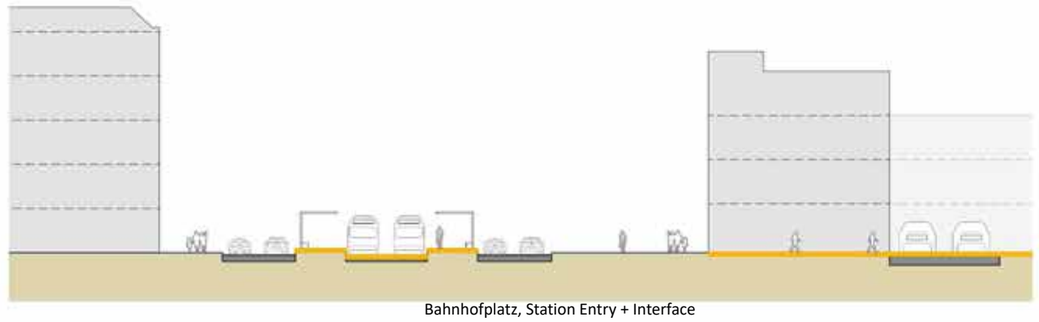
Bicycle Lanes

Structural Transport (Trams and Trains)

Tram and Train Stations



Bahnhofstrasse, typical condition



Bahnhofplatz, Station Entry + Interface

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B2

URBAN PROGRAMME

2.1 URBAN STADIA

Urban Stadia

Name:	**St. Jakob Park, Basel**
Capacity:	38 512
Roof:	Partial Roof over stands
Stands:	3 Tiers
Urban Setting:	3km from CBD
Field Type:	Football
Field Dimensions:	105 metres by 68 metres
Public Transport:	30 metres to Bus Stop Stadium has it's own Train Station – St Jakob Station 1200 metres to Tram Stop Munchenstein Ruchfeld 800 metres to Train Station Basel Dreispitz
Features:	Multiple Uses: - Shopping Centre (50 shops) - Tertianum (residence for seniors) - St Jakob Turm (Apartments/offices and shops)

Source: worldarchitecture.org/eng.archinform.net / Google Earth

Name:	**Braga Municipal Stadium, Braga**
Capacity:	30 154
Roof:	Canopy Roof, retractable
Stands:	2 Stands, 2 Tiers
Urban Setting:	2km from CBD The Braga Municipal Stadium is situated within the Dume Sports Park on the northern slope of Monte Castro. Behind the goal at one end are the rock walls of the quarry and at the other is an open view over the city in the distance.
Field Type:	Football
Field Dimensions:	105 metres by 68 metres
Public Transport:	2000 metres to Train station
Features:	- The stadium was carved from a quarry (Monte Castro) that overlooks the city of Braga. - Stands run only along both sides of the pitch. - Each stand is covered with a canopy-style roof, and both are connected to each other across the pitch by dozens of steel strings, a design inspired by ancient South American Inca bridges.

Source: blog.emiratesstadium.info/flickr.com/photos/carloscoutinho / Google Earth

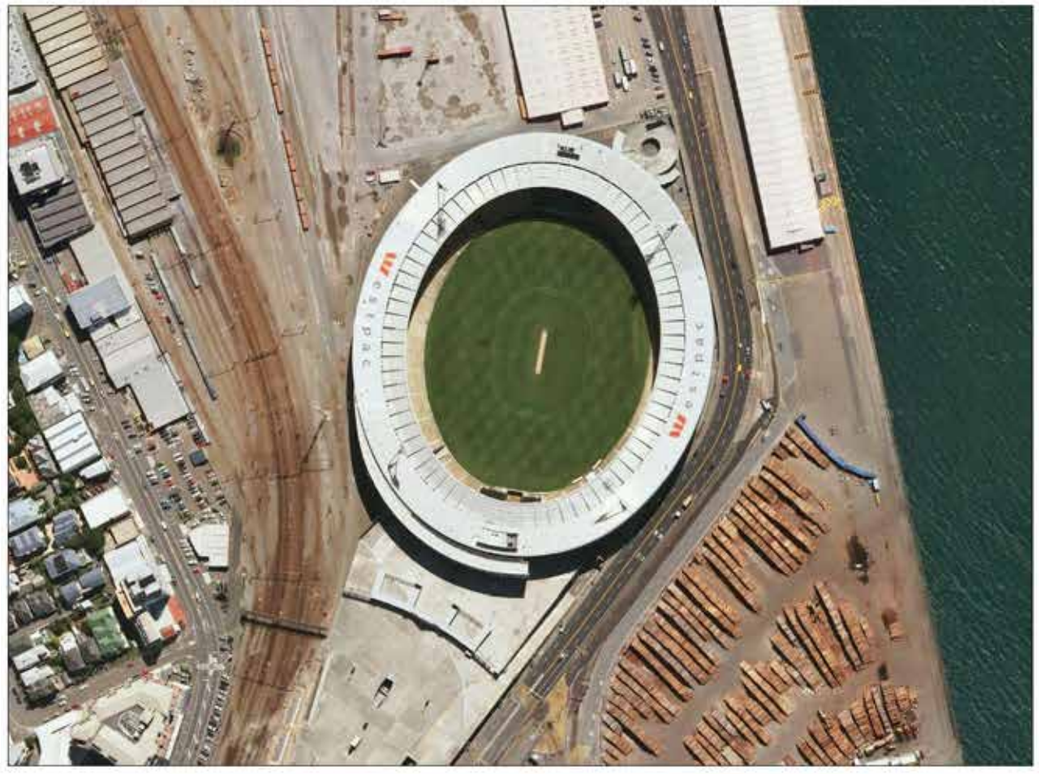
2.1 URBAN STADIA

Urban Stadia

Name:	**Westpac Stadium, Wellington**
Capacity:	36 000
Roof:	Partial Roof
Stands:	2 Tiers
Urban:	1.5km from Wellington Town Hall
Field Type:	Rugby
Footprint:	48 000 m2
Field Dimensions:	235 metres by 185 metres
Public Transport:	700 metres to Wellington Train Station 150 metres to Bus Stop

Features:

- Accommodates football league, soccer, concerts, cricket, rugby union, rugby league, entertainment events
- Building Structure responds to the intense earthquake and wind loadings of the area.



Source: ca.bestpicturesof.com/ farm3.staticflickr.com/ Google Earth

Melbourne Rectangular Stadium, Melbourne

Name:	**Melbourne Rectangular Stadium, Melbourne**
Capacity:	30 050
Roof:	Geodesic Dome Roof
Stands:	2 Tiers
Urban:	1.5km from Melbourne Town Hall
Field Type:	Rectangular pitch – accommodating rugby league, rugby union and soccer
Field Dimensions:	136 metres by 85 metres
Public Transport:	200 metres to Tram Stop Melbourne Park 300 metres to Richmond Train Station

Features:

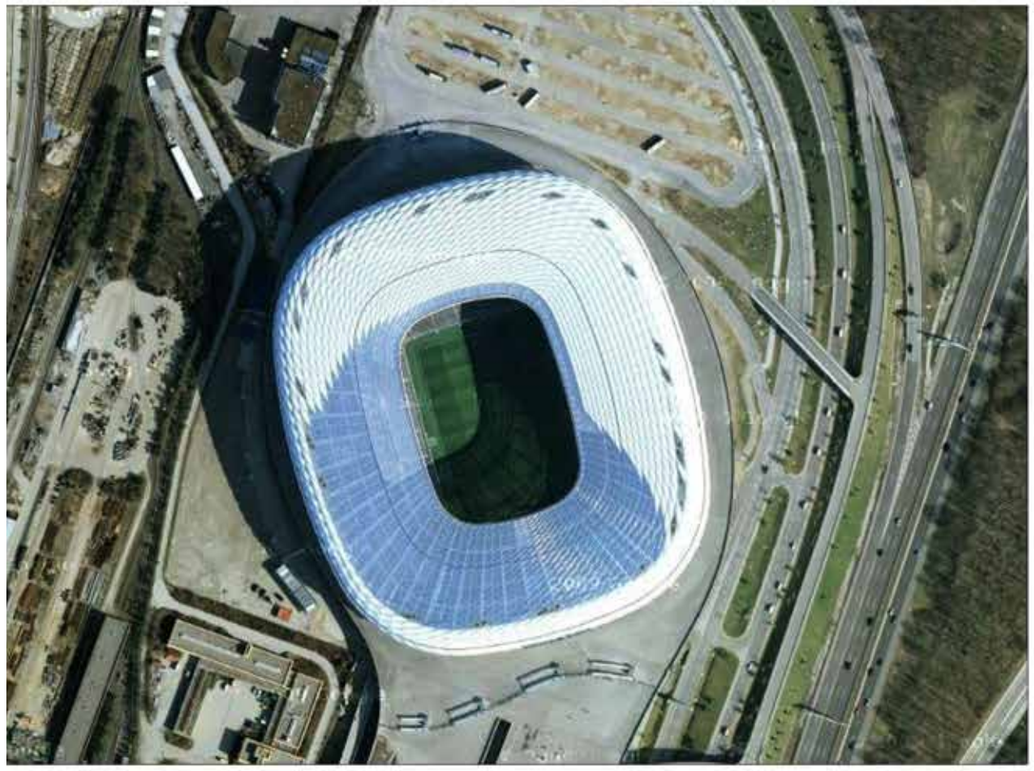
- Unique bio-frame roof featuring a spectacular LED lighting feature
- Sports campus including 800sqm of elite training facilities
- Four-lane 25m lap pool with additional player recovery facilities
- Office space for elite sporting teams, sporting organisations and medical facilities including radiology and sports medicine
- 24 corporate suites with exclusive internal and external seating
- Dining room with capacity for 1,000
- Merchandising facilities, 14 food/ beverage outlets and 14 bars
- Rainwater collection from roof
- Bike storage facilities

Source: austadiums.com / Google Earth

2.1 URBAN STADIA

Urban Stadia

Name:	**Allianz Arena, Munich**
Capacity:	69 901
Roof:	Partial Roof (Covers Stands)
Stands:	3 Tiers
Urban:	8km from Munich Town Hall
Field Type:	Football
Footprint:	171 000m2
Field Dimensions:	105 metres by 68 metres
Public Transport:	900 metres to Train Station Frottmaning



Source: sadellite.blogspot.com/ worldradio.ch / Google Earth

Name:	**Cape Town Stadium, Cape Town**
Capacity:	64 100
Roof:	Retractable Glass Roof, 36 000m2
Stands:	3 Tiers
Urban:	2.5km from Cape Town City Hall
Field Type:	Rugby/Football
Field Dimensions:	290 metres by 265 metres
Public Transport:	2500 metres to Train Station Kaapstad
Features:	Sustainable Features: - - 95% materials recycled and reused Water from the stadium roof is pumped into ponds on Green Point Common

Source: blog.sa-venues.com/ sunpack.com / Google Earth

2.1 URBAN STADIA

Urban Stadia

Name:	**Gregotti Stadium, Genoa**
Capacity:	36 703
Roof:	Partial Roof
Stands:	2 Tiers
Urban:	1.5km from City Centre (Dense Urban Area)
Field Type:	Football, Rugby Union
Field Dimensions:	105 metres by 68 metres
Public Transport:	Bus: near Bobbio5/Stadio bus stop Train: Within walking distance from Genova Brighole Station

Source: xxxx/ Google Earth

Name:	**Poljud Stadium, Split, Croatia**
Capacity:	35 000
Roof:	Partial, 2 Arced Roofs
Stands:	3 Tiers
Urban:	1km from CBD
Field Type:	Football, athletics
Field Dimensions:	105 metres by 68 metres
Public Transport:	Located near Lola bus stop from bus 3

Features:

- Roof structure spans 215m
- 19 cabins are suspended on the west shell
- They are interconnected via a catwalk that runs through the structure which spans the entire roof

Source: xxxx/ Google Earth

2.1 URBAN STADIA

Urban Stadia

Name:	**Dunedin Stadium, Otago, New Zealand**
Capacity:	30 748
Roof:	Fully enclosed clear ETFE roof
Stands:	2 Tiers
Urban:	3km from CBD
Field Type:	Rugby Union, Rugby League, Football, Baseball, Basketball and Netball
Footprint:	31 050 m2
Field Dimensions:	132 metres by 81 metres
Public Transport:	20 minutes walk from the Octagon connecting with all major bus services

Features:

- Worlds first fully enclosed grassed stadium
- Re locatable seating for greater flexibility in events
- The rood is made from ETFE, a transparent roofing material that is angled north to optimise the sun
- Real grass is strengthened by synthetic grass fibres injected deep into the soil
- Stadium is connected to the Unipol Recreation Centre for the Otago University. It includes a student gym, recreational facilities and a Cafe.

2.2 CONFERENCE + EXHIBITION

Conference and Exhibition

Vancouver Convention and Exhibition Centre, Canada

Facilities Capacity:

- Exhibition Space: 28940m2
- Meeting Space: 7900m2 total, 72 meeting rooms
- Signature Ballroom Space: 6500m2
- Retail Space: 8825m2
- Walkways, bikeways, public open space and plazas: 37161m2
- 450 car parking spaces

Public Transport:

- Train: Burrard Skytrain 450m
  Waterfront Station 350m
- Boat: Seabus 450m

Urban Setting:

The centre is situated on Vancouver's waterfront, and includes the existing East Building on Canada Place and the recently completed West Building.

Point of Difference:

Sustainability Features include:

- 6 acre living roof with (400000 indigenous plants and 4 bee colonies of 60000 bees each)
- Shoreline and marine habitat restorations
- Water conservation and reuse system - black water treatment and desalination
- Seawater heat pump system for cooling and heating
- Local materials including locally harvested Douglas fir and Hemlock wood finishes

Urban Connections include:

- An elevated 6-lane viaduct for vehicles and pedestrians connects the site back to the city grid
- Urban spaces formed by the building's landforms extend the downtown street grid to preserve view corridors out to the water.
- Waterfront and urban pedestrian activities extend the public realm through and around the site.

Source: vancouverconventioncentre.com/ thefacilities/image-gallery / Google Earth

Melbourne Convention and Exhibition Centre, Australia

Facilities Capacity:

- Entry Level Foyer: 8400 people
- Plenary: 5541 seats (can be divided into 3 separate theatres)
- Meetings Rooms: 32 rooms
- Grand Banquet Room: 1500 people
- Exhibition Centre: 30000m2 exhibition space

Public Transport:

- Tram: 250 metres
- Train: 800 metres to Southern Cross Station

Urban Setting:

- MCEC located on banks of Yarra on South Wharf with views of the city skyline and river.
- Located next to retail, restaurants and entertainment
- Attached to Hilton South Wharf for accommodation

Point of Difference:

- First Convention Centre in the world to achieve a 6 star green rating

Source: woodsbagot.com/en/Pages/MelbourneExhibitionConventionCentre.aspx / Google Earth

2.2 CONFERENCE + EXHIBITION

Conference and Exhibition

Tokyo International Forum, Japan

Facilities Capacity:

- Halls: 2900m2 floor space
- Exhibition Halls: 5000m2 floor space
- Conference Rooms: 34 rooms ranging from 26m2 to 206m2
- Lobby Gallery: 560m2 floor space
- Lounge: 224m2 floor space
- Outdoor Plaza: 2042m2 floor space
- Parking for 422 vehicles

Public Transport:

- Train: 5 minutes to JR Tokyo Station (500m approx)
  1 minutes to JR Yurakucho Station (100m approx)

Urban Setting:

The Tokyo International Forum is situated on the boundary between Marunouchi, Tokyo's central business area and the Ginza shopping and entertainment district. The railway is located on the eastern elevation with two of the most heavily used train stations, Tokyo and Yarakucho stations.

Point of Difference:

Urban Response

- The Plaza at the centre of the complex serves not only as the entry point for the complex, but as a public space with seating among Zelkova trees and sculptures.
- Includes a variety of civic functions including a library, mediatech, 24 hour multimedia theatre, cafes, restaurants, shops and an art gallery (Mitsuo Aida Museum)
- Visual connections through the theatre lobbies that overlook the Plaza at second floor level.
- Underground pedestrian connections from the centre to the surrounding main train stations

Source: rvapc.com /works/1-tokyo-international-forum / Google Earth

Suntec International Convention and Exhibition Centre, Singapore

Facilities Capacity:

- Convention Halls: 12000m2 floor space, 10000 people
- Exhibition Halls: 12000m2 floor space
- Gallery: 3700m2 floor space, 1000 people (banquet setting) or 3000 people (theatre setting)
- Theatre: 596 seats
- Concourse: 930m2 floor space, 600 people (banquet)
- Ballrooms: 2150m2 floor space, 1800 people (theatre setting) or 1300 people (banquet setting)
- Meeting Rooms: 31 rooms – 10 to 400 people

Public Transport:

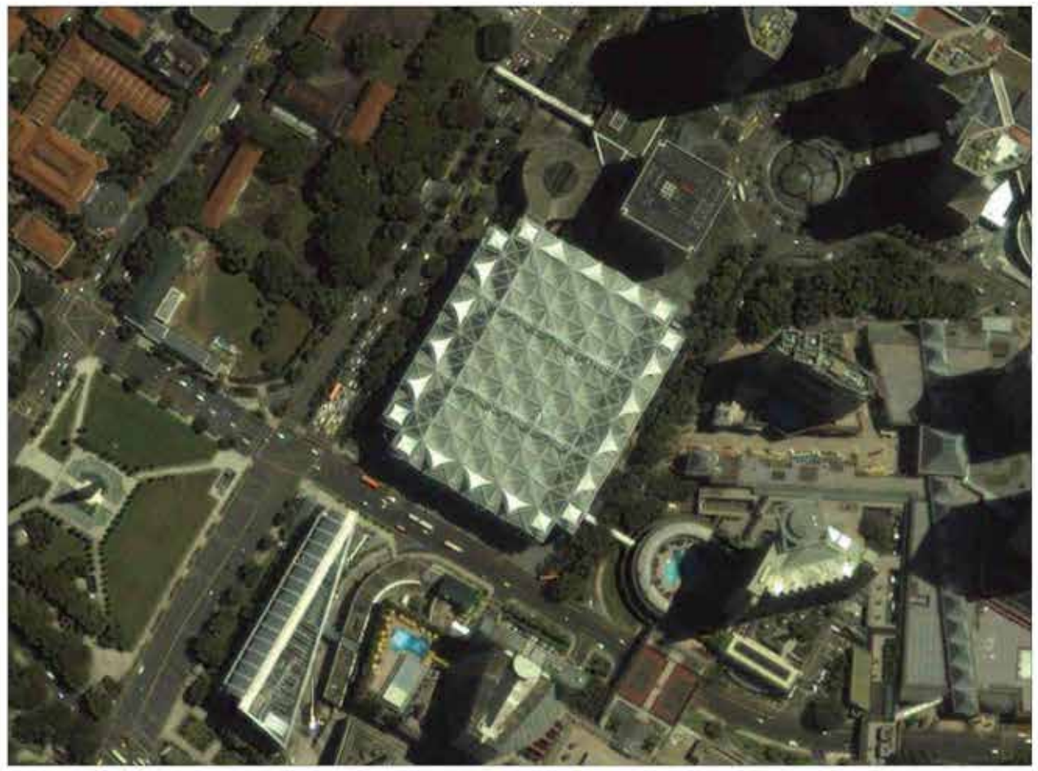
- Rail : 100m to Esplanade Station
- Bus : Stops right out the front of Convention Centre

Urban Setting:

- Situated in the CBD, 20 minutes from Changi International Airport

Point of Difference:

- Self contained, totally integrated events infrastructure, which offers direct access to 5200 hotel rooms, 100 retail stores, 300 restaurants and the regions new centre for performing arts – Esplanade Theatre on the Bay.



Source: en.wikipedia.org/ www.suntecsingapore.com /media/pg_exterior.htm/ Google Earth

2.2 CONFERENCE + EXHIBITION

Conference and Exhibition

Darwin Exhibition and Convention Centre, Australia

Facilities Capacity:

- Hall: 4000m2 space
  - Theatre 4200 seating
  - Banquet 3000 seating
  - Cocktail 4700 seating
- Auditorium: 669m2 floor space with 1500 seating
- Meetings Rooms: 4 rooms accommodating 70-170 people
- Waterfront Rooms: 508m2 floor space
  - Theatre 630 seating
  - Classroom 300 seating
  - Banquet 420 seating
  - Cocktail 630 seating
- 300 car parking spaces

Distance to Centre of Darwin:

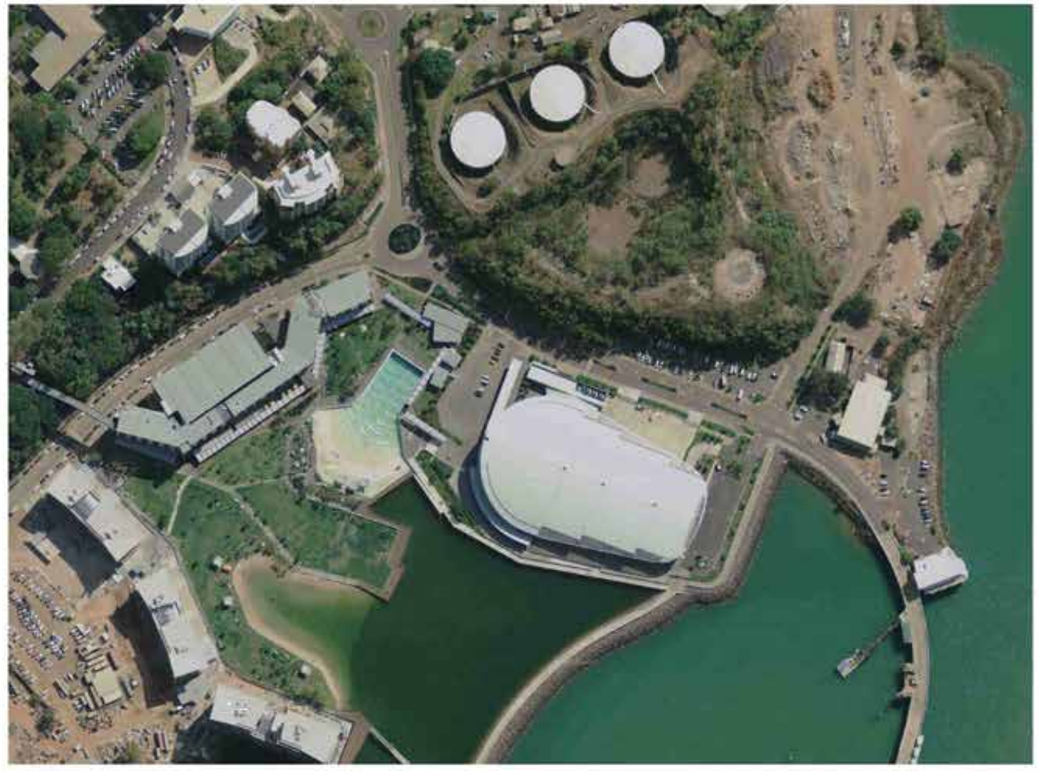
- approx 1.5km

Urban Setting:

- The centre is situated on edge of Arafura Sea which is also next to the Darwin waterfront development.

Point of Difference:

- Convention Centre is part of the $1.1 billion Darwin Waterfront Project



Source: darwinconvention.com.au/ Google Earth

Adelaide Convention and Exhibition Centre, Australia

Facilities Capacity:

- Plenary Hall: 10400m2 floor space
  - 3500 seating
- Hall:
  - Theatre 2350 seating
  - Cocktail 2000 seating
  - Banquet 1320 seating
- Meeting Rooms: 11 rooms accommodating 30-200 people
- Riverbank Space: can be divided into 3 spaces
  - Theatre 396 seating
  - Classroom 216 seating
  - Cocktail 300 seating
  - Banquet 250 seating
- Car Parking: 1200 on site spaces

Public Transport:

- Tram: 100 metres to trams on North Terrace
- Train: Convention centre is built over the top of Adelaide Central Station

Urban Setting:

- ACEC located on banks of River Torrens
- Shares site with South Australian State Parliament Houses, Adelaide Exhibition Hall, the Festival Centre and Adelaide Railway Station
- Located next to retail, restaurants and entertainment
- Attached to Intercontinental Hotel for accommodation

Point of Difference:

- the first purpose built convention centre to be built in Australia
- Located next to Intercontinental Hotel
- The redesign in 2001 reconnected historic parts of the city to the waterfront
- The ‘rational cooking system’ which is the largest of any convention centre i the world is equipped to service 4000 diners in 20 minutes

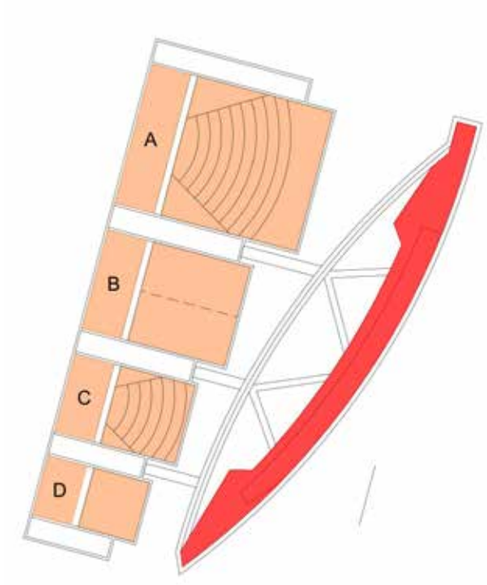
Source: adelaidecc.com.au/ Google Earth

2.2 CONFERENCE + EXHIBITION

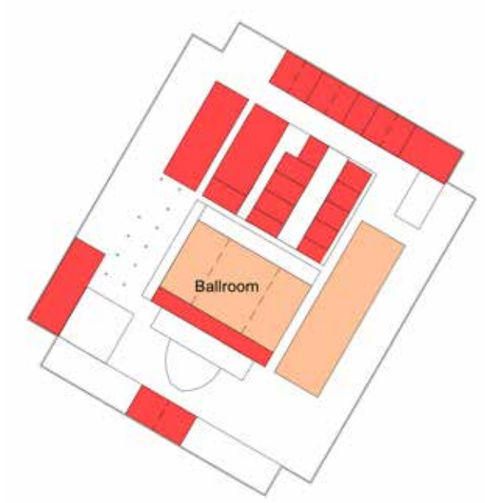
Conference and Exhibition

A comparison of functional elements can be seen in the highlighted plans, pictured right.

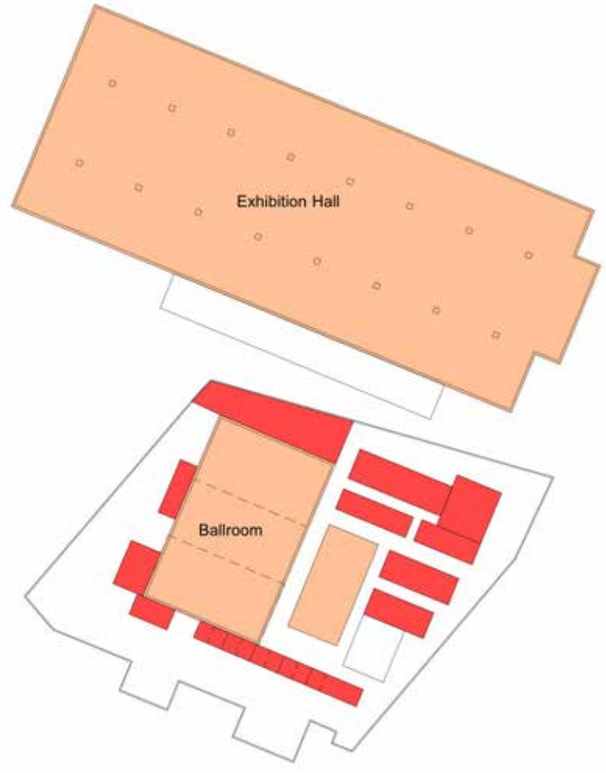
Plans are at scale.



Tokyo Forum, Japan



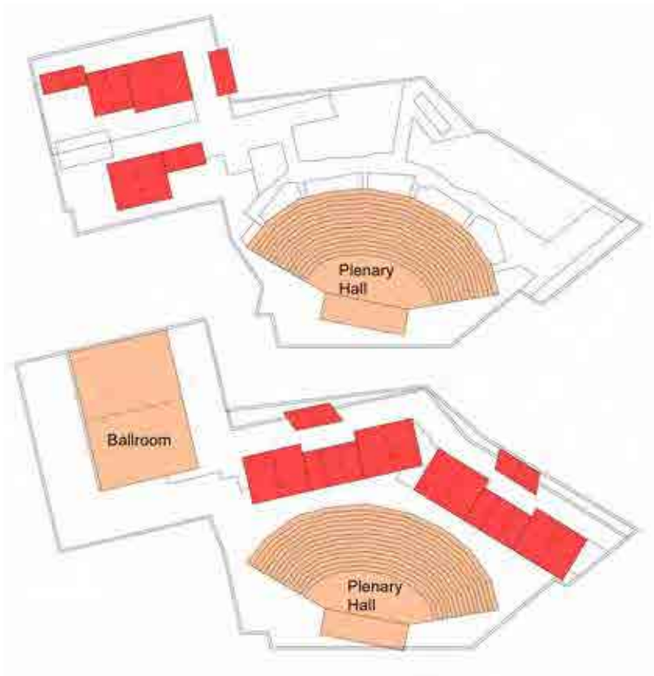
Suntec, Singapore



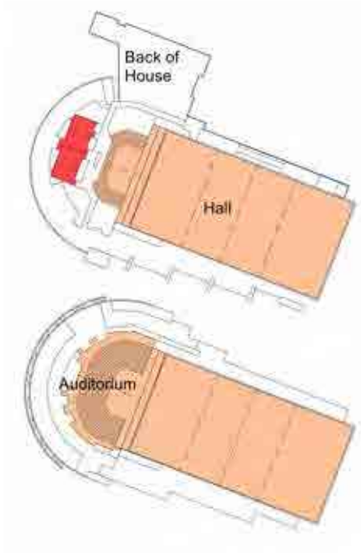
Vancouver Convention and Exhibition Centre, Canada

Larger Spaces - Auditoriums, Halls, Ballrooms, Plenary Halls

Smaller Scaled Rooms - Meeting/conference/board rooms



Melbourne Exhibition and Convention Centre, Australia



Darwin Exhibition and Convention Centre, Australia

Adelaide Exhibition and Convention Centre, Australia

2.3 URBAN POOLS

Urban Pools

Canberra Olympic Pool and Health Club, Civic

Urban Setting:
- Park / carpark setting

Distance to Public Transport:
- 100 metres to Bus Stop

Dimensions:
- 50m indoor pool, 25m outdoor pool

Type:
- Indoor and outdoor heated pool

Features:
- Gym
- Diving Board

Source: visitcanberra.com.au/abc.net.au/ Google Earth

Manuka Swimming Pool, Griffith

Urban Setting:
- Beside a lush park with wading pool and playground

Distance to Public Transport:
- 100 metres to Bus Stop

Dimensions:
- 30 metres by 10 metres

Type:
- Outdoor courtyard pool

Features:
- Canberra's first bathing house
- Built in 1930
- Café kiosk

Source: mildenhall.moadoph.gov.au/rephoto/168/ Google Earth

2.3 URBAN POOLS

Urban Pools

North Sydney Pool, Milson's Point

Urban Setting:

- Located next to Sydney Harbour Bridge

Distance to Public Transport:

- 400 metres to Train Milsons Point Station
- 20 metres to Bus Stop (outside pool entrance)

Dimensions:

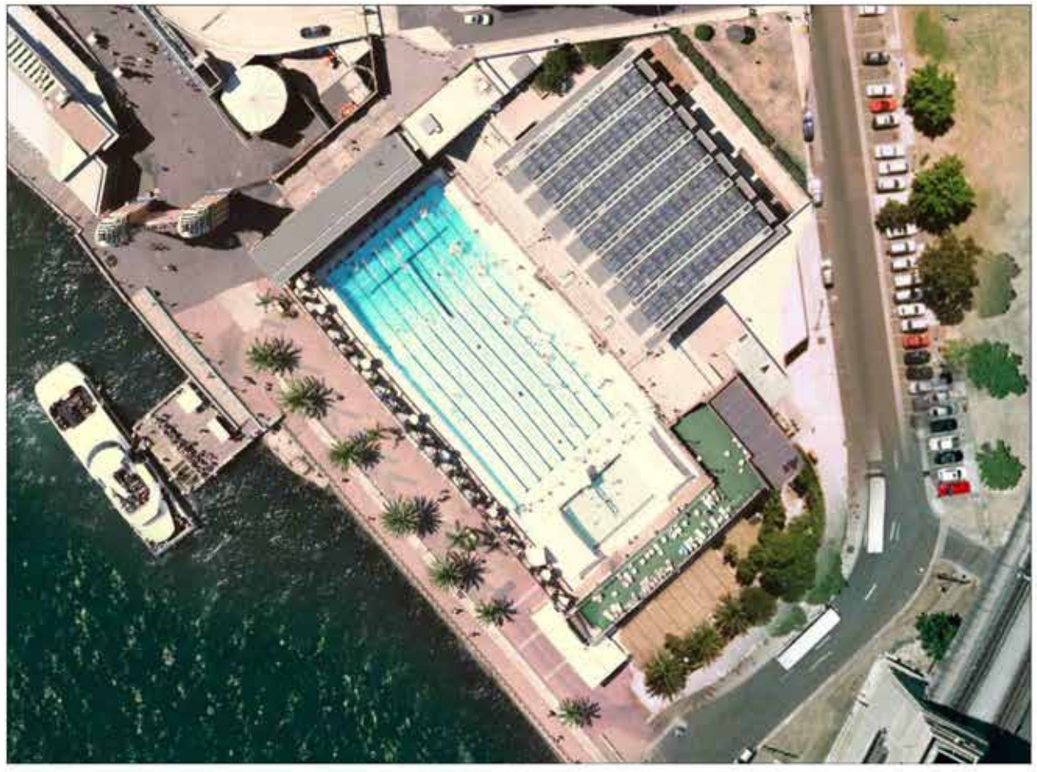
- 50 metre pool

Type:

- 8 lane heated outdoor pool with heated indoor leisure pool

Features:

- Pool was opened in 1936
- Fine dining restaurant over looking the pool (Aqua Dining)
- Luna Park next to swimming pool adding to the areas rich cultural heritage
- Fitness centre including gymnasium, spa, sauna and heated program pool
- Dramatic level changes across the site
- Part of an infrastructure project - the harbour bridge replacing rail interface with ferry services



Source: HillThalis/ Google Earth

Josephine Baker Pool, Bercy, Paris

Urban Setting:

- On left bank of the River Seine
- Permanently moored at the Quai Francois Mauriac

Distance to Public Transport:

- 200 metres to Metro Subway Quai de la Gare Station
- 850 metres to Train Bibliotheque Francois Witterand Station

Dimensions:

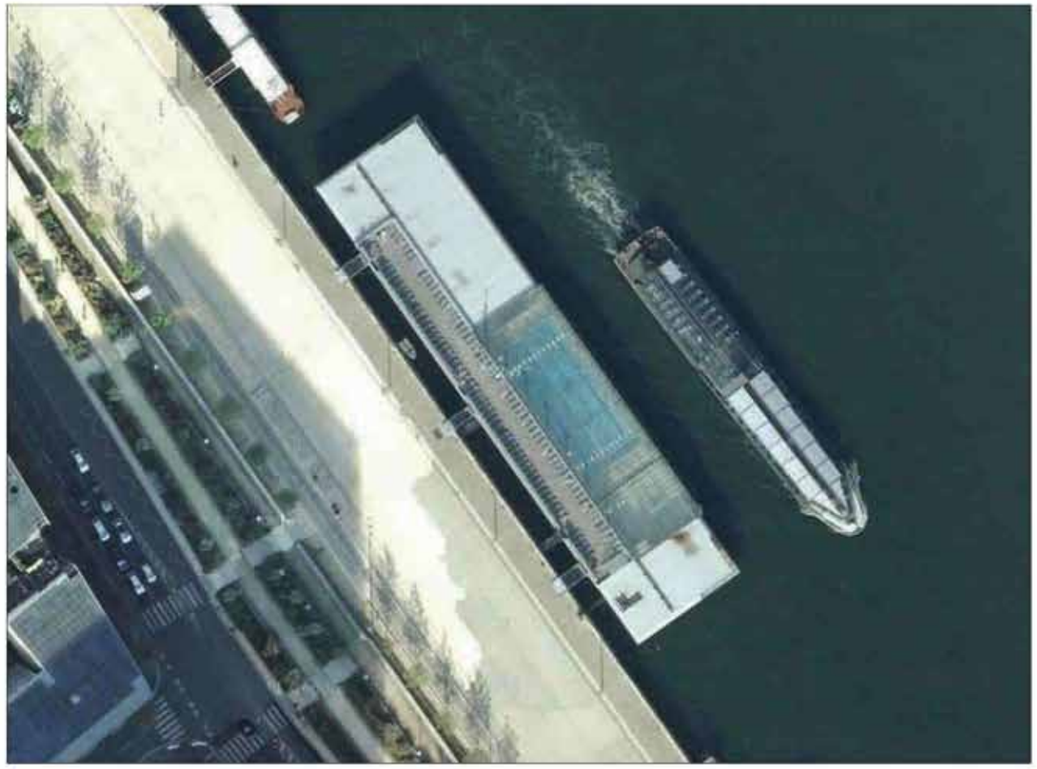
- 25 metres by 10 metres

Type:

- Outdoor floating pool

Features:

- Open to the sky in summer + glass roofed in winter
- Paddling pool, café, gym and sundeck
- Jacuzzi, two saunas, and a Turkish bath
- Admission price €5 for two hours and €5 for each additional hour
- Sliding Roof
- Open Façade towards river gives the impressions you are swimming on the Seine River



Source: paristopten.com/ Google Earth

2.3 URBAN POOLS

Urban Pools

Name: **Casa de Campo Pools, Madrid**

Urban Setting:

- Located next to Casa de Campo park and major sporting facilities including the Madrid Arena.

Public Transport:

- Adjacent to Lago Metro station
- 500 metres to Subway Puerta del Angel Station
- 500 metres to Bus Stop Extremadura Pta. Del Angel

Dimensions:

- Large pool 50 metres by 25 metres
- Medium pool 30 metres by 15 metres
- Small pool 20 metres by 10 metres

Type:

- Three outdoor swimming-pools – Olympic, babies, general leisure

Features:

- Lawn and shade trees
- Cafeteria
- Generative city making element

Source: intransit.blogs.nytimes.com/ Andrew Ferren/ Google Earth

Name: **Dawn Fraser Pool, Balmain**

Urban Setting:

- Adjoins Elkington Park in Balmain

Public Transport:

- 100 metres to Ferry Stop
- 300 metres to Bus Stop

Dimensions:

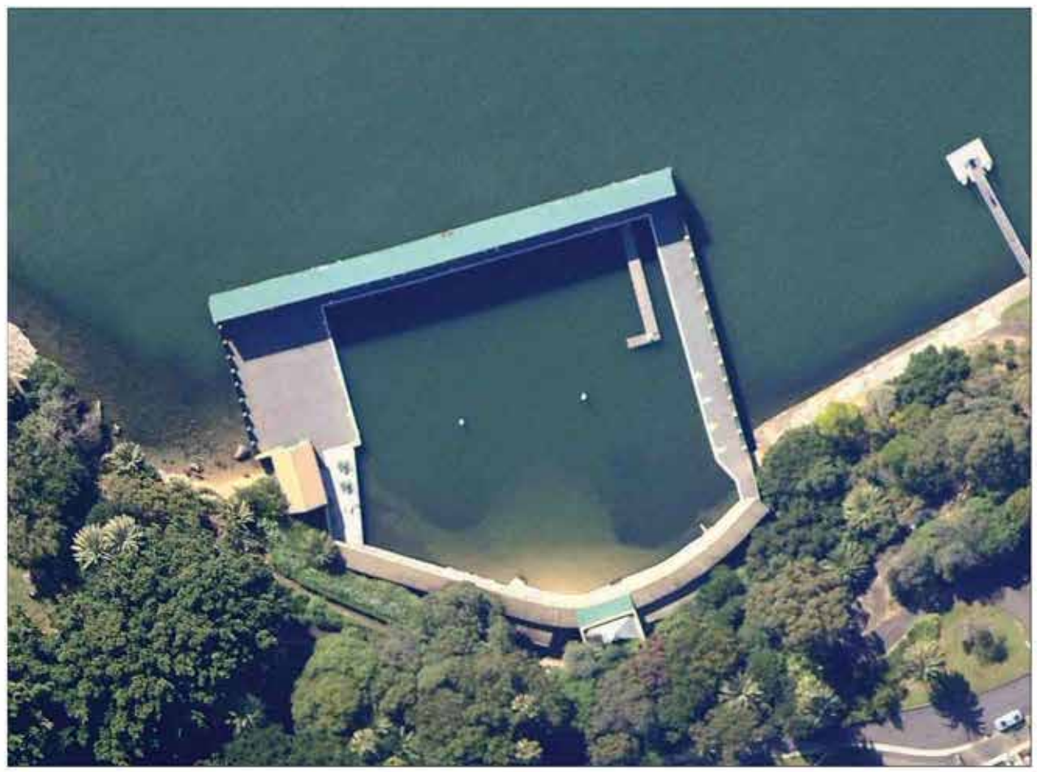
- 50 metre pool

Type:

- Outdoor tidal flow salt water pool

Features:

- Oldest pool and swimming club in Australia.
- Lagoon
- Solar heated showers.
- Café kiosk serves hot food, snacks, ice
- Low tide beach
- Dramatic level changes across the site
- Host's international water polo games
- After hours functions hire (marquee available)



Source: sydneywebcam.blogspot.com/ Paul Murphy/ Google Earth

2.4 PLEASURE POOLS

Cairns Esplanade

Urban Setting:

- Located on the Cairns Esplanade on the waterfront

Type:

- Public saltwater swimming lagoon

Features:

- Water play areas that include water channels and hand pumps, water gates, rain shelters and jumping water jests

Source: cairnsesplanade.com.au/ Google Earth

Townsville Waterfront

Urban Setting:

- Located on Townsvilles foreshore in North Ward

Type:

- Public Rockpool/ Lagoon

Features:

- Includes a jetty
- Recreational Pool
- Restaurants
- Cafes

Source: wikipedia.com/ Google Earth

2.4 PLEASURE POOLS

Kastrup Sea Baths, Copenhagen

Urban Setting:

- Situated offshore in the Oresund Sound

Public Transport:

- Tram: 200m to Femoren Metro Station

Type:

- Offshore sea pools

Features:

- Changing rooms
- 3m and 5m diving boards

Source: wikipedia.com/ Google Earth

Brygge Harnebadet, Copenhagen

Urban Setting:

- Located in the water at the Northern end of the Havneparken

Public Transport:

- Trams: 5A, 12, 33, 34, 40 and 250S

Type:

- Public swimming facilities

Features:

- Includes 5 pools with a capacity for 600 people
- 2x pools dedicated to children
- 2x 50m pools for swimming
- Diving pool with 3m and 5m diving boards

Source: wikipedia.com/ Google Earth

2.4 PLEASURE POOLS

Szechenyi Thermal Baths, Budapest

Urban Setting:

- Located in central Pest (East-bank)

Public Transport:

- Tram: Located near Metro Line 1 from Vorosmarty Square
- Train: Located near M1 Line from Budapest Metro

Type:

- 8 Medicinal Thermal Bath complex

Features:

- Largest medicinal bath in Europe
- Water supplied by 2 thermal springs
- 3 outdoor pools and 15 indoor pools

Source: wikipedia/ Google Earth

Eastern Beach, Geelong

Urban Setting:

- Located in Corio Bay

Public Transport:

- Train: 1.5km Geelong Station

Type:

- Shark proof sea bath, timber boardwalk and balustrade

Features:

- Includes a sea bath
- Children's swimming pool
- Kiosk
- Dressing Room Pavillion
- Enclosure includes diving boards, loating islands and slides

Source: Hill Thalis/ Google Earth

2.4 PLEASURE POOLS

Street Beach, Southbank, Brisbane

Urban Setting:

- Located in Southbank on the Brisbane River

Public Transport:

- City Cat and Ferry: Next to South Bank River Terminal
- Train: Next to South Bank and South Brisbane Stations
- Bus: Next to South Bank Busway Station

Type:

- Man-made swimming beach

Features:

- Lagoon
- Part of Southbank precinct which includes bars, cafes, retail, bbq and recreational facilities

Source: visitsouthbank.com.au/ Google Earth

Cook and Phillip Aquatic Centre

Urban Setting:

- Located in central Sydney, adjacent to St Mary's Cathedral

Public Transport:

- Train: 200m to St James Station

Type:

- Indoor aquatic and fitness centre

Features:

- 50m flexible indoor heated pool
- Group fitness studio
- Cardio Room
- 25m Wave Pool
- Indoor Sports Stadium
- Spin Studio
- Heated Indoor Leisure Pool
- Car Park
- Cafe

Source: bvn.com.au/ Google Earth

2.5 ENGAGEMENT WITH WATER

GASP! Boardwalk, Hobart

Location:

- Glenorchy Art and Sculpture Park

Urban Setting:

- runs along the edge of Elwick Bay on the Derwent River and provides a coastal walking link to the Museum of Old and New Art.

Public Transport:

- Bus: Located adjacent to 800 Route (Brooker Highway)

Type:

- Interpretive coastal boardwalk

Features:

- 800m in length
- Large BBQ pavillion (‘Grove’ Pavilion)
- Small entry pavilion (Little John Rivulet Pavilion)
- Repeating rhythm of 44 coloured batons

Source: Room 11 Architecture/GASP!

2.5 ENGAGEMENT WITH WATER

Sackler Crossing, Kew, UK

Location:

- Adjacent to the Syon Vista, Royal Botanic Gardens, Kew

Urban Setting:

- Set out from the Burton Palm House as the central point of a notional circle, the masterplan draws a sweeping circle bounded at extremity by important through views and bisected by William Nestfield Syon Vista.

Public Transport:

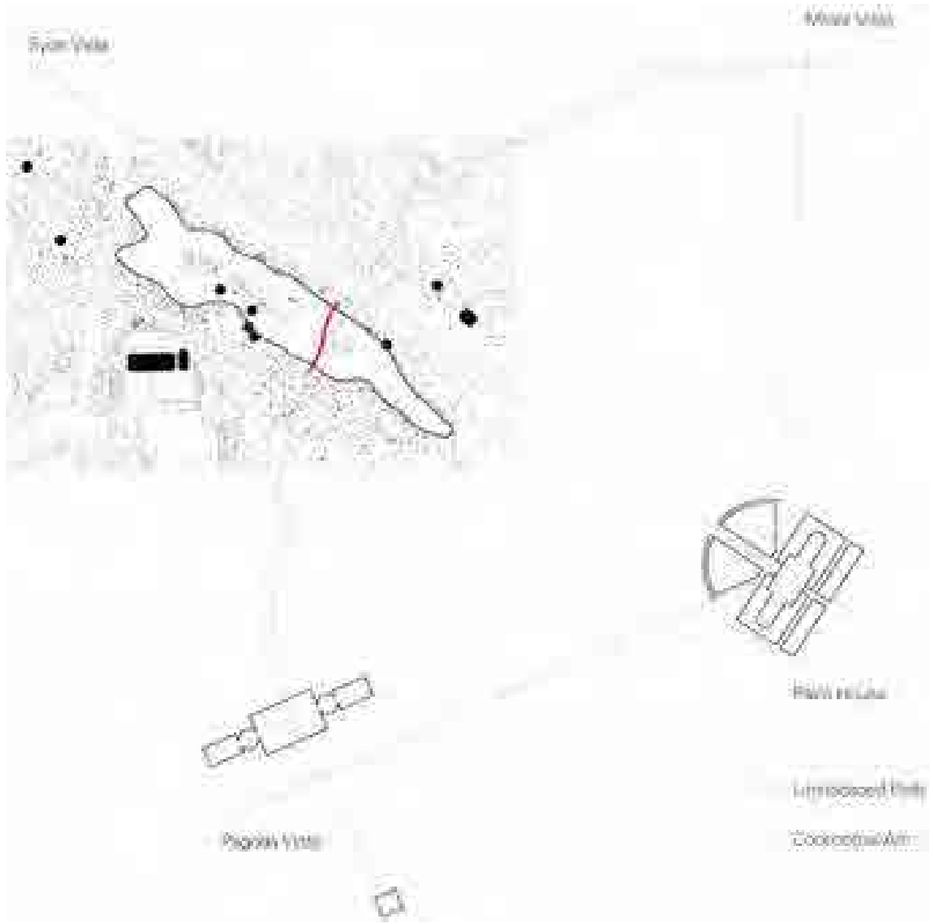
- Train: 300m Kew Gardens Underground

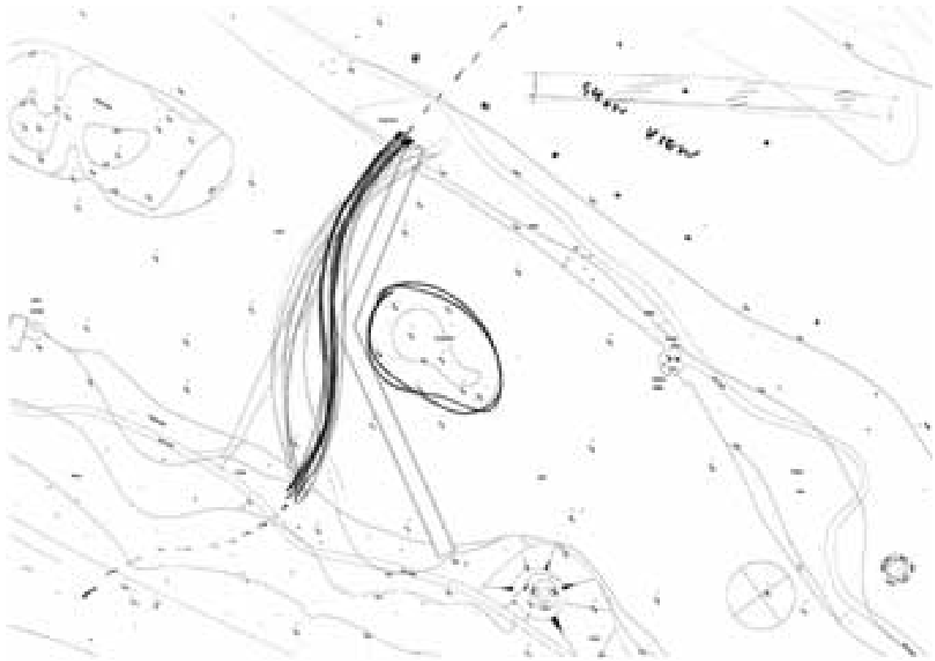
Type:

- Pedestrian bridge

Features:

- curved design and integrated lighting





Source: www.johnpawson.com

2.5 ENGAGEMENT WITH WATER

Shanghai Houtan Park, China

Location:

- Shanghai 2010 Expo Park

Urban Setting:

- Located on the south bank of the Pudong River, 6km from Central Shanghai

Public Transport:

- Metro: 600m Lujiazui Station

Type:

- Regenerative wetland and boardwalk

Features:

- 14 hectares in size
- Significant baordwalk path network
- Multi-stage water treatment and flood control system

Source: www.turenscape.com

2.5 ENGAGEMENT WITH WATER

Newfarm Waterfront Boardwalk, Brisbane

Location:

- Newfarm, Brisbane

Urban Setting:

- Located outboard of the Brisbane River's edge, 1km from Central Brisbane

Public Transport:

- Ferry: 300m , Sydney Street ferry terminal
- Ferry: 800m , Riverside ferry terminal

Type:

- Recreational boardwalk and key public waterfront connection

Features:

- Network of riverwalk pavement along the banks of the Brisbane River.
- Floating halfway between Storey Bridge and Newfarm - it was destroyed in the Brisbane floods, and a new permanent structure will be built to replace it.
- Brisbane City Planners require developers of private riverfront blocks to create new sections of the Brisbane Riverwalk so they are accessible to the public.

APPENDIX

URBAN ENGINEERING

LINKING CANBERRA CITY TO THE LAKE

October 2013

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URBAN STRATEGY

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C1 - Urban Services and Infrastructure

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1.2	Communications
1.3	Water and Sewerage
1.4	Stormwater
1.5	Electricity and Gas
1.6	Geotechnical Investigations

APPENDIX D - URBAN TRANSPORT

APPENDIX E - HERITAGE

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C1

URBAN SERVICES AND INFRASTRUCTURE

1.1 URBAN INFRASTRUCTURE

This purpose of this section of the report is to provide the results of preliminary investigations resulting from survey, an investigation of existing services and infrastructure and the review of back ground materials to facilitate the future provision of expanding the city to the lake within the area identified by the proposed master plan.

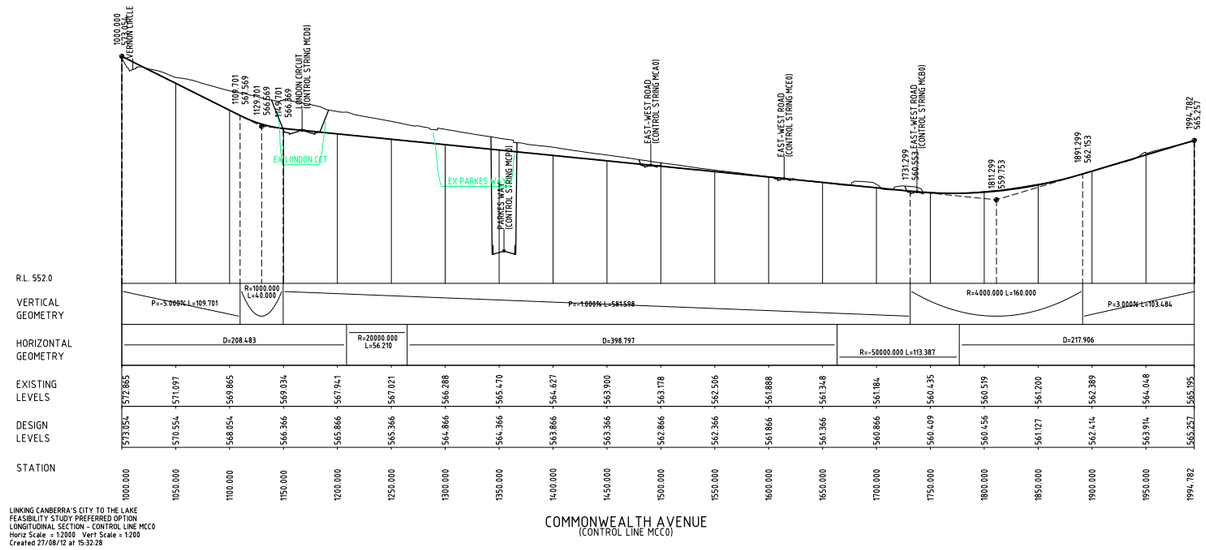
Background material
As part of preparation of this report a review of existing background material has been undertaken. The documentation reviewed include but was not limited to the following:

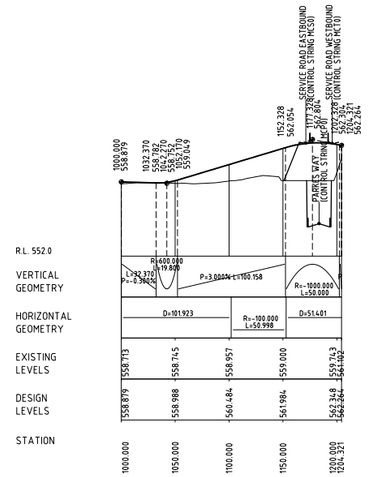
- As part of a separate engagement LandDATA has prepared a survey model of the study area the survey included:
    - Contours at 200mm intervals.
    - Structures, top and bottom kerb levels, retaining walls etc.
    - Invert levels.
    - Service locations where they can be picked up.
    - Existing trees, including height, canopy drip line and girth.
    - Shorelines / mean operating levels of water bodies.

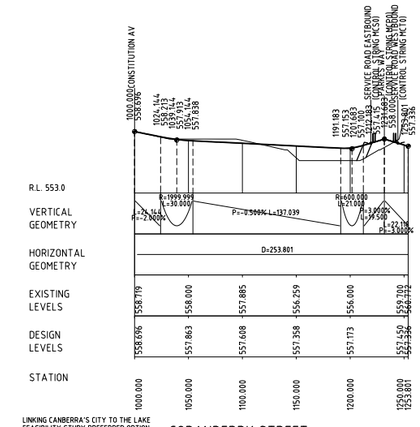
- AECOM (14 January 2010). East West Corridor Infrastructure Study. Canberra ACT including the Paramics Modelling Technical Report;
- Canberra Central Q Paramics micro simulation model created for the Territory by SMEC in 2010;
- AECOM. City East Stormwater Analysis and Options Study;
- Catchment analysis compiled by Cardno (April 2006). City Area Infrastructure Capacity and Catchment Study. ACTPLA;
- Ernst and Young & Cox Architects (April 2011) Australia Forum Scoping Study, Canberra ACT;
- Canberra Olympic Pool Precinct – Long Term Options Study prepared by Suters for ACT Sports and Recreation Services; and
- Planning Objectives described in the National Capital Plan.

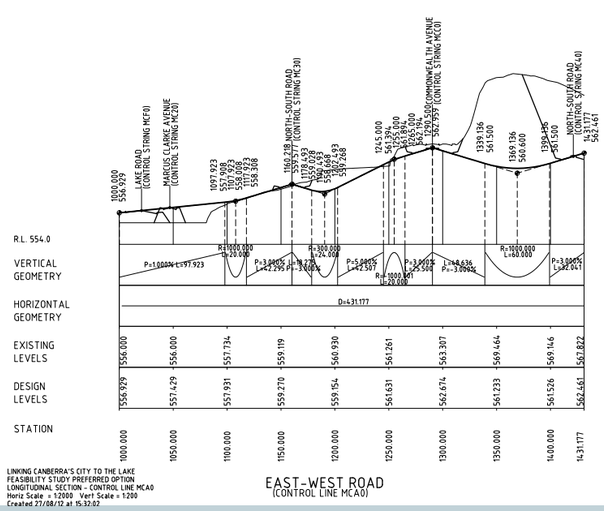
The following sub-sections detail the existing services located in and around the subject site or impacted upon subject to the implementation of the proposed master plan. Existing service locations are indicatively illustrated and shown in diagrams provided within section 2.3 this of the report.

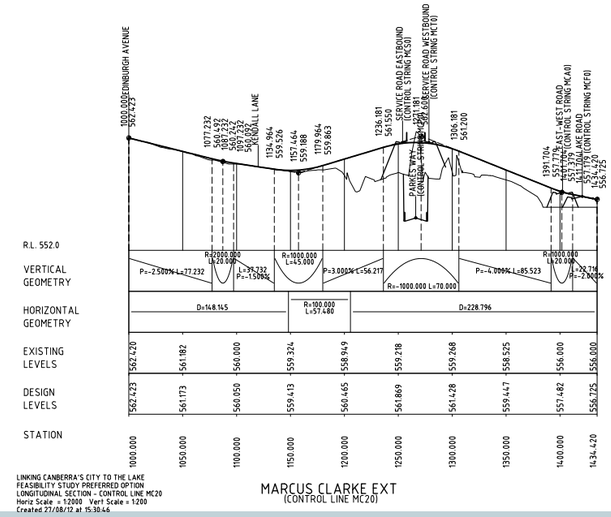
Service locations are based on a survey carried out by LANDdata Surveys, as well as data provided by the relevant service and utility authorities through a Dial Before You Dig request conducted March 2012. Additional information has been obtained from service authorities such as ActewAGL, Jemena, Roads ACT (stormwater) and ICON to supplement what has been provided. Exact locations of all services should be verified prior to construction.

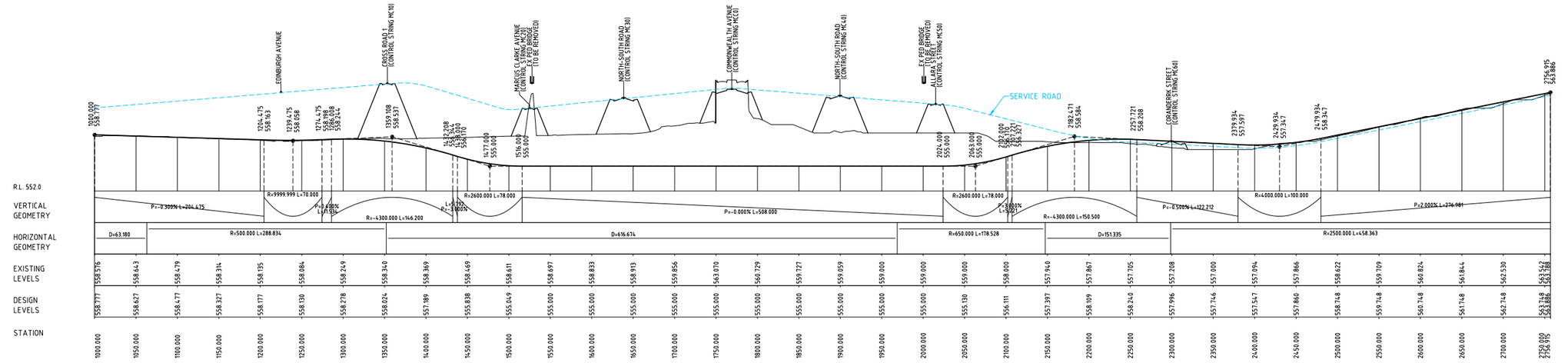












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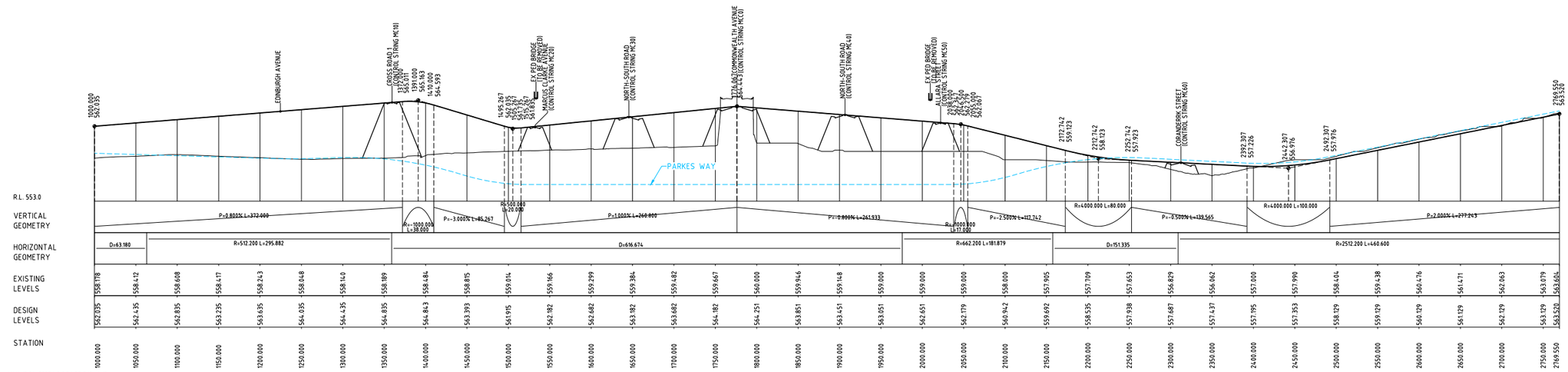

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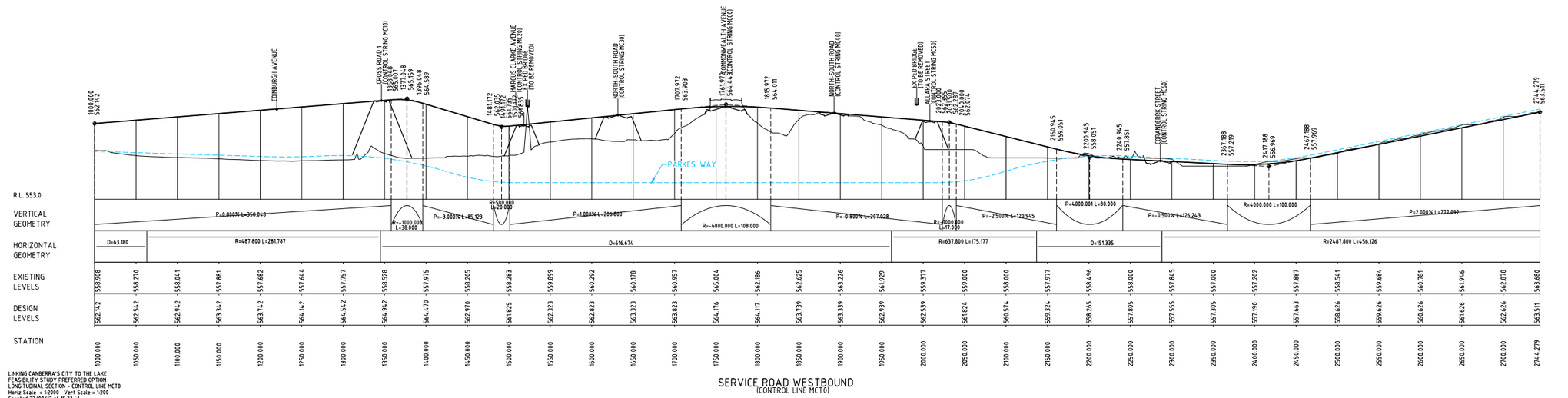

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1.2 COMMUNICATIONS

AAPT

Underground AAPT cable is located within the site, usually in shared trenches with TransACT. The following details the key AAPT cable located within the site:

- Underground cable runs along the eastern verge of Commonwealth Ave to London Cct;
- Underground cable is located in the outer verge of London Cct; and
- Underground cable runs along the southern verge of Constitution Ave between London Cct and Coranderrk St; and
- Underground cable runs along the northern verge of Parkes Way east of Coranderrk St.

ICON

Underground ICON cable is located within the site. The following details the key ICON cables located within the site:

- Underground cable runs along the northern verge of Parkes Way; and
- Underground cable runs along the southern verge of Constitution Ave.

Nextgen

Underground Nextgen cable is located within the site, primarily in shared trenches with Telstra and Optus. The following details the key Nextgen cables located within the site:

- Underground cable runs along the eastern verge of Commonwealth Ave to Allara St;
- Underground cable is located in the outer verge of London Cct; and
- Underground cable runs along the southern verge of Constitution Ave.

Optus

Underground Optus cable is located within the site, primarily in shared trenches with Telstra and Nextgen. The following details the key Optus cables located within the site:

- Underground cable runs along the eastern verge of Commonwealth Ave to Allara St;
- Underground cable is located in the outer verge of London Cct; and
- Underground cable runs along the southern verge of Constitution Ave.

Telstra

There are extensive underground Telstra cables located within the site, often in shared trenches with Optus and Nextgen. The following details the key Telstra cables located within the site:

- Underground cable runs along the eastern verge of Commonwealth Ave to Allara St;
- Underground cable is located in the outer verge of London Cct;
- Underground cable runs along the southern verge of Constitution Ave; and
- Underground cable crosses Parkes Way at the eastern end of the Coranderrk St intersection, and at the pedestrian bridge west of Commonwealth Ave.

Transact

Underground TransACT cable is located within the site, usually in shared trenches with AAPT. The following details the key TransACT cable located within the site:

- Underground cable runs along the eastern verge of Commonwealth Ave to London Cct;
- Underground cable is located in the outer verge of London Cct; and
- Underground cable runs along the southern verge of Constitution Ave between London Cct and Coranderrk St; and
- Underground cable runs along the northern verge of Parkes Way east of Coranderrk St.

Proposed Augmentation Measures for Telecommunications

The measures proposed to augment existing telecommunications are summarised below:
The existing network which provides service to Commonwealth Park is proposed to be realign into the verge of the proposed extension to Allara Street;
Service provided into West Basin will be decommissioned and provision for service will be installed as part of the subdivision works proposed for West Basin with connection from Commonwealth Avenue.
Existing Icon services within Parkes Way between Edinburgh and Coranderrk are proposed to be relocated against the outside face of the northern edge of the cutting resulting from the lowering of Parkes Way.

1.3 WATER AND SEWERAGE

The existing potable water infrastructure is located within most of the roadways within the master plan area with connections to most commercial and residential buildings. Major existing water service infrastructure is located within the site is as follows:

- 600mm diameter distribution main runs along the western verge of Commonwealth Ave and west of the off-ramps to Parkes Way, crossing Parkes Way and connecting to a main on London Cct;
- 300mm diameter distribution main runs along the inner verge of London Cct;
- 300mm diameter distribution main runs along the northern verge of Parkes Way connecting to the 600mm main on Commonwealth Ave and crossing to the northern verge of Constitution Ave approximately midway between Anzac Pde and Coranderrk St; and
- 300mm diameter distribution main runs along the northern verge of Constitution Ave connecting to the main on London Cct and continuing through Anzac Pde.

Proposed Augmentation Measures for the potable water supply

- The critical measures proposed to augment the existing potable water system are summarised below:
- The existing system within the existing road reserve of Parkes Way between Marcus Clarke Street and Coranderrk is proposed to be both horizontally and vertically realigned to the proposed northern verge of the upper level of the smart boulevard;

- The existing main reticulated into West Basin from Marcus Clarke is to be decommissioned and reconnected from a service main proposed in the new Marcus Clarke road link to West Basin;

- Existing services into Commonwealth Park reticulated from Allara Street will be realigned in the verge of the new Allara Street extension established by the proposed civil works;

The existing trunk and critical components of the sewer network within the area of investigation is primarily located within the northern verge of Parkes Way extending beneath the intersection of Parkes Way and Commonwealth Avenue.
The sewer grades from both the City East catchment and the City West catchment to the intersection of Commonwealth Avenue and Parkes Way and continue grading towards Commonwealth Avenue bridge where it is then pumped over the lake continuing south. The pump station is located adjacent the eastern edge of Commonwealth Avenue within Commonwealth Park.

The depth of the sewer is approximately 10 metres below the surface of Parkes Way under the current alignment of the Commonwealth Avenue bridge over Parkes Way.
Sewer connections within Commonwealth Park and West Basin would be decommissioned by any works proposed by the lowering of Parkes Way but would be re-established and be re-connected downstream to the line extending south down Commonwealth Avenue. Major existing trunk sewer service infrastructure located in proximity or required to be considered by the scope of the master plan are as follows:

A 750mm diameter trunk main runs down the eastern verge of Commonwealth Ave from Parkes Way to a pumping station just south of the intersection with Albert St;

A 450-600mm diameter trunk main crosses the Civic Pool site and runs west along the northern verge of Parkes Way before splitting west of Commonwealth Ave into a 450mm diameter trunk main which runs to London Cct, and a 225-300mm diameter reticulation main which continues along Parkes Way; and

- A 375mm diameter trunk main runs along the southern verge of Constitution Ave.

1.3 WATER AND SEWERAGE

Proposed Augmentation Measures for Sewer network

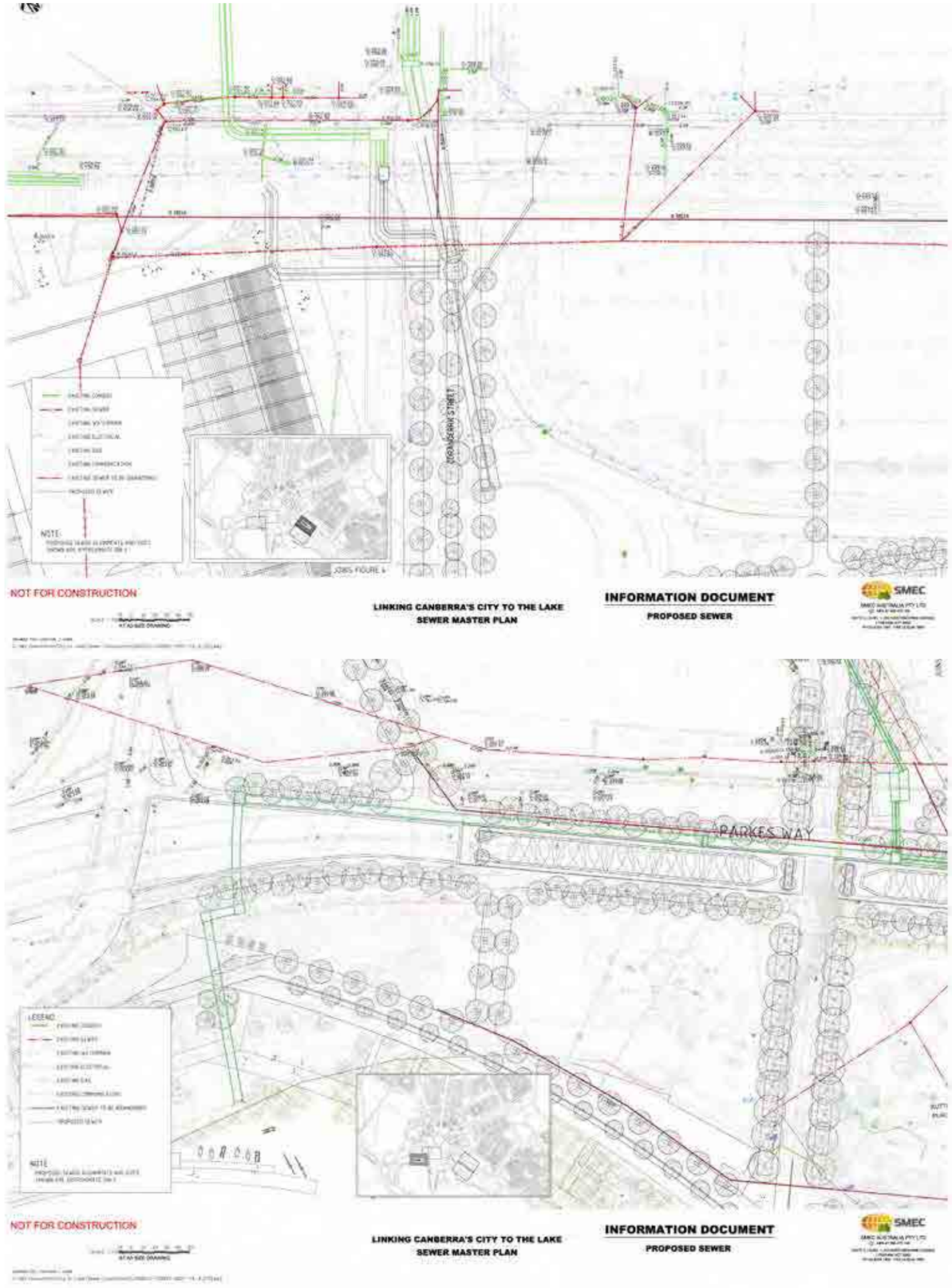
- Some critical measures proposed to augment the existing sewer system are summarised below:
- The existing sewer services from the boat shed facilities within West Basin will require decommissioning. A new service is proposed to service this site from the south west and reconnect to a new connection into the sewer main situated under Commonwealth Avenue;

The existing sewer lines situated in the northern verge of the existing Parkes Way between Edinburgh Avenue overpass and Coranderrk Street are proposed to be horizontally realigned further south and partially lowered in behind the northern retaining wall of the proposed cutting as a result of the lowering of Parkes Way, existing sewer lines will require extension to this new alignment. Grades to the new alignment can be maintained or are to be improved as a result of the partial lowering or the existing line and ties;

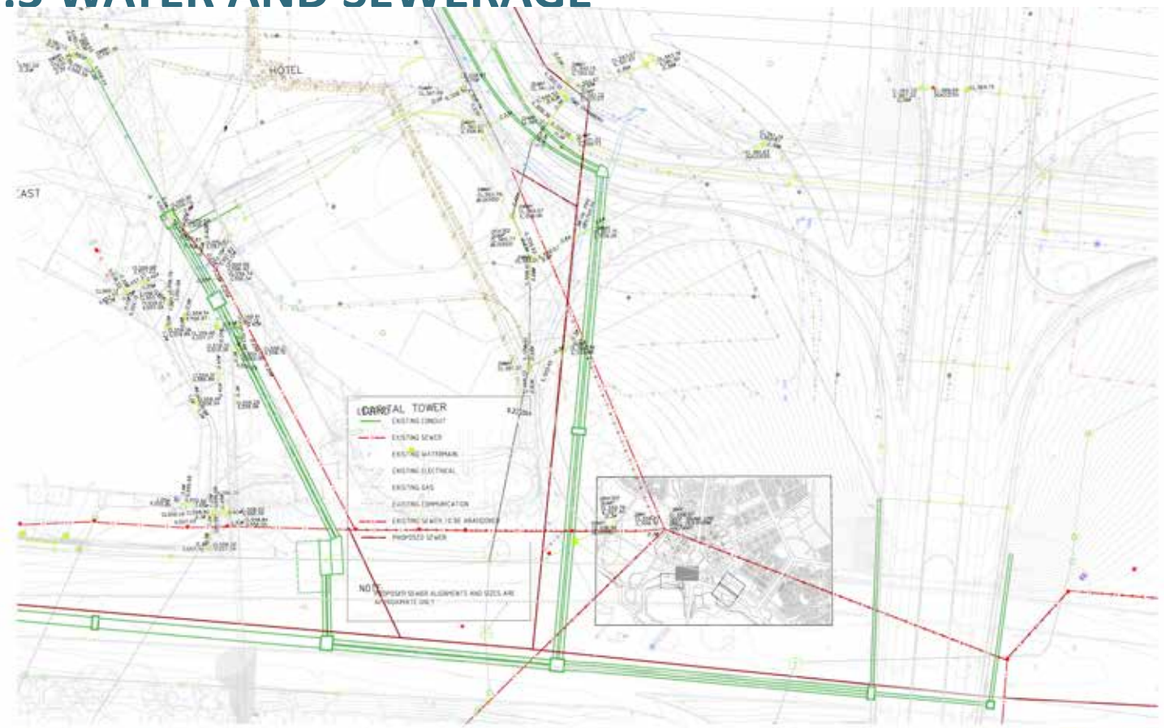
- The proposed lowering of Parkes Way does not impede the existing tie located geometrically beneath the intersection of Parkes Way and Commonwealth Avenue as the depth of this tie exceeds the depth of the proposed lowering of Parkes Way by a number of metres. The proposed concept design for the lowering has been constrained by the invert level of the sewer at this point and the design has made allowances and maintains sufficient cover levels;
- The sewer line connections across Parkes Way to Commonwealth Park which service Commonwealth Park facilities are proposed to partially lowered in response to the realignment and lowering of the existing sewer line, these grades will only improve as a result of this modification;

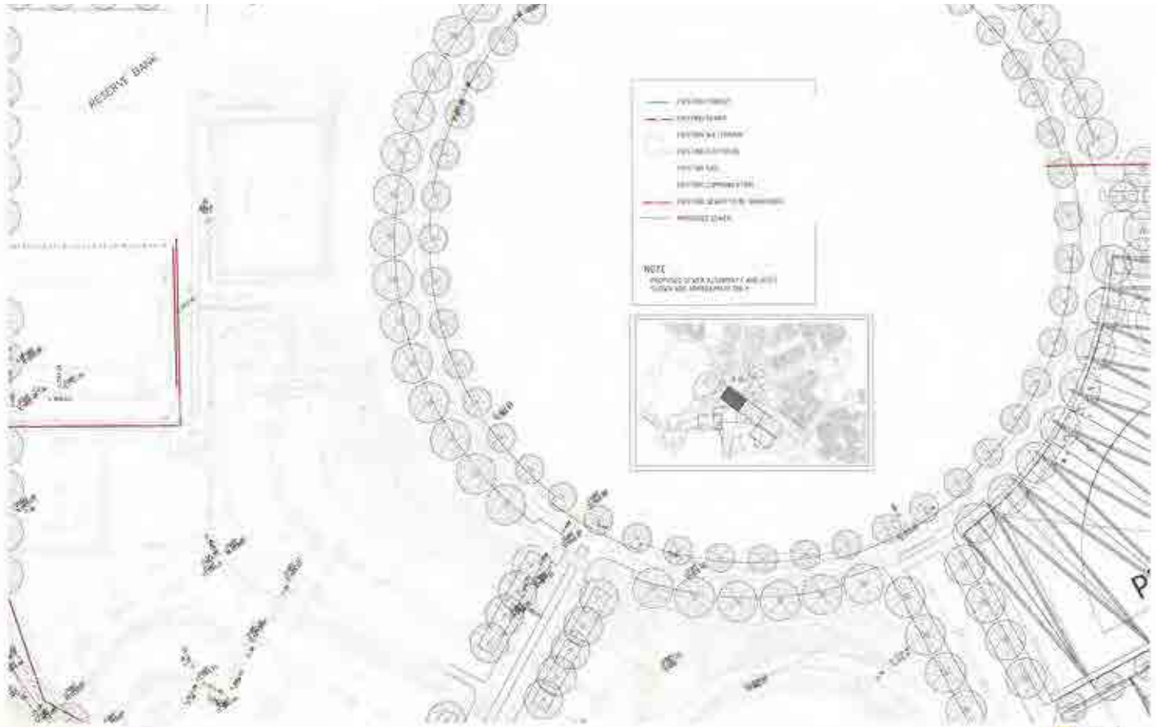
Capacity analysis of Water and Sewerage

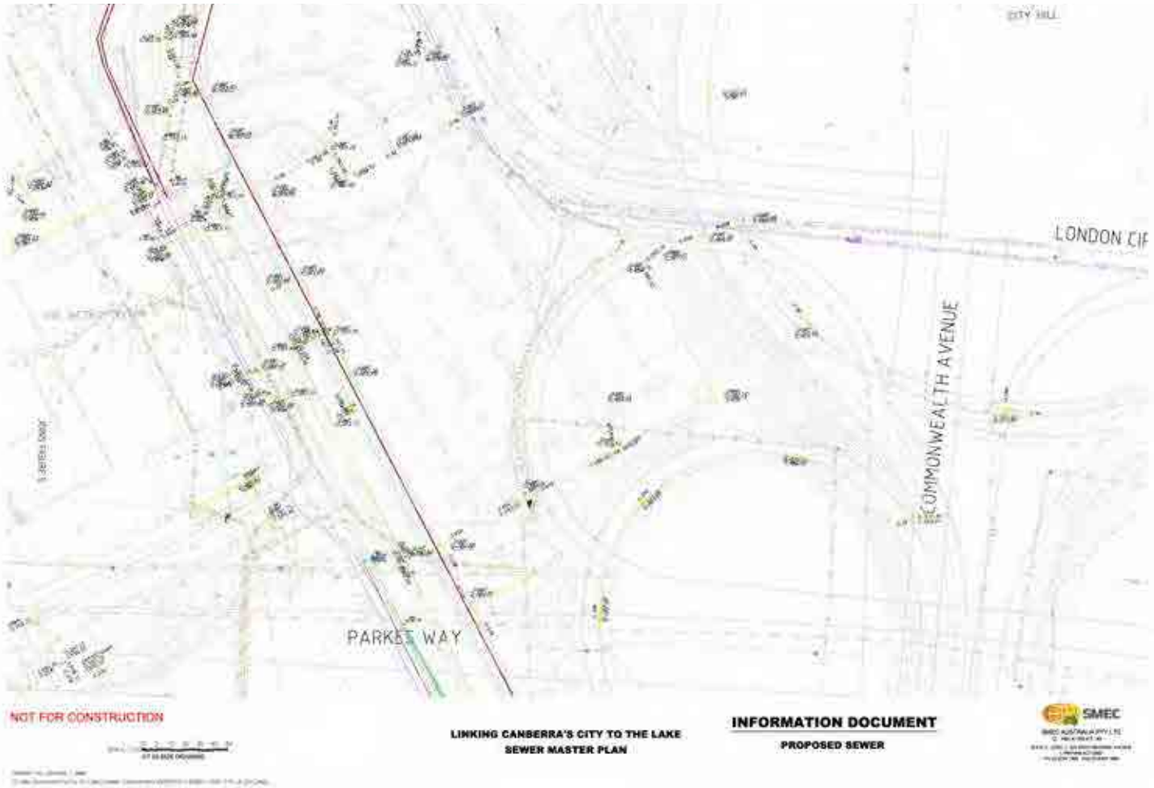
The proposed master plan and landuse assumptions have been provided to Actew Water and Sewerage for comment and review regarding service capacities.
Feedback from Actew Water and Sewerage has advised that both the Water and Sewerage capacities will not be exceeded or impeded by the proposed development as indicated by the proposed master plan.

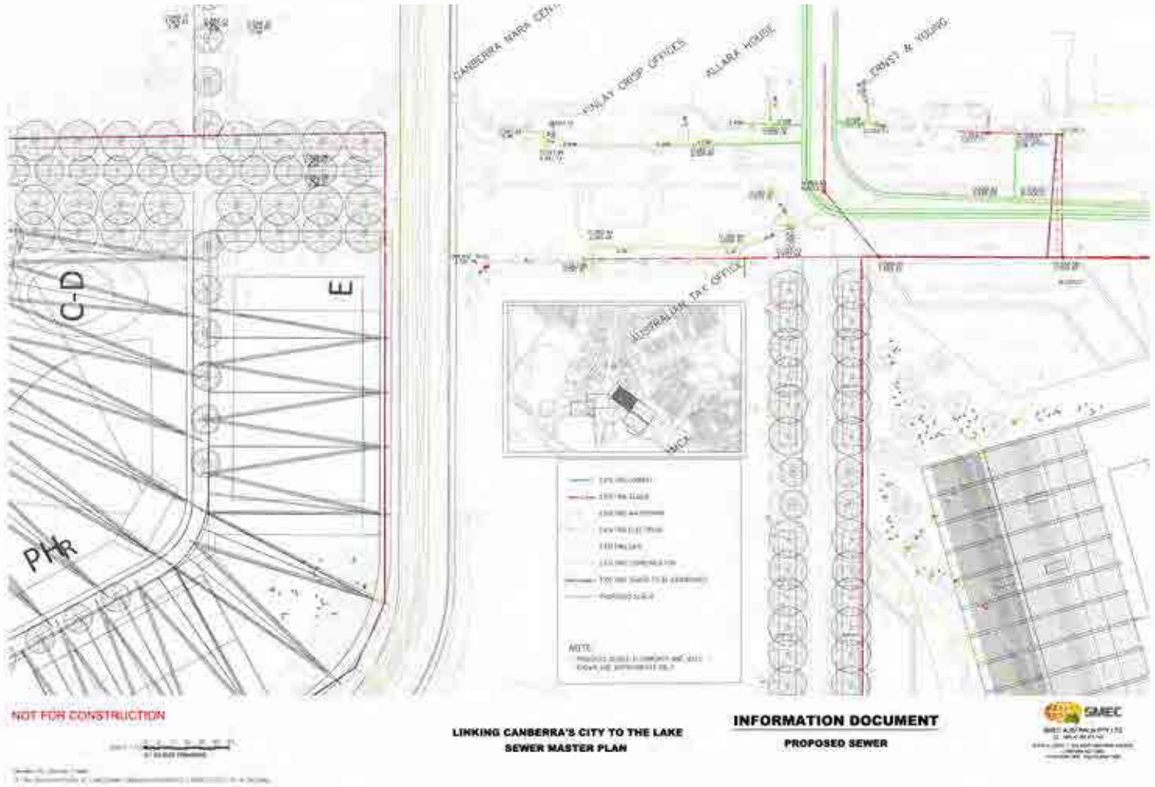


1.3 WATER AND SEWERAGE









1.4 STORMWATER

City East Catchment

The City East catchment extends from City Hill in the west to Anzac Parade in the east, and from Haig Park (Turner) in the north to Lake Burley Griffin in the south. A majority of the piped and overland flows from the catchment discharge into the Coranderrk Street GPT Pond and Nerang Pool. The catchment area is estimated to be about 240 ha for the piped catchment and about 480 ha for the overland flow catchment. The catchment is comprised of a mix of multi-storey buildings (including shopping centres), car parks, sporting facilities, public buildings, some open space areas and single residential blocks.

Sub-catchments

The City East catchment can be dissected into 6 sub-catchments. These sub-catchments are shown in Figure 2 and are summarised below.

Sub-catchment A
This sub-catchment is located in Civic and is roughly bounded by Northbourne Avenue, Cooyong Street, Ballumbir Street, Allara Street and Constitution Avenue.
This sub-catchment is generally comprised of high density commercial development

Sub-catchment B
Sub-catchment B: This sub-catchment is located in Reid and is roughly bounded by Coranderrk Street, Limestone Avenue, Girrahween Street, Torrens Street, Elouera Street, Ballumbir Street, and Constitution Avenue. This sub-catchment comprises a combination of commercial, residential and open space areas.

Sub-catchment C
This sub-catchment is also located in Reid and is roughly bounded by Anzac Parade, Limestone Avenue, Coranderrk Street and Constitution Avenue for up to the 5-year ARI event. The catchment extent is larger for the 20-year ARI event and extends to Mount Ainslie.

Sub-catchment D
This sub-catchment comprises Anzac Parade to the south of Blamey Crescent and Constitution Avenue between Anzac Parade and Coranderrk Street for up to the 5-year ARI event. The catchment extent is larger for larger events and extends into existing residential areas in Campbell. This sub-catchment comprises a combination of commercial and residential land use. A large percentage of the catchment for up to the 5-yr ARI event comprises the Anzac Avenue and Constitution Avenue pavements.

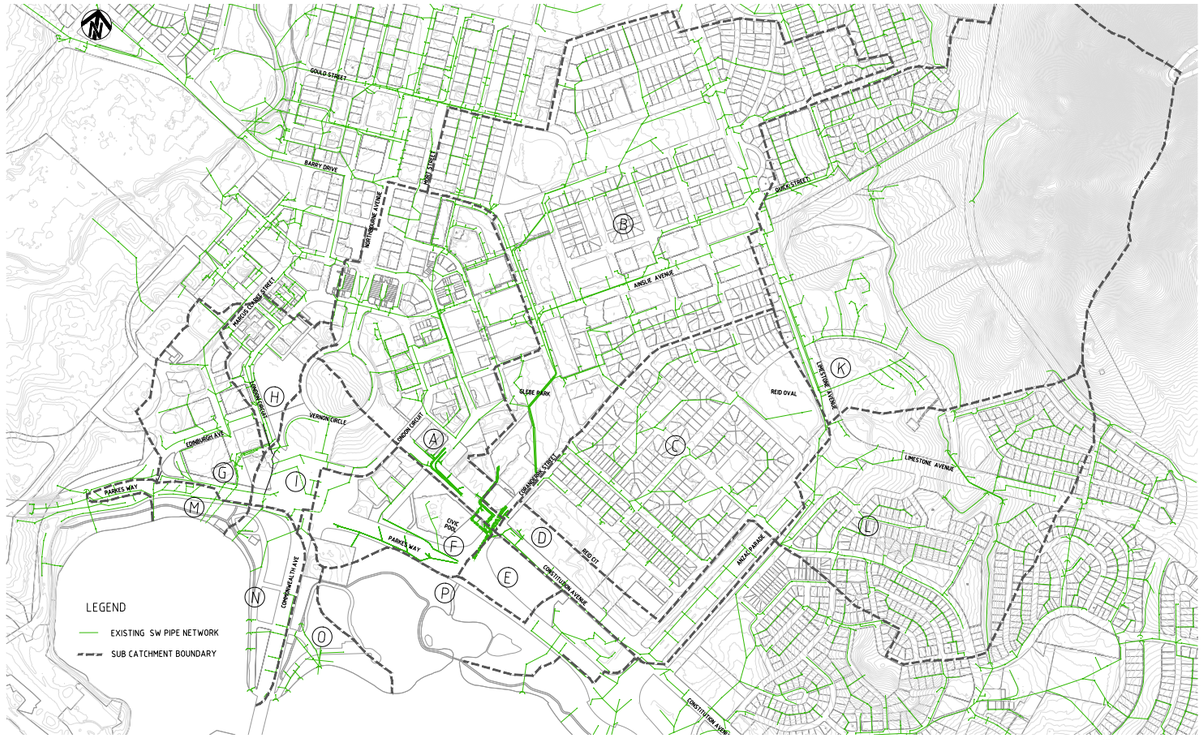
Sub-catchment E
This sub-catchment comprises a section of Parkes Way to the east of Coranderrk Street and the existing car park in Section 3, Parkes.

Sub-catchment F
This sub-catchment is bounded by Constitution Avenue, London Circuit, Parkes Way and Commonwealth Avenue.
Stormwater infrastructure
Stormwater mains within the catchment are illustrated on Figure 2 of this section of the report.

Pipe System

Sub-catchment A
The pipe system draining this catchment consists of two 1200 mm and one 1500 mm pipes located along Allara Street and then along Constitution Avenue, into a stormwater structure south of the National Convention Centre. From the stormwater structure, this pipe system becomes a twin 2100x1050 RCBC which runs further east along Constitution Avenue and turns into the carpark at Block 2 Section 37. The exact location of the 2100x1050 RCBC is uncertain.

Sub-catchment B
The pipe system draining this sub-catchment consists of one 900mm and one 750mm pipe running along Boolee Street, and a twin 1050 mm pipe and one 1500 mm running along Cooyong Street. It becomes two 1050mm and two 1350mm pipes which run through Glebe Park. The pipe system becomes three 1800 mm pipes as it passes further through Glebe Park towards Coranderrk Street and then along Coranderrk Street. It changes to two 1800 pipes just upstream of Constitution Avenue and flows into the Coranderrk Street GPT Pond. The exact location of the twin 1800 pipe is unknown.



1.4 STORMWATER

Sub-catchment C
The pipe system draining this sub-catchment consists of a 600 mm pipe from the Reid Oval and a 750 mm pipe from Currong Street. It becomes a 900 mm pipe at Booroondarry Street and increases to 1200 mm as it approaches Coranderrk Street, and runs along Coranderrk Street to the GPT Pond.
The existing cutoff drain to the east of Reid (within sub-catchment K) has an estimated 5-year ARI event capacity. This cutoff drain

extends into Campbell before becoming an 1800 mm pipe that discharges beneath Constitution Avenue near the intersection with Blamey Crescent. For events with ARI larger than 5-years, overland flows would enter sub-catchment C.

Sub-catchment D
This sub-catchment is drained by a 450 mm pipe which drains Anzac Parade. It increases to a 600 mm as it turns into Constitution Avenue. It gradually increases to a 1050 mm as it runs along Constitution Avenue towards Coranderrk Street. The 1050 mm runs into a 3600x2000 RCBC downstream of the stormwater structure on Coranderrk Street.
The existing cutoff drain and stormwater network to the east of Anzac Parade (within sub-catchment L) has an estimated 5-year ARI capacity. For events with ARI larger than 5-years, overland flows would enter sub-catchment D.

Sub-catchment E
The sub-catchment is drained by small pipes that drain directly into the GPT Pond and the twin 3600x2000 RCBC which runs from the stormwater structure on Coranderrk Street to the GPT Pond. Pipe details are unknown.

Sub-catchment F
This sub-catchment is drained by two 600 mm pipes which flow directly into the GPT Pond. Pipe invert levels are unknown. Pipe alignments are also uncertain.

Overland Flow System

Sub-catchment A
Overland flow paths within this catchment are primarily comprised of roads and median strips.

Sub-catchment B
Overland flows within this catchment primarily travel along roadways and open space areas.

Sub-catchment C
Up to the 5-year ARI event, overland flow paths are chiefly roadways and open space areas. For larger ARI events, the catchments upstream of Limestone Avenue consists of roadways, open space areas and cutoff drains.

Sub-catchment D
For the 5-year ARI event, overland flow paths are chiefly roadways and open space areas. For larger ARI events, the areas upstream of Anzac Parade consist of roadways, open space areas, swales and cutoff drains.

Sub-catchments E and F
Overland flow paths for these two sub-catchments are entirely road surfaces.

The invert levels of the RCBCs flowing into and out of the GPT Pond were not surveyed.

Capacity of the Existing System

The XP-Rafts and Drains models (for 1 and 20 year ARI) for the catchment supplied by AECOM were initially reviewed. In their XP-Rafts model AECOM used ARBM parameters as given in the current Design Standards for Urban Infrastructure (DSUI) for pervious areas, and an initial loss of 1.5mm and a continuing loss of 0 mm for impervious areas. The Drains models by AECOM were for pipes without any blockages and pipes with blockages including estimates of blockage due to the sediment accumulated in the pipes. AECOM analysed the existing pipes systems with inflow hydrographs as determined by their XP-Rafts model.

In the current study, for the XP-Rafts modelling, ARBM parameters were used for both pervious and impervious areas, as per the DSUI and for consistency with other hydrologic modelling within the ACT. All other sub-catchment data were as in the AECOM report. The model was run for future developed conditions for 1-, 20- and 100-year ARI events.

Peak flows calculated for the sub-catchments and at the GPT pond are tabulated below along with the sub-catchment areas.

Table 1 Sub-catchment Peak Flows at GPT Pond.

	Catchment Area (ha)		**Peak Flows (m3/s)**		
	Up to and including 5-year ARI event	**Events larger than 5-year ARI event**	**1-year ARI**	**20-year ARI**	**100-year ARI**
A	49.0	49.0	5.7	13.9	18.2
B	116.9	116.9	6.7	17.0	22.4
C	61.2	184.9	4.2	10.7	19.3
D	14.6	80.2	1.1	4.7	8.9
E	5.0	5.0	0.6	1.3	1.7
F	16.5	16.5	1.1	2.9	3.8
Total at GPT Pond	263.2	452.5	15.8	40.0	52.2

The difference between the AECOM peak flows and peak flows computed in the current study were generally less than 5%, with only the 20-year ARI peak flow computed in the current study for catchment D about 50% higher than the peak flow reported by AECOM, although when compared with the peak flow computed by their model provided to us the difference was about 30%. The cause for the difference was mainly due to the overflow from the cutoff drain upstream of Anzac Parade being higher in the current study.

For our Drains modelling, the model was run for the 1-, 20- and 100-year ARI events with the relevant inflow hydrographs for the nodes and ARI events. Without blockages. Inlet capacities were assumed to be unlimited for modelling purposes. The XP-Rafts determined hydrographs were input to determine pipe and overland flows. Pipe flows and overland flows were computed. Design overland flows were calculated based on the total flows and pipe flows allowing for a percentage blockage of the pipe cross-sectional area corresponding to the ARI capacity of the pipe, in accordance with the DSUI. RL 554.65 was used as the level for the GPT Pond.

Pipe System

Summarised below are the pipe capacities determined from our modelling work.

Sub-catchment A
The twin 2100x1200 RCBC that drains the trapped low point behind the National Convention Centre (NCC) has greater than a 20-year ARI capacity. The twin 1350 pipes which also drain the NCC and discharge directly to the twin 3600x1200 RCBC have a 100-year ARI capacity.

Sub-catchment B
The three 1800 mm pipes through Glebe Park have a 100-year ARI event capacity.
The 1200 mm pipe running across Constitution Avenue has less than a 20-year ARI capacity.

1.4 STORMWATER

Sub-catchment C
Sub-catchment C: These pipes were not included in our model, due to lack of pipe invert level information.

Sub-catchment D
The 1050mm pipe running along Constitution Avenue towards Coranderrk Street has less than a 20-year ARI capacity.

Sub-catchment E
The 1050mm pipe connecting to the 3600x2000 RCBC downstream of the Coranderrk Street stormwater structure has a greater than 20-year ARI event capacity.

Sub-catchment F
The hydraulic grade line (HGL) in the 2400x900 RCBC running across Constitution Avenue (west of Coranderrk Street) would cause surcharging at the trapped low points in front of the National Convention Centre. This flow would discharge through the Civic Pool carpark in a 100-year ARI event. The twin 2100x1050 RCBC through the Civic Pool carpark has a 100-year ARI event capacity.

The twin 3600x1200 RCBC has a greater than 20-year ARI capacity up to the GPT pond and less than a 20-year ARI capacity downstream of the GPT pond.

Prior to AECOM's study, Cardno (2006) undertook an XP-SWMM modelling of the City East and City West catchments and identified problem areas. These were minor in nature.

Overland Flow System

Summarised below are the design overland flow for a 20 year ARI event determined from our modelling work.

Sub-catchment A
Design overland flow is approximately 6 m3/s. This flow would travel through the National Convention Centre carpark towards the GPT Pond.

Sub-catchment B
Design overland flow is approximately 4 m3/s. This flow would travel through Glebe Park towards the GPT Pond.

Sub-catchment C
Design overland flow is approximately 8 m3/s. This flow includes the overflows from the Limestone Avenue and Anzac Parade cutoff drains. This flow would travel through the carpark on Block 6 Section 3 towards the GPT Pond.

Sub-catchment D
Design overland flow is approximately 5 m3/s. This flow would travel along Parkes Way towards the GPT Pond.

Sub-catchment E
Design overland flow is approximately 2 m3/s. This flow would travel along Parkes Way towards the GPT Pond.

Sub-catchment F
Design overland flow is approximately 4 m3/s. This flow would travel along Parkes Way towards the GPT Pond.

At the GPT Pond
Estimated 100-year design overland flow upstream of the GPT Pond is about 15 m3/s. Estimated 100-year ARI design overland flow downstream of the GPT pond is in excess of 40 m3/s. This is a significant flow and would cause major disruption to traffic and flooding at Parkes Way and through Commonwealth Park. Should the pipes stay at flat grades and continue to be silted the design overland flows could be much larger than those given above with potential to cause much more damage.

Floodway through Commonwealth Park:
The 20-year ARI event flow through the floodway is expected to overtop the channel banks.

Flood Retardation

AECOM reported that the GPT Pond attenuates 20-year ARI event flows by 15% and the Nerang Pool attenuates the peak 20-year ARI flow by 40%. Cardno did not report any flow attenuation at either of these locations.
Flood retardation options were modelled in the current study. 100-year ARI simulations show insignificant retardation by the GPT Pond and 29% retardation by Nerang Pool.

Cardno recommended flood retardation basins at the two carparks at the Swimming Pool and opposite the Reid CIT.
Although the Reid Oval retardation basin could reduce the peak 100-year ARI flow to less than 1 m3/s from 14 m3/s. The peak flows at Constitution Avenue, can only be reduced to about 15% resulting in a flow rate of 13.6 m3/s.
A retardation volume of 1000 m3 at the carpark opposite Reid CIT does not result in any reduction in peak 100-year ARI flows .
Nerang Pool alone (with the GPT Pond decommissioned) will result in a 25% reduction in peak 100-year flows to 39 m3/s.

Water Quality

The GPT Pond located at the intersection of Coranderrk Street and Parkes Way is installed to service most of the City East catchment, in addition there is an existing in-ground GPT south of the Albert Street-Barrine Drive intersection. However, this GPT appears to be servicing only part of Albert Street.

Nerang Pool, due to its location within the stormwater drainage path, is meant to be a water quality control pond with the GPT Pond intended to screen out the coarse sediments and gross pollutants. However, because the GPT is lower than the level of Lake Burley Griffin, sediment is trapped within the GPTand therefore always wet, with major maintenance and contamination concerns currently associated with it.

A feasibility study completed by SMEC in 2005, focussing only on the City East catchment and recommended three new GPTs. These were at:
- Vortex GPT at Constitution Avenue near Civic Pool
- Vortex GPT at Coranderrk Street entry
- Major DUS GPT in carpark opposite Reid CIT.

In 2006, Cardno recommended four wetlands and three bio swales within this catchment. These measures, targeting suspended solids generated within this catchment, were meant to provide water quality improvement for the catchment and were to be retrofitted. They would reduce pollutant loads discharging into LBG under ultimate developed conditions, below the existing pollutant load levels. The Cardo study included MUSIC water quality modelling.

The locations for the four wetlands recommended were as follows:
- Corner of Quick Street and Limestone Avenue
- Open space in Glebe Park
- Carpark at Constitution Avenue near swimming pool
- Carpark opposite Reid CIT

The locations for the three bio swales recommended were as below:
- Two within the median strip on Ainslie Avenue
- One small bio swale in Commonwealth Park, downstream of Anzac Parade.

In 2006, SMEC completed a PSP design for the Glebe Park GPT, which included a 3-month flow diversion and a trash rack on the diversion. The PSP design drawings included a concept drawing for three major GPTs and for three ponds.

Also included was a concept drawing by SMEC in 2006 for pond locations. This concept nominated ponds at the last three locations given by Cardno.

The existing Coranderrk Street GPT Pond inlets and outlet pipes are heavily silted and the conduits flowing in and out if it are also heavily silted. Detailed description of the volume of sediment accumulated, cleaning history etc. are given in the AECOM report.

1.4 STORMWATER

The wetlands nominated by Cardno would require GPTs immediately upstream of them. This would reduce the catchment for the GPT Pond and in turn reduce the size of the GPT required at Coranderrk Street.

Cardno reported details of GPTs nominated previously by SMEC for the catchment. These three GPTs were nominated at locations where Cardno nominated wetlands. To achieve a proper treatment sequence for the flows, a GPT would be required upstream of each wetland, to screen out the gross pollutants and coarse sediment. Based on their catchment areas, the swimming Pool carpark, the carpark opposite Reid CIT (Block 6 Section 3) and Glebe Park (Block 2 Section 65) would require major DUS GPTs. Quick Street would only require a minor DUS GPT.

The Glebe Park Master Plan Report produced by Parks, Conservation & Lands of the Department of Territory and Municipal Services in June 2008, states that Roads ACT have proposed a gross pollutant trap in the southern part of the Park edge zone. The location nominated for the GPT is upstream of the location of the trash rack in the PSP prepared by SMEC in 2005.

The PSP completed by SMEC in 2006 for the trash rack allows for a short weir which would divert the 3-month ARI flow from the 3x1800 mm pipes towards the trash rack. Any flows in excess of the 3-month ARI flow would overtop the weir and flow straight through bypassing the trash rack. For the GPT proposed to be provided at Glebe Park the design would be based on 1-year ARI flow as per the design standards, and would include a sediment trap and a trash rack.
The provision of major DUS GPTs in the locations nominated may impact on the development opportunities at these locations.

City West Catchment

The City West catchment extends from Liversidge Street in the west to City Hill in the east, and from University Avenue in the north to the West Basin in the south. It should be noted that the City West catchment as defined in this report does not include the part of the catchment that drains into Sullivans Creek. All piped and overland flows from the catchment discharge into the West Basin. The catchment area is estimated to be about 45 ha. The catchment is largely composed of multi-storey buildings and car parks with some open space areas around City Hill. The catchment may be divided into three sub-catchments.

Sub-catchments

The City West catchment can be discretised into three sub-catchments:

Sub-catchment G – (Marcus Clarke System)
This sub-catchment is roughly bounded by lower London Circuit, Marcus Clarke Street, McCoy Street and Parkes Way.

Sub-catchment H – (London Circuit System)

This sub-catchment is roughly bounded by Marcus Clarke Street, Hobart Place, Vernon Circle and the laneway opposite Kendall Lane.

Sub-catchment I – (Lower London Circuit System)
This sub-catchment is roughly bounded by Vernon Circle, City Hill, London Circuit and Parkes Way.

Stormwater infrastructure

Pipe System

Sub-catchment G – (Marcus Clarke System)
This system starts from University Avenue. At Gordon Street it is a 750 pipe and runs along the eastern verge of Marcus Clarke Street, picking up flows from smaller pipes upstream of Gordon Street. It increases to a 900 mm pipe at Edinburgh Avenue and runs up to the southern boundary of the Block 1 Section 7. It then increases to a 1050 pipe and discharges into a stormwater structure just south of the Marcus Clarke Street-Kendall Avenue intersection.

Two other 900 mm pipes from London Circuit also discharge into this structure. Two pipes flow out of the structure. One is a 1050 pipe which increase to 1200 at Parkes Way. The other is a 1200 pipe. Both pipes flow into the West Basin, with their invert levels approximately 1.2m below the LBG water level.

Sub-catchment H (London Circuit System)
This system consists of two pipes, one running close to the central median strip and the other located in the western verge. The former starts as a 600 mm running from Gordon Street to about 400 m upstream of Edinburgh Avenue, where it increases in size to 750 mm and then increases further to a 900 mm at a manhole located in line with the southern boundary of Block 1 Section 7. The latter is a 750 mm from Gordon Street, which increases to 900 mm at a manhole south of the south-eastern corner of the block. The two 900 pipes run along the open area within Block 9 Section 8 (which lies between Block 1 Section 7 and Block 8 Section 8) into a structure just south of the Marcus Clarke Street-Kendall Avenue intersection, and flows into the Marcus Clarke system.

It is important to note that the survey undertaken as part of the Linking Canberra City to the Lake project did not locate one of the 900 mm pipes along London Circuit.

Sub-catchment I (Lower London Circuit System)
At the upstream end this system it consists of two pipes (a 375 mm and a 525 mm) draining the open area bounded by, and around, the ramp from Commonwealth Avenue to London Circuit. This gradually increases to 750 mm when it flows into an in-ground GPT within the median strip of Parkes Way. The pipe from the GPT to the West Basin is also a 750 mm, with the invert level at the outlet about 1m below the lake water level. At the southern verge of Parkes Way, it also picks up flows from a pipe of unknown size draining the car park (north of London Circuit) and the open space (south of London Circuit) east of Commonwealth Avenue.

Overland Flow System

The overland flow system is chiefly composed of road surfaces and open space areas.
Capacity of the Existing System

An XP-RatHGL (XP Software, 2009) model was assembled for the pipe systems within the catchment, and was run for the 5-, 20- and 100-year ARI systems. The model was primarily assembled to quantify the capacity of the pipes and to estimate the overland flows for different ARIs. The model was based on a review and extension of an XP-RatHGL model for a previous project in the City. Pipe details were derived from Work As Executed (WAE) information including the Chapman Plan, and any survey information which became available from previous projects in the area. Pipe invert levels, where available, were input to the model. Where pipe details were not available, assumptions were made. Inlet capacities were assumed to be unlimited for the modelling.

Catchment and slope data for each node were derived from 1m contours, and percentage imperviousness was estimated from aerial image of the catchment.

Pipe System

Pipe capacities determined from our XP-RatHGL modelling are summarised below:

Sub-catchment G – (Marcus Clarke System)
The pipes upstream of the structure close to the Marcus Clarke Street – Kendall Avenue intersection have about a 5-year ARI capacity. The two pipes downstream of the structure collective have a 20-year ARI capacity.

1.4 STORMWATER

Sub-catchment H (London Circuit System)
The pipes running close to the central median strip have less than a 5-year ARI capacity. The pipes running along the western verge have about a 20-year ARI capacity.

Sub-catchment I (Lower London Circuit System)
The pipes upstream of Parkes Way have about a 20-year ARI capacity and the pipes downstream of Parkes Way have less than a 5-year capacity.
Overland Flow System
Overland flows were calculated by the XP-RatHGL model. Design overland flow or 'gap flow' was calculated at strategic locations by applying the appropriate blockage factor to the pipe flow at that location.

Sub-catchment G – (Marcus Clarke System)
The design overland flows calculated in this manner are as follows:

- From Marcus Clarke Street to Parkes Way 5 m3/s
- From Lower London Cct to Parkes Way 2 m3/s

Sub-catchment H (London Circuit System)
Along Parkes Way, up to Marcus Clarke Street, the overland flows would flow within the westbound carriage way. When the flows combine at Marcus Clarke Street the combined flow is likely to overtop the median strip, with some flow entering the eastbound carriageway. Local overland flows from the two carriageways will combine with this run-on from the two streets and flow towards the low-point under the Edinburgh Avenue bridge. From the low-point the flows are piped to the lake; the capacity of the pipes from this low-point are not known.

Flood Retardation

There are no known flood retardation facilities within this catchment.

Water Quality

There are two existing minor DUS (in-ground) GPTs within the median strip of Parkes Way. These GPTs service only sub-catchment I (Lower London Circuit sub-catchment). There are no known GPTs servicing the Marcus Clarke Street system.
There are no known water quality improvement measures within the catchment. Cardno (2006) recommended one bio swale south of the Albert Street-Barrine Drive intersection east of Commonwealth Avenue. Their MUSIC model results for the catchment showed that the retention rates for TSS, TP and TN, would meet the targets specified in the Waterways: Water Sensitive Urban Design General Guide, when the bio swale is installed.

Constitution Avenue is situated within the City East catchment. Preliminary design for the upgrade of Constitution Avenue has recently been undertaken, with further design development occurring towards the end of 2012.

It is important that the shortcomings of the existing stormwater drainage system and remedial measures to overcome these shortcomings be considered and incorporated in the upgrade design of Constitution Avenue. As noted earlier in this report, this will require a holistic consideration of stormwater management within the City East catchment.

The stormwater management strategy for both the City West and City East catchments as part of linking the city to the lake requires detailed solutions to enable to opportunity to remove the requirement for the Coranderrk Street pond (GPT). The design of the upgrade to Constitution Avenue needs to incorporate stormwater measures to improve stormwater drainage and water quality for the City East Catchment. This is critical to the successful implementation and delivery of linking the city to the lake and managing stormwater both piped and the overland flow systems.

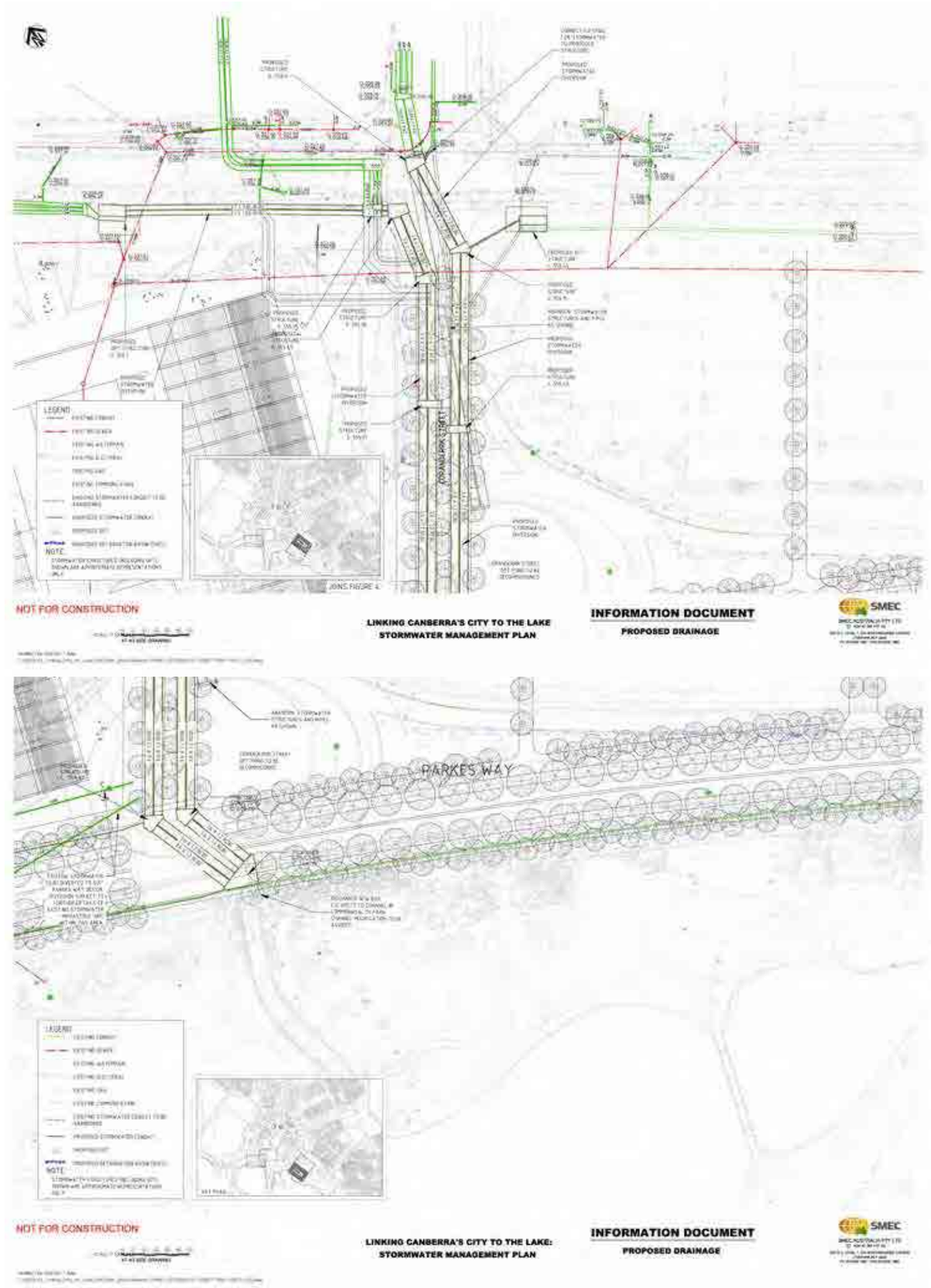
1.4 STORMWATER

Proposed Augmentation Measures

The measures proposed to augment the existing stormwater system are summarised in Figure 3. Figures 4 to 7 capture the recommended measures in more detail. The primary augmentation measures recommended are as given in this section of the report.

City East Catchment

- Divert the two 750mm pipes on London Circuit from the south-eastern corner of Block 1 Section 7 (Rydges Canberra) along London Circuit towards Parkes Way;
- Intercept the 600mm pipe to the east of Commonwealth Avenue at the northern verge of Parkes Way and divert along the northern verge;
- Connect the London Circuit diversion pipes to the pipe along Parkes Way northern verge;
- Install twin 900/1050/1200 mm pipes along Marcus Clarke Street from Parkes Way northern verge to Edinburgh Avenue;
- Connect the twin 1200 mm pipes to the new pipe along Parkes Way northern verge. Provide a minor DUS GPT;
- Continue the new pipe along Parkes Way northern verge, across Parkes Way into Commonwealth Park;
- Abandon the two 1200/1050/900 mm pipes along Marcus Clarke Street;
- Abandon the 2x900 pipes between Block 1 Section 7 (Rydges Canberra) and Block 9 Section 8;
- Abandon the 675 mm pipe from the northern verge of Parkes Way to the southern verge of Parkes Way including the two existing in-ground GPTs;
- Abandon the two existing 1200 mm pipes from the northern verge of Parkes Way to LBG.
- Retardation basins are not recommended at the Civic Pool carpark nor the carpark opposite Reid CIT;
- Wetland is not recommended at the Civic Pool carpark.



1.4 STORMWATER

City West Catchment

- Provide a DUS minor GPT to the east of the entry to the Civic Pool carpark, close to the existing stormwater structure;
- Install 2x2100x1050 RCBC from the new GPT to the north-eastern corner of the Civic Pool carpark;
- Provide a new structure on the 2x3600x1200 RCBC at the intersection of Parkes Way and Coranderrk Street;
- Install 2x3600x1200 RCBC from the new structure to the north-western corner of the carpark opposite Reid CIT;
- Provide a GPT at the north-western corner of the carpark opposite Reid CIT, at the downstream end of the 2x3600x1200 diversion;
- Provide a new structure on the 2x2100x1050 RCBC at the north-eastern corner of the Civic Pool block and connect the twin 1350 mm and the 2400x900 RCBC coming across Constitution Avenue to this structure;
- Continue the 2x3600x1200 RCBC across Coranderrk Street to the south-western corner of the carpark opposite Reid CIT and continue across Parkes Way to Nerang Pool. Provide structures, where there is change of direction;
- Install 2x3600x1200 RCBC from the pond/retardation basin in the carpark opposite Reid CIT to LBG;
- Connect the two 600 mm pipes currently discharging to the GPT Pond, to the culvert discharging to the floodway leading to Nerang Pool, if possible. Available information on these pipes is inadequate to make a decision on these diversions;
- Abandon the Coranderrk Street stormwater structure
- Abandon the 2x3600x1200 RCBC downstream of the new structure at the intersection of Constitution Avenue and Coranderrk Street;
- Abandon the 2x2100x1050 RCBC from the Civic Pool carpark to the Coranderrk Street stormwater structure
- Abandon the GPT pond. This will require careful removal and disposal of its contents;
- Seal the culvert at Parkes Way; and
- Abandon the 2x3600x1200 RCBC from the Coranderrk Street structure to the GPT pond;

Limitations

The analysis reported herein is only based on pipe capacities. Inlet capacities have not been quantified and inlets have been assumed to have unlimited capacities in the analyses.

References

- Drainage and Service Plans, Constitution Avenue Upgrade (AECOM, 2012).
- City Area Infrastructure Capacity and Catchment Study – Final Report (Cardno, 2006)
- Glebe Park Master Plan Report – Block 2 Section 65 City (PC&L – Dept of TaMS, 2008)
- Rond Pond Water Quality Improvement – Glebe Park GPT PSP (SMEC, 2006)
- Coranderrk Street GPT Short-term Upgrade Options Study (Draft, AECOM, April 2012)

1.5 ELECTRICITY AND GAS

There is a mix of medium and high pressure steel and nylon mains located within the site. The following highlights the major gas pipes located within the site:

- 450mm diameter steel secondary main runs along Marcus Clarke St, connecting to a main in the northern verge of Parkes Way; and

- 350mm diameter steel secondary main runs along the northern verge of Parkes Way, transitioning down to a 100mm diameter main west of the 450mm diameter main.

Proposed Augmentation Measures for natural gas supply

The key measures proposed to augment existing gas lines are summarised below:

- the existing gas services situated within Parkes Way are proposed to be realigned to be located in the upper level of the smart boulevard road system and be placed within the northern verge of the upper boulevard, existing connections into Allara Street and Marcus Clarke Street are to be re-established as part of this work;

- existing services connecting into Commonwealth Park are to be decommissioned and a new connection established within the verge of the proposed Road B link across the surface of the split boulevard;

- existing services running west along the southern verge of the existing Parkes Way are to be reconnected to the new surface gas reticulated system as part the proposed extension of Marcus Clarke Street to West Basin.

There is extensive existing electrical infrastructure located within the site. This primarily includes streetlights and streetlight cabling. There is also underground high and low voltage cabling and overhead powerlines located within the subject site.

The site is serviced by two zone substations in Ainslie and Acton. As advised by Actew Electricity there are no major distribution cables which pass through the or are impacted upon by the proposed master plan.

The following details the major electrical infrastructure located within the site which will be considered through the detailed design phase:

- underground high voltage distribution cables run along both sides of Parkes Way west of Edinburgh Ave / Lawson Cres with a crossing point east of the Acton Tunnel;

- underground high voltage distribution cables run along Marcus Clarke St and cross Parkes Way west of Commonwealth Ave before heading south down Barrine Dr and Commonwealth Ave; and

- underground high voltage distribution cables run south along Allara St, cross Parkes Way and run to Regatta Point before crossing the lake.

Any new developments within the site will require detailed analysis of the capacity requirements for the electrical network. New substations will most likely need to be installed and incorporated as part of the future development of West Basin to service new development.

Proposed Augmentation Measures for electrical

The measures proposed to augment existing electrical services are summarised below:

- Existing high voltage and street lighting cabling services from Marcus Clarke and Allara Streets are proposed to be re-established into the verges of the proposed extensions to these roads into the upper and lower split boulevard road network;

- Street lighting currently within Parkes Way between Edinburgh Avenue and Coranderrk Street and West Basin are to be decommissioned with a new design for street lighting established through the detailed design of the split boulevard and West Basin subdivision;

- High Voltage cabling transversing West Basin from Marcus Clarke Street to Commonwealth Avenue is to be rerouted into the southern verge of the upper and lower smart boulevard of Parkes Way into Commonwealth Avenue;

- Current services into Commonwealth Park are to be realigned into the southern verge of the new road alignment of Parkes Way;

- The existing Boat Shed facility in West Basin is to be serviced from realigned services as part of the extension of Marcus Clarke Street.

1.6 GEOTECHNICAL INVESTIGATIONS

This section of the report presents the results of a preliminary geotechnical assessment carried out as part of an urban design study for modification works between Canberra City and Lake Burley Griffin. The assessment was undertaken to provide preliminary comment on likely subsurface conditions to assist in the conceptual planning and design of the modification works and to advise on the extent of detailed geotechnical investigations. The assessment was also undertaken to enable comment to be made on the likelihood of soil contamination within the site area The assessment comprised a review of existing information, a walkover inspection by an experienced geotechnical engineer, followed by engineering analysis and reporting. Details of the work undertaken together with the results obtained are given within together with comments relating to design and construction practice.

Background information

A list of the relevant investigations is provided below with a brief summary of the findings.

Report on Foundation Conditions, Captain Cook Memorial, Canberra - Ground Test (Project SSI/2108 dated May 1969).

Boreholes encountered rock on the lake edge below depths of 3 and 6 feet (0.9 – 1.8 m) being deeper beyond the lake edge with boreholes in the lake encountering bedrock below depths of 18 to 42 feet (5.5 – 12.8 m). Lake depths were about 7 to 30 feet (2.1 – 9.1 m).

Preliminary Geotechnical Investigation, Proposed Development, Part Section 63, City – Coffey Geotechnics Pty Ltd (Reference GF8765AA-01 dated December 2007).

Boreholes encountered weathered rock below depths of 0.5 – 1.5 m (one borehole with extremely weathered/extremely low strength bedrock to 12 m depth) being variably very low to high strength becoming high and very strength with depth. Page 2 of 9 Report on Preliminary Geotechnical Assessment, Urban Design Study Project 77210 Canberra City to Lake Burley Griffin July 2012.

Preliminary Review of Contamination Potential, Section 63, Canberra City – Douglas Partners Pty Ltd (Project 46205 dated December 2007).

The review assessed that the site would be compatible for reuse as a mixed-use high density residential/commercial development. No visual signs of contamination were observed.

Report on Preliminary Geotechnical Investigation, Proposed Multi-Storey Building, Block 4 & Part Block 11 Section 19 Canberra City – Douglas Partners Pty Ltd (Project 46256 dated July 2008).

Boreholes encountered weathered rock below depths of 0.2 – 2.0 m becoming high and very high below depths of 1.4 – 3.6 m. Monitoring of groundwater levels indicated a depth of 12.5 – 16.5 m below existing surface level.

Report on Preliminary Geotechnical Investigation, Proposed Multi-Storey Building, Part Block 11 Section 19 Canberra City – Douglas Partners Pty Ltd (Project 46257 dated July 2008).

Boreholes encountered weathered rock below depths of 0.2 – 0.7 m becoming high and very high below depths of 0.5 – 17.1 m. Monitoring of groundwater levels indicated a depth of 13.6 m below existing surface level.

Report on Preliminary Geotechnical Investigation, Proposed Multi-Storey Building, Block 13 Section 63 Canberra City – Douglas Partners Pty Ltd (Project 46262 dated July 2008).

Boreholes encountered weathered rock below depths of 0.2 – 1.9 m becoming high and very high below depths of 9.5 – 14.7 m. Monitoring of groundwater levels indicated a depth of 12.6 –12.7 m below existing surface level.

Report on Preliminary Geotechnical Investigation & Contamination Testing, Block 14 Section 63 Canberra City – Douglas Partners Pty Ltd (Project 50400 dated September 2009).
The test pits encountered filling to depths of 0.3 – 0.9 m with weathered rock below depths of 1.4 – 2.6 m. Laboratory testing for typical contaminants indicated levels suitable for residential site development with minimal access, however when compared against waste classification thresholds would be classified as solid waste due to an exceedance in benzo(a)pyrene.

Geotechnical Investigation, Residential & Commercial Development, Acton – Coffey Geotechnics Pty Ltd (Reference GEOTFYSH09089AA-05 dated November 2009).

Boreholes encountered filling to depths of 1.5 – 8.0 m with weathered rock below depths of 2.0 – 10.3 m. The rock was generally very low to low strength with some medium strength and/or clay bands.

Geotechnical Investigation Report, Proposed Parkes Way Widening, Glenloch Interchange to Edinburgh Avenue – ACT Geotechnical Engineers Pty Ltd (Reference JM/C6116 dated August 2011).

Boreholes drilled in the median of Parkes Way encountered filling to depths of 1.2 – 1.4 m overlying original topsoil where the boreholes were terminated at depths of 1.3 – 1.6 m.

1.6 GEOTECHNICAL INVESTIGATIONS

Regional Geology

Reference to the 1:10 000 Geological Series Sheet for Central Canberra (Ref 1), indicates that the site is underlain by several geological units and a series of north-south trending fault lines. An extract of the geological map is presented below in Figure 2 with the approximate extent of the proposed site.

The units mapped within the project area are described below:

- Qf1: soil and waste rock filling of Quaternary age.
- Qa1 & Qa2: gravel, sand silt, clayey gravel and sand clay and clay, silt, clay loam, sandy and silty clay of Quaternary age.
- Cz1: high level deposits of poorly to well layered gravel, sand, silt and clay of Cainozoic age.
- Smc: undivided sedimentary rocks of Silurian age.
- Smc2: siltstone, minor fine sandstone, probably originally calcareous of Silurian age. Report on Preliminary Geotechnical Assessment, Urban Design Study Project 77210 Canberra City to Lake Burley Griffin July 2012
- Smc6: mudstone and shale may be calcareous, strong cleavage of Silurian age.
- Smc8: sandstone, tuffaceous, interbedded siltstone and tuff of Silurian age.

The western, eastern and southern extents of the project area are underlain by the Quaternary and Cainozoic aged soils with the central part mainly by sedimentary rocks of the Canberra Formation. The presence of limestone and/or cavities within the Canberra Formation rocks (Smc) cannot be discounted and is noted in other sub-units.

Field Work

An inspection of the site was undertaken by an experienced geotechnical engineer and indicated the following site features:
Majority of the project fully urbanised with roadways, cycle paths and landscaped areas;
Majority of excavation and/or filling embankments retained by stone mortared retaining walls or stone pitched batters; weathered rock was observed in an unprotected batter on the eastern side of Commonwealth Avenue near Regatta Place;
Other batters landscaped with grass, plants and mulch;
Due to the development undertaken in the area, very few opportunities arose where usable site features could be observed.

Commentary

General

The comments below are provided to assist in preliminary planning and cannot be considered comprehensive. They are based on a site walkover and previous experience on adjacent sites. Site specific investigation must be undertaken at an appropriate time to enable more detailed comments.

Expected Subsurface Conditions
Based on the results of the site walkover and experience on nearby sites, the expected subsurface profile is likely to comprise extensive uncontrolled filling areas as a result of the construction of the road network, topsoil and silty soils generally to about 0.3 – 0.5 m overlying alluvial and residual soils predominantly of silty and sandy clay with gravelly and sandy bands.
As a result of recent wet weather site soils are expected to be moist to wet and in parts would require considerable earthworks to achieve a subgrade suitable to support pavement construction and future traffic loads.
Rock is likely to be below depths of 0.5 – 1.5 m in higher elevation areas and could be as deep as 8 m in low lying areas. The rock is expected to comprise siltstone of variably extremely low to medium strength with deep excavation in shallow rock likely to intersect medium to high strength bedrock.

Excavation Conditions
Removal of the filling, silty clay and extremely low to low strength rock should be readily achievable using conventional earth moving plant. Further excavation into the low to medium strength siltstone should be achievable by a combination of bucket excavation and the use of single tyne and light rock hammer attachments. It is expected that excavation of the high to very high strength, slightly fractured to unbroken siltstone will require heavy rock breaking, rock grinding or ripping equipment with rock sawing to minimise disturbance and overbreak of the final batters. The excavation of rock is dependent both upon rock mass characteristics, primarily the spacing and orientation of jointing, and rock strength, as well as the equipment used and skill of the operator.
The presence of groundwater will be dependent on prior weather conditions with seepages most likely following periods of inclement weather.
Pavement Design Considerations
Based on the results of field investigations undertaken for adjacent developments and previous experience in the City area, Table 1 gives likely design CBR values for various subgrade conditions.

Table 1 Design CBR Values

Subgrade Material	Expected Design CBR (%)
Clays	2-3
Sandy/Gravelly Soils	4-5
Re-compacted Siltstone	4-7
Insitu Siltstone	7-10

Site Drainage
All stormwater should be collected in a controlled manner and discharged into the stormwater system to ensure that softening of subgrade material, erosion and scour does not occur. Subsoil drainage may also be required as part of the overall site development. Such drainage could include the construction of gravel-filled trenches with basal ag pipes in existing saturated areas, to a drainage system, comprising blanket and/or trench drains beneath fill areas. Subsoil drainage systems are installed to ensure saturation does not occur, particularly along the residual/fill or soil/rock interfaces. The extent of subsoil drainage system that may be required can only be determined once the earthworks design has been finalised and stripping of the construction area is well advanced.

Soil Contamination
A series of contaminated land searches were undertaken through the Environmental Protection Authority (EPA) on selected sites within the study area (parts of Acton, Canberra City and Parkes).
Discussions with the EPA prior to the searches were undertaken to target potentially contaminated sites or sites of interest. The EPA search results are presented in Appendix D.

The EPA contaminated land search results and email communications are summarised in Table 2.

1.6 GEOTECHNICAL INVESTIGATIONS

Table 2 – Contaminated Land Search Results

Search Area	Findings
B1 S7 Canberra Central	Site currently occupied by commercial/ industrial complexes that may contain underground fuel storage systems. Site not recorded by EPA as a contaminated site.
B8 S8 Canberra Central	Site currently occupied by commercial/ industrial complexes that may contain underground fuel storage systems. Site not recorded by EPA as a contaminated site.
B19 S10 Canberra Central	Hazardous materials may be located on the block, including pesticide/herbicides and possibly refuelling facilities. Site not recorded by EPA as a contaminated site.
B4 S24 Canberra Central	Following removal and validation of a fuel storage tank, the site was found to be suitable for sensitive landuse. Site not recorded by EPA as a contaminated site.
B2 S37 Canberra Central	Site currently occupied by the Civic Swimming Pool Complex and may contain fuel storage systems and hazardous materials. Site not recorded as a contaminated site.
B4 & 6 S2 Parkes	Site not recorded as a contaminated site.
B 4 S 343 Acton	Site not recorded as a contaminated site.
Cnr Coranderrk and Parkes Way	Pond sediments contain elevated hydrocarbons and heavy metals. Approvals must be granted by the EPA prior to disposal or re-use of sediment materials.

The EPU notes that their records do not absolutely rule out the existence of contaminated soils at any of the sites.

Potential Constraints
As a result of the assessment, it is considered that the presence of uncontrolled filling, groundwater, soil contamination, moisture affected and low CBR value subgrade soils could be possible constraints to development. As detailed in Section 7.8 below subsurface investigations must be undertaken to advise on the presence, extent and possible control measures.

Further Investigation
It is recommended that site-specific geotechnical and/or soil contamination investigations be undertaken following determination of the road layouts to assess the subsurface profiles in particular the presence of hard rock and/or moisture affected subgrade, groundwater and soil contamination and should include the collection of samples for laboratory testing. The investigation should comprise a series of test pit excavations and boreholes adjacent to proposed roadways followed by CBR, moisture content and plasticity testing to assist in pavement and earthworks design and a suite of testing for common contaminants to enable comment on contamination levels. In addition, a Construction and Environment Management Plan should be drafted to manage potential contaminants of concern associated with the project site, in addition to unexpected finds that may be encountered in fill areas. All necessary approvals and permits must be applied for prior to disposal or beneficial re-use of excavated materials.

References and Limitations
Geology of Central Canberra 1:10 000 Geological Series Sheet 208-600, Bureau of Mineral Resources, (1995).

Douglas Partners (DP) has prepared this report as part of the urban design study undertaken for the Canberra City to Lake Burley Griffin area in accordance with DP's proposal dated 28 March 2012. The report is provided for the exclusive use of SMEC Urban Pty Ltd for this project only and for the purpose(s) described in the report. It should not be used for other projects or by a third party. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results of the previous investigations provided in the report are indicative of the surface conditions at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of anthropogenic influences. Detailed sub-surface investigations must be undertaken to establish the soil and rock profile across the site.

DP's advice is based upon the conditions encountered during this assessment. The accuracy of the advice provided by DP in this report may be limited by undetected variations in ground conditions. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion given in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

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APPENDIX D

TRANSPORT

LINKING CANBERRA CITY TO THE LAKE

October 2013

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Executive Summary

Background

As Canberra approaches its centenary, it is beginning to change from a low density City built around unconstrained car movement to one with a greater emphasis on pubic and active transport, and with higher densities particularly in Civic, other town centres and along key public transport corridors.

These changes are a natural response to the growth of Canberra, as well as to wider changes in society, and are recognised in a number of transport related policy documents released by the ACT Government.

In the last decade, across Australia and in other developed countries, car use is peaking and car use per person is falling, while walking, cycling and public transport use is growing faster than population. These changes reflect higher fuel prices, changes in lifestyles, greater willingness by many people to live in apartments in order to have easy access to amenities, increased awareness of the health benefits of walking and cycling, and a greater emphasis on sustainability.

The re-emergence of public transport is occurring in both large and medium sized cities. Some of the fastest growth is occurring for light rail, which is emerging as the primary public transport mode in medium sized cities and an important secondary mode in large cities. In the United States, overall public transport patronage grew by 23% between 1993 and 2011, faster than car use. However patronage on light rail systems almost trebled while bus patronage remained static, and there are now over 25 cities with newly built light rail systems. In Europe, more than 65 cities built new or expanded light rail systems between 1980 and 2007. In Australia, light rail systems are being built in Sydney, Adelaide and the Gold Coast, is being planned for in Perth, and is under consideration on the Sunshine Coast. Furthermore, Australia's major tram / light rail system in Melbourne continues to be improved and expanded to respond to significant patronage growth. At the same time, the uncontrolled urban sprawl of the 1950's – 2000 period is now slowing and cities are redeveloping in a more compact and less car-dependent form. For example apartments and town houses accounted for nearly 40% of new dwellings built in Australia since 2010, compared with 25% in the 1980's.

In Canberra, these trends are reflected both in land use plans, such as the National Capital Plan, the "City to the Lake" strategy, and transport plans including "Transport for Canberra" and the more recently announced plans to introduce light rail through "Capital Metro".
The land use and transport plans are therefore complementary and fit together well. They will also require other changes over time, particularly to parking policies.

City to the Lake Strategy is expected to provide for an additional 10,000 residents in the most accessible location in the ACT. Data from the 2011 Census showed that 85% of people living in Civic that worked in the City Centre walked to work, while 25% of people with jobs in Civic used public transport, walked or cycled to work - much higher than the average for Canberra which was 14%. Thus the additional development in Civic proposed as part of the City to the Lake Strategy will minimise the demand for additional road-space and parking.

Furthermore, it will also help make Civic more walkable, providing more convenient links between Civic and the prime lake front areas in Commonwealth Park and Acton.

The alternative of relying on past travel patterns, based on long distance travel by car, will become increasingly unattractive as Canberra grows. Traffic congestion would increase significantly unless a higher share of trips is made by public and active transport.

The key differences between a "business as usual" future and the proposed future are set out below, and their implications for travel and traffic are discussed further in this Transport Assessment.

	Current (2011)	2031 "Business as Usual"	2031 with Canberra City to the Lake and Light Rail
Population (ACT)	406,742*	518,198	518,198
Population in Civic	2,842*	5,150	13,749
Employment in Civic	33,500	40,500	40,500
Person Trips to Civic	13,287	18,024	19,000
Car Passengers	10,094	5,941	6,558
Public Transport Passengers	3,193	12,083	12,442
Walk / Cycle			

** 2011 ABS Census of Population and Housing*

Transport Implications of the City to the Lake Strategy

The way in which the City to the Lake strategy interacts with the City's transport network is critical when considering the attractiveness and viability of the project. There will be four broad changes to transport demand:

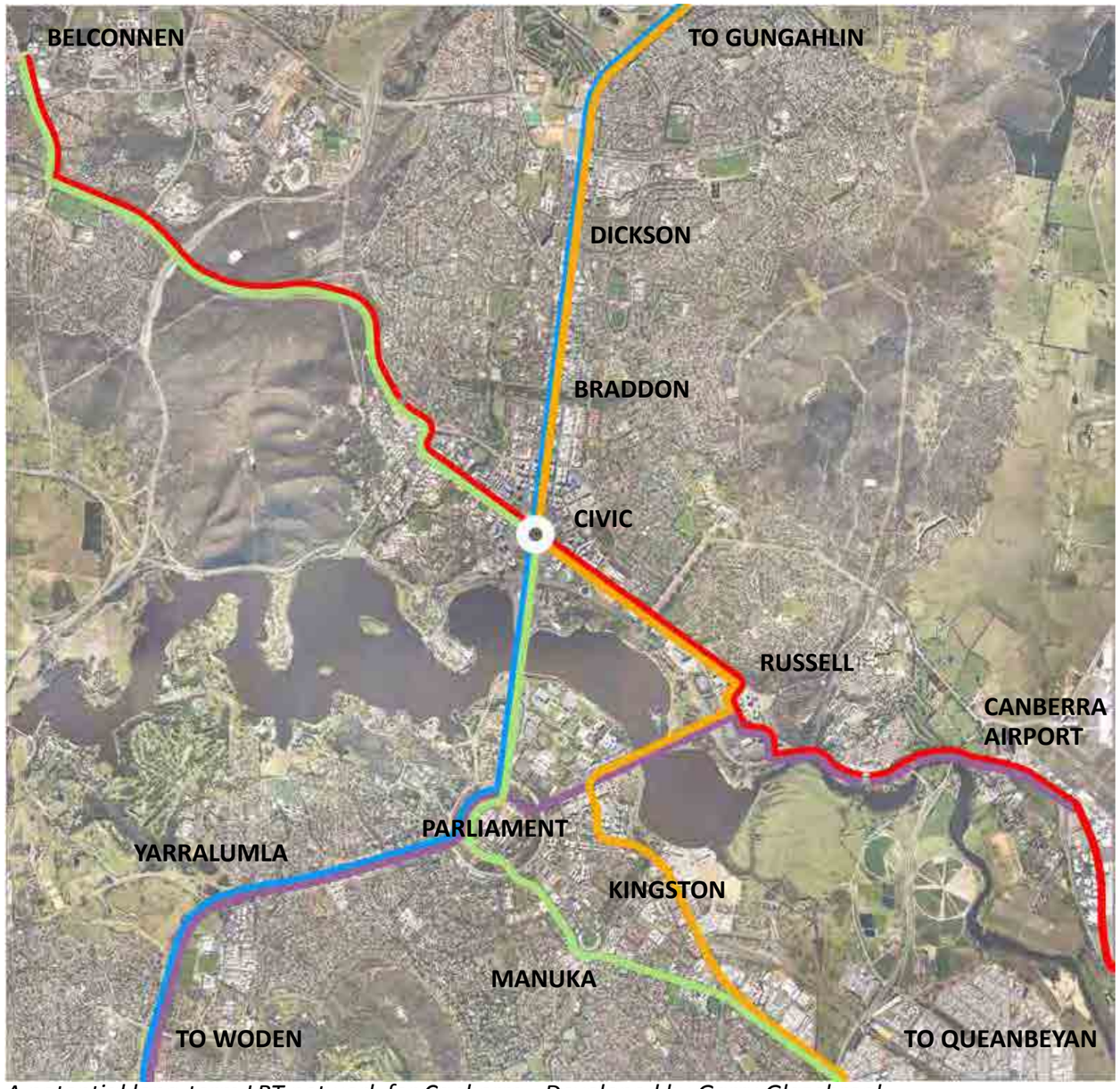
1. The proposed development will increase residential population of the City. As a consequence there will be increased use of public transport, cycling and walking in and around the City.

2. There will be some increase in the traffic to and from the City, however this will be much less than the demand on the Canberra transport network if the equivalent residential population was to occur on Canberra's periphery.

3. The proposed changes in the project area will have impacts on the "through traffic" (that is traffic passing through the City to destinations on the other side). This includes north-south traffic on Commonwealth avenue and Northbourne Avenue, and east-west traffic on Parkes Way.

4. The ACT Government has made a commitment to construct a Light Rail Transit (LRT) system - "Capital Metro". The first line of this system is proposed to extend from Civic to Gungahlin. Based on experience in other cities, the line is likely to result in a significant mode shift from private car usage to public transport. This, in addition to the completion of the peripheral Parkway system (i.e. Tuggeranong Parkway/Gungahlin Drive extension and the Majura Parkway) will transform the way people access and move through the City Centre.

Taking into account the above four issues, the following investigates the likely impacts on the transport network that the project will have by first discussing strategic transport modelling of both the Business as Usual and City to the Lake Strategy scenarios. The assessment then also discusses the possible implications for walking and cycling trips, public transport usage, and also reviews the results of micro-simulation and intersection traffic modelling that has been undertaken to assess the likely traffic impacts of the project on the local road network. A parking assessment has also been undertaken for the project area.



A potential long-term LRT network for Canberra - Developed by Garry Glazebrook

D1

STRATEGIC TRANSPORT MODELLING

1.1 BACKGROUND + ASSUMPTIONS

1.1.1. Strategic Transport Model Investigations

Strategic transport modelling for the project was undertaken using an EMME model of the Canberra transport network. SMEC maintains a strategic transport model that is heavily based on the ACT Government model. The primary differences in the SMEC model are network based although calibration parameters including travel related costs, mode choice parameters and future assumptions remain consistent with the ACT Government model.
It is noted that all the results of modelling presented here represent forecast conditions as the strategic transport model has not yet been calibrated to 2011 conditions.

1.1.2. Strategic Transport Model Operation and Assumptions

The strategic transport model that is used by SMEC operates as a relatively standard four-step model. The four steps are:

- Trip generation
- Trip distribution
- Mode choice
- Assignment

These steps are discussed in the following sections.

1.1.3. Trip Generation

The number of trips generated in each Traffic Analysis Zone (TAZ) is estimated on land use information provided by the ACT Government. The trip generation rates used for estimating generated trips, according to different trip purposes, in each TAZ are listed in the adjacent table.

These figures were taken from the Transport Modelling and Analysis 2006/2011, Study Report (Draft) by MRC (2009).

The listed trip rates were further adjusted by applying adjustment factors that are based on income levels and age. These income and age group-based adjustment factors were also used in the development of the ACT Government's EMME model and are shown in the adjacent tables. The adjustment factors for public transport (PT) usage are also shown in the tables.

1.1.4. Generalised Costs

Previous household travel surveys revealed "trip-maker" behaviour and perceptions, which served as the basis for estimating 2006 generalised cost function parameters, as shown adjacent.

SMEC utilised the same highway generalised cost equation used by MRC in updating the EMME/2 model for the ACT Government, which is given by:

where:
TT: zone to zone travel time (h)
VOT: Value of Time ($/hr)
VOC: Vehicle Operating Cost ($/km)
FCost: Fuel Cost ($/L)
FCon: Fuel Consumption (L/km)
D: zone to zone travel distance (km)
CPark: parking cost ($)

The fuel and parking costs that have been employed by SMEC for each model year, in consultation with ESDD, are shown adjacent.

Table: Assumed Trip Generation Rates for Different Trip Purposes

Trip Purpose		2006 Trip Rate (/2h)
Home Based	Work	0.239
	Education	0.104
	Shopping	0.040
	Other	0.085
Non Home Based	Business Appointments, etc.	0.107
	Other	0.039

Source: MRC, Transport Modelling and Analysis 2006/2011, Study Report – Draft (p. 25)

Table: Trip Rate and Public Transport Usage Adjustment Factors based on Income

Income Level	2006 Trip Rate Adjustment Factor	2006 PT Usage Adjustment Factor
Low (< $25,999 p.a.)	0.593	1.332
Medium ($26,000 to $51,999 p.a.)	1.142	0.959
High (> $52,000 p.a.)	1.327	0.649

Source: MRC, Transport Modelling and Analysis 2006/2011, Study Report – Draft (p. 25)

Table: Trip Rate and Public Transport Usage Adjustment Factors based on Age

Age Group	2006 Trip Rate Adjustment Factor	2006 PT Usage Adjustment Factor
< 14	0.756	0.781
15 to 24	0.704	1.537
25 to 44	1.316	1.091
45 to 64	1.198	0.795
> 65	0.336	0.705

Source: MRC, Transport Modelling and Analysis 2006/2011, Study Report – Draft (p. 26)

Elements	Key Influencing Factors	Base Year Value
Travel Time	Distance, Operating Speeds, Lane Capacity (Volume Delay Functions)	Defined for each link
	Traffic Volumes	Identified through network assignments
Operating Costs	Fixed Vehicle Operating Cost	$0.13/km
	Fuel Price ($/L)	$1.03/L
	Fuel Consumption per km (L/km)	0.09L/km
	Value of Time	$10/hr
Road User Charges	Parking Charges	Defined by area and factored with the Parking Charge Factor
	Public Transport Fares	Based on base year fares
	Tolls, etc.	Not implemented in current modelling framework

Source: MRC, ACT Strategic Public Transport Network Plan Final Report (p. 59)

1.1 BACKGROUND + ASSUMPTIONS

The daily parking costs have been advised by the ACT Government. The model assumes that parking in Civic costs twice as much as in the other town centres. The parking cost for workers has also been changed from an hourly rate to a daily rate to better reflect the parking behaviour of these trips.
The public transport generalised cost function includes travel time and fare costs. Travel time in public transport is made up of the variables and corresponding weights shown in the adjacent table.

1.1.5. Trip Distribution

The trip distribution impedance function is assumed to be exponential in form given by:

$$f(d_{ij}) = e^{-c \cdot (d_{ij})}$$

where:
f(dij): impedance function
dij: impedance from zone i to zone j
c: exponential function parameter; c > 0

The assumed values of c for different trip purposes were taken from the study report by MRC and are shown adjacent.

1.1.6. Modal Split

The transport models developed only considered two modes – passenger cars (PC) and public transportation (PT). The proportion of trips opting to use public transportation was estimated using the following equation:

$$P_{PT} = \frac{1}{1 + e^{\lambda (C_H - C_{PT}) + a}}$$

where:
PPT: proportion of public transport trips
λ: spread parameter
CH: highway generalised cost
CPT: public transport generalised cost
α: mode constant

The parameter values used for the mode choice equation given above are summarised adjacent. To account for the effect of the increased work trip parking cost the work mode choice constant was increased from 0.66 to 2.51.

Table: Fuel and Parking Costs

Year	Fuel Cost	Parking Cost			
		Civic		Other Town Centres	
		Work Trips	Other Trips	Work Trips	Other Trips
2011	$1.50/L	$11.25/day	$2.25/hr	$5.63/day	$1.13/hr
2021	$2.00/L	$13.12/day	$2.62/hr	$6.56/day	$1.31/hr
2031	$2.50/L	$22.50/day	$4.50/hr	$11.25/day	$2.25/hr

Table: Public Transport Travel Time Variables and Corresponding Weights

Variable	Weight
Walk Time	1.15
Wait Time	1.2
Boarding Time	1.1
Travel Time (In-vehicle)	1

Source: MRC, ACT Strategic Public Transport Network Plan Final Report

Table 7: Assumed c Values for the Exponential Impedance Function

Trip Purpose	c
Work	0.256
Education	0.608
Other	0.494

Source: MRC, ACT Strategic Public Transport Network Plan Final Report

Table 8: Mode Choice Function Parameters

Trip Purpose	Spread Parameter	Constant
Work	-0.27	0.66
Education	-0.2	0.2
Other	-0.3	3

Source: MRC, Transport Modelling and Analysis 2006/2011, Study Report – Draft (p. 32)

Table 9: Volume/Capacity Thresholds for Congestion Levels

Condition	Threshold
Free Flow	0 < V/C ≤ 0.25
	0.25 < V/C ≤ 0.45
	0.45 < V/C ≤ 0.70
Unstable	0.70 < V/C ≤ 0.85
	0.85 < V/C ≤ 1
Above Capacity	V/C > 1

Where V/C represents Volume/ Capacity, that is, the proportion of the capacity of given link that is taken up by the volume of traffic using that link. Note: These thresholds were set to demonstrate the varying levels of congestion in the network and are not based on any particular traffic engineering manual.

1.2 STRATEGIC MODELLING - BUSINESS AS USUAL

The following section describes strategic transport modelling for years 2011 and 2031. The 2011 Business as Usual scenario assumptions (i.e. parking costs, capacity unconstrained public transport, etc.) remain consistent throughout the model comparisons. The intent of this section is to demonstrate how traffic growth over the analysis period occurs given current planned development in the City centre (excluding the proposals associated with the City to the Lake Strategy), and to provide a baseline for comparison of the City to the Lake Strategy. The strategic modelling for the transport network following implementation of the City to the Lake Strategy is discussed in Section 1.3 of this report.

1.2.1. Strategic Transport Modelling Results – 2011

The adjacent figure shows the strategic transport modelling results for the 2011 AM Peak hour. It is noted that the modelling results for the 2011 AM Peak Hour are based on the 2006 calibrated model and are not based on recorded land use or traffic counts from 2011.

Strategic transport modelling results for 2011 indicate that a number of the roads in the study area are expected to be operating very close to, or above, capacity in the AM peak period (one hour).

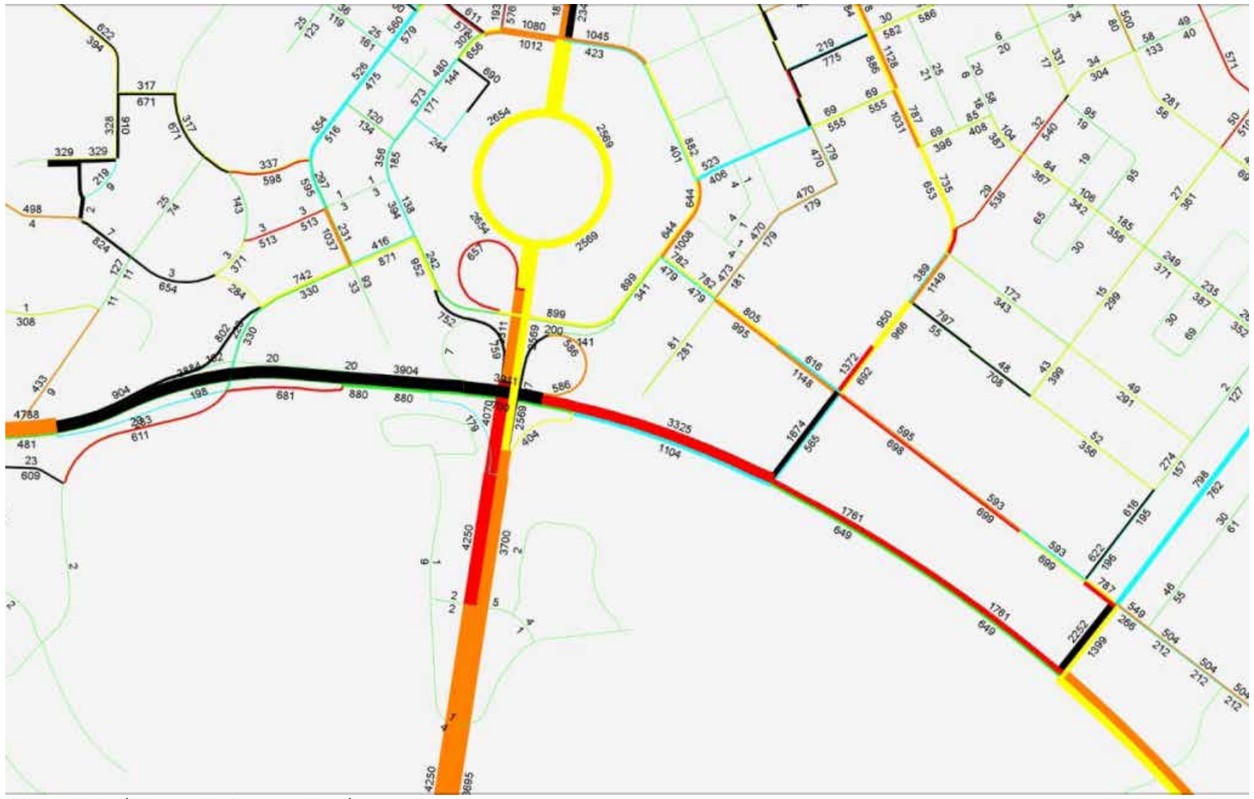
In particular, the following roads are predicted to operate above capacity:

- Parkes Way eastbound (between Edinburgh Avenue and Commonwealth Avenue)
- Off-ramp from Commonwealth Avenue to London Circuit (clockwise)
- On-ramp to Commonwealth Avenue from London Circuit (clockwise) and Parkes Way eastbound
- Ramp from Parkes Way eastbound to Edinburgh Avenue northbound
- Coranderrk Street northbound

In other words, the model indicates that delays due to congestion are already expected on these roads. This accords with actual user experience on the existing road network. Roads that are operating close to capacity (above 85% of modelled capacity) include:

- Parkes Way eastbound (between Commonwealth Avenue and Anzac Parade)
- Commonwealth Avenue northbound between Albert Street and Parkes Way
- Off-ramp from Commonwealth Avenue northbound to London Circuit anti-clockwise
- Off-ramp from Parkes Way westbound to Edinburgh Avenue/Lawson Crescent

Of particular note is the fact that vehicles approaching the City from the west along Parkes Way are offered a limited set of access points to the City. Vehicles can turn left at Edinburgh Avenue on a ramp that is operating significantly over capacity or turn left at Coranderrk Street, which is also operating significantly above capacity. The only other options are to access the City via Barry Drive or Commonwealth Avenue (via Adelaide Avenue) instead of Parkes Way, both of which are likely to be significantly longer routes.



2011 AM Peak Hour - Business as Usual

Primary traffic movements in the study area during the 2011 AM peak hour appear to be:

- From Parkes Way to the City (approximately 2,450 vehicles per hour)
  - Parkes Way to Coranderrk Street northbound (approximately 1,650 vehicles per hour)
  - Parkes Way eastbound to Edinburgh Avenue (approximately 800 vehicles per hour)
- Commonwealth Avenue northbound to the City via Vernon Circle (approximately 2,500 vehicles per hour)
- Vernon Circle to Commonwealth Avenue southbound (approximately 2,500 vehicles per hour)
- Parkes Way to destinations east of Coranderrk Street (approximately 1,750 vehicles per hour)
- Commonwealth Avenue northbound to London Circuit (approximately 750 vehicles per hour clockwise and 700 vehicles per hour anti-clockwise)
- Parkes Way westbound to Lawson Crescent (approximately 700 vehicles per hour)
- Parkes Way eastbound to Commonwealth Avenue southbound (approximately 600 vehicles per hour)

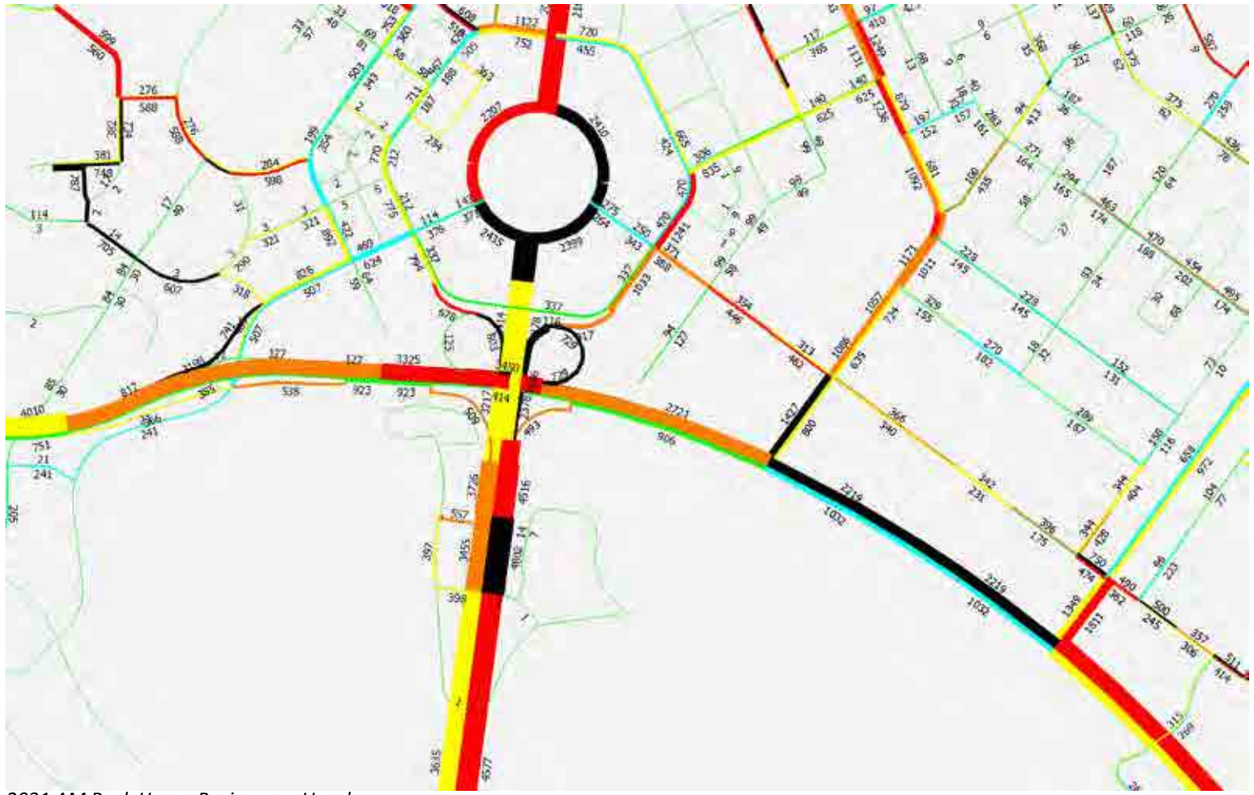
These volumes are likely to be reversed during the PM peak period, albeit at around 90% of the respective AM peak hour flows.

1.2 STRATEGIC MODELLING - BUSINESS AS USUAL

1.2.2. Strategic Transport Modelling Results – 2031

The adjacent Figure shows the strategic transport modelling results for the 2031 AM peak hour. Again, the 2031 AM peak hour modelling results show a similar pattern to the 2011 results. The same roads are operating above capacity, many of them further above capacity.

It is noted that many of these movements are constrained by the capacity of the road network in all modelled years. If capacities were higher, it is likely that these movements would have higher volumes.



2031 AM Peak Hour - Business as Usual

The primary movements are similar to 2011 as follows:

- Parkes Way eastbound to the City (approximately 2,100 vehicles per hour) consisting of two movements:
    - Parkes Way eastbound to Coranderrk Street northbound (approximately 1,400 vehicles per hour)
    - Parkes Way eastbound to Edinburgh Avenue (approximately 700 vehicles per hour)
- Commonwealth Avenue northbound to the City via Vernon Circle (approximately 2,400 vehicles per hour)
- Vernon Circle to Commonwealth Avenue southbound (increased to approximately 2,400 vehicles per hour)
- Parkes Way to destinations east of Coranderrk Street (increased to approximately 2,200 vehicles per hour)
- Commonwealth Avenue northbound to London Circuit (approximately 700 vehicles per hour clockwise)
- Parkes Way westbound to Lawson Crescent (approximately 550 vehicles per hour)
- Parkes Way eastbound to Commonwealth Avenue southbound (still approximately 750 vehicles per hour)
- Parkes Way westbound to Commonwealth Avenue southbound (increased to approximately 500 vehicles per hour)

1.3 STRATEGIC TRANSPORT MODELLING - CITY TO THE LAKE STRATEGY

For the strategic transport modelling carried out in this stage of the project, all assumptions except parking cost are consistent with the background Business as Usual modelling discussed above.

As discussed earlier, for this assessment, it is assumed that the future parking costs in Civic have risen to $4.50 per hour (2011 dollars). However, in the City to the Lake Strategy scenario, this cost has been applied to all areas in the Parliamentary Zone, including the Russell employment area. This increased cost has been assessed to significantly increase the public transport mode share of the zones with the new parking costs, which will reduce private car demand.

In addition to the cost assumptions, the modelling assumes that the public transport network has sufficient capacity to meet the modelled demand which is consistent with the ACT Government's Canberra Strategic Transport Model.

In order to increase network capacity during peak periods, and to also realise frontage activation associated with on-street parking, the City to the Lake Strategy proposes the implementation of clearways on Commonwealth Avenue and Northbourne Avenue within the bounds of London Circuit and on Vernon Circle. The scenario with a clearway in operation during the AM peak has been considered in the strategic transport model.

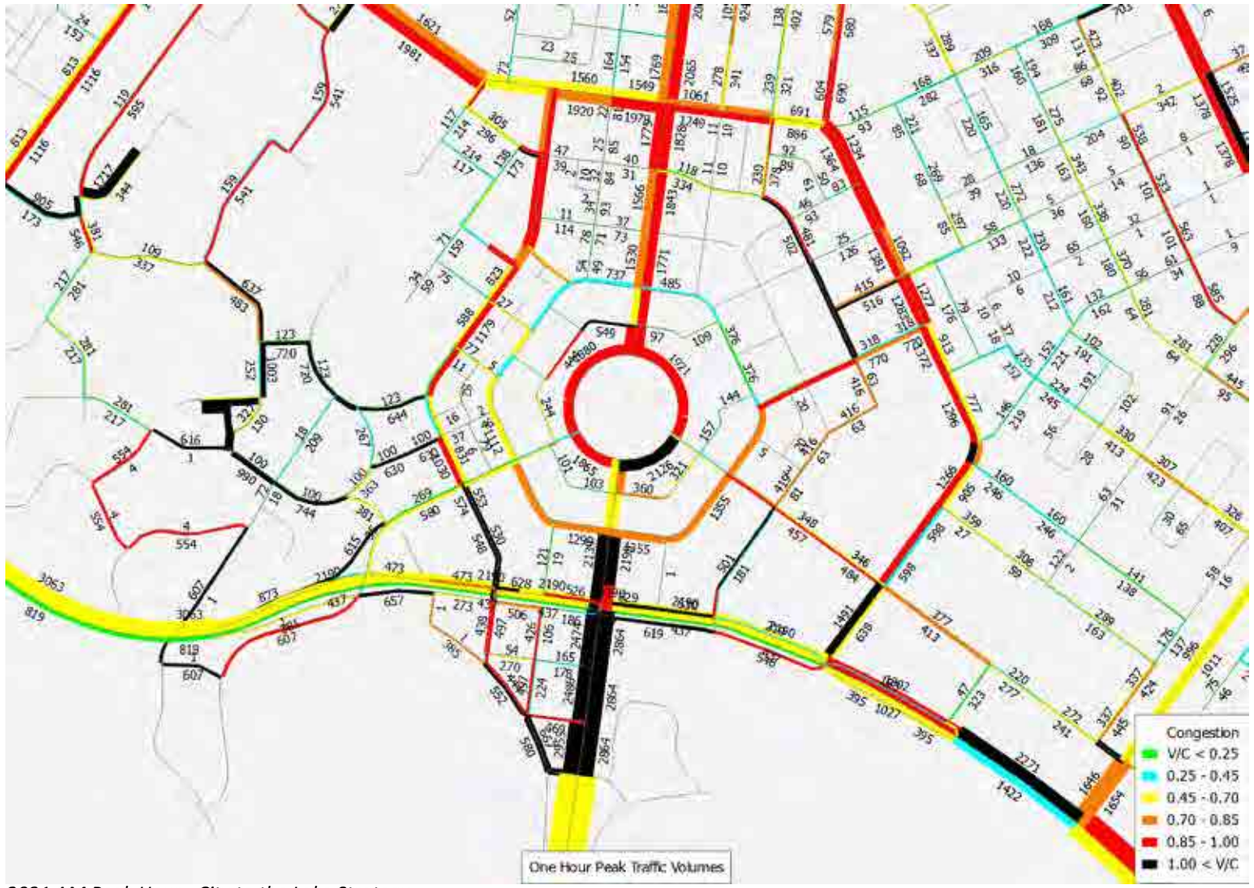
The figure to the right shows that there is expected to be a significant increase in the number of roads operating near or at capacity in the 2031 AM peak hour for the City to the Lake Strategy. These include Commonwealth Avenue (both directions) south of London Circuit, Vernon Circle, Marcus Clarke Street, Bunda Street, the Promenade, the Boulevard and Northbourne Avenue.

Overall, the modelled volumes on roads around Civic, including Anzac Parade, Clunies Ross Street and Gooreen Street (parallel to Limestone Avenue), increase in the City to the Lake Strategy model. This indicates that the additional congestion in Civic is causing traffic to deviate to alternative routes including by-passes around the City.

Strategic Transport Model calibration to 2011 Census data

The strategic transport modelling described above uses an EMME model that has been calibrated to the 2006 Census data. At the time of compiling this report, the EMME model was being re-calibrated based on the 2011 Census data. This process involves review of the 2011 Census data, revision to current conditions and assumptions, and consultation with the ACT Government to agree the re-calibration approach.

A cursory assessment of the Linking City to the Lake road network utilising a preliminary version of the recalibrated 2011 model has been undertaken and indicates that there are likely to be some changes to the strategic modelling results when assessed with the recalibrated model. The nature of these changes will need to be confirmed in future phases of the project when a re-calibrated EMME model has been approved for use by the ACT Government.



2031 AM Peak Hour - City to the Lake Strategy

D2

WALKING, CYCLING + PUBLIC TRANSPORT

2.1 WALKING AND CYCLING

Walking and cycling are transport modes that form a key part of Canberra's strategic transport network plan. Policy objectives target mode shift from private vehicles to walking and cycling, with a view to both alleviating traffic congestion and achieving public health objectives.

The densification of Canberra's centre resulting from the City to the Lake Strategy is expected to increase the number of short distance commutes and subsequently promote walking and cycling trips.

Whilst formal modelling of likely trip generation rates for these modes has not been undertaken as part of this assessment, some commentary has been provided below relating to the possible implications on these modes as a result of the project.
The adjacent table shows the mode share of Journey to Work (JTW) trips from suburbs around Civic (e.g. Turner and Braddon) to destinations in Civic.

As can be seen from the table, the mode share of walking and cycling for Civic and its surrounding suburbs for JTW trips to the City Centre are significantly higher than those generally across the Canberra network (overall 4.7% for walking and 2.3% for cycling). From the data the following conclusions can be drawn:

- Walk trips are very sensitive to distance
- Cycling trips are less sensitive to distance than walk trips and tend to occur over a longer trip
- If walkability, as expected, is to be enhanced by the City to the Lake Strategy, it is likely that JTW walk mode share within the City could be improved beyond the 85%, noting that current walk mode share is 85% in Civic, and 60-66%, in the adjacent precincts of Acton, Braddon, Turner

As the Project will provide significant residential accommodation adjacent to the City Centre, and given that this accommodation is likely to attract a higher than average proportion of residents that work in Civic, it can be expected that the development will have a high proportion of walking and cycling JTW trips.

The City to the Lake Strategy caters for walking movement throughout the project area in a number of different ways. Most critically, it provides an interconnected grid of highly accessible streets on a ground plain with grades appropriate for both pedestrians and mobility impaired users. In addition, the City to the Lake Strategy proposes generous and attractive public realm spaces that will facilitate and encourage pedestrian use of the street network.

Similarly, cyclists benefit because of the interconnected and appropriately graded street network. In addition, on road cycle lanes have been provided wherever possible within the trunk road network. It is noted that clearways are proposed in a number of locations as part of the City to the Lake Strategy. Due to the nature of a clearway's operation, where present it will preclude the provision of an on-road cycle lane. As such, it is proposed to provide a one way cycle way in the verge to cater for cyclists.

Mode Share of Trips to Civic from Surrounding Suburbs (2011)

Mode	Acton	Ainslie	Braddon	Campbell	Civic	O'Connor	Turner
Car	7%	53%	20%	51%	10%	44%	19%
Bus	0%	9%	2%	13%	1%	15%	5%
Park & Ride/ Kiss & Ride	0%	0%	0%	0%	0%	0%	0%
Motorcycle/ Scooter	0%	3%	0%	2%	0%	3%	0%
Bicycle	33%	15%	10%	13%	4%	21%	8%
Walk	60%	20%	66%	21%	85%	14%	62%
Other	0%	0%	2%	0%	0%	3%	5%

2.2 PUBLIC TRANSPORT

2.2.1 Policy Background

The ACT government has recognised the need to encourage the use of public transport in the Territory. In its Transport for Canberra Plan it has identified public transport mode share targets of 10.5% in 2016 and 16% by 2026 To achieve these targets, the ACT Government has a number of policy levers it can utilise.

Due to the nature of the City to the Lake Strategy, the strategic and micro-simulation modelling outputs indicate that there will be impacts on the operation of the road network locally in Civic and its surrounds.

Even allowing for much higher levels of walking and cycling within the City area, it will be essential for the public transport system to expand, and for public transport patronage to rise.

Due to the increased residential and working population within the City, as well as increases in recreational visits, the City to the Lake Strategy will affect the operation of the local road network.

The aspirations of the City to the Lake Strategy are highly consistent with the public transport objectives of the ACT Government.

The proposed new light rail system will be a vital part of an expanded public transport system.

As such, factors such as improved public transport infrastructure (including the provision of an LRT network which is likely to encourage mode shift in and of itself independent of other external factors), population densification in the CBD, policy measures (including increasing / introduction of parking costs), and increased congestion will all serve to improve public transport mode share in the ACT, assisting with the realisation of strategic transport goals and the evolution of a more sustainable City.

City East Bus Layover

A study currently underway by SMEC (City Bus Layover and City Interchange Feasibility Study) has identified the need for a bus layover facility in the east of the City area to improve the efficiency and coverage of the current bus network. The study was unable to find a feasible location in the eastern part of the City using the constraints of its scope (which did not allow major changes to existing planning policy). However, ACT Government stakeholders have expressed a desire to investigate the possibility of a layover further.

Broader changes to land use are able to be recommended and it is expected that a suitable location can be found. At this stage, it has been recommended that the layover be located in the site that has recently been proposed as a possible location for the new stadium (ie south-eastern quadrant of the Constitution Avenue / Coranderrk Street). Extending bus services to a stadium will allow better public transport access to this facility. In addition, the peak parking demand of a stadium is likely to be different to the peak layover demand and there will be little interference between the two users of the site.

Public Transport Priority

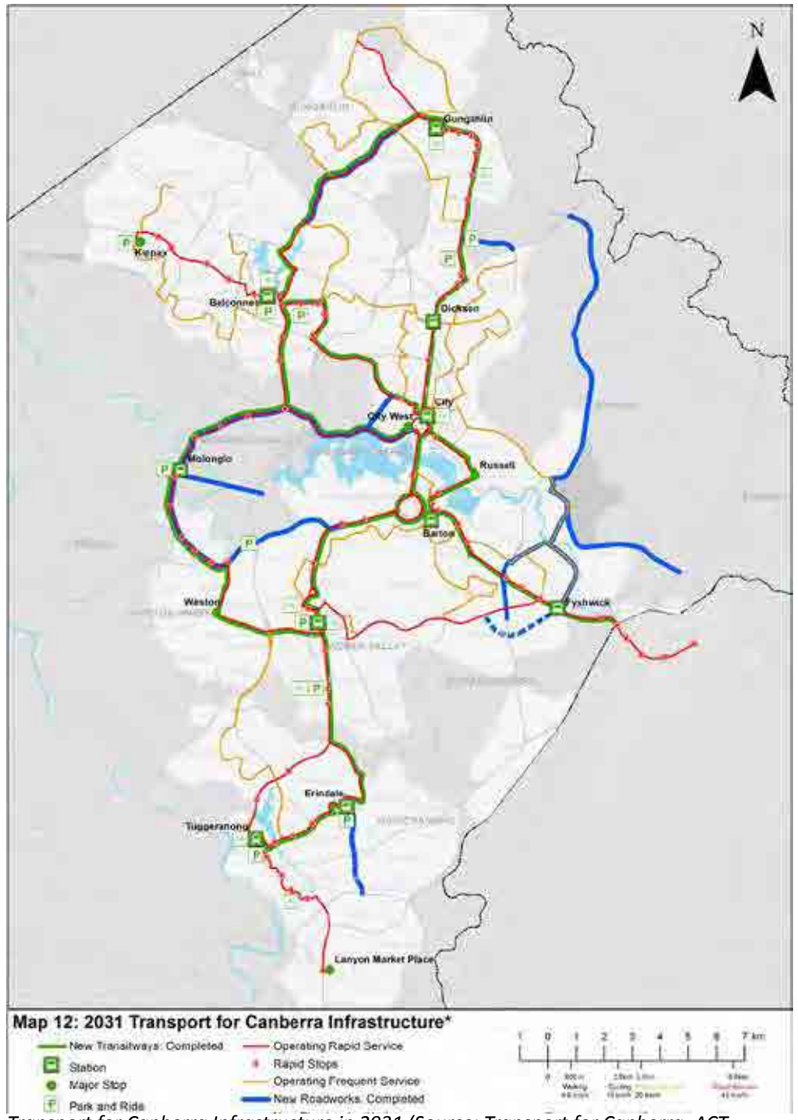
The Transport for Canberra policy document includes a number of plans for public transport into the future. One of these plans identifies likely locations for public transport priority. The proposed infrastructure is shown in the adjacent map.

This map shows that there are expected to be transitways along Commonwealth Avenue, London Circuit and Constitution Avenue. In addition, there will be a major bus stop located on (or near) the western side of London Circuit to service City West.

The red lines in the figure are routes that are expected to have Rapid bus lines running on them. The ACT Strategic Public Transport Network Plan (MRC, 2009) identified the “spine” of the public transport network as being the Rapid network. This rapid network is expected to operate at high frequency (5-15 minutes) and high average speed (40 km/hr). Any proposed changes to the road network in the study area must consider these requirements and endeavour to provide appropriate infrastructure.

The three Rapid connections from the south, east and west must have appropriate levels of priority and connectivity to allow fast and efficient access to the City. It is expected that congestion in and around the City will continue to rise in the future and efficient public transport operations are critical to ensure that public transport is an attractive choice.

The focus of public transport operations in the City is currently City Bus Interchange. This will remain the main hub for the foreseeable future. However, increased development around London Circuit is likely to see an increase in the number of boardings and alightings in this area.



Transport for Canberra Infrastructure in 2031 (Source: Transport for Canberra, ACT Government, 2012)

2.2 PUBLIC TRANSPORT

2.2.2 Strategic Modelling Results for Public Transport

The strategic modelling process described in Chapter 1 was used to estimate the number of public transport trips entering, leaving and passing through the study area. As discussed earlier, the public transport mode share in the strategic modelling process is determined by a comparison of the generalised cost of the available transport modes.

One of the major components of the generalised cost of trips to Civic is the parking cost. For 2031, it is assumed that the cost of parking in Civic is $4.50 per hour ($22.50 per day) in 2011 dollars. In addition, for this modelling exercise, these costs are applied in the Russell employment area and the Parliamentary Triangle. This represents a major increase in the hourly cost and geographical coverage of parking fees and has a significant impact on the mode share of trips to Civic and the Parliamentary Triangle.

In addition, it is assumed that the capacity of the public transport system in Civic is sufficient to meet the modelled demand, taking into account the parking costs discussed above.

These assumptions represent a shift from the assumptions typically used for the strategic modelling process and are expected to significantly increase public transport patronage forecasts in the modelling compared to the previous strategic transport modelling results.

The two adjacent diagrams show the 2031 AM peak hour public transport patronage by link across the study area for both the Business as Usual and the City to the Lake Strategy scenarios.

As can be seen the main public transport flows in the 2031 AM peak Business as Usual scenario are along Barry Drive (into the City via Marcus Clarke Street and Alinga Street), Northbourne Avenue, Constitution Avenue and Commonwealth Avenue. Most of the patronage inside Civic is on London Circuit, with a relatively small northbound volume through Vernon Circle, probably on an Express route.

The City to the Lake Strategy scenario indicates that there is expected to be a slight change to the public transport flows through the study area. The Rapid Routes (or equivalent) are now expected to be routed through Vernon Circle, with local routes using London Circuit. This provides a relatively shorter travel path for passengers on the Rapid Routes (or equivalent). However, they are no longer able to directly access the land uses around London Circuit, which may explain the very slight reduction in mode share.

Overall, the access paths along Barry Drive, Northbourne Avenue, Constitution Avenue and Commonwealth Avenue remain relatively unchanged in route and patronage between the Business as Usual and City to the Lake Strategy scenarios.

Public Transport Patronage by Link (2031 AM Peak – Business as Usual)

** Assumes a 45m long vehicle, with nominal max capacity of 300, and average (across the peak hour) of 250*

2.2.3 Light Rail

The ACT Government has committed to the provision of a Light Rail Transit (LRT) system between Gungahlin and Civic. In addition, planning activities for a Canberra light rail network have also begun.

The provision of LRT is a key consideration for the City to the Lake Strategy. As discussed above, the change to the road network associated with the Project has implications for network capacity that will need to be offset by an increase in the provision of public transport.

Whilst the master planning for the LRT network is currently in its infancy, and there remain many unknowns, some initial broad assumptions have been required when considering this Project. These assumptions, and how they affect the City to the Lake Strategy are discussed following.

LRT System Assumptions

At this stage the details of the likely light rail vehicles are unknown. However, based on experience with planned systems in Sydney, Gold Coast and other systems in operation overseas (eg Strassbourg) it is assumed that initially, 30 m long vehicles could be purchased, and that these could later be extended to 45 m by adding sections. As such, light rail stops should therefore be planned to be ultimately 45 m long.

Whilst the ultimate LRT network is yet to be confirmed, it is understood that it is likely to replace both the Red Rapid and Blue Rapid routes on the Canberra bus network. As such, it is considered that light rail is likely to be implemented first on the route from Gungahlin to Civic, with a possible extension to Russell as part of the first stage. Following this, other routes would follow including Woden via Commonwealth and Adelaide Avenues and to Belconnen via Barry Drive.

LRT Ridership Projections

Corridor	Max LRT Passenger Volume /hr	Av load / LRT vehicle*	No of LRT vehicles / hr
Belconnen	5000	250	20
Gungahlin	5000	250	20
Woden	5000	250	20
Russel	1500	150	10

* Assumes a 45m long vehicle, with nominal max capacity of 300, and average (across the peak hour) of 250

LRT interchanging has been proposed on Vernon Circle utilising a central loop arrangement that will potentially be common to all LRT lines. Within the Project area, these routes can be accommodated within the median on both the Northbourne Avenue (Gungahlin Line) and Commonwealth Avenue (Woden Line) corridors, and carriageway based options are currently being investigated as part of the upgrade of Constitution Avenue (Russell Line). In regard to the future Belconnen line, it is likely to also route along Northbourne Avenue from Barry Drive although an option has been developed as part of the Project that routes through the Australian National University and accesses the Vernon Circle loop adjacent to Law Courts.

LRT Interchanging

In regard to LRT to LRT interchanging, the proposed Vernon Circle stops would allow convenient interchange and provide additional access to Civic from any given LRT line, so that most passengers bound for anywhere in Civic and arriving by LRT would in general not need to interchange.

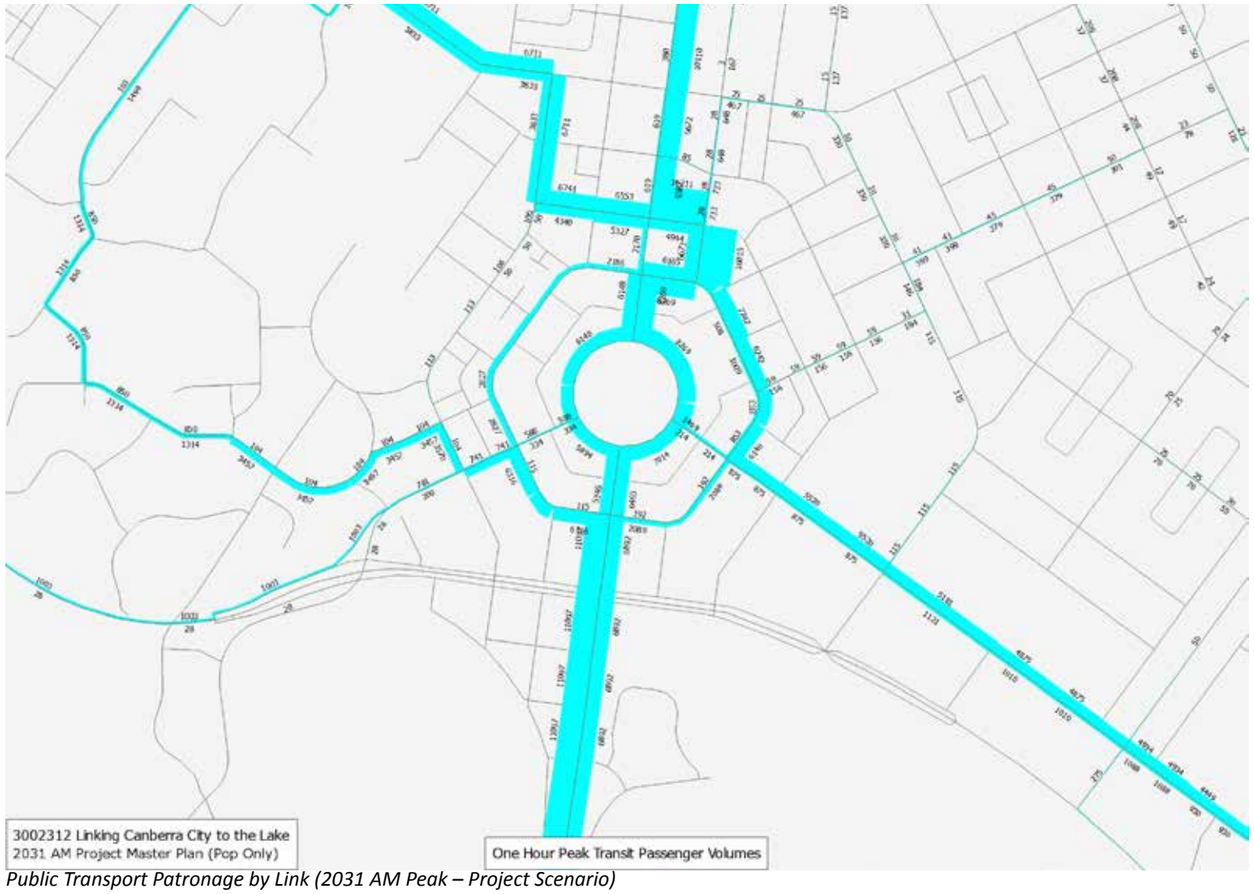
If this arrangement was to be adopted it is anticipated that volumes on different parts of the Vernon Circle would reach up to 40 vehicles per hour in the AM peak. This is not considered an issue for general capacity, however it could create capacity difficulties at stops. Accordingly, the stop arrangements developed as part of the City to the Lake project have been developed as a partial two track system with island platforms facilitating cross-platform interchange between different LRT services.

With regard to interchanging with secondary public transport corridors, key LRT stop locations in Civic could be as follows:

- In Northbourne Avenue, between East and West Row
- Immediately east of London Circuit/University Avenue
- In Constitution Avenue, either east of London Circuit, or one block further to the east (and adjacent to the proposed Canberra Stadium)

These stops would allow good interchange with other public transport corridors and would service the three segments of Civic (North, South-East, and South-West respectively).

It is noted that a proposed station on Northbourne Avenue could be sited adjacent to the existing City Bus Interchange, allowing for relatively efficient interchange between buses and LRT. It is noted that there is a possibility that this interchange may be downsized or removed in the future, and that the use of major bus stops around London Circuit could potentially act in an interchange role pending further public transport analysis.



Public Transport Patronage by Link (2031 AM Peak – Project Scenario)

LRT Network Capacity

The strategic modelling of the unconstrained public transport scenario results in a dramatic mode shift towards non private vehicle trips in the peak hour. Of this, public transport is considered likely to account for a significant majority of this mode share.

The current bus network is unlikely to be able to convey the number of passenger trips generated by the strategic model in the unconstrained scenario. As such, the likely capacity of an LRT network needs to be considered.

As can be seen a proposed LRT line running with 3 minute headways has the capacity to convey at least 50% of the passengers in 2031 that have been identified as using public transport on the likely LRT.

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D3

PRIVATE VEHICLES

3.1 PRIVATE VEHICLES

The potential demand and performance of private vehicles in and around the study area has been assessed using three methods, each with a different level of detail. These assessment methods are:

- Strategic transport modelling
- Micro-simulation modelling
- Intersection analysis

Strategic transport modelling, as discussed earlier, covers the entire urban area of the ACT and Queanbeyan and is based on broad assumptions about transport cost and transport network components. Vehicle travel times are based on empirical curves relating delay to volume. Transport zones are relatively coarse at the level of analysis. Outputs from this analysis include bulk travel times and distances, approximate link volumes and predicted public transport mode share.

Micro-simulation modelling is conducted only for the study area and contains much more detail. Vehicles are modelled as individual agents and zones are disaggregated to allow more detailed prediction of traffic volumes. The inputs for the micro-simulation modelling are taken from the strategic transport model outputs and all assumptions made in the strategic modelling assessment affect the micro-simulation process. Outputs from this stage include route travel times into and through the study area and other bulk travel statistics relating only to the study area.

The final level of analysis is intersection analysis. This involves the assessment of a single intersection in the study area. The outputs of this analysis quantify the expected performance of that single intersection.

3.1.1 Micro-simulation Modelling

To understand the likely impact of the City to the Lake Strategy on the road network performance micro-simulation modelling has been undertaken. This section describes the micro-simulation assumptions, process and results.

Network Coding

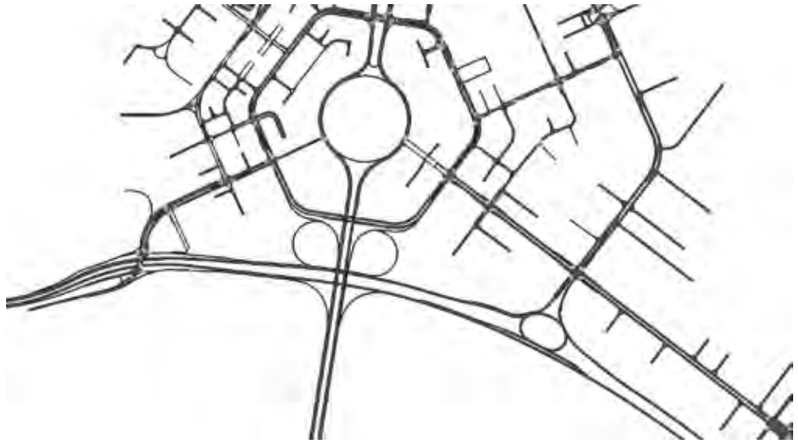
The existing road network coding was based on current road network TCD drawings obtained from Environment and Sustainable Development (ESDD). The extents of the model are shown below.

For the 2031 Business as Usual Scenario, the coded network includes committed network upgrades, which include the Belconnen to City Transitway and Parkes Way widening from Glenloch Interchange to Edinburgh Avenue. The central area from the Base Case network for 2031 is shown to the right.

The road network for the proposed City to the Lake Strategy model was coded based on the intersection layouts developed for the project. The central area of the City to the Lake Strategy network for 2031 is shown bottom right.

Extent of the Paramics Micro-simulation Model

2031 Business as Usual Scenario Paramics Micro-simulation Model



2031 City to the Lake Strategy Paramics Micro-simulation Model

3.1 PRIVATE VEHICLES

3.1.2. Demand Estimation

2012 AM Demand

Micro-simulation demand estimation was performed using Paramics Estimator. Paramics Estimator uses an incremental method to attempt to fit an OD matrix to the supplied turn, midblock and cordon count data. It runs an individual simulation of the model and records the traffic at each point for which traffic count data has been supplied, testing the simulated volumes against the provided real world counts to determine their accuracy.

From this, it makes a small change to the contents of the input OD matrix and repeats the process, eventually converging on a best fit to the input data.

Traffic input into Estimator was comprised of the following for each modelled network:

- The pattern matrix for the 2011 estimation was extracted from the SMEC EMME strategic transport model of Canberra.
- 2012 AM turning movement volumes were collected for all major intersections within the study area from the SCATS database.

2031 AM Demand

To generate demand for the 2031 AM Paramics micro-simulation models, the EMME strategic transport model is used to produce an OD matrix encompassing study area for each option. These 2031 AM OD matrices, along with the 2011 AM OD matrix extracted from EMME for use in the micro-simulation model estimation, enable the calculation of annual growth rates for each zone in the model. These growth rates are then applied to the 2012 AM estimated micro-simulation matrix, to generate 2031 AM micro-simulation matrices for each option.

3.1.3. Micro-simulation Modelling Results

The City to the Lake Strategy option generates more traffic than the base option due to the additional land uses in the development. In addition, the overall network capacity is decreased, and this puts additional pressure on the micro-simulation model, to the point that it breaks down after 08:30. As such, the performance results have been extracted for the period between 08:00 and 08:30, rather than the full peak hour. The peak hour traffic demand profile is fairly level – with 48.3% of the total peak hour traffic demand falling in the first half hour – so this methodology is considered to be legitimate in the interest of extracting meaningful peak results.

The micro-simulation model was used to record the average speed and travel time for vehicles using eight important routes through the study area, as shown below. The average speed and average travel time recorded for each of these routes in each of the options, as well as the difference in performance, are shown in the table to the right. The results indicate that an increase in travel time can be expected on some of the major routes through the study area.

Some of the routes show large increases and/or decreases in travel time:

- The north-south movements along Commonwealth Avenue and Northbourne Avenue via Vernon Circle experience a large increase in travel time due to the addition of several signalised intersections.
- The eastbound movements along Parkes Way improve substantially due to the replacement of the problematic Parkes Way – Coranderrk Street roundabout with signals. In contrast, the westbound movements, which currently bypass this roundabout, now have to negotiate a signalised intersection.
- Constitution Avenue, which is already under stress, struggles to cope with the additional traffic.

The overall average increase in travel time for vehicles using the proposed road network in 2031 when compared to the business as usual scenario is 1 minute 37 seconds.

In addition, there is queuing along Commonwealth Avenue and Parkes Way that extends past the network boundary in the City to the Lake Strategy model. The additional travel time caused by this is not included in the results as it occurs outside the model and cannot be measured.

Micro-simulation Route Performance

	Route	Direction	2031 AM Business as Usual		2031 AM City to the Lake Strategy		Difference	
			Ave Speed	Ave Time	Ave Speed	Ave Time	Ave Speed	Ave Time
1	Commonwealth Ave/ Northbourne Ave via Vernon Cir	Northbound	19.2	08:26	16.6	11:47	-2.6	+03:21
		Southbound	33.6	04:50	14.8	13:13	-18.8	+08:24
2	Commonwealth Ave/ Northbourne Ave via London Cct	Northbound	15.4	11:25	17.4	12:06	+1.9	+00:40
		Southbound	13.5	13:03	17.0	12:23	+3.4	-00:40
3	Parkes Way	Eastbound	15.4	14:33	36.0	06:07	+20.6	-08:26
		Westbound	78.4	02:56	20.4	11:15	-58.0	+08:19
4	Parkes Way/ Commonwealth Ave	Northbound	69.9	01:45	22.5	06:56	-47.4	+05:11
		Southbound	15.9	09:23	27.7	05:27	+11.8	-03:56
5	Coranderrk St/ Cooyong St	Northbound	14.3	07:09	12.6	08:28	-1.7	+01:19
		Southbound	17.9	05:57	19.2	05:35	+1.3	-00:21
6	Barry Dr	Eastbound	17.0	06:15	21.6	04:55	+4.6	-01:20
		Westbound	24.7	04:19	18.4	05:49	-6.4	+01:30
7	Marcus Clarke St	Northbound	15.3	03:47	16.0	03:36	+0.7	-00:11
		Southbound	15.5	03:44	11.1	05:13	-4.4	+01:28
8	Parkes Way/ Edinburgh Ave	Eastbound	12.5	08:09	22.9	04:26	+10.5	-03:43
		Westbound	17.1	06:23	21.7	05:03	+4.6	-01:20
9	Constitution Ave	Northbound	11.1	07:00	16.5	04:41	+5.5	-02:19
		Southbound	12.5	06:10	5.6	13:43	-6.9	+07:33
Overall Average			**16.5**	**05:39**	**13.3**	**07:16**	**-3.2**	**+01:37**

Micro-simulation Performance Audit Routes

3.1 PRIVATE VEHICLES

3.1.4. Delay Reduction

As can be seen from the results described above, the proposed City to the Lake Strategy has impacts on the performance of the road network. The City to the Lake Strategy presents a network of streets and intersections that seek to provide an attractive public realm and a highly permeable pedestrian environment that encourages movement between the CBD and the lakefront, promoting connectivity to the new public facilities proposed there.

It is noted that there exist opportunities to improve the performance of the road network through revision to the City to the Lake Strategy or the inclusion of additional infrastructure elements. However, it is noted that such measures are likely to have cost implications and / or potentially undermine the overall objectives of the project by partially compromising the public realm.

Furthermore, the micro-simulation modelling does not account for behavioural change that may mitigate these delays such as peak spreading that would likely result from the increased congestion.

Notwithstanding the above, a number of intersection improvements have been identified that result in significant improvements in the performance of the road network. These improvements have been included in the micro-simulation modelling described above, and are summarised as follows:

Lower Parkes Way / Commonwealth Ave Link

An intersection and associated pair of unidirectional tunnels that link Commonwealth Avenue south and Parkes Way west has been considered. The intent of this intersection is to provide for the heavy AM movement of traffic between the eastbound approach of Parkes Way onto southbound Commonwealth Avenue. This intersection significantly reduces congestion at the surface Parkes Way Boulevard / Commonwealth Avenue intersection as it removes the majority of commuters travelling to the parliamentary triangle from the intersection. The signalised right turn at the lower level intersection could potentially only operate in the AM peak as the demand for this movement is significantly lower outside this time. A layout of the intersection is shown below:

Parkes Way / ANZAC Parade intersection

Due to the altered traffic patterns resulting from the changed road network, this intersection experiences higher traffic loading than would otherwise be expected in the Business as Usual scenario. As such, there is significant congestion that can be attributed to this intersection in the Project scenario. Signalisation of this intersection can dramatically improve its performance given the revised traffic regime associated with the City to the Lake Strategy.

3.2 INTERSECTION ANALYSIS

Intersection analysis was conducted for 20 intersections as defined in the proposal and 16 additional intersections that are part of defined the City to the Lake Strategy development. The locations of these new intersections are shown in green in the adjacent image.

The intersection analysis was conducted using SIDRA Intersection 5.1 to assist calibration of the Paramics models as well as to provide the expected performance at each intersection. The intersection layouts used for the City to the Lake Strategy were modified to improve traffic operations whilst constrained by the City to the Lake Strategy requirements (e.g. the elimination of left turning slip lanes.)

In congested networks, it is common for a queue on a short turn lane to spill over into an adjacent lane. In these circumstances, SIDRA Intersection moves traffic out of the turn lane into an adjacent lane, which can result in an optimistic result if the adjacent lane has better performance. To avoid this issue, the length of the oversaturated turn lanes has been increased to contain the queue. Thus, the reported intersection performance has been based on this “worst case” scenario.

The results summary for both the Business as Usual and City to the Lake Strategy scenarios, showing Level of Service (LoS) and vehicle average delay, is given in the adjacent table.

Intersections 1, 6, 19, 20 and 28 have internal storage areas and their analysis follows appropriate closely spaced intersection analysis guidelines for SIDRA Intersection.

The intersections along London Circuit operate at LoS E or better. However, the intersections on London Circuit are spaced relatively closely, and SIDRA does not consider the impact of queues on adjacent intersections. The impact of the City to the Lake Strategy on London Circuit can be more realistically interpreted from the micro-simulation modelling.

Most intersections on the east-west route (Parkes Way and its Boulevard) operate at LoS D or better with the exception of Commonwealth Avenue – Parkes Way Boulevard and Parkes Way – Marcus Clarke Street. These two intersections have high traffic demand relative to their capacity.

3.3 Heavy Vehicle Movements

The likely routing of heavy vehicles through the road network proposed in the City to the Lake Strategy needs to be established in consultation with a number of key stakeholders.

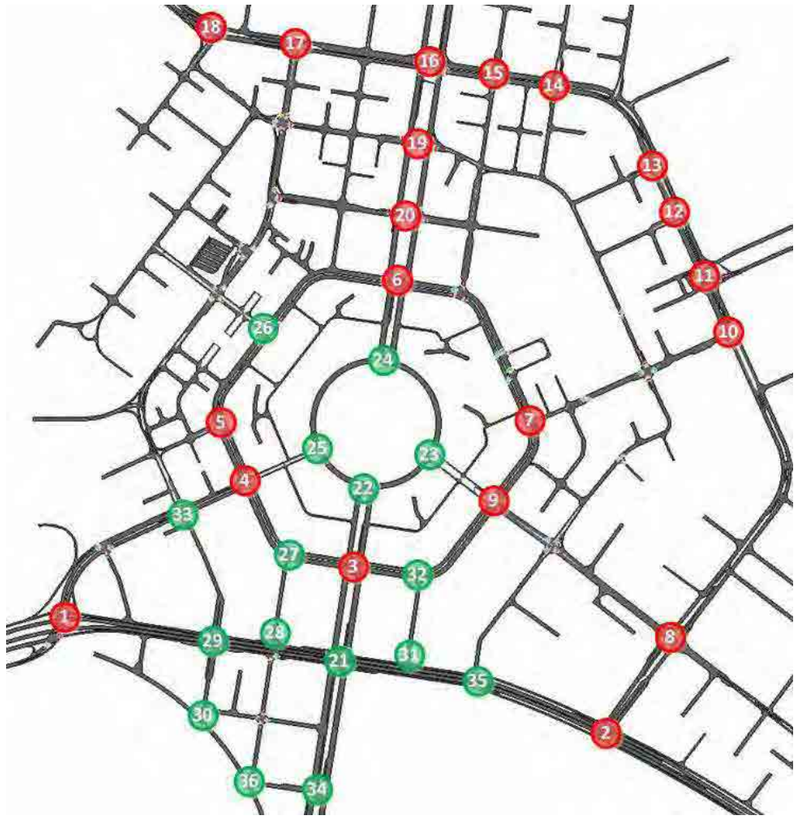
For example, it is noted that Northbourne Avenue / Vernon Circle / Commonwealth Avenue is a designated B Double route, however the appropriateness of this classification following completion of the project will require confirmation from Roads ACT.

As such, it is likely that road elements of the City to the Lake Strategy such as lane widths, intersection alignments and kerb radii will require refinement to suit heavy vehicle requirements once they have been confirmed through stakeholder consultation.

SIDRA Results Summary [Level of Service (Average Delay)]

ID	Intersection	BAU	City to the Lake Strategy
1	Parkes Way – Edinburgh Ave (North)	B (12s)	C (20s)
	Parkes Way – Edinburgh Ave (South)	B (16s)	B (14.5s)
2	Parkes Way – Coranderrk St	B (14.2s)	C (33.1s)
3	Commonwealth Ave – London Cct	N/A	F (254.4s)
4	London Cct – Edinburgh Ave	D (53.8s)	D (46.6s)
5	London Cct – Gordon St	E (59.2s)	A (5.6s)
6	Northbourne Ave – London Cct (West)	C (23.4s)	C (33s)
	Northbourne Ave – London Cct (East)	C (27s)	
7	London Cct – Akuna St	D (35.6s)	C (29.9s)
8	Coranderrk St – Constitution Ave	D (94.6s)	F (63.4s)
9	Constitution Ave – London Cct	D (62.4s)	E (58.6s)
10	Cooyong St – Akuna St	D (48s)	E (72.7s)
11	Cooyong St – Ainslie St	E (55.5s)	F (91.4s)
12	Cooyong St – Petrie St	C (20.1s)	C (27.9s)
13	Cooyong St – Scotts Crossing	C (25.8s)	B (12.6s)
14	Cooyong St – Genge St	D (38.3s)	D (39.6s)
15	Cooyong St – Mort St	D (42s)	E (52.4s)
16	Northbourne Ave – Barry Dr/Cooyong St	F (153.5s)	F (101.3s)
17	Barry Dr – Marcus Clark St	C (28.7s)	C (28.7s)
18	Barry Dr – Kingsley St	C (34.8s)	C (35s)
19	Northbourne Ave – Rudd St/Bunda St (West)	F (1147.1s)	F (368s)
	Northbourne Ave – Rudd St/Bunda St (East)	C (22.9s)	C (21.7s)
20	Northbourne Ave – Alinga St (West)	D (39.1s)	E (64.7s)
	Northbourne Ave – Alinga St (East)	D (42.4s)	C (28.6s)
21	Commonwealth Ave – Parkes Way	N/A	F (518.5s)
22	Commonwealth Ave – Vernon Cct	N/A	F (215s)
23	Vernon Cct – Constitution Ave	N/A	F (198.7s)
24	Northbourne Ave – Vernon Cct	N/A	F (253.9s)
25	Vernon Cct – Edinburgh Ave	N/A	F (143.6s)
26	London Cct – University Ave	N/A	C (21.5s)
27	London Cct – Road A	N/A	B (12.6s)
28	Parkes Way Boulevard – Road A (North)	N/A	A (4.4s)
	Parkes Way Boulevard – Road A (South)		B (12.6s)
29	Parkes Way Boulevard – Marcus Clarke St	N/A	F (91.9s)
30	Marcus Clarke St – Promenade	N/A	C (30s)
31	Road B – Parkes Way Boulevard	N/A	A (6.5s)*
32	Road B – London Cct	N/A	A (0.2s)*
33	Marcus Clarke St – Edinburgh Ave	D (52.6s)	E (74.6s)
34	Commonwealth Ave – Promenade Link Rd	N/A	A (1.6s)
35	Boulevard – Allara St	N/A	C (58.9s)
36	Promenade – Albert St	N/A	C (25.1s)

Intersection Analysis Locations



** Red intersections were defined in the proposal, green intersections were defined during the City to the Lake Strategy development*

** SIDRA Intersection does not report LoS for sign controlled intersections, so it has been calculated manually from average delay according to HCM2010. Red indicates existing intersections. Green indicates proposed intersections*

4 PARKING ASSESSMENT

In May 2009, ISG conducted a parking survey for many of the major centres around Canberra, including Civic. The survey was conducted on a weekday between 10:00 AM and 12:00 PM and catalogued supply and demand.

It was found that the total supply in the city area (including Acton, Braddon, City East, City West, Parkes (north of Lake Burley Griffin), Reid and Turner) was 25,245 parking spaces. These are described in the table below

The diagram opposite shows a graphical representation of the parking supply in the City and surrounding areas. It can be seen that a fairly substantial proportion of the parking supply in the City is located in the study area for this project. The six largest parking areas on Constitution Avenue and London Circuit contain a total of 4,323 parking spaces.

The parking occupancy survey found that there appears to be significant spare capacity in the city area. However, there are certain areas and parking types that are under pressure. These include:

- Short stay public parking in Acton
- Long stay public parking in Braddon and City (West)
- Overall parking utilisation in City (West)

The surplus parking spaces and parking utilisation rates are shown in Table 14 and Table 15, respectively. Note that these tables show demand for a typical weekday between 10:00AM and 12:00 PM only. There are no available data for weekend parking usage.
The data underlying Table 14 and Table 15 has been compiled into a graphical form and is shown in adjacent figure.

The numbers on each block indicate the number of free parking spaces while the colour of the block indicates the utilisation ratio as shown in the legend.

It can be seen that the parking areas south of Parkes Way tend to be underutilised. This is likely due to the fact that they are relatively remote from the City and not easy to access either by car or on foot. The large car parking areas around City Hill, the Civic Pool site and around Reid CIT tend to be highly utilised, mainly due to their central location and easy access. Many of the smaller parking areas are not very well utilised. The data from ISG (2009) do not indicate whether this is due to a lack of knowledge or if the parking is reserved for drivers who do not use it during the day (i.e. residential parking).

Any recommendations that result in redevelopment of existing parking areas are expected to provide a replacement of the parking already on the site and additional parking appropriate for the development, according to the ACT Parking and Vehicular Access General Code.

In 2010, Luxmore Parking Consulting (a division of ARRB) conducted an investigation into parking in Civic and the major town centres.

The findings of that study included recommended daily parking charges, based primarily on land values, for different types of parking supply. It was found that underground parking tends to be the most expensive to provide and above ground multi-level parking in a six storey structure is the cheapest. While the cost of constructing a parking structure can be considerable, the high land values in the City centre mean that the lower land costs of a development with a smaller footprint offset the construction costs.

The Luxmore Parking Consulting 2010 study also found the following:

- Parking in Canberra is cheaper and is perceived as more convenient than public transport, providing little incentive to use alternative modes of travel.
- There appears to be an incorrect perception of shortage of parking bays. The average vacancy at peak demand time needs to be accurately surveyed.
- A significant portion of available parking capacity is underutilised.
- Drivers will continue to expect to find a space close to their destination.
- Drivers and developers are demanding more and more parking bays, and expecting the ACT Government to provide these.

Parking Utilisation in Civic and Surrounds (Proportion)

Category	Total Area	Acton	Braddon	City (East)	City (West)	Parkes	Reid	Turner
Short-stay public	73.4	98.2	68.3	68.5	78.1	27.1	50.7	82.6
Long-stay public	72.0	46.6	80.4	63.1	90.2	65.7	79.9	112.3
Tenant	62.4	0.0	65.3	58.0	71.1	27.6	79.9	60.7
Other Restricted	66.3	0.0	51.6	74.5	76.8	2.3	24.8	24.2
TOTALS	**67.9**	**49.5**	**70.5**	**61.5**	**81.9**	**60.4**	**70.4**	**70.2**

(Source: ISG 2009, (Table 40))

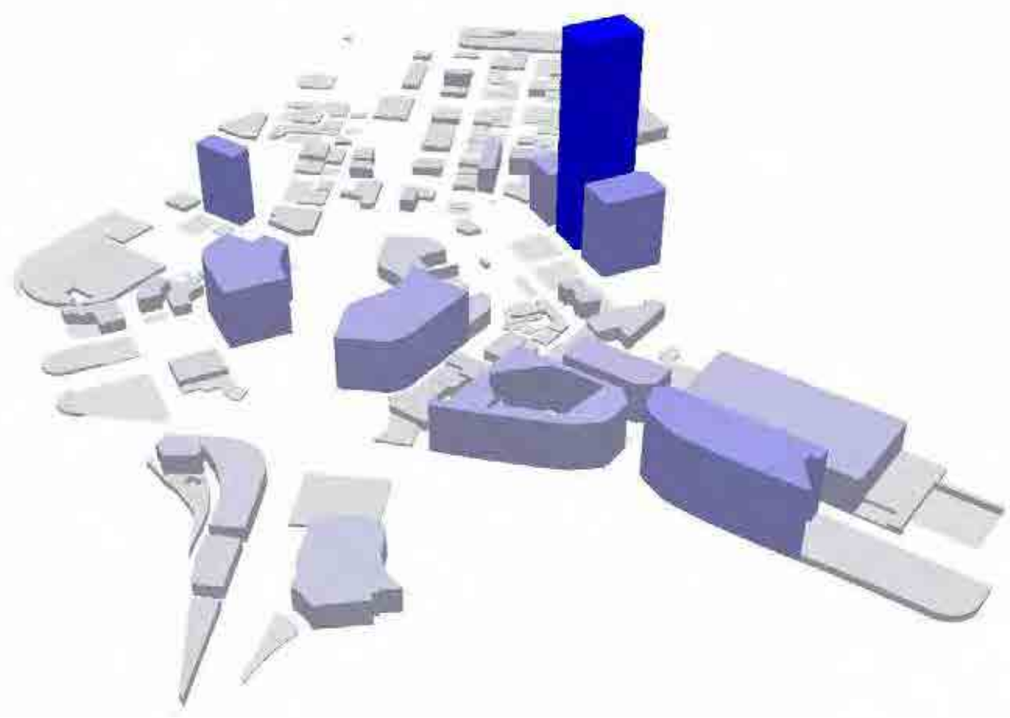
Parking Supply in Civic and Surrounds (Source: ISG 2009, (Table 7))

Category	Acton	Braddon	City (East)	City (West)	Parkes	Reid	Turner	Total Area
Short-stay public	56	306	276	447	48	73	167	1,370
Long-stay public	871	1,087	5,282	2,965	1,444	323	244	12,166
Tenant	0	1,615	5,616	1,928	29	313	848	10,336
Other Restricted	4	93	664	413	87	101	95	1,373
TOTALS	**931**	**3,101**	**11,838**	**5,753**	**1,608**	**810**	**1,354**	**25,245**

Surplus Parking Spaces in Civic and Surrounds

Category	Total Area	Acton	Braddon	City (East)	City (West)	Parkes	Reid	Turner
Short-stay public	365	1	97	87	98	35	36	29
Long-stay public	3,402	465	213	1,950	292	495	65	-30
Tenant	3,886	0	560	2,357	558	21	63	333
Other Restricted	463	4	45	169	96	85	76	72
TOTALS	**8,116**	**470**	**915**	**4,563**	**1,044**	**636**	**240**	**404**

(Source: ISG 2009, (Table 40))



Location and Quantity of Parking Supply (see plan oposite)

4 PARKING ASSESSMENT

- Transport for Canberra, which is the ACT Government's policy document for transport into the future mentions a number of specific plans for parking management, including:
  - Limiting total parking supply where other transport options are available
  - Improving parking provision for people with disabilities
  - Improving parking supply for motor cycles and cyclists
  - Prioritising short stay parking over long stay parking to encourage turnover and support businesses

Parking pricing will be used to encourage greater private involvement in parking supply and to influence mode choice decisions (i.e. make it financially attractive for people to choose a travel mode other than car).

Transport for Canberra notes that an appropriate parking price regime can result in the following:

- more efficient use of existing parking facilities
- reduced total parking requirements
- commercial viability of the parking industry
- reduced adverse impacts of traffic, including congestion
- a more attractive, people-focused environment; and
- accessibility which supports economic development.

The Transport for Canberra plan also states that area wide parking management plans will be adopted for the City and each of the town centres.

When planning for parking provision in the City, the requirements of the Parking and Vehicular Access General Code must be considered. For CZ1 and CZ2 zones, which make up most of the City area, long stay parking can be provided on-site or up to 1 km distance in publicly available car parks. A large, relatively central car park could thus service most of the City's long stay parking requirements. Short stay and visitor parking must be provided on-site or within 400m. Smaller parking facilities, or on-street parking, distributed across the City could provide for the short stay requirements.

The general code lists the following objectives in regard to parking and vehicular access in commercial zones:

- Amenity
- Safety
- Efficiency
- Access
- Equity
- Commercial Viability
- Non-commercial use

The general code also discusses the possibility of reducing overall parking provision by sharing and consolidating parking requirements for land uses with different peak times. This will increase the overall utilisation of each parking space and increase the efficiency of the parking system.

It is noted that access to parking facilities directly from highways and arterial roads is generally not permitted. If it can be demonstrated that the efficiency and safety of the road system will not be adversely affected, access from these roads may be allowed. Access to other classes of road is generally permitted but traffic volumes and sightlines will be considered before access is granted. Access and egress to and from parking facilities is to be in a forward direction only.

Unused Parking

Location and Quantity of Parking Supply

APPENDIX

HERITAGE ANALYSIS

LINKING CANBERRA CITY TO THE LAKE

November 2013

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HERITAGE ANALYSIS

1.0 INTRODUCTION

The objective of this document is to establish a framework of heritage considerations to inform the City to the Lake project.

The project takes as its starting point the outcomes of work previously undertaken by the National Capital Authority (NCA) and the ACT Government to establish priorities for future development on the southern flank of Canberra's city centre. These priorities are responsive to the underpinning principles and vision of Walter Burley Griffin's plan for the city. The following heritage analysis likewise gives primacy to the Griffin plan.

This document also acknowledges that Canberra, like all cities, is multi-layered. It includes buildings and landscape elements that reflect the priorities and preferences of different eras. Within the study area these include remnants of European settlement from the 1820s to the 1910s, which Griffin accommodated in his city plan, and legacies of post-World War II development that were not anticipated by Griffin, notably Parkes Way.

This document includes:

- An overview of the regulatory context, with an emphasis on heritage issues and considerations;
- details of previously identified heritage places within and in proximity to the study area;
- a summary history of the study area, addressing its role (symbolically, functionally and in terms of planning) as part of Walter Burley Griffin's vision for the city, and key phases in its development since the 1820s; and
- an overview of heritage principles to guide future development within the study area.

The report addresses European cultural heritage, including landscaping, and does not address Indigenous or environmental heritage issues.

Study area

The study area, illustrated at Figure 1, includes:

- Civic, the westernmost apex of the National Triangle;
- West Basin; and
- the western half of Constitution Avenue.

The area forms part of a larger cultural landscape (central Canberra). It is located on the north bank of the Molonglo River valley and generally slopes down from north to south.

Sources

Primary research was beyond the scope of this report. As such, existing sources have been relied upon. These are referenced in endnotes throughout. See also the tables at Section 2.3, which include details of reports (including Conservation Management Plans, heritage assessments and the like) prepared in relation to specific sites and places within and close to the study area.

Figure 1 The approximate extent of the study area is indicated.

2.0 PLANNING AND REGULATORY FRAMEWORK

The following provides:

- A summary of the legislative framework within which the study area sits; and
- details of buildings, monuments and areas within the study area that are subject to statutory controls, and buildings identified in non-statutory registers.

Note: an overview of the 'Planning Context' affecting the study area is provided in the Urban Strategy document (Section 3).

2.1 THE GRIFFIN LEGACY

Almost in its entirety, the City to the Lake study area is within 'designated land,' under the provisions of Section 10 (1) of the *Australian Capital Territory (Planning and Management Act) 1988*. Designated land is identified in the National Capital Plan (NCP), administered by the National Capital Authority (NCA), as being land that, '[has] the special characteristics of the National Capital'. The NCP defines 'designated areas' and establishes policies for land use and conditions for future development, planning and design within them. The NCA is responsible for works approval within designated land. As stated in the NCP, development in these areas is to be guided by the *Griffin Legacy*.[1]

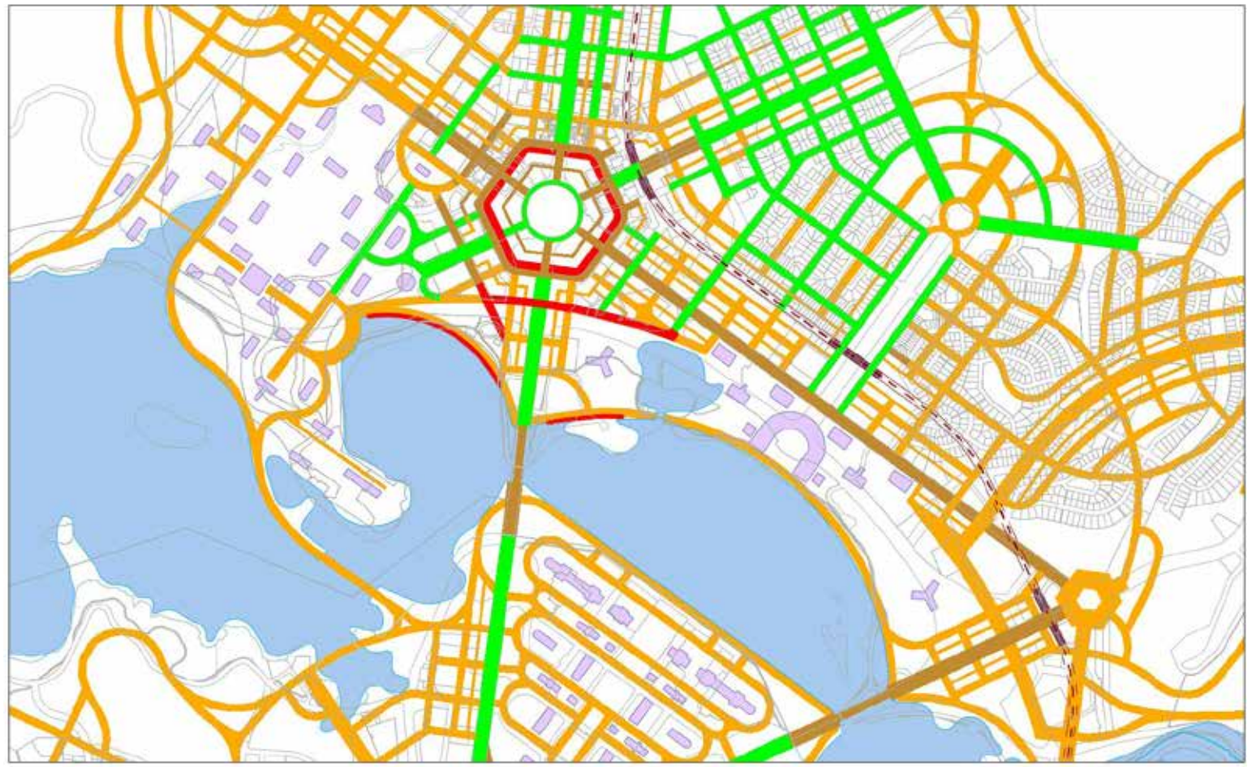
The *Griffin Legacy* was a major initiative of the NCA, the Commonwealth agency responsible for the planning and development of Canberra and the Australian Capital Territory in accordance with their 'national significance'.[2] The findings of the initiative were published in 2004 – *The Griffin Legacy – Canberra, the Nation's Capital in the 21st Century*, National Capital Authority.

The *Griffin Legacy* assesses the relevance of the Griffin Plan in the twenty-first century, and articulates a framework to deliver or recover elements of the Griffin Plan considered to have the potential to reinforce core values of Griffin's vision. Critically, the *Griffin Legacy* reasserts the primacy of Griffin's vision for Canberra as the primary driver in the city's future development.

In considering the existing condition of the Griffin Plan, the *Griffin Legacy* publication responds to the main elements and principles of Griffin's vision.[3] The starting point is the 'Landscape Framework,' being the primary determinant of the plan, followed by analysis of the core structural components of the plan, including the primary axes and the National Triangle. For each of the elements/principles, the *Griffin Legacy* organises aspects of the Griffin Plan in four categories, aspects that were: realised or reinterpreted; not realised; no longer relevant or not recoverable; and twenty-first century opportunities.

The structure of the *Griffin Legacy*, tailored to the qualities and characteristics of the study area, has been adopted for this heritage analysis. Analysis of the Griffin plan is addressed under the following headings:

- Landscape framework
- Land Axis (Parliament House Vista and Anzac Parade)
- Water Axis (Lake Burley Griffin) and parklands
- The National Triangle
- Municipal Axis (Constitution Avenue)
- City Hill and Civic Centre



Analysis of proposed, realised, altered and demolished elements of Griffin's 1918 street plan Source: Hill Thalis

2.2 NATIONAL CAPITAL PLAN

In 2006, the NCP was amended to incorporate a number of the recommendations of the *Griffin Legacy*. These amendments included general policies with city-wide application, including a commitment to 'Protect the Griffin Legacy' by:

> (a) fostering recognition of the 1918 Griffin Plan as a work of national and international cultural significance, and conserve those elements that contribute to this significance in a sustainable manner whilst allowing for the evolution of the city in contemporary terms.
>
> (b) recognising that Canberra is a young city and ensure that future development continues to give expression to the visual geometry, built form, landscape and cultural vitality of the 1918 Griffin Plan.
>
> (c) recognising that some elements (for example, the Australian War Memorial and Parliament House) are successful reinterpretations of the 1918 Griffin Plan which are consistent with and strengthen the framework and spirit of the Plan.[4]

The amendments to the NCP also included area-specific strategies to guide development. Of relevance to the study area were changes made to the West Basin (Amendment 61), Constitution Avenue (Amendment 60) and City Hill (Amendment 59) precincts.

Amendment 59 – City Hill Precinct

Amendment 59 (incorporated at Clause 1.3 'City Hill Precinct' and Appendix T7 of the NCP) seeks to reinforce City Hill as the municipal heart of Central Canberra. Objectives of Amendment 59 of particular relevance to the study area include:

> Vitalise City so that it becomes first amongst equals in the hierarchy of town centres within Canberra – with the City Hill Precinct as the pre-eminent heart of City; and
>
> The planning approach to the City Hill Precinct should be guided by and extend the legacy of the Griffin Plan for a vital and urban city heart by embracing contemporary realities.

Amendment 59 anticipates development to the south of Civic, with 'landmark buildings' (RL617) flanking Commonwealth Avenue. City Hill Park is to be, 'retained and enhanced as an enclosed central park serving a functional role within an urban built form'.

Amendment 60 - Constitution Avenue

The overarching aim of Amendment 60 (incorporated at Clause 1.5 'Constitution Avenue' and Appendix T8: Constitution Avenue and Anzac Parade of the NCP) is to implement the Griffin Legacy by establishing Constitution Avenue as an elegant and vibrant mixed use boulevard. This is to be achieved through the implementation of policies relating to appropriate urban structure, pedestrian connections, landscaping, public transport, road hierarchy, bicycle routes, streetscape design, active frontages and building height and form.

Of particular relevance to the City to the Lake project are the urban structure requirements and diagrams at Appendix T8 of the NCP. These requirements seek to reinforce Constitution Avenue as the base of the National Triangle by promoting appropriate urban form and the creation of a street grid sympathetic to Griffin's intended pattern of streets and city blocks. It is intended that this will link Civic, Reid and Campbell with Lake Burley Griffin and Kings and Commonwealth Parks to the south. The associated Indicative Urban Structure Diagram along with the diagrams showing indicative main pedestrian connections and road hierarchy provide a specific urban network for the realisation of these policy requirements. Building heights within the study area are generally to be medium rise (up to 25m) to retain the landscape backdrop of the inner hills of Central Canberra.

Directly relevant to the City to the Lake project is policy 1.5.3(d) which states:

> Reduce the barrier created by Parkes Way and its high speed intersections along its length by changing the character of Parkes Way to become a boulevard addressed with prestigious buildings, at grade pedestrian crossings and appropriately scaled road reserves and intersections.

Amendment 61 – West Basin

Amendment 61 (incorporated at Clause 1.4 'West Basin' and Appendix T9 of the NCP) applies to land on the northern side of the West Basin of Lake Burley Griffin being the land bounded by the foreshore, Commonwealth Avenue, London Circuit and Edinburgh Avenue. This land is included within the study area.

The Amendment seeks to realise the objectives of the *Griffin Legacy* by promoting the development of a vibrant cultural and entertainment precinct on a reclaimed waterfront promenade along the West Basin foreshore. A new mixed use city neighbourhood will be created including recreation and tourist activities and accommodation. The activation of West Basin is central to the implementation of the *Griffin Legacy*.

The policy requirements of Amendment 61 seek to create a legible network of paths and streets that link the city to the lake. In particular, the policies for West Basin are directed to ensure Commonwealth and Edinburgh avenues are enhanced as important physical, visual and symbolic links of Canberra. Appendix T9 includes policy requirements relating to urban structure, lake reclamation and land bridge, building height and form, heritage, landscape/streetscape, waterfront promenade, cycle and ferry, road hierarchy, car parking, bicycle and ferry routes, active frontages, water sensitive urban design and building height.

Building heights across most of the land included within Amendment 61 are required to be generally to be a maximum of 25m. Taller built form is contemplated north of Parkes Way having regard to appropriate access to sunlight, visual and environmental amenity and microclimate. Lower building heights are stipulated for land adjacent to the waterfront promenade, stepping up to the north.

Particularly significant for this project are the provisions of Appendix T9 relating to Lake Reclamation and the Land Bridge. These provisions are as follows:

> Replace the clover leaf intersection of Parkes Way and Commonwealth Avenue with a signalised grade-separated intersection.
>
> Create a land bridge over a section of Parkes Way for streets to extend to the lake.
>
> Reclaim land from the lake to establish a public waterfront promenade, reflecting the geometry of the 1918 Griffin Plan.

Specifically relating to heritage, Amendment 61 requires the provision of public access to heritage places around West Basin and the creation of a public waterfront promenade reflecting the geometry and intent of the 1918 Griffin Plan. These heritage places include the Acton Hotel, the Australian Academy of Science, Ian Potter House, the National Film and Sound Archive, and properties to Acton Ridge (including Lennox House and Old Canberra House).

A specific policy of Amendment 61 is the development of a significant public building, cultural attraction or landscape space on the water axis at the western shore of West Basin.

2.3 HERITAGE PLACES WITHIN THE STUDY AREA

The following tables list previously identified heritage places within and adjacent to the study area. The tables are based on a review of the:

- National Heritage List (NHL) and the Commonwealth Heritage List (CHL), established under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- ACT Heritage Register, established under the Heritage Act 2004 (ACT)
- National Trust of Australia (ACT) register (non-statutory)
- Register of the National Estate (RNE) (non-statutory)
- The Australian Institute of Architects' (ACT Chapter) Register of Significant Twentieth Century Architecture

The tables identify the places by name and location, and provide details of existing heritage listings and classifications. The columns on the right list existing heritage reports, including Conservation Management Plans, Heritage Management Plans, heritage analyses and the like.

The Griffin Plan

The Griffin Plan has yet to be formally recognised by way of heritage listings under the EPBC Act, 1999 or the Heritage Act 2004 (ACT). However, the Commonwealth department responsible for management of the land is subject to the provisions of the EPBC Act Section 26 (1), which requires that, 'A person must not take on Commonwealth land an action that has, will have or is likely to have a significant impact on the environment'. Under the Act, an action that is likely to have a significant impact of the environment should be referred to the Department of Sustainability, Environment, Water, Population and Communities.

At the time of writing the Australian Heritage Council was considering two nominations for the City of Canberra (Canberra - Central National Area and Inner Hills and Canberra and Surrounding Areas) to the National Heritage List. A nomination for Lake Burley Griffin and Lakeshore Parklands to the NHL was also being considered.

The significance of the Griffin Plan in the context of twentieth century urban planning has been widely acknowledged, including the examples below:

> *Australia's National Capital, Canberra, is one of the most important town planning projects undertaken in the world … the world wide competition for an ideal plan for Canberra created tremendous interest and the city that has eventuated is a remarkable memorial to the extraordinary vision of one of America's foremost architects, Walter Burley Griffin.*

Charles Daley, Federal Congress on Regional and Town Planning (Canberra), 1951

> *Griffin himself recognised that his competition design was far from flawless, and he made many significant changes in it as early as 1913. However, a special burden of proof falls on those seeking to change what an original designer conceived of both as a work of art and as an orderly and efficient framework for the conduct of urban life. That part of Canberra bearing the Griffin stamp unquestionably qualifies for that status. Modest in size and altered in many respects from Griffin's vision, it remains an extraordinary achievement deserving recognition and protection as one of the treasures, not only of Australia, but of the entire urban world.*

Prof. Emeritus John W. Reps, Canberra 1912, 1997

> *I profoundly believe that Canberra belongs among the greatest creations of man. And, if I may say so, Canberra is the most undersold work of architecture I know of.*

Edmund Bacon, Executive Director of Philadelphia City Planning Commission, 1968

> *[Canberra is] all exceedingly grand, dignified, elegant, yet … reposeful; it will soon rank with Washington as one of the world's great monumental capitals, an eloquent testimony to thewisdom of making haste slowly … Canberra achieves the difficult feat of being one of the last Cities Beautiful, and also the world's biggest Garden City.*

Peter Hall, Cities of Tomorrow, 2002

Acton

Place	**Heritage listing / classification**	**Existing reports**
Acton Peninsula Limestone Outcrops, west bank of West Basin, close to Lawson Crescent	CHL (ID 105344); RNE (ID 100891)	
Acton Conservation Area, a c. 20ha area extending from the south of the ANU campus	Acton Conservation Area: CHL (ID 105340); RNE (ID 13329) The Action Conservation Area includes a number of individually listed buildings, including Lennox House, Old Canberra House, Acton Cottages and the former Royal Canberra Hospital complex	Acton Conservation Area Heritage Management Plan, ANU, March 2011
Acton Peninsula Buildings 1, 2 and 15, Lawson Crescent, Acton (remnants of the former Royal Canberra Hospital complex	CHL (ID 105341, ID 105343 and ID 105342 respectively); the properties are also included in the RNE	Former Hospice Acton Peninsula Conservation Plan, Eric Martin and Associates, 2003
Lennox House complex, Section 34 Block 4, located with the Acton Conservation Area	CHL (ID 105307); RNE (ID 19455); ACT Heritage Register	ANU Lennox House Heritage Management Plan, ANU/ John Armes & Associates, 2009
Old Canberra House, located with the Acton Conservation Area	CHL, part of the Acton Conservation Area; ACT Heritage Register (Nominated); National Trust of Australia (ACT), Classified Place; RNE	Australian National University Heritage Study: Volumes 1 and 2, Ratcliffe and Armes, 1993
16 Lennox Crossing, Acton, Block 4, Section 34	CHL, part of the Acton Conservation Area; ACT Heritage Register (Nominated place); National Trust of Australia (ACT) Recorded Place; Royal Australian Institute of Architects Register of Significant Twentieth Century Buildings (R112)	Conservation Plan for ANU Cottage No. 3 (16 Lennox Crossing), Freeman Collett and Partners, 1992; Australian National University Heritage Study: Volumes 1 and 2, Ratcliffe and Armes, 1993
Acton Cottages, Balmain Crescent No's 16,18, 20, 22, 26, 28 and Liversidge Street, No's 3, 5, 7, and 8, Section 14 Block 1	CHL, part of the Acton Conservation Area;), RNE (ID 13329); nominated to ACT Heritage Register	ANU Draft Acton Conservation Area Management Plan, ANU, 2011; Australian National University Heritage Study: Volumes 1 and 2, Ratcliffe and Armes, 1993
University House and Garden, ANU, Block 1, Section 39 Acton	CHL (ID 105190); ACT Heritage Register, Nominated place; National Trust of Australia (ACT) Recorded Place; Royal Australian Institute of Architects (R024)	University House The Australian National University: Conservation Management Plan, Pegrum and Associates, 2001
National Film & Sound Archive (Institute of Anatomy), Section 21 Block 1 (fmr Institute of Anatomy)	CHL (ID 10531); RNE (ID 13261); RAIA ACT Register of Significant Twentieth Century Architecture (R022)	National Film and Sound Archive Heritage Management Plan, Eric Martin and Associates (2009)
ANU – Centre for Continuing Education, (Fmr Isolation Ward) R G Menzies Library, Jaeger Building, Former Canberra Hospital, Administration Building, Research School of Biological Sciences (Mills Road), Section 39 Block 1	Nominated to ACT Heritage Register CHL (ID 105341 - Former Isolation Ward, ID 105685 – R.G. Menzies Building, Research School of Biological Sciences – not included in CHL) RNE (ID 100815 – Former Isolation Ward, ID 19833 – R.G. Menzies Building, ID 19839 - Research School of Biological Sciences,) RAIA ACT Register of Significant Twentieth Century Architecture: University House (R024), RG Menzies Building (R056), Research School of Biological Science (R05	ANU Heritage Strategy 2010-2012, ANU Draft Acton Conservation Area Management Plan, ANU (2011)

2.3 HERITAGE PLACES WITHIN THE STUDY AREA

Campbell

Place	**Heritage listing / classification**	**Existing reports**
Australian War Memorial and Anzac Memorial Parade. The area covers c. 25ha in Reid and Campbell, comprising the whole of Anzac Parade from the northern alignment of Constitution Avenue to the southern boundary of Section 39 Reid; Anzac Park (comprising Block 1 Section 41 Reid, Block 4 Section 39 Reid, Block 1 Section 1 Campbell, Block 2 Section 60 Campbell); the whole of Section 39 Campbell; Limestone Avenue to the east of the alignment of the south-eastern most boundary of Block 5 Section 39 Reid; Fairbairn Avenue to the west of the alignment of the north west boundary of Block 3 Section 60 Campbell.	Australian War Memorial and Anzac Memorial Parade: NHL ID 105889 Australian War Memorial: CHL ID 105469 RNE ID 13286 National Trust (ACT), Classified RAIA ACT Register of Significant Twentieth Century Architecture (R016)	Australian War Memorial Heritage Management Plan, Godden Mackay Logan (2011) Anzac Parade Heritage Management Plan, Duncan Marshall (Draft 3) *et al* (2012)

City

Place	**Heritage listing / classification**	**Existing reports**
Hotel Acton, Block 1, Section 24	ACT Heritage Register; RNE (ID 100943)	Hotel Acton Conservation Management Plan, Campbell Dion Pty Ltd (2004).
Glebe Park, Section 65 Block 2	ACT Heritage Register (ID 20085), RNE; (ID 13348 - Glebe Plantings)	Glebe Park Master Plan Report, by Parks, Conservation & Lands, Department of Territory and Municipal Services (2008).
School of Music, Section 28 Block 13	Nominated to ACT Heritage Register; CHL (ID 105636); RNE (ID 19836); RAIA ACT Register of Significant Twentieth Century Architecture (R031)	Management plan to be located
School of Art, Section 28 Block 5,10,13	Nominated to ACT H R; CHL (ID 105765); RNE (ID 13356); RAIA ACT Register of Significant Twentieth Century Architecture (R005)	School of Art Heritage Management Plan, Jackson & Swain (2000)
Canberra Olympic Swimming Pool (Civic Pool), Section 37 Blocks 2 and 6	Nominated to the ACT Heritage Register; RNE (Registered place, ID 17635); RAIA ACT Register of Significant Twentieth Century Architecture (R028); National Trust of Australia (ACT) Classified	Conservation Management Plan prepared by Eric Martin & Associates (2004)
Australian Academy of Science Building (aka Becker House), Section 25 Block 2	ACT Heritage Register, National Heritage List (ID 10571); RNE (ID 19835); RAIA ACT Register of Significant Twentieth Century Architecture (R026)	Academy of Science CMP by John Armes & Associates
Ian Potter House, Section 25 Block 1	ACT Heritage Register; RNE (ID 13288); RAIA ACT Register of Significant Twentieth Century Architecture (R002)	
Law Courts Precinct, Section 18 Blocks 1, 4 & 6, Section 63 Block 16 The Precinct includes the Law Courts Building (now the Supreme Court), the Reserve Bank and the ACT Police HQ	Nominated to ACT Heritage Register; RNE (ID 19700 – Law Court Building, ID 19696 – Precinct, ID 19703 – Police Headquarters Building); RAIA ACT Register of Significant Twentieth Century Architecture (R069) The Reserve Bank of Australia is included in the CHL (ID 105396), RNE (ID 19704)	Freeman Collett & Partners (1996) ACT Supreme Court Building & Precinct Stage 1, Volume 1: Heritage Assessment
City Hill, Section 34 Block 1	ACT Heritage Register; National Trust of Australia (ACT)	Peter Freeman, Statement of Heritage Impact relating to an urban design proposal for the public realm, of Northbourne Avenue and City Hill, Peter Freeman (2011)
Melbourne and Sydney Buildings, Section 48 and Section 1	ACT Heritage Register (ID 20032); RNE (ID 13287), National Trust (ACT); RAIA ACT Register of Significant Twentieth Century Architecture (R004)	Duncan Marshall *et al*, Sydney and Melbourne Buildings Conservation Management Plan (2011) Philip Cox, Richardson, Taylor and Partners, Conservation Management Plan, 1993
ANZ Bank Building, 17 London Circuit, Section 3 Block 1	ACT Heritage Register (ID 20150), RNE (Indicative Place – ID 19832), RAIA ACT Register of Significant Twentieth Century Architecture (R060)	Former ANZ Bank Building : conservation management plan, Eric Martin and Associates (2006)

2.3 HERITAGE PLACES WITHIN THE STUDY AREA

Parkes

Place	**Heritage listing / classification**	**Existing reports**
Lake Burley Griffin and Lakeshore Parklands Area includes the Central, West and East Basins, the West Lake area, islands, Scrivener Dam, Commonwealth Avenue and Kings Avenue Bridges, and the lakeshore parklands. Within or adjacent to the study area the parklands include Commonwealth Park, the Rond Terraces, Kings Park, West Basin, and the lakeshore parklands from the lake edge to the National Museum of Australia, from the lake edge to Lawson Drive, Parkes Way and Commonwealth Bridge.	Lake Burley Griffin and Lakeshore Parklands: Nominated to NHL, ID 106206 Lake Burley Griffin and Adjacent Lands: Nominated to the CHL, ID 105230 The Central Basin is within the Parliament House Vista: Listed in the CHL, 105466 Registered in the RNE, 13371)	Lake Burley Griffin and Adjacent Lands, Heritage Management Plan, Volumes 1-4, Godden MacKay Logan (2009); Lake Burley Griffin, Heritage Assessment, Godden MacKay Logan (2009). A Heritage Assessment of the Canberra Central Parklands (comprising Commonwealth Park, the Rond Terraces and Kings Parl) was prepared by Duncan Marshall *et al* in 2007. Study of the Social Value of Lake Burley Griffin and its Setting, Shirley Pipitone, 2009
Parliament House Vista, Part Sections 2, 3, 4, 21, 22, 23, 24, 25, 27, 28, 29, 33, 34, 35, 37, 38, 39, 40, 42, 43, 44, 45, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 58, 59	Nominated to ACT HR; CHL (ID 105466); RNE (ID 13371	Parliament House Vista Heritage Management Plan, Duncan Marshall *et al* (2010).
Blundell's Cottage, Section 47 Block 6	Nominated to ACT HR; CHL (ID 105734); RNE (ID 13324)	Blundell's Cottage Precinct Conservation Management Plan, Freeman Collett & Partners (1994)
East and West Portal Buildings (Anzac Parade), Section 3 Block 7, Section 4 Block 1.	CHL (ID 105474); RNE (ID 101058)	The portal buildings ANZAC Park East and West, Conservation Plan prepared by Australian Construction Services for Australian Estate Management (1994); The portal buildings ANZAC Park East and West, Management Plan prepared by GHD for the Department of Finance and Administration (2004)
West Portal Cafeteria, Section 3 Block 7	Nominated to the CHL (ID 105554, on 2011-2012 priority list); RNE (ID 102813)	
Commonwealth Park Geological Site, c. 50m east of the carriageway of Commonwealth Avenue south of the intersection with Parkes Way	National Trust of Australia (ACT) classified place	
The Archbishop's Residence, Parkes, Block 1, Section 2	N/A The Archbishop's Residence, located within Commonwealth Park to the south-east of the intersection of Parkes Way and Commonwealth Avenue is not included in any heritage registers (statutory or non-statutory)	N/A The authors did not locate any heritage analyses of the property during research for this report.

Reid

Place	**Heritage listing / classification**	**Existing reports**
Reid Housing Precinct, part Sections 15, 16, 17, 18, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36, 37, 38, 39, 40	ACT Heritage Register (ID 20023); RNE (ID 13270); RAIA ACT Register of Significant Twentieth Century Architecture (R014)	CMP for original street furniture and utility services within the Reid Heritage Precinct, Peter Freeman
Reid Uniting Church, Section 25 Block 1	ACT Heritage Register (ID 20035); RNE (ID 13403)	
St John the Baptist Church Precinct, Section 33 Block 1 (part), Block 2, & Block 10 (part)	ACT Heritage Register (ID 20019); RNE (ID 13263 – Precinct, ID 13265 – Church & Churchyard, ID 13264 – Schoolhouse Museum)	Duncan Marshall *et al*, St John's Church Precinct Heritage Management Plan - landscape (2010). Peter Freeman Pty Ltd, The St John the Baptist Church Precinct, Canberra, Heritage Management Plan, 2 volumes (2007)
Amaroo Street Railway Easement, Section 33, Block 11 (part)	Nominated to ACT Heritage Register	

2.3 HERITAGE PLACES WITHIN THE STUDY AREA

Pre-national capital European history[6]

European settlement in the Limestone Plains between the 1820s and the 1910s was concentrated in the area between the St John's Church complex and Acton Ridge. The area was flanked to the east and west by fording points over the Molonglo River.[7]

Discovery and settlement of the Limestone Plains followed the establishment of a passage across the Blue Mountains to Bathurst Plains in 1815, and a road to the Goulburn Plains in 1820. The abundance of pasture in the area was a significant attraction to the Europeans.

The first settlement in the vicinity of the present Canberra was a stock station at Acton established in c. 1824 on behalf of John Joshua Moore, a retired lieutenant and Waterloo veteran who was appointed the first Prothonotary of the Supreme Court of New South Wales in the same year. Moore's station was established on Crown land without a permit or licence. His tenure was formalised in 1826-27, with the purchase of 400ha (1,000 acres). The construction of Moore's homestead, 'Canberry' on the Acton Ridge, is believed to have commenced in 1826. The rendered stone property was resumed by the Commonwealth in 1911. The first resident in an official Government capacity was Charles R Scrivener, Director of Commonwealth Surveys. The building was demolished in the 1940s, to accommodate the Royal Canberra Hospital.[8]

In 1825, merchant, pastoralist, politician and philanthropist Robert Campbell was granted land in the Limestone Plains to a value of £1,000 to compensate for the loss of his ship *Sydney* in 1806 while under Government charter.[9] James Ainslie, Campbell's overseer, transported 700 sheep from the Government flocks at Bathurst and settled on the south-eastern slopes of Mount Pleasant on the north bank of the Molonglo River. Campbell was subsequently granted an additional 400ha (1,000 acres) to complete his compensation. This was later supplemented by the acquisition of a further 2,000ha (5,000 acres), meaning that Campbell was owner of the largest landholding in the area.

Extant built legacies of the colonial era settlement and land use within and around the study area associated with the Campbell family's Duntroon estate and include:

- St John's Anglican Church and Schoolhouse to the north-west of the intersection between Anzac Parade and Constitution Avenue;
- Blundell's Cottage, on the north bank of Lake Burley Griffin within Kings Park; and
- Glebe Park, the site of a parsonage for the rector of St John's.

St John's Church and schoolhouse were built in the 1840s to serve residents of the Campbell's Duntroon estate and neighbouring settlers (Figure 4). The original bluestone nave survives. The original tower was replaced in the 1870s by the present sandstone spire designed by Victorian architect Edmund Blacket. As originally built, the schoolhouse (1845) included a schoolroom and teacher's residence. The building was gutted by fire in 1864, and re-built and enlarged to the present colonial vernacular style structure. The schoolroom is built of locally quarried bluestone and finished with white lime wash. In 1967 it was restored by the National Capital Development Commission (NCDC) and adapted as a museum.[10]

Reverend Pierce Galliard Smith was appointed rector of Canberra at St John's in 1855, and remained in the position until his death in 1906 – he is buried at St John's graveyard. In 1873, the Duntroon estate commissioned the construction of a rectory (Glebe House) a short distance north-west of the St John's complex.[11] Reverend Smith was an enthusiastic horticulturalist and planted a number of trees in the rectory grounds, now Glebe Park. The rectory was demolished in 1955.[12]

The other remnant of the Campbell's occupation and use of the land in the vicinity of the subject site is Blundell's cottage and outbuildings, built from c. 1860 as premises for families of farm workers. Today the stone cottage overlooks Lake Burley Griffin (Parkes Section 47 Block 6 (part)).

Acton Ridge

Following the selection of Yass-Canberra as the location of the National Capital the Acton ridge emerged as the administrative, social and residential centre of the nascent settlement. The ridge included the first worker's hostel built in Canberra (Lennox House); a residence for first administrator of the Federal Capital Territory and premises for the first diplomatic mission in Canberra, both of which were located in the Old Canberra House complex of 1913; and Acton Cottages, providing accommodation for high and middle-class public servants. The 11 timber buildings that made up the Acton Cottages group was the old Lands and Survey Camp, which had previously been established near Capital Hill in March 1909 and was relocated to Acton in June 1911. Today these elements, and associated roads, tracks and native vegetation have been described as the, 'most extensive surviving cultural landscape from that period [1911-1920s]'.[13]

Plans for the Federal Capital 1911-1925

The Griffins' competition entry[14]

In April 1911 the Minister for Home Affairs, on behalf of the Commonwealth Government, initiated an international competition for designs for the layout of the federal capital. The 137 entries were judged by a three-man panel comprising James Alexander Smith (engineer), John Kirkpatrick (architect) and John Montgomery Coane (licensed surveyor). On 14 May 1912, two of the panel members, (Smith and Kirkpatrick) selected Walter Burley Griffin's entry as the winner. On 23 May 1912 the Minister for Home Affairs concurred with the majority decision and Griffin was awarded first prize, with entries by Eliel Saarinen (Helsinki) and Alfred Agache (Paris) placed second and third respectively.

It was not the Government's intention to fully implement the winning design. Rather, the terms of the competition were that, 'the premiated designs shall become the property of the Government for its unrestricted use, either in whole or in part.'[15] Accordingly, the three winning entries, as well as the scheme placed first by Coane (prepared by Sydney practice Griffiths, Coulter and Caswell) were purchased by the Government.

The Griffin scheme – planned by Walter and rendered by his wife Marion Mahony Griffin – was distinguished by an intimate relationship with the landscape. The central component of the proposal was an equilateral triangle (the National Triangle) whose corners were aligned on topographic outcrops or elevated land, specifically Mount Vernon in the north-west, Mount Kurrajong in the south, and the saddle between Russell Hill and Mount Pleasant in the north-east. The sides of the triangle formed the major avenues connecting the three primary centres of activity in the new city: the national government at the apex, and the municipal and market centres at the east and west of the base respectively.

A series of axes provided a further organisational underpinning for the plan, specifically the Land Axis, Water Axis and the Municipal Axis.

The Land Axis formed the central alignment of the plan. The line extended from Mount Ainslie to distant Mount Bimberi via Mount Kurrajong, bisecting the central triangle and tying the city to its site. The formality and definition of this broad central axis was reinforced by the symmetrical siting of buildings at major intersections.

The Municipal Axis (Constitution Avenue) was a 3.2km (two-mile) boulevard to the north of the Water Axis, connecting the east and west points of the central triangle (now Civic and Russell). This was conceived as the city's major commercial thoroughfare, lined by commercial and residential buildings of scale. To the west of the boulevard was the Civic Centre, a hexagonal planning arrangement with City Hall surmounting Mount Vernon at its centre, and to the east was the Market Centre. Residential areas were located to the north of the Municipal Axis, and public gardens to the south, stretching down to the lakefront. Public buildings (museums, galleries and a 'zoological garden') were identified within the public gardens, arranged symmetrically on either side of the Land Axis. During his tenure as Federal Capital Director of Design and Construction (18 October 1913 to 31 December 1920) Griffin consistently advocated the development of the Municipal Axis as the starting point for the city.[16]

The Water Axis (Lake Burley Griffin), at right angles to the Land Axis, followed the approximate alignment of the Molonglo River, extending from the summit of Black Mountain along the river valley towards the south-east. The Heritage Assessment of Lake Burley Griffin prepared by Godden Mackay Logan (2009) includes the following description of the three formal lake basins in the city centre:

> Griffin's design … [included] a formal central trinity of basins with circular and curved edges flanked on either side by informal lakes, the whole covering the Molonglo flood plain. The East Basin was conceived as having a higher fluctuating water level maintained by a second dam and was to act as a reservoir to maintain Central Basin levels. Another reservoir was proposed far to the east in the catchment area to be used to maintain levels and flow to the whole system. Griffin's central triple basin was designed as the city's heart where buildings would be reflected in the waters, while the two informal lakes either side were more for recreational use with enhanced interest from botanical gardens, arboreta and forest reserves. The plans proposed a number of central bridge crossings, the most easterly one, the Causeway, carrying a rail link.[17]

In addition, as noted in *The Griffin Legacy* document prepared by the NCA (2004):

> The Plan provides for a number of waterfront centres, judiciously located, which allow city life to extend to the lake. These centres are urban in character and contain a relatively high density of buildings. They are served by a tram network and provide for mixed commercial and residential activity fronting broad landscaped esplanades. Tree-lined pedestrian promenades follow the water's edge.
>
> The balance of the lakeshores … remains overwhelmingly in favour of open space … [18]

Symbolically, the arrangement provided views for the 'people' from the public gardens over the lake to their government, with the various government departments in an ascending axis terminated by the Parliament on Camp Hill and the Capitol rising above.

1 Acton Conservation Area
2 Old Canberra House (approximate extent)
3 Acton Cottages (approximate extent)
4 Lennox House Complex (approximate extent)
5 16 Lennox Crossing
6 University House
7 Buildings (x3) associated with the former Royal Canberra Hospital
8 Acton Peninsula Limestone Outcrop
9 National Film and Sound Archive (former Australian Institute of Anatomy)
10 Canberra School of Art (former Canberra High School)
11 Australian Academy of Science
12 Ian Potter House (former Beauchamp House)
13 Hotel Acton
14 Canberra School of Music
15 ANZ Bank
16 Law Courts of the ACT precinct, including the Supreme Court, the Reserve Bank and the ACT Police HQ
17 The Melbourne and Sydney Buildings
18 City Hill
19 Canberra Olympic Swimming Pool
20 Glebe Park
21 Amaroo Street Railway
22 West Portal Cafeteria
23 East and West Portal Buildings
24 St John's Church and schoolhouse
25 Reid Housing Precinct
26 Reid Uniting Church
27 Blundell's Cottage
28 Australian War Memorial and Memorial Parade (extends to Constitution Avenue)
29 Lake Burley Griffin and Lakeshore Parklands
30 Parliament House Vista

Identified heritage places within and adjacent to the study area (includes places listed in the NHL, CHL, ACT Heritage Register, RNE, National Trust register and Institute of Architects Register)

3.0 SUMMARY HISTORY OF THE STUDY AREA

Revisions to the plan for Canberra (1912-1925)

Between 1912 and 1925, when the layout of the city of Canberra and its environs was gazetted, the plan for the federal capital was the subject of a number of modifications and revisions. The first of these, in November 1912, was a plan prepared by the Departmental Board, a body charged with implementing the city structure. The Board's plan, which was approved in 1913, retained Griffin's Land Axis, but generally incorporated very little of Griffin's scheme, which was deemed extravagant, costly and impractical.

Major changes in the Departmental Board plan of relevance to the study area included the following:

- the central triangle was removed, including the Municipal Axis at its base;
- Mount Vernon was identified as the site for a university, as opposed to the Civic Centre;
- military barracks were proposed for the site of the present Australian War Memorial; and
- the Civic Centre was located to the south-east of Capital Hill on the south side of the Molonglo River flood plain.

The first peg of the city was driven on 20 February 1913, six months before the Griffins arrived in Australia (18 August 1913), at the invitation of William Kelly who followed King O'Malley as minister responsible for the national capital following a change of government.

On 26 August, the Departmental Board met with Walter Burley Griffin in Melbourne and expressed a number of fundamental concerns about the proposal, including its scale and siting.[19] Griffin revised his scheme (in 1913, Figure 9), seeking to address a number of the matters raised by the Board, but the distance between the architect's vision and that proposed by the government officials remained significant. The working relationship between the two was also increasingly dysfunctional. Forced to choose between the two, Minister Kelly disbanded the Board in October 1913 and appointed Griffin as Federal Capital Director of Design and Construction on a three-year contract (the contract eventually expired at the end of 1920). Also in 1913, Kelly revoked the approval of the Board plan and formally sanctioned support for Griffin's revised plan. As noted by Duncan Marshall:

> This plan now became the basic planning document, informing all of the Griffins' later revisions, including the final version of the design prepared in 1918. The final version served, in turn, as the model for the official gazette plan of 1925 which was to have a long lasting effect.[20]

In the revised scheme Griffin's original vision for the base of the central triangle as a boulevard extending between the Civic and Market centres was re-established, as was the hexagonal planning of the Civic Centre. However, the City Hall had been removed, with Mount Vernon now proposed as a public park.

Griffin's tenure as Federal Capital Director of Design was mired by tensions between government officials and departments, and hampered by changes in government. In addition, World War I (1914-18) was a significant distraction and drain on resources. The tensions between Griffin and government officials were addressed in a Royal Commission on Federal Capital Administration (1916-17), which found that Griffin had been obstructed.[21] Following the Royal Commission, responsibility for the national capital shifted from the Department of Home Affairs to a new branch within Home and Territories under Griffin's control, allowing him a freer rein in his remaining years as the Federal Capital Director of Design.[22]

In 1916, Griffin prepared a detailed set of plans (200ft to an inch) for the land to the east of the Civic Centre, his preferred starting point for the city.[23] As noted by Reid:

> For the first time, city sections were subdivided into development lots, footpaths and services lanes, and the road hierarchy is clear. Densities corresponded to a city of pedestrians using trams rather than motor cars. Six avenues, radiating from the hexagonal road around Vernon (City) Circuit, were 200 feet wide with a very wide median except for Commonwealth Avenue which had wide verges, perhaps to allow the carriageways to continue across a single bridge.[24]

A plan of 1917 focused on the establishment of the primary axial lines within and around the city, and reaffirmed the relationship between the city and the landscape. This was followed in 1918 by Griffin's final masterplan for the entire city. In this plan the Civic Centre comprised a circular road (Civic Circle) around Mount Vernon, outside of which was a hexagonal ring road (City Circuit); six boulevards radiated from the angles of the hexagon. Zoning is not indicated on the plan, but assuming that the 1918 plan is consistent with the 1911 competition entry, civic and institutional buildings would have been located on Civic Circle with an outer ring of commercial and retail buildings. Development extended along the six avenues, reaching the lake to the south.

The 1918 plan became the basis for the gazetted plan of 1925. This established Griffin's layout in law. Of note for the study area is that the circular road within the hexagonal road around Mount Vernon was removed from the gazetted plan, and a City Square was located at the base of the hexagon (London Circuit).

Map of the Canberra district, 1916. Note Vernon (Civic Hill); the rectory' (red arrow); the St John's Church complex (green arrow); and the concentration of development on the Acton Ridge (circled).

Source: National Archives of Australia (reproduced in Reid, 2002, p. 19).

3.0 SUMMARY HISTORY OF THE STUDY AREA

Development at Canberra (1910s-1930s)

The pace of development in Canberra between 1913 and the mid-1920s was slow. In the period to 1924 (when the Federal Capital Advisory Committee was disbanded), a total of £3.4 million was invested in the construction of the city,[25] and in 1916 and 1917 annual expenditure on capital works was only £8,000.[26]

By 1920 development in the city included the Power House complex at Kingston, the brickworks at Yarralumla, Cotter Dam, sewerage works and transmission lines. Also, as noted, a complex of 11 weatherboard cottages had been erected at Acton Ridge for Department staff.

Also during this period exploratory investigations into establishing the lake (Water Axis) were initiated by Percy Owen, a former member of the Departmental Board who was appointed part-time director of design and construction in Canberra following the dissolution of the Board in 1913.[27] The idea was shelved following a 1916 Parliamentary Standing Committee on Public Works, with recommendations that:

> … the eastern lake to be postponed indefinitely, the western lake to be modified to follow a more naturalistic contour of the land, the lakes to be surrounded by parks when they were created and the 1,825 feet of land contour [556m] to be the final surface level of the lake waters.[28]

As noted by Reid, by the time Griffin left Canberra at the end 1920, '[his] design was apparent only in some road forming and finishing east of [Mount] Vernon and west of Kurrajong'.[29]

Federal Capital Advisory Committee (1921-24)

The Federal Capital Advisory Committee (FCAC) was established in January 1921 to advise the Government on the development of Canberra. The Committee recommended a three-phase approach:

> the transfer of Parliament and essential departments to Canberra;
>
> the development of rail connections, engineering works and the establishment of the central administration of other government departments; and
>
> the damming of the Molonglo River and construction of major architectural projects.[30]

The FCAC's role was primarily advisory. Works were undertaken by the executive officers of the Departments of Home & Territories and Works & Railways. Of its three-point approach, the FCAC's principal focus was engineering and infrastructure works. The transfer of Parliament and the major architectural works were delivered by the Federal Capital Commission (FCC, Section 0).

In the early years of the federal capital, the dispersal of construction materials was heavily reliant on a light rail network. In 1921 a rail line connecting Kingston (the rail head for the main line from Queanbeyan) to the Civic Centre was introduced. The line ran parallel with Constitution Avenue, on the approximate alignment of the rail line proposed by the Griffins in their 1911 competition entry. It crossed the River Molonglo on a causeway close to the point where the river now enters the lake. This causeway was damaged irreparably by floodwaters in 1922, dealing a significant blow to the prospects for development in the 'northern' settlement. The tracks of the redundant rail line were taken up in 1940. The alignment of street trees (eucalypts) at the intersection of Amaroo and Coranderrk streets, Reid is a legacy of the rail easement.[31]

Of relevance to the study area is a plan for the Civic Centre prepared in 1921 by FCAC chairman Sir John Sulman, consulting architect. Much as Griffin had anticipated, Sulman's plan for Civic proposed the introduction of retail buildings around the 'outside' of the hexagon, and civic buildings to the 'inside'. He also proposed a serpentine pathway extending north-south across Mount Vernon. The only built outcomes of this plan were the Melbourne and Sydney Buildings at the north of London Circuit. The two-storey colonnaded buildings were built in stages and completed by the FCC in c. 1927. Their colonnaded form was promoted forcefully by Sulman who objected to the varied verandahs of commercial properties common in Australian towns.

St John's Church and the Schoolhouse Museum viewed from the west.

3.0 SUMMARY HISTORY OF THE STUDY AREA

Charles Weston

During the early 1920s, the character of Canberra as a city in the landscape was given form by horticulturalist Thomas Charles George Weston (generally known as Charles). Weston was officer-in-charge of Afforestation (later Parks and Gardens) at the national capital from 1913 to 1926. He was an island of continuity during a period of rapid change in the management and administration of the emerging city.

Weston's challenge, as noted in the *Australian Dictionary of Biography*, was:

> … to create an urban landscape [at the remote, infertile, windy and rabbit infested location] consonant with the capital city to be built at Canberra. He was also expected to establish a local forestry industry. Weston set down on paper his four objectives: to establish a first-class nursery, to raise stocks of plants likely to prove suitable, to reserve all local hilltops and improve their tree cover, and to seek out and procure useful seeds.[32]

His work in Canberra fell into two phases. The first, from 1913 to 1920, was focussed on the establishment of nurseries and plant propagation. The second, from 1920 to 1926, was focussed on planting and landscape development.[33] One of the nurseries was on the south-facing slope of the Molonglo River flood plain near the Lands and Survey Camp at Acton. A larger nursery and arboretum was subsequently established by Weston at Yarralumla. The Acton nursery was submerged by Lake Burley Griffin in the 1960s.

In general, Weston favoured conifers as a key structure planting. In 1917 he stated that three cedars, Deodar, Atlas and Lebanon (*Cedrus deodara, C. atlantica* and *C. libani)* would be useful as the chief arboreal feature of the city.[34] He also pioneered the use of several eucalypts such as Brittle Gum (*Eucalyptus mannifera*) and Argyle Apple (*Eucalyptus cinerea)*.

Weston's approach to formal avenue plantings was to use one predominant species, often adding a smaller scale tree that would give seasonal colour, such as an avenue of Blue Gum (*Eucalyptus bicostata*) with Flowering Cherry Plum (*Prunus cerasifera 'Nigra'*). A variation on this approach was to use a conifer, such as a cypress, cedar or pine, as the major planting. In some instances a Kurrajong (*Brachychiton populneus)* was used as the smaller tree.[35]

Weston planted parks and reserves in a less formal manner. The style of planting employed in these reserves followed the Garden City style, and was a notable departure from Walter Burley Griffin's intentions for the city.[36] Weston would no doubt have been influenced by John Sulman. As noted by the late landscape architect Peter Harrison, author of *Walter Burley Griffin: landscape architect* (1995) Sulman, 'required that Griffin's conception of the capital as a city of monumental buildings be modified, that it should be regarded in the early period of its existence more as a Garden Town, the erection of the permanent buildings being deferred … until economic conditions might be more favourable'.[37]

Early plantings within the study area included street trees to the main avenues around Civic,[38] and formal landscape treatments to Anzac Parade (previously known as Prospect Parkway and Parkway Parade) and City Hill. The original landscaping to Anzac Parade compromised a series of six oval and circular beds arranged within a 183m-wide (660ft) *plaisance* with peripheral tree plantings and oval ends. This layout, including the trees, was removed in the 1960s as part of the formalisation of Anzac Parade as a ceremonial way.[39] The landscaping treatment to City Hill is unusual in being a hybrid of Griffin and Weston's approaches. Griffin prepared a planting scheme for City Hill in 1918. The suitability of some of the species was questioned by Chief Surveyor John Goodwin, and it was decided that the final selection should be left to Weston. As noted by Professor Ken Taylor, in *Canberra, City in the Landscape*:

> Weston maintained the central evergreen structure, replacing some of the pines with a mixture of Roman cypress and False acacia, and the surrounding ovals were changed from cypress to spring flowering and autumn foliage trees and shrubs … Weston partly planted the area focussing on the summit of City Hill and this planting dominated by the dignified sentinel-like Roman cypress and *Pinus radiata*, survives to the present day.[40]

National Triangle: detail of the Griffins' competition entry.

3.0 SUMMARY HISTORY OF THE STUDY AREA

Federal Capital Commission (1925-1930)

The Government established the Federal Capital Commission (FCC), under the *Seat of Government (Administration) Act* of 1924. The immediate task of the FCC was to oversee the relocation of Parliament from Melbourne to Canberra. The FCC was also responsible for the gazettal of the Griffin plan of 1918.

Griffin's plan was, in the main, ignored by the FCC, as was his recommended pattern of settlement. The FCC chose to focus on the delivery of isolated buildings; Griffin's vision had been to concentrate development around the Municipal Axis (Constitution Avenue). The FCC promoted the development of an 'Initial City' to the south of the Molonglo River flood plain, close to the Civic Centre indicated on the Departmental Board plan of 1913; Griffin had recommended that the core of the city be located around Mount Vernon, the Civic Centre indicated on his original competition entry.

The FCC was a dynamic, fast-acting agency which oversaw the first concerted wave of development at Canberra. By the time it was wound up in 1930 development within and around the study area included:

- The Melbourne and Sydney Buildings (predominantly complete by 1927).
- Acton Hotel (1927), which comprises a number of two-storey pavilion-type structures. It was one of several hostels constructed by the government during the 1920s to address the accommodation shortage in Canberra.
- The Reid Housing Precinct, one of a number of Garden City-style housing precincts planned by the FCC.
- Beauchamp House (now Ian Potter House), a two-storey guest house (now offices), also built in 1927.

A 1930 aerial photograph (Figure 18) shows that road alignments at Civic and the Municipal Axis had generally been laid out as per the 1925 plan, but only some of the roads had been sealed. A short stretch of Griffin's Garden Circuit, a gently curving road leading from Constitution Avenue to West Basin and shown on the 1918 plan, was sealed between 1930 and 1950. The pace of development in the northern settlement was significantly behind the 'Initial City' (including the present suburbs of Kingston, Griffith, Barton and Forrest).

A further development at the south of the study area was the presbytery of the Catholic Archbishop (completed in 1931). In 1930 a site to the south of the Civic Centre (east of the present intersection between Parkes and Commonwealth avenues) was granted by the Federal Government to the Catholic Church in perpetuity as the future location of a Catholic Cathedral. The Cathedral was never built; St Christopher's at Manuka had become the primary centre of the Catholic faith in Canberra.[41]

Progress on the lake (or 'ornamental waters') included the gazettal of a plan in November 1925 showing three formal water bodies flanked by two lakes with less rigid boundaries. The following year the Parliamentary Standing Committee on Public Works postponed works to establish the lake. Percy Own also recommended the removal of the West Basin from the scheme.[42]

The development of the national capital slowed during the inter-war and post-war years, to be revitalised under the Liberal Government of Sir Robert Menzies in the late 1950s and early 1960s.

Early post-war development (1945-1960)

Early post-World War II development in Canberra was slow. Prior to the establishment of the National Capital Development Commission (NCDC) in 1958 development north of the Molonglo River included the establishment of the Education Group (Australian National University), from 1945, on a large site extending from the west of Civic to Acton Ridge. This was approximately the site identified for a university by Griffin, although he also anticipated a presence for the university on the lake. Another major introduction to the west of Civic was the Australian Academy of Science (1959), designed by Roy Grounds.

Development in proximity to Constitution Avenue included, in 1947, Mulwala House, a complex of World War II-era timber buildings, and the Canberra Olympic Swimming Pool (1955). The pool was designed by Ian Slater of the Commonwealth Department of works ACT Branch in 1953/54, and was completed in 1955. It was awarded the Sir John Sulman Award for public buildings in New South Wales in 1955. In that year, buildings considered were those in the recreation and sporting class.[43] The complex, which included three pools, a diving board, changing facilities and a manager's residence, was set in a large landscaped setting. At the time of its construction it was anticipated that the pool would form part of 'Central Park,' a 5-acre (2ha) landscaped park.[44] This was never delivered.

At the east end of Constitution Avenue, on the site of Griffin's Market Centre, the Australian-American Memorial was unveiled on 16 February 1953. Significantly, the memorial was sited off-axis, a blow to the potential for the Municipal Axis to be delivered as per Griffin's vision (Figure 22).

Detail of the 1913 plan.

Source: National Library of Australia.

3.0 SUMMARY HISTORY OF THE STUDY AREA

Detail of the 1918 plan.

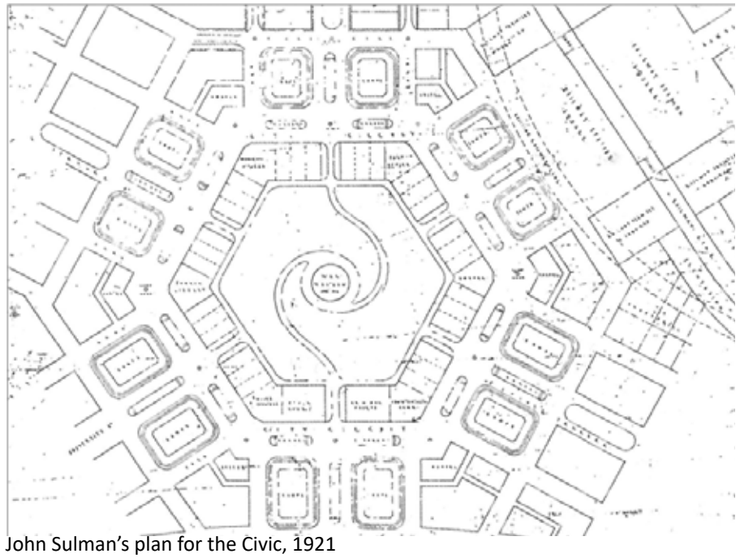
Source: National Library of Australia.

Detail plan of the west end of the Municipal Axis and the Civic Centre prepared by Griffin (1916).

Source: Australian Construction Services (reproduced from Reid, 2002, p. 142).

The Melbourne Building under construction, mid-1920s.

Source: National Library of Australia.



John Sulman's plan for the Civic, 1921

Source: Reproduced from Reid, p. 205.

3.0 SUMMARY HISTORY OF THE STUDY AREA

The National Capital Development Commission

The National Capital Development Commission (NCDC), a Commonwealth Government body established under the *National Capital Development Commission Act,* 1957, oversaw a major phase of development at Canberra. By the time the NCDC was wound up in 1989, the population of Canberra had increased from 38,000 to over 250,000, an outcome –primarily – of the NCDC's commitment to relocating Government departments from Melbourne and Sydney.[45]

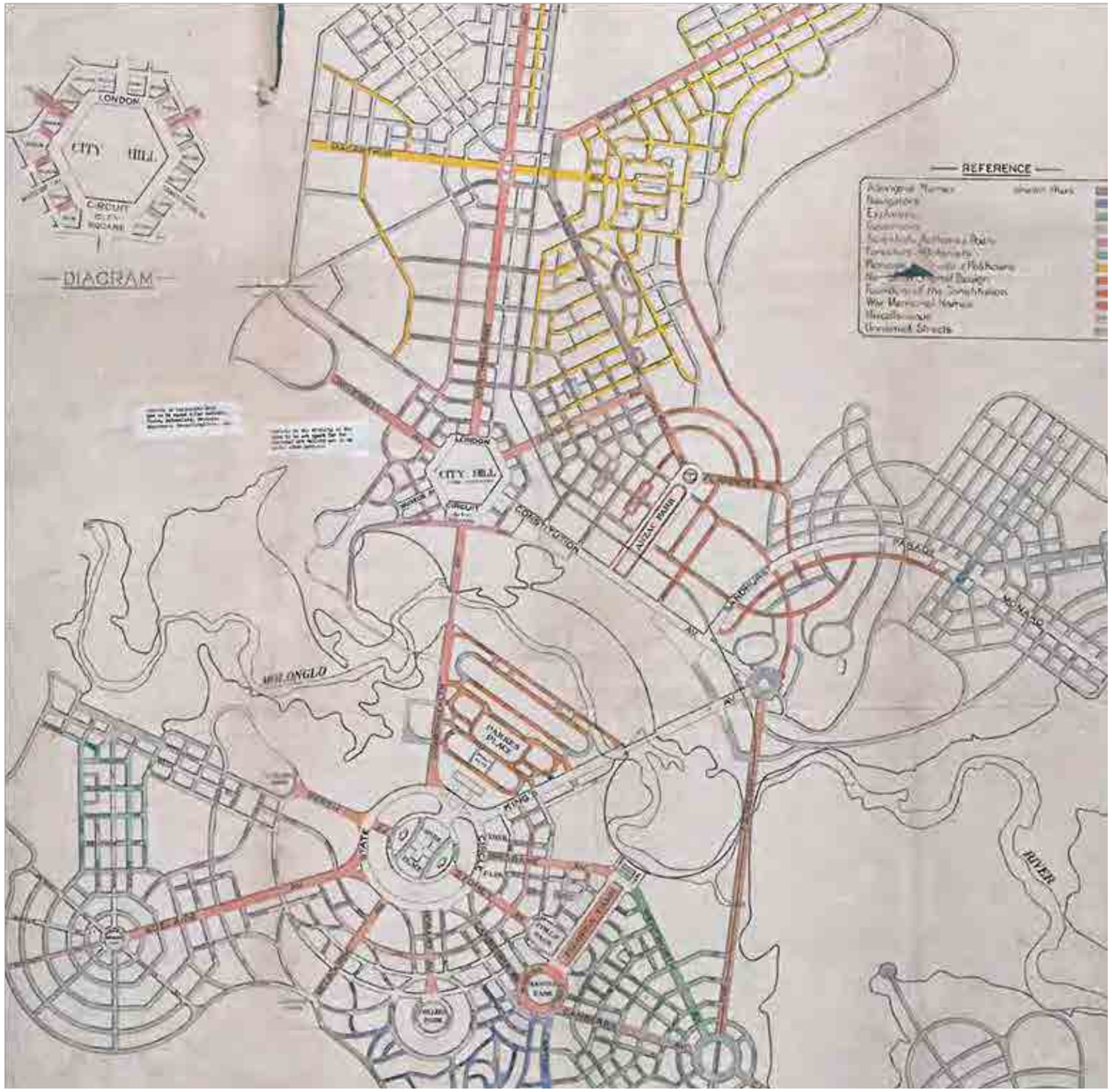
The background to the establishment of the NCDC was a Senate Select Committee (1954-55), which was convened to 'inquire into and report upon the development of Canberra in relation to the original plan and subsequent modifications'.[46] The 76 resolutions in its report (tabled in September 1955) included:

> a commitment to delivering the lake (the Water Axis) as a means of beautifying and unifying the city;
>
> strong opposition to an earlier recommendation by the Public Works Committee for a road through Griffin's public gardens, and the introduction of Griffin's 'cultural group' (museums, theatres, centres of excellence in drama and fine arts and the like) in this location;
>
> support for the development of City Hill (Mount Vernon) for public/civic buildings; and
>
> a reaffirmation of the importance of landscaping / planting as a unifying device in the development of the city.

Another report, commissioned in 1957 by Prime Minister Menzies, became a key document in guiding the future development of Canberra under the NCDC. The report was prepared by British planner Sir William Holford in response to a brief to outline steps for the transformation of Canberra into a true capital city. Holford's paper, *Observations on the Future Development of Canberra, ACT*, was issued in December 1957. The NCDC's response to the document, *Report on Sir William Holford's 'Observations on the Future Development of Canberra, ACT'* accepted the majority of Holford's recommendations

Outcomes of the NCDC report with implications for the study area included:

- The construction of a new east-west road along the north side of the proposed lake (now Parkes Way);
- affirmation that Griffin's Civic Centre would be developed as Canberra's CBD, with rings of civic and commercial buildings around the central hill park and extending north along Northbourne Avenue;
- the creation of the lake (Lake Burley Griffin) to establish Canberra as a unified metropolitan centre rather than two urban areas divided by the Molonglo valley;
- the introduction of a landscaped parkland on the north bank of the lake (Commonwealth Park); and
- the redevelopment of Anzac Parade as a formal ceremonial way leading to the Australian War Memorial, and the extension of Anzac Parade to intersect with Parkes Way; and the construction of buildings at the intersection of Parkes Way and Anzac Parade to frame and accentuate the Anzac Parade vista (the Portal Buildings).



Version of the 1925 gazetted plan with street names.

Source: The Griffin Legacy, National Capital Authority, 2004, p. 17.

3.0 SUMMARY HISTORY OF THE STUDY AREA

Inner-city highways

As part of his drive to establish Canberra as a twentieth century capital city, William Holford was committed to the introduction of a network of major inner-city roads in Canberra. Within and around the study area this included a significant upgrade of Commonwealth Avenue, the west side of the central triangle; the delivery of two bridges spanning the lake (Commonwealth Avenue Bridge and Kings Avenue Bridge); and the introduction of Parkes Way, a major arterial road running approximately east-west in a gentle arc through the north of Griffin's 'Recreation Group'. This was the road so vehemently opposed by the Senate Select Committee of 1955.

In Holford's view, Parkes Way was required because Constitution Avenue was not capable of functioning as the sole east-west link at the north side of Griffin's central triangle. His reasons related in part to the east end of Constitution Avenue not extending to Russell (as envisaged by Griffin), but also to its inability to handle large volumes of traffic due to its relatively narrow dimensions and the large number of intersections which were prohibitive to traffic flow. Griffin had envisaged Constitution Avenue as a dual carriageway with a broad central median. The road was laid out on this basis in the 1920s, and rows of street trees planted in anticipation of the roads being completed. But only the northern carriageway was sealed (as remains the case today). It has been established that the 1920s plantings to Constitution Avenue, comprising False Acacia, Roman Cypress and Lombardy Poplar, have 'all but disappeared'.[47]

Parkes Way was developed from the early 1960s and built in multiple phases. The first extended to Corranderrk Street (Figure 25). Subsequent phases required a cutting at the intersection with Commonwealth Avenue. In addition a road tunnel was cut under the ANU campus (completed in 1977). This has never been used to carry traffic, and is used by the University as climate-controlled storage.[48]

The introduction of Parkes Way was an expression of the post-war dominance of the motor vehicle. It clearly reduced the importance of Constitution Avenue in favour of the newly introduced traffic route, and created a significant barrier between Civic and the lake.

Anzac Parade

The extension of Anzac Parade to the south, and its regrading and redevelopment as a ceremonial way leading to the Australian War Memorial resulted in the removal of the 1922-23 Charles Weston landscape treatment, and its replacement with a broad avenue with three lanes of traffic in each direction, a median finished in crushed brick and three rows of Blue Gums on either side. These now provide a backdrop to the memorials along the length of Anzac Parade. The scheme for Anzac Parade was designed by Gareth Roberts, a former member of Holford's staff in London, and Australian landscape designer Richard Clough. Anzac Parade was officially opened on 25 April 1965 to commemorate the 50th anniversary of the Gallipoli landings.

Built outcomes of Holford's recommendation for the Land Axis to be given greater definition are the two Portal Buildings, also known as Anzac Park East and Anzac Park West. They were designed by Gareth Roberts in collaboration with the Commonwealth Department of Works led by Chief Design Architect Richard Ure. The East Portal Building was completed in 1965; the West Portal Building was completed in 1968. They are almost identical in plan (L-shaped), form and height (five storeys to Anzac Parade and six to Parkes Way). The Portal Buildings are approximately 28m high to the parapet of their six-storey wings. They demonstrate the Stripped Classical style adopted by the NCDC during this period.

Figure 15 - Oblique aerial looking south-east, with the Melbourne and Sydney buildings in the foreground. c. 1949.

Source: National Library of Australia.

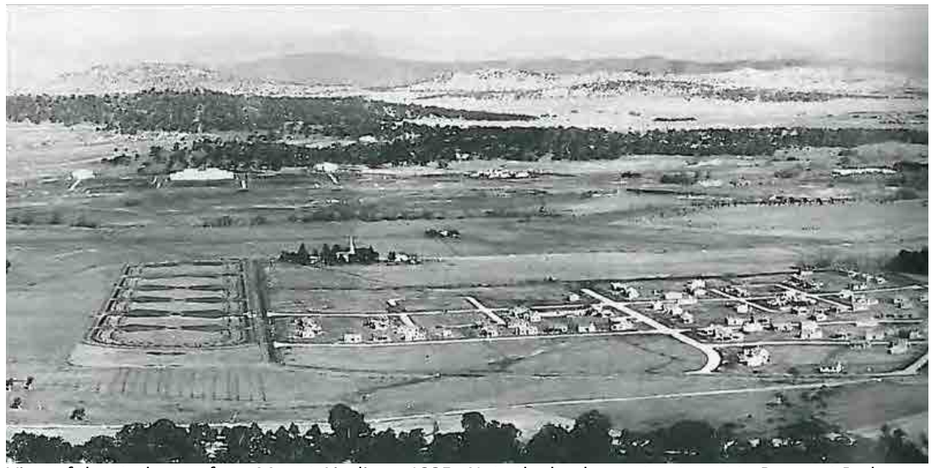
3.0 SUMMARY HISTORY OF THE STUDY AREA

Lake Burley Griffin

Development of the lake was one of William Holford's core recommendations. He saw it as a means of unifying the settlements on either side of the Molonglo River plains. The following summary of investigative and implementation works for the development of Lake Burley Griffin, the two bridges and the lake shore is reproduced from Godden Mackay Logan's *Heritage Assessment of Lake Burley Griffin* (October 2009):

> Holford supported the lakes scheme, albeit in an altered form primarily consisting of the formal central basins with a reduced East Basin, and a reduced but still naturalistic West Lake … Holford's vision included the location of the permanent Parliament House on the southern shore of the central basin.
>
> With full responsibility for the reinstated lake vested in them, and the confidence of the Prime Minister in Canberra as the nation's capital, the NCDC planning team proceeded to execute the Canberra Lakes Scheme with speed … The plan for the Canberra Lakes once again restored West Basin to its larger size [it had been deleted in 1926].
>
> The NCDC followed a three-stage process for the Canberra Lakes Scheme. Firstly, there was investigation work. In 1959 contracts were let for the lake dam and work commenced on the lake bridges to provide a much-needed modern road system. A river/lakes hydraulic model was constructed to test water flows and assess the need to control weeds, algae and mosquitoes. The model suggested the need for islands in parts of the lake to direct water flows, while weeds and insect pests were to be controlled by maintaining a minimum depth of seven feet and appropriate treatment of lake edges. Investigations were made into the geological structure of lake basins and on weir structures. Soil conservation and lake water catchment programs were commenced to avoid silting of the lakebed and discolouration of its waters …
>
> The second stage of the lake project was to shape the results of the initial investigations and have the finalised plans formally accepted. The active political support of Prime Minister Robert Menzies was instrumental in silencing opposition and ensuring that the construction of the lake would occur after decades of doubts and delays.
>
> The third stage was the actual construction where the main agencies involved in the work were William Holford and Associates, Guy Maunsell and Partners, Rankine and Hill (advisors on West Lake) and the Commonwealth Department of Works. William Holford, as part of his firm, provided advice in relation to landscape development in the Central Basins area. His vision did not adhere to Griffin's geometric regularities but towards producing a more naturalistic line. Holford's plans, based on hydraulic flows in the proposed lake, advocated an informal north bank contrasting with a formal straight-sided south bank, similar to Griffin's but with sides splaying back to each bridge. The Central Park, now known as Commonwealth Park, was designed to show off autumn and spring displays of exotic plantings. The Acton area with its hospital buildings was to act as a prominent feature, and as many poplars and other mature trees as possible were to be retained in West Basin. The Parks and Gardens section of the Department of the Interior commenced planting higher ground on the lake margins, especially near Russell, according to this plan.[49]

The Lake reached its full height on 29 April 1964.



View of the study area from Mount Ainslie, c. 1925. Note the landscape treatment to Prospect Parkway (now Anzac Parade) at left of picture.

Source: National Archives of Australia (reproduced from Reid, 2002, p. 154).

Archbishop's residence: west elevation.

View looking south-west from Mount Vernon, c. 1930, with the Hotel Acton (pictured left) and Beauchamp House (right).

Source: National Archives of Australia (reproduced from Reid, 2002, p. 184).

3.0 SUMMARY HISTORY OF THE STUDY AREA

Lakeshore parklands

The following provides a summary of the lakeshore areas in the vicinity of the study, specifically Commonwealth Park, the Rond Terraces and the West Basin shoreline. It draws on the *Heritage Assessment of the Canberra Central Parklands* prepared by Duncan Marshall *et al* in 2007, and should be read in conjunction with 'Urban Analysis' Appendix A to the Urban Strategy document prepared by Jane Irwin Landscape Architecture. King's Park, to the east of the Rond Terraces, is on the periphery of the study area for the Linking Canberra City to the Lake project, and is not anticipated to be impacted by development as a direct outcome of The Griffin Legacy amendments.

Commonwealth Park covers an area of 34.25ha to the west of the north shore of the Central Basin. As noted by Marshall, 'it was established with two intentions: as a place of recreation for city residents, and as a showpiece of national horticultural excellence continuing from the endeavours of Charles Weston. The horticultural aspirations were outlined in a master plan created by [British landscape designer] Dame Sylvia Crowe in 1964-65 but over the years the development of the park has steered more towards the needs for recreation and community events'.[50] The site for the Catholic Cathedral, to the north-west of the park, has been reserved from park development since it was granted to the Catholic Church by the FCC in 1930.

William Holford's vision for the northern shore of the Central Basin as a public park was articulated in an NCDC publication of 1961, *Advisory Report on the Landscape of the Canberra Lake Scheme*. The park was a place of recreation and walking, with open grassed area, a playground for children, a pool, restaurant and music bowl. An inlet (or aquarium pool) was introduced (Nerang Pool), and the Rond Terraces on the Parliament House Vista were to be formally arranged as tiered viewing platforms for spectators to watch events on the water. Marshall notes that, 'The overall landscape aesthetic was to preserve a sense of unity in the design through grouping poplars and willows along the shore with indigenous vegetation on higher ground, while also creating recognisable character for specific internal spaces' .[51] The park was formally named Commonwealth Park in March 1963.

The next phase in the development of the park was the preparation of Dame Sylvia Crowe's Master Plan, which established a set of principles for the area: the primary means of access of circulation was to be by foot, with the main entry being a pedestrian bridge over Parkes Way; there was to be ferry quay below Regatta Point; views and vistas to landmarks of interest were to be framed; a dense row of plantings was to be located to the north of the park, to block out the sight and sound of Parkes Way; and public lighting was to be installed, including underwater lights in Nerang Pool. The Master Plan also included planting plans.

Over the years, Commonwealth Park has become a repository for commemorative plantings and trees donated by overseas dignitaries, including a gift of 200 cherry trees from Japanese Prime Minister Ohira in 1980. It has also become a setting for artworks and memorials. Since 1988, Commonwealth Park has arguably been best known as the venue for the enormously popular annual Floriade spring flower and bulb display.

The landscape for King's Park, to the east of the study area, was designed by NCDC landscape architect Richard Clough in 1959. Marshall notes that it, 'was designed to recall the scale and space of rural Australia …'[52] This provides a contrast with the comparatively picturesque Commonwealth Park, and the formality of the Rond Terraces.

West Basin was identified in the early-1960s as an area suited to boating recreational activities, due presumably to the sense of enclosure created by the Acton Ridge. The West Basin Ferry Terminal was built in 1965. The nominator's entry for Lake Burley Griffin and the Lakeshore Parklands to be included in the National Heritage notes that West Basin was to be kept free of 'non-conforming development'.[53] The meaning of this comment is unclear, and may relate to a preference for development not associated with recreational boating to be avoided. If so, this aspiration has largely been delivered. The only buildings on West Basin are the Ferry Terminal and the National Museum of Australia, at the end of Acton Ridge. The balance of the foreshore has an open park-like character, with trees (primarily natives) planted to the periphery of the space, a sealed pathway and seating areas. There is direct access to the lake edge, which follows the natural contours. Overall, the West Basin foreshore does not have a strongly designed character.

Aerial view of the study area, 1930.

Source: National Archives of Australia (reproduced from Reid, 2002, p. 197).